A1 in Northumberland: Morpeth to Ellingham

Scheme Number: TR010041

6.3 Environmental Statement – Chapter 9 Biodiversity

Part B

APFP Regulation 5(2)(a)

Planning Act 2008

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

June 2020

Infrastructure Planning

Planning Act 2008

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

The A1 in Northumberland: Morpeth to Ellingham

Development Consent Order 20[xx]

Environmental Statement

Regulation Reference:	APFP Regulation 5(2)(a)
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TABLES

9. BIODIVERSITY

9.1. INTRODUCTION

9.1.1. This chapter presents the assessment of likely significant environmental effects of Part B: Alnwick to Ellingham (Part B) on Biodiversity.

9.1.2. The chapter is informed by baseline surveys for protected and notable species, habitats and designated sites (refer to **Appendices 9.1** to **9.10, Volume 8** of this Environmental Statement (ES) (**Application Document Reference: TR010041/APP/6.8**)), **Appendix 7.1: Arboricultural Survey, Volume 8** and **Appendix 9.11: Biodiversity No Net Loss Assessment Report, Volume 8** of this ES). A full account of baseline conditions is presented in **Appendices 9.1** to **9.10, Volume 8** of this ES to support this chapter, with summarised baseline conditions provided in **Section 9.7** of this chapter.

9.1.3. A full description of Part B along with the Scheme as a whole is provided in **Chapter 2: The Scheme, Volume 1** of this ES (**Application Document Reference TR010041/APP/6.1**). An assessment of combined effects of Part B is set out in **Chapter 15: Assessment of Combined Effects** of this ES and combined and cumulative effects of the Scheme are set out in **Chapter 16: Assessment of Cumulative Effects, Volume 4** of this ES (**Application Document Reference: TR010041/APP/6.4**).

9.1.4. **Section 4.3** of **Chapter 4: Environmental Assessment Methodology, Volume 1** of this ES (**Application Document Reference: TR010041/APP/6.1**) identifies any differences in the assessment methodology employed for Part A: Morpeth to Felton (Part A) and Part B. Further to this, there are other differences between the chapters for Part A and Part B. All key differences include:

a. There are differences between Part A and Part B that relate to the scoping process, for example elements that are scoped in and out of the assessment. Refer to the **Scoping Report** (**Application Document Reference: TR010041/APP/6.10**) and **Scoping Opinion** (**Application Document Reference: TR010041/APP/6.12**) for Part A, and the **Scoping Report** (**Application Document Reference: TR010041/APP/6.11**) and **Scoping Opinion** (**Application Document Reference: TR010041/APP/6.13**) for Part B.

b. There are several differences in survey areas between Part A and Part B, for example Part A has a Phase 1 survey of 500 m and Part B is 50 m. Survey distances for Part A were identified by the Applicant prior to selection of the preferred option and therefore allowed for potential changes in the Part A alignment and design. Part B surveys were undertaken at a later stage when the alignment was well defined, which allowed survey distances to be refined. However, Natural England have been consulted for Part A and Part B (separately) and no concerns were raised.

c. The Part A appendices are baseline reports presenting results only, and the impact assessment is presented in full within **Chapter 9: Biodiversity, Volume 2** of this ES (**Application Document Reference: TR010041/APP/6.2**). The Part B appendices present full baseline results, potential impacts, mitigation and significance of effect. This is then summarised in this chapter. However, the same level of information is presented for Part A and Part B and there is therefore no difference in the level of assessment.

d. Part A includes an assessment of the nitrogen deposition on designated sites. Part B does not as there are no designated sites within the defined study area.

e. Part A considers the potential impacts upon brown hare and hedgehog. Part B does not consider these species as it would be a predominantly online scheme within minimal land take of roadside habitat. This approach has been agreed with Natural England.

9.2. COMPETENT EXPERT EVIDENCE

9.2.1. **Table 9-1** below demonstrates that the professionals contributing to the production of this chapter have sufficient expertise to ensure the completeness and quality of this assessment.

Table 9-1 - Relevant Experience

Name	Role	Qualifications and Professional Membership	Experience
David Chatterton	Author	Bachelor of Science (Honours) Member of the Chartered Institute of Ecology and Environmental Management (CIEEM)	Associate Over seven years' experience in ecological consultancy and impact assessment. Other relevant experience includes: - Ecological coordinator, author and collaborator for A9 Dalraddy to Slochd Dualling scheme ES; - Ecological coordinator for A9 – Tomatin to Moy Dualling scheme; - Delivery of a number of other major infrastructure schemes including renewables and OHL - Extensive pre-construction and construction site presence as Ecological Clerk of Works (ECoW) as both Principal Contractor ECoW and audit capacity
Andy Bascombe	Reviewer / Approver	Bachelor of Science (Honours) Master of Science Doctor of Philosophy	Environmental Technical Director 28 years' experience in ecological consultancy and impact assessment. Other recent relevant experience includes:

Name	Role	Qualifications and Professional Membership	Experience
		Member of the Chartered Institute of Ecology and Environmental Management (MCIEEM) Member of the Chartered Institute of Water and Environmental Management (MCIWEM) Chartered Scientist Chartered Environmentalist	- Delivery of numerous road schemes including the M1, M4, M6, M9, M18, M25, M27, M42, A249, A27, A5 Northern Ireland and other major infrastructure schemes.

9.3. LEGISLATIVE AND POLICY FRAMEWORK

LEGISLATIVE FRAMEWORK

International

9.3.1. The applicable international (European) legislation includes the following:

a. Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora 1992 (the Habitats Directive), transposed to the Conservation of Habitats and Species Regulations 2017 (as amended).
b. Council Directive 2009/147/EC on the Conservation of Wild Birds (2009) (the Birds Directive), transposed to the Conservation of Habitats and Species Regulations 2017 (as amended).

9.3.2. These Directives are transposed into national legislation through The Conservation of Habitats and Species Regulations 2017 (as amended) (**Ref. 9.1**), see below.

National

9.3.3. The applicable legislative framework includes:

The Conservation of Habitats and Species Regulations 2017 (as amended) (Ref. 9.1)

9.3.4. The Conservation of Habitats and Species Regulations 2017 consolidate the Conservation of Habitats and Species Regulations 2010 with subsequent amendments. The Regulations transpose Council Directive 92/43/EEC, on the conservation of natural habitats and of wild fauna and flora (EC Habitats Directive), into national law. They also transpose elements of

the EU Wild Birds Directive in England and Wales. The Regulations are transposed through a combination of the Habitats Regulations 2010 (in relation to reserved matters) and the Conservation (Natural Habitats &c.) Regulations 1994.

9.3.5. All species listed under Annex IV of the Habitats Directive require strict protection and are known as European Protected Species (EPS). Under Regulation 42 of the Habitats Regulations it is unlawful to: Deliberately kill, capture or disturb; Deliberately take or destroy the eggs of; and Damage or destroy the breeding site/resting place of any species protected under this legislation.

9.3.6. If it is determined that impacts upon an EPS are unavoidable then the works may need to be carried out under a site-specific mitigation licence from Natural England. Low Impact Class Licences are also available in England for bats and great crested newts. This enables 'Registered Consultants' to undertake certain low impact activities reducing the EPS application paperwork and process length.

9.3.7. Certain EPS are also listed under Annex II of the Habitats Directive and are afforded protection by the establishment of core areas of habitat known as Special Areas of Conservation. This means these species are a relevant consideration in a Habitats Regulations Assessment (HRA).

9.3.8. The Birds Directive seeks to maintain populations of all wild bird species across their natural range (Article 2). All bird species listed under Annex I of the Birds Directive are rare or vulnerable and afforded protection by the classification of Special Protection Areas (SPAs) or Ramsar, these are also designated under all regularly occurring migratory species, with regard to the protection of wetlands of international importance (Article 4). This means these bird species and communities are a relevant consideration in HRA.

Wildlife and Countryside Act 1981 (as amended) (Ref. 9.2)

9.3.9. Protected birds, animals and plants are listed under Schedules 1, 5 and 8 respectively of the Wildlife and Countryside Act 1981 (WCA).

9.3.10. Birds listed under Schedule 1 of the WCA are afforded additional protection with regard to intentional or reckless disturbance whilst nest-building, or at a nest containing eggs or young, or disturb the dependent young of such a bird.

9.3.11. Species listed in Schedule 5 can either be fully protected or be partially protected under Section 9, which makes it unlawful to intentionally: kill, injure or take; possess or control (live or dead animal, part or derivative); damage or destruct any structure used for shelter or protection; disturb them in a place of shelter or protection; obstruct access to place of shelter or protection; sell, offer for sale, possess or transport for the purpose of sale (live or dead animal, part or derivative); and advertise for buying or selling.

9.3.12. The Act makes it an offence (subject to exceptions) to pick, uproot, trade in, or possess (for the purposes of trade) any wild plant listed in Schedule 8.

9.3.13. Invasive species listed under Schedule 9 are prohibited from release into the wild and the Act prohibits planting or "causing to grow" in the wild of any plant species listed in Schedule 9. It should be noted that certain bird species listed on Schedule 1 of the WCA are also

listed on Schedule 9 to prevent release of non-native and captive individuals, this includes barn owl, red kite, goshawk and corncrake.

9.3.14. Under the WCA, all birds, their nests and eggs (with exception of species listed under Schedule 2) are protected by the WCA.

Natural Environment and Rural Communities Act 2006 (Ref. 9.3)

9.3.15. Species and Habitats of Principal Importance are listed under Section 41 of the Natural Environment and Rural Communities Act 2006 (NERC). Section 41 lists species that are of principal importance for the conservation of biodiversity in England and Wales and should be used to guide decision-makers such as local and regional authorities when implementing their duty to have regard for the conservation of biodiversity in the exercise of their normal functions, as required under Section 40 of the NERC Act 2006.

Countryside and Rights of Way Act 2000 (Ref. 9.4)

9.3.16. The Countryside and Rights of Way (CRoW) Act has amended the WCA in England and Wales strengthening the protection afforded to Sites of Special Scientific Interest (SSSI) and the legal protection for threatened species. It adds the word 'reckless' to the wording of the offences listed under Section 9(4) of the WCA. This alteration makes it an offence to recklessly commit an offence, where previously an offence had to be intentional to result in a breach of legislation.

Wild Mammals (Protection) Act 1996 (Ref. 9.5)

9.3.17. The Wild Mammals (Protection) Act provides protection for wild mammals against certain acts of deliberate harm. 'Wild mammal' means any mammal which is not a "protected animal" within the meaning of the Animal Welfare Act 2006 (Schedule 3, Section 13 of the 2006 Act). The following offences are specified in relation to any wild mammal: to mutilate, kick, beat, nail or otherwise impale, stab, burn, stone, crush, drown, drag or asphyxiate. The offences require proof of intent to inflict unnecessary suffering.

Protection of Badgers Act 1992 (Ref. 9.6)

9.3.18. It is an offence to wilfully take, kill, injure, possess or ill-treat a badger. Under the Protection of Badgers Act 1992 their setts are protected against intentional or reckless interference. Sett interference includes damaging or destroying a sett, obstructing access to any part of the sett, or disturbance of a badger whilst it is occupying a sett. The Act defines a badger sett as 'any structure or place, which displays signs indicating the current use by a badger' and Natural England takes this definition to include seasonally used setts that are not occupied but that show sign of recent use by badgers (**Ref. 9.7**).

The Hedgerows Regulations 1997 (Ref. 9.8)

9.3.19. 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. Should the hedgerow be deemed unimportant according to the criteria within the Regulations the LPA is obliged to allow removal; however, 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.

PLANNING POLICY

National

9.3.20. In addition to the legislative provision described above, planning policy at a national level is informed by the following:

a. National Policy Statement for National Networks (NPS NN) (**Ref. 9.9**).
b. National Planning Policy Framework 2019 (NPPF) (**Ref. 9.10**).
c. Highways England Biodiversity Action Plan (**Ref. 9.11**).
d. Office of the Deputy Prime Minister (ODPM). Government Circular - Biodiversity and Geological Conservation - Statutory Obligations and their Impacts within the Planning System (**Ref. 9.12**)

9.3.21. An overview of the relevant policy objectives is provided in **Table 9-2** below. The table makes comment on the policy objective with regards to the likely significant effects of Part B.

Local

9.3.22. Planning policy at the local level is informed by the following:

a. Northumberland Consolidated Planning Policy Framework May 2019 (**Ref. 9.13**) and
b. Northumberland Local Plan – Draft Plan for Regulation 19 Consultation (**Ref. 9.14**).
c. Northumberland Local Biodiversity Action Plan (LBAP) (**Ref. 9.15**).

9.3.23. Under the Northumberland Consolidated Planning Policy Framework, the following local plans are applicable to Part B:

a. Former Alnwick District Local Development Framework (**Ref. 9.16**).

9.3.24. The following local policies are applicable to Part B. An overview of the relevant policy objectives is provided in **Table 9-3** below. The table makes comment on the policy objective with regards to the likely significant effects of Part B (presented in **Section 9.10**).

Table 9-2 - National Planning Policy Relevant to Biodiversity

Policy	Relevant Policy Objectives	Significance of Part B on Policy Objective
National Policy Statement for National Networks (NPS NN)	The NPS NN sets out the Government's policies to deliver nationally significant infrastructure projects on the national road networks in England. Relevant sections include the requirement: - To detail likely significant effects on internationally, nationally and locally designated sites of ecological importance, protected species, habitats and other species identified as being of principal importance for the conservation of biodiversity within an Environmental Impact Assessment (EIA). - The statement considers the full range of potential impacts on ecosystems. - The Applicant should show how the project has taken advantage of opportunities to conserve and enhance biodiversity and geological conservation interests.	This chapter, and therefore Part B, adheres to the NPS NN requirements. Part B takes into consideration appropriate ecological receptors, with reference to the NPS NN. This chapter provides mitigation requirements for Part B, including avoidance measures and enhancement opportunities.
National Planning Policy Framework 2019 (NPPF)	The NPPF forms the basis for planning decisions with respect to conserving and enhancing the natural environment. Paragraph 170 of the NPPF sets out, amongst other points, how at an overview level the planning system *"should contribute to and enhance the natural and local environment by*: - *… minimising impacts on and providing net gains for biodiversity, including by establishing coherent ecological networks that are more resilient to current and future pressures…"* A list of principles that local planning authorities should follow when determining planning applications is included in paragraph 175 of the NPPF. They include the following: - *"if significant harm resulting from a development cannot be avoided…adequately mitigated, or, as a last resort, compensated for, then planning permission should be refused;* - *…development resulting in the loss or deterioration of irreplaceable habitats (such as ancient woodland …) should be refused., unless there are wholly exceptional reasons and a suitable compensation strategy exists; and* - *…opportunities to incorporate biodiversity improvements in and around developments should be encouraged."*	This chapter details design, avoidance, mitigation and compensation in order to minimise impacts on biodiversity, in line with the NPPF requirements. Opportunities for enhancement are also identified. In addition, Part B does not result in the loss or deterioration of irreplaceable habitat, in compliance with the NPPF. Adequate and appropriate mitigation has been included within this assessment and its supporting appendices (refer to **Appendices 9.1** to **9.10**, **Volume 8** of this ES (**Application Document Reference: TR010041/APP/6.8**)).
Highways England Biodiversity Action Plan	The Highways England Biodiversity Action Plan sets out targeted outcomes, which include: - **Outcome 1**: Highways England and our suppliers are equipped to produce good biodiversity performance - **Outcome 2**: The Strategic Road Network is managed to support biodiversity - **Outcome 3**: We have delivered biodiversity enhancements whilst implementing a capital programme of network improvement - **Outcome 4**: We have addressed the legacy of biodiversity problems on our network via a targeted programme of investment - **Outcome 5**: We are fully transparent about our biodiversity performance	The design, avoidance and mitigation measures detailed within this chapter work towards achieving the action plan outcome targets.

Policy	Relevant Policy Objectives	Significance of Part B on Policy Objective
ODPM Government Circular	This Circular: - "Provides administrative guidance on the application of the law relating to planning and nature conservation as it applies in England (...)" - Defines that habitats or species listed as priorities in the UK Biodiversity Action Plan (BAP), and by Local Biodiversity Partnerships can be considered a material consideration in the preparation of regional spatial strategies and local development documents and the making of planning decisions. - Details the local planning authorities' duties regarding trees, woodlands and hedgerows.	Part B takes into consideration priority habitats and species at both a national and local level, Part B also appropriately considers hedgerows, trees and woodland; including ancient woodland.

Table 9-3 – Local Planning Policy Relevant to Biodiversity

Local Policy Reference	Policy Overview	Significance of Part B on Policy Objective
Former Alnwick District Local Development Framework		
S3 – Sustainability criteria	"*Before allocating sites or granting planning permission for new development, the district council will need to be satisfied that the following sustainability criteria are met: …* *That there would be no significant adverse effects on the natural resources, environment, biodiversity and geodiversity … assets of the district …* *In exceptional circumstances, when … environmental benefits to the district clearly outweigh sustainability shortcomings, it may be necessary to allow development which does not meet … the above sustainability criteria. In such cases it will be appropriate, through the use of conditions and/or agreements, to secure adequate mitigation measures or, if these are not possible, compensatory measures to offset any negative impacts*."	Part B has been designed to avoid and mitigate impacts to the environment and biodiversity where possible. Mitigation has been developed as part of Part B to address potential impacts to biodiversity in accordance with the Policy, as detailed within **Appendices 9.1** to **9.10**, **Volume 8** of this ES (**Application Document Reference: TR010041/APP/6.8**). This mitigation also contributes to the conservation and, where possible, enhancement of natural assets. Overall, no significant adverse effects to ecological receptors are predicted. Therefore, it is considered that Part B adheres to the policy.
S12 – Protecting and enhancing biodiversity and geodiversity	*"All development proposals will be considered against the need to protect and enhance the biodiversity and geodiversity of the district, especially those areas designated as of international, national and local importance. All proposals will be assessed in terms of their impact on the interests of the site and on habitats and species present.* *In all cases where development involves key habitats as defined in the Northumberland Biodiversity Action Plan, it must result in no net loss of or fragmentation of biodiversity value and the developer will be required to carry out and maintain appropriate mitigation measures informed by the Northumberland BAP."*	Part B would not result in significant effects to protected sites of international, national or local importance. Mitigation and compensation have been developed as part of Part B to address potential impacts to protected species, including the provision of EPS licences as necessary. In addition, a biodiversity no net loss assessment has been undertaken to quantify the impact of Part B on biodiversity as presented within **Appendix 9.11: Biodiversity No Net Loss Assessment Report**, **Volume 8** of this ES (**Application Document Reference: TR010041/APP/6.8**) and summarised within **Section 9.9**. Therefore, it is considered that Part B adheres to the policy.

Local Policy Reference	Policy Overview	Significance of Part B on Policy Objective
S16 – General design principles	Proposals should take full account of the need to protect and enhance the local environment.	Opportunities for enhancement have been identified within this chapter, in accordance with this Policy (refer to **Section 9.9**).
Northumberland Draft Local Plan		
STP 3 – Sustainable development	Development proposals are expected to deliver across the range of the economic, social and environmental factors and adhere to a set of guiding principles surrounding contribution to the environmental assets and mitigation of anticipated impacts.	Mitigation has been developed as part of Part B to address potential impacts to biodiversity, ecosystems, water resources and the natural environment in accordance with the Policy. This mitigation also contributes to the conservation and, where possible, enhancement of natural assets. Therefore, it is considered that Part B adheres to the policy (refer to **Section 9.9**).
STP 6 – Green infrastructure	Development proposals should seek to protect, improve and extend Northumberland's green infrastructure.	The landscape design for Part B has incorporated linear and connective habitat throughout to maintain and, where possible, improve connectivity of habitats and green infrastructure. This has included, where possible: retention of habitats, reinstatement following potential temporary loss during construction and compensation for habitats of principal importance. Connectivity has also been considered within the ecological mitigation plan, informing the design of Part B, such as maintaining passage for fish and mammals through culverts. Therefore, it is considered that Part B adheres to the policy (refer to **Section 9.9**).
QOP 1 – Design principles	Proposals will be supported where design respects and enhances the natural and built environment and incorporates green infrastructure and opportunities to support wildlife and contribute to net gains for biodiversity.	Part B incorporates mitigation and green infrastructure to support wildlife and a biodiversity assessment has been undertaken to understand the impacts of Part B in the context of achieving no net loss of biodiversity. Therefore, it is considered that Part B adheres to the policy (refer to **Section 9.9**, and **Appendix 9.11: Biodiversity No Net Loss Assessment Report**, **Volume 8** of this ES (**Application Document Reference: TR010041/APP/6.8**)).
ENV 1 - Approaches to assessing the impact of development on the natural, historic and built environment	The character and significance of natural, historic and built environments will be conserved, protected and enhanced through a set of guiding principles.	The significance, character and function of ecological assets has been considered and used to inform the impact assessment, recognising that assets with a lower designation may still be irreplaceable. Of importance is the consideration of ancient woodland and the impacts of Part B, which are discussed within this chapter. The mitigation hierarchy has been applied to address potential impacts, including avoidance, mitigation compensation and enhancement. Therefore, it is considered that Part B adheres to the policy.
ENV 2 - Biodiversity and geodiversity	Adverse impacts affecting biodiversity and geodiversity will be minimised and net gains for biodiversity sought. This will be secured by: - Avoiding significant harm through location and/or design. Where significant harm cannot be avoided, applicants will be required to demonstrate that	Part B incorporates mitigation to minimise adverse impacts on biodiversity and opportunities for enhancement have been identified within this chapter. A biodiversity assessment has been undertaken to understand the impacts of Part B in the context of achieving no net loss of biodiversity. In addition, ecological enhancements have been considered. Therefore, it is considered that Part B

Local Policy Reference	Policy Overview	Significance of Part B on Policy Objective
	adverse impacts will be adequately mitigated or, as a last resort compensated for. - Securing net biodiversity gains and/or wider ecological enhancement through new development.	adheres to the policy (refer to **Section 9.9** and **Appendix 9.11: Biodiversity No Net Loss Assessment Report**, **Volume 8** of this ES (**Application Document Reference: TR010041/APP/6.8**)).

9.4. ASSESSMENT METHODOLOGY

SCOPE OF ASSESSMENT

9.4.1. The scope of the assessment is to consider the likely effects of Part B upon sensitive ecological receptors within the Study Areas (defined in **Section 9.6** below) and in the wider area (where appropriate) identified during baseline surveys and data collection.

9.4.2. The zone of influence for each ecological receptor is defined by the pathways available for an impact, either directly or indirectly, to result in a potential effect upon the habitat and/or species.

9.4.3. The following ecological receptors were scoped in within the **Scoping Report** (**Application Document Reference: TR010041/APP/6.11**), and are within the scope of this assessment:

a. Habitats of Principal Importance (HPI)[1] within Part B
b. Protected and notable species, including Species of Principal Importance (SPI)[2], which include:
   i. Great crested newt *Triturus cristatus*
   ii. Bats
   iii. Badger Meles meles
   iv. Barn owl *Tyto alba*
   v. Breeding birds
   vi. Wintering birds
   vii. Reptiles
   viii. Red squirrel Scuirus vulgaris
   ix. Water vole Arvicola amphibius
   x. Otter Lutra lutra
   xi. Fish;
   xii. White clawed-crayfish Austropotamobius pallipes
   xiii. Aquatic macroinvertebrates
   xiv. Invasive non-native species

9.4.4. Subsequent to the **Scoping Report** (**Application Document Reference: TR010041/APP/6.11**), the following ecological receptors are also scoped into this assessment due to their proximity to Part B Main Scheme Area, Lionheart Enterprise Park Compound and Main Compound:

a. Longhoughton Quarry SSSI
b. Hulne Park Local Wildlife Site (LWS)
c. Littlemill Quarries LWS
d. Ratcheugh Crag-Pepper Moor LWS

[1] Habitats listed under section 41 of the Natural Environment and Rural Communities (NERC) Act 2006 – Section 41

[2] Species listed under section 41 of the Natural Environment and Rural Communities (NERC) Act 2006 – Section 41

e. Cawledge Burn LWS
f. River Coquet and Coquet Valley Woodlands SSSI
g. Coquet River Felton Park LWS
h. Ancient woodland

9.4.5. Additionally, terrestrial invertebrates are scoped into this assessment as a result of the scoping response from the Planning Inspectorate. An assessment in relation to ecological receptors and impacts arising as a result of air quality is also scoped into the assessment.

9.4.6. An account of those ecological receptors scoped out from assessment is presented in the **Scoping Report** (**Application Document Reference: TR010041/APP/6.11**).

9.4.7. An assessment in relation to Part B and European designated sites is presented separately in the **Habitats Regulations Assessment** (**Application Document Reference: TR010041/APP/6.14**).

CONSULTATION

9.4.8. The following organisations were contacted for their comments on Part B, baseline surveys, and mitigation proposals:

a. Natural England
b. Environment Agency
c. Northumberland County Council (NCC) – County Ecologist
d. Forestry Commission

9.4.9. To date, Natural England, Forestry Commission and the Environment Agency have responded to consultation engagement.

Natural England

9.4.10. In response to the **Scoping Report** (**Application Document Reference: TR010041/APP/6.11**) for Part B, Natural England agreed that impacts to nationally and internationally designated sites can be scoped out, but also noted that a Habitats Regulations Screening Assessment would be produced (documented within the **Habitats Regulations Assessment** (**Application Document Reference: TR010041/APP/6.14**)).

9.4.11. Natural England also referred to their standing advice with respect to surveys for protected species and habitats, guidelines for Ecological Impact Assessment developed by the CIEEM and general advice in relation to how the ecological impact assessment should be undertaken.

9.4.12. Natural England were contacted for comment on the proposals for Part B and the approach to Environmental Assessment and HRA. Following a meeting on the 11 December 2019 to discuss the approach to ecological receptor assessments and surveys, and proposed mitigation, Natural England provided written confirmation and feedback that they were satisfied with the approach presented and discussed.

9.4.13. Natural England agreed with the proposed mitigation approach for the translocation of bat boxes containing regionally important Natterer's bat *Myotis nattereri* maternity roosts to adjacent woodland, with an associated post-translocation monitoring strategy (refer to

Appendix 9.5: Bat Report, **Volume 8** of this ES (**Application Document Reference: TR010041/APP/6.8**)). Further, Natural England also agreed to the approach and proposed mitigation associated with the demolition of Charlton Mires Farm and East Cottage.

9.4.14. Natural England also agreed to the approach and conclusions of the impact assessment in relation to European sites, as presented in the **Habitats Regulations Assessment** (**Application Document Reference: TR010041/APP/6.14**). The HRA concludes that there are no likely significant effects to European sites as a result of Part B.

9.4.15. A full account of the matters discussed, resolved and agreed is evidenced in **Appendix 4.2: Environmental Consultation**, **Volume 1** of this ES (**Application Document Reference: TR010041/APP/6.1**).

Environment Agency

9.4.16. Details pertaining to ecological matters discussed with the Environment Agency are presented below. Consultation for other relevant matters (such as flood risk) is presented within **Chapter 10: Road Drainage and the Water Environment** of this ES.

9.4.17. In response to the **Scoping Report** (**Application Document Reference: TR010041/APP/6.11**) for Part B, the Environment Agency stated that in the absence of the full suite of surveys [at the time], comment could not be provided on any additional assessments. However, the Environment Agency did confirm that the level of assessments documented within the **Scoping Report** for Part B were thorough and methodology did not raise any concerns. The Environment Agency also confirmed that the statutory designated sites included in the scope are sufficient. Furthermore, the Environment Agency stated that habitats and species of importance appeared to be assessed at an appropriate level for the Scoping stage, although would expect a full suite of species surveys to be undertaken as part of the DCO submission.

9.4.18. During the assessment, the Environment Agency was consulted with regards matters of the water environment and permissions/consents to undertake aquatic ecology surveys.

9.4.19. Discussions were held regarding consent for the undertaking of electro-fishing surveys of the Shipperton Burn as part of the suite of surveys required to inform this assessment. Correspondence pertaining to receiving such consent is detailed within **Appendix 4.2: Environmental Consultation**, **Volume 1** of this ES (**Application Document Reference: TR010041/APP/6.1**).

Forestry Commission

9.4.20. In response to the **Scoping Report** (**Application Document Reference: TR010041/APP/6.11**) for Part B, the Forestry Commission confirmed that they are "*essentially satisfied"* with what has been scoped in and out, as well as the level of assessment (in relation to methodology). The Forestry Commission sought confirmation that the desk study for ancient woodland was carried out using the Natural England's Ancient Woodland Inventory; this tool has been used to inform the assessment and identify areas of woodland within the Study Area (as identified in **Section 9.6** of this chapter).

METHODOLOGY

Guidance

9.4.21. The ecological assessment has been undertaken using the approach detailed in the CIEEM Guidelines for Ecological Impact Assessment (**Ref. 9.17**) and Interim Advice Note 130/10 (IAN 130/10) (**Ref. 9.18**), which supplements the Design Manual for Roads and Bridges (DMRB) Volume 11, Section 3, Part 4 (**Ref. 9.19**).

9.4.22. In order to characterise and assess the impacts of Part B, IAN130/10 (**Ref. 9.18**) has been used, building on existing advice as set out in DMRB Volume 11, Section 3, Part 4 (**Ref. 9.19**).

9.4.23. In addition to the guidance detailed above, the assessment of ecological impacts has been undertaken in accordance with the following guidance:

a. Natural England Standing Advice on ancient woodland and veteran trees (**Ref. 9.20**)
b. DMRB Volume 10 Section 4 Nature Conservation (**Ref. 9.21**)
c. IAN 125/15: Environmental Assessment Update (**Ref. 9.22**)
d. Best Practice in Enhancement of Highways Design for Bats (March 2006) (**Ref. 9.23**)
e. IAN 116/08 Nature Conservation Advice in Relation to Bats (October 2008) (**Ref. 9.24**)
f. IAN 174/13: Updated advice for evaluating significant local air quality effects for users of DMRB Volume 11, Section 3, Part 1 Air Quality (HA 207/07) (**Ref. 9.25**)

Updated DMRB Guidance

9.4.24. Since the assessments reported in this ES were completed, a number of DMRB guidance documents have been superseded and replaced with revised guidance. For Biodiversity, the guidance documents listed in **paragraph 9.4.23** above were used in the preparation of this assessment.

9.4.25. These guidance documents have been superseded by the following updated DMRB guidance, released between July 2019 and January 2020:

a. DMRB LA 101 Introduction to environmental assessment (**Ref. 9.26**) (superseded IAN 125/15)
b. DMRB LA 103 Scoping projects for environmental assessment (**Ref. 9.27**) (superseded IAN 125/15)
c. DMRB LA 104 Environmental assessment and monitoring (**Ref. 9.28**) (superseded IAN 125/15)
d. DMRB LA 105 Air Quality (**Ref. 9.29**) (superseded IAN 174/13)
e. DMRB LA 108 Biodiversity (**Ref. 9.30**) (superseded DMRB Volume 11 Section 3 Part 4 and IAN 130/10)
f. DMRB LD 118 Biodiversity design (**Ref. 9.31**) (superseded DMRB Volume 10 Section 4)

9.4.26. To determine the implications of the updated guidance to the conclusions of the ES, a sensitivity test has been undertaken to identify key changes in the assessment methodology and determine whether there would be changes to the significant effects reported in this ES if the updated guidance had been used for the assessment.

9.4.27. The sensitivity test has determined that the application of the updated guidance would change the assessment in relation to operational effects from air quality only, as a result of LA 105 Air Quality (**Ref. 9.29**). With the exception of LA 105 Air Quality, the other updated DMRB guidance documents listed in **paragraph 9.4.25** above are less prescriptive in their requirements regarding methodologies and approach to mitigation when compared to the former guidance. The updated DMRB guidance primarily references best practice, CIEEM guidelines and standing advice, which were used to inform the assessment presented within this chapter. As such, with the exception of LA 105 Air Quality, the conclusions of the assessment in relation to potential impacts and their likely significance would remain unchanged with the application of the updated guidance.

9.4.28. The findings of the biodiversity sensitivity test are summarised in **Section 9.10** of this chapter and in **Appendix 4.5: DMRB Sensitivity Test**, **Volume 1** of this ES (**Application Document Reference: TR010041/APP/6.1**), and a full assessment in relation to operational air quality is presented in **Appendix 9.12: Biodiversity DMRB Sensitivity Test**, **Volume 8** of this ES (**Application Document Reference: TR010041/APP/6.8**).

Desk Study

9.4.29. A desk study was undertaken between September and December 2019. The desk study reviewed existing ecological baseline information within the last 10 years available in the public domain and obtained information held by relevant third parties in relation to Part B. This included records of protected sites (local, national and international) and protected/ notable species. The desk study data and sources consulted are described fully within the supporting appendices to this assessment (**Appendices 9.1** to **9.10**, **Volume 8** of this ES (**Application Document Reference: TR010041/APP/6.8**)).

9.4.30. Data was sought from the following sources:

a. National Biodiversity Network – NBN Gateway
b. Environment Agency
c. The Multi-Agency Geographic Information for the Countryside (MAGIC)
d. Google Maps
e. Alnwick and District Natural History Society
f. Alnwick Wildlife Group
g. Environmental Records Information Centre (ERIC) North East
h. North East England Butterfly Conservation
i. Northumberland Moth Group
j. Northumberland Bat Group
k. Northumberland Badger Group
l. North East Reptile and Amphibian Group
m. Northumberland and Tyneside Bird Club (NTBC)

Field Surveys

9.4.31. An extended Phase 1 habitat survey was undertaken in 2016 (**Ref. 9.32**), which included recommendations for further targeted species and habitat surveys. Subsequent to this original extended Phase 1 survey, given the time elapsed since the original survey and following revisions to Part B design, the Phase 1 habitat survey was updated in March 2019.

9.4.32. Baseline surveys completed to inform this assessment have been carried out with regard for good practice guidelines where applicable, and in compliance with the scope agreed with the Applicant. References to specific guidelines are contained within the respective technical reports contained in **Appendices 9.1** to **9.10**, **Volume 8** of this ES (**Application Document Reference: TR010041/APP/6.8**) and noted where applicable in **Table 9-6**, which summarises the ecological baseline surveys completed to inform this assessment.

9.4.33. An arboriculture survey has also been completed, with full details presented in **Appendix 7.1: Arboricultural Report**, **Volume 8** of this ES (**Application Document Reference: TR010041/APP/6.8**).

Nature Conservation Evaluation

9.4.34. Ecosystems, habitats and species within the Study Areas (defined in **Section 9.6** of this chapter) are assigned levels of importance for nature conservation based on the criteria detailed within CIEEM guidance (**Ref. 9.17**), IAN 130/10 (**Ref. 9.18**) and summarised in **Table 9-4** below. The rarity, ability to resist or recover from environmental change and uniqueness of an ecological receptor, function/role within an ecosystem and level of legal protection or designation afforded to a given ecological receptor are all factors considered in determining its importance. Consideration has also been given to the importance of the species or habitat and its conservation status at a geographic level taking population size, life cycle, rarity and/or distribution into account.

9.4.35. In addition, the importance of an ecological receptor takes into account any statutory or non-statutory designations, the intrinsic importance of the ecological receptor and whether it supports legally protected or notable species.

Table 9-4 - Importance Criteria

Importance	Criteria
International	Ecosystems and Habitats - Ecosystems or habitats essential for the maintenance of: - Internationally designated areas or undesignated areas that meet the criteria for designation - Viable populations of species of international conservation concern. Species: - Species whose presence contributes to the maintenance of qualifying habitats, communities and assemblages that occur within internationally designated sites or within undesignated areas that meet the criteria for such designation. - Resident, or regularly occurring, populations of species that may be considered at an International or European level including those listed on Annexes II, IV and V of the Habitats Directive and Annex I of the Birds Directive, where:

Importance	Criteria
	o The loss of the population would adversely affect the conservation status or distribution of the species at this geographical stage; or o The population forms a critical part of a wider population at this scale; or o The species is at a critical phase of its life cycle at this scale
National	Ecosystems and Habitats - Ecosystems or habitats essential for the maintenance of: - Qualifying communities and assemblages that occur within nationally designated sites or within undesignated areas that meet the criteria for such designation; and/or - Viable populations of species of national conservation concern. - Areas of ancient woodland. - Habitats listed for their principal importance for biodiversity (Section 41 of the NERC Act 2006). Species: - Species whose presence contributes to: o The maintenance of qualifying habitats, communities and assemblages that occur within nationally designated sites or within undesignated areas that meet the criteria for such designation o The maintenance and restoration of biodiversity and ecosystems at a national level, as defined in the Natural Environment and Rural Communities (NERC) Act 2006 Section 41 requirements - Resident, or regularly occurring, populations of species that may be considered at an International/European (as detailed above), National or UK level including those receiving legal protection (listed within Schedules 1, 5 and 8 of the WCA) or listed for their principal importance for biodiversity or conservation status, where: o The loss of the population would adversely affect the conservation status or distribution of the species at this geographical stage o The population forms a critical part of a wider population at this scale o The species is at a critical phase of its life cycle at this scale
Regional	Ecosystems and Habitats - Ecosystems or habitats essential for the maintenance of: - Populations of species of conservation concern within the region. Species:

Importance	Criteria
	- Species whose presence contributes to the maintenance and restoration of biodiversity and ecosystems within the region. - Resident, or regularly occurring, populations of species that may be considered at an International, European, UK or National level (as detailed above), where: o The loss of the population would adversely affect the conservation status or distribution of the species at this geographical stage o The population forms a critical part of a wider population at this scale o The species is at a critical phase of its life cycle at this scale.
County	Ecosystems and Habitats - Ecosystems or habitats essential for the maintenance of: - Populations of species of conservation concern within the authority area. Species: - Species whose presence contributes to the maintenance and restoration of biodiversity and ecosystems within a relevant area such as Northumberland. - Resident, or regularly occurring, populations of species that may be considered at an International, European, UK or National level (as detailed above), where: o The loss of the population would adversely affect the conservation status or distribution of the species at this geographical stage; or o The population forms a critical part of a wider population at this scale; or o The species is at a critical phase of its life cycle at this scale.
Local	Ecosystems and Habitats - Ecosystems or habitats essential for the maintenance of: - Populations of species of conservation concern within the local area (for example a Local Nature Reserve). Species: - Species whose presence contributes to the maintenance and restoration of biodiversity and ecosystems at a local level. - Resident, or regularly occurring, populations of species that may be considered at an International, European, UK or National level (as detailed above), where:

Importance	Criteria
	o The loss of the population would adversely affect the conservation status or distribution of the species at this geographical stage; or o The population forms a critical part of a wider population at this scale; or o The species is at a critical phase of its life cycle at this scale.
Less than Local	Ecosystems or habitats that do not meet the above criteria, i.e. supporting at least populations of species of conservation concern within the local area.

IMPACT ASSESSMENT

Characterisation of Potential Impacts

9.4.36. CIEEM (**Ref. 9.17**) notes that impacts that are likely to be relevant in an assessment are those that are predicted to lead to significant effects (adverse or beneficial) on important ecological receptors. Significant effects are those that undermine the conservation status[3] of important ecological receptors. Knowledge and assessment of construction methods and operational activities, together with the ecological knowledge of ecologists with experience of similar large-scale infrastructure schemes, has been used to identify the potential impacts of the project on ecological receptors.

9.4.37. Habitats and species that are considered to have a nature conservation importance of less than Local are not considered important ecological receptors[4] in the context of this assessment. Any impact on such a feature as a result of Part B is considered unlikely to have a significant effect on the conservation status of such habitats or species on a local, regional, national or international scale. Therefore, features assessed to be of Less than Local nature conservation importance have been scoped out of the EcIA.

9.4.38. Characterisation of potential impacts has considered the processes that could lead to effects on ecological receptors, using the range of standard parameters from IAN 130/10,

3 Conservation status for habitats is determined by the sum of the influences acting on the habitat and its typical species that may affect its long-term distribution, structure and function as well as the long-term distribution and abundance of its population within a given geographical area. Conservation status for species is determined by the sum of influences acting on the species concerned that may affect the long-term distribution and abundance of its population within a given geographical area.

4 An ecological receptor is considered important based on many factors including its rarity, diversity, naturalness, context in the wider landscape, size and distribution as set out in CIEEM Guidelines (**Ref. 9.17**).

(**Ref. 9.18**) as well as others deemed appropriate (informed by CIEEM's Guidelines (**Ref. 9.17**)). These included whether the impact was positive (beneficial) or negative (adverse), the probability of the impact occurring (certain, probable, unlikely), its complexity (direct, indirect, cumulative), extent, size, duration, reversibility and timing/duration.

Significance of Effects

9.4.39. Having characterised importance (in accordance with **Table 9-4**) and potential impacts, proposals for mitigation and compensation have been considered, with the aim of avoiding, preventing, reducing or, if possible, offsetting any identified significant adverse effects. After the application of mitigation proposals, where significant effects are likely to occur, the overall significance of the effect has been assessed. Proposed enhancement measures documented in **Section 9.9** of this chapter have not been considered when assessing the significance of effects.

9.4.40. For the purpose of EcIA, 'significant effect' is an effect that either supports or undermines biodiversity conservation objectives for 'important ecological features' (explained in Chapter 4 of CIEEM's EcIA guidelines (**Ref. 9.17**)) or for biodiversity in general. IAN 130/10 does not prescribe a method for determining the significance of ecological effects but does propose significant effect categories which are aligned with other topic areas in the DMRB. These are neutral, slight, moderate, large or very large (Table 3 of IAN 130/10) and are reproduced in **Table 9-5** below.

9.4.41. In all instances, when determining the level of significance of the ecological effect, **Table 9-5** has been used as a guide in association with professional judgement (this is consistent with guidance in Interim Advice Note 130/10). For example, an effect on an ecological receptor of county level importance could be considered Large if a particularly high proportion of the county resource were to be affected. To determine whether an effect is significant or not, CIEEM's Guidelines have been considered (in lieu of comparable guidance in the DMRB).

Table 9-5 - Significance Categories of Effects on Ecological Receptors

Significance Category	Typical Descriptors of Effect (Nature Conservation)
Very Large	An impact on one or more receptor(s) of International, European, UK or National importance.
Large	An impact on one or more receptor(s) of Regional importance.
Moderate	An impact on one or more receptor(s) of County or Unitary Authority Area importance.
Slight	An Importance on one or more receptor(s) of Local importance.
Neutral	No significant impacts on key nature conservation receptors.

AIR QUALITY AND ECOLOGICAL RECEPTORS

9.4.42. As there are no ecological receptors within the Study Area for impacts as a result of air quality (refer to **Section 9.7** of this chapter), detailed assessment methodology for air quality impacts on ecological receptors has been omitted from this chapter.

BIODIVERSITY NO NET LOSS CALCULATIONS

9.4.43. A biodiversity no net loss calculation has been carried out on Part B to quantify biodiversity losses and gains in terms of 'biodiversity units. The calculation was undertaken in accordance with the Highways England approach[5] and consideration of the Defra metric (**Ref. 9.33**). This is undertaken by establishing the baseline biodiversity units (i.e. the existing biodiversity value within the Order Limits) and the value of the same area upon completion of Part B to quantify the change in biodiversity and inform the requirements for compensation to work towards no net loss (excluding irreplaceable habitats) and net gain (with regards to HPI). A summary is presented in **paragraph 9.10.24** and **9.10.25** of this chapter, with full details and findings presented in the **Biodiversity No Net Loss Assessment Report** (**Appendix 9.11**, **Volume 8** of this ES (**Application Document Reference: TR010041/APP/6.8**)).

MITIGATION

9.4.44. The principles of the mitigation hierarchy have been applied when considering potential impacts and subsequent effects on ecological receptors within the Study Area; through the following sequential actions:

a. Avoidance
b. Mitigation
c. Compensation
d. Enhancement

9.4.45. For the purpose of this assessment, mitigation refers to measures that are considered essential to avoid and reduce adverse impacts of Part B. Compensation refers to measures taken to offset the loss of, or permanent damage to, biological resources through the provision of replacement areas.

9.4.46. The mitigation measures described within this EcIA have been incorporated into the design and construction programme and taken into account in the assessment of likely significant effects. The mitigation prescribed aims to avoid or negate impacts on ecological receptors in accordance with best practice guidance and UK, English and local government environmental impact, planning and sustainability policies. These mitigation measures include those required to achieve the minimum standard of established good practice together with additional measures to further reduce any adverse impacts of Part B. The

[5] Highways England supplement the standard DEFRA metric with Phase 1 habitat survey linked condition assessment criteria, which has been agreed with Natural England. This is documented within an internal Highways England memorandum (not publicly accessible) (**Ref. 9.34**).

mitigation measures include those required to reduce or avoid the risk of committing legal offences.

9.4.47. Mitigation measures set out in this ES are captured in the **Outline Construction Environmental Management Plan** (**Outline CEMP**) (**Application Document Reference: TR010041/APP/7.3**) as environmental commitments to ensure implementation by the main contractor. The Outline CEMP would be used to inform a CEMP produced by the main contractor.

9.4.48. Impacts that are not significant (including those where compliance with regulation is required) would be expected to be avoided or reduced through the application of measures detailed within a CEMP, including best working practice (e.g. mitigation of potential pollution impacts through adherence to standard best practice and guidelines). Significant ecological impacts are expected to be mitigated through a combination of best practice and typical, proven mitigation methods along with mitigation targeted to specific locations as described in this assessment.

9.5. ASSESSMENT ASSUMPTIONS AND LIMITATIONS

9.5.1. Ecological survey data represents a snapshot of conditions recorded at the time of the survey. Surveys are typically valid for two years unless otherwise specified, for example if conditions are likely to change more quickly as a result of ecological processes or anticipated changes in habitat management. The validity of surveys greater than two years old, such as breeding birds, to inform the impact assessment has been discussed and agreed with Natural England.

9.5.2. Records held by local biological record centres and local recording groups are generally collected on a voluntary basis; therefore, the absence of records does not guarantee the absence of species but may simply be a result of a gap in recording coverage.

9.5.3. Part B has undergone several (increasingly minor) design iterations alongside the development of the EIA. In most instances, further field survey has been undertaken and/or existing survey information has been extrapolated based on desk study information (e.g. contemporary aerial photography) to inform the valuation and impact assessment. Where it has not been possible to undertake further survey, the assessment of impacts and need for mitigation has been assessed on a precautionary basis, taking into account existing knowledge and professional judgement. Details are provided within this chapter and supporting appendices where this is applicable.

9.5.4. Details of the limitations encountered during the baseline surveys are presented within the baseline reports, **Appendices 9.1** to **9.10**, **Volume 8** of this ES (**Application Document Reference: TR010041/APP/6.8**). Efforts were made to provide a comprehensive description of the field survey Study Areas (refer to **Section 9.6**) and their ecological importance; however, the following provides a summary of the limitations encountered:

a. Access was not possible to several areas within the Study Areas for some protected and notable species surveys because of refused access, health and safety restrictions or impassable or impenetrable vegetation. However, due to the high percentage of Study Area coverage, increased survey effort and additional survey techniques utilised, the survey data collected is valid and suitable to inform the impact assessment.

b. A number of protected and notable species surveys were partially undertaken during sub-optimal weather conditions, including periods of rainfall or low temperature. However, given the repeated and increased survey effort, the surveys are considered valid.

c. Failure of survey equipment during the survey period (bat automated detector surveys) resulted in missing data. However, due to the large amount of data obtained from the various survey techniques employed, the baseline data collected, as a whole, is considered sufficient to inform the impact assessment.

9.5.5. The biodiversity calculations for the no net loss assessment rely on an accurate measure of permanent and temporary habitat loss of a scheme. Following the completion of the calculations, minor changes were made to the alignment of the Order Limits. This resulted in a reduction of the area of temporarily or permanently lost habitat. As such, the calculations represent a precautionary and worst-case scenario. In addition, the Assessment Parameters (refer to **Chapter 2: The Scheme**, **Volume 1** of this ES (**Application Document Reference: TR010041/APP/6.1**)) are not considered within the calculations.

9.6. STUDY AREA

9.6.1. Different Study Areas for Part B, for the desk study and field surveys, have been used to assess different ecological receptors or issues in relation to Part B, including all associated construction compounds.

9.6.2. For the purpose of the desk study, the distances from Part B within which searches were carried out were identified following Assessment Methods in DMRB guidance (**Ref. 9.21**) and the approach recommended in CIEEM Guidelines for Preliminary Ecological Appraisal (**Ref. 9.35**). The search areas within these distances are appropriate to the resources considered and the likely zone(s) of influence of Part B. The following search areas were used:

a. 2 km from Part B for protected species records
b. 2 km from Part B for statutory and non-statutory designated sites
c. 5 km from Part B for bat species records and local / national statutory and non-statutory designated sites for bats
d. 10 km from Part B for European designated sites, although extended to include additional sites with a hydrological or air quality connection to Part B and 30 km from Part B for Special Areas of Conservation (SACs) designated for bats

9.6.3. The Study Area with regards to ancient woodland has been informed principally by the Zone of Influence (ZoI) for hydrological connection and the air quality assessment.

9.6.4. The Study Area for ancient woodland with regards to hydrological connection is 1 km from the Order Limits and has been informed by potential effects through hydrological pathways and connectivity. This encompasses a 0.5 km Study Area for surface water connectivity and consideration of direct effects (i.e. associated with overland migration of pollutants directly to surface features, pollutants conveyed in drainage systems, and works within a river channel). Direct effects beyond 0.5 km are unlikely given the relatively flat and vegetated topography, ability of vegetation to remove sediment pollutants and upper soil filtration.

9.6.5. The 1 km Study Area additionally encompasses groundwater features and considers surface-borne pollutants migrating to groundwater features. Any significant impacts beyond this distance are unlikely owing to underlying geology and soils being slowly permeable, loamy and clayey. Further details on hydrological Study Area considerations are presented in **Chapter 10: Road Drainage and the Water Environment** of this ES.

9.6.6. The Study Area with regards air quality assessment is defined as within 200 m of the Affected Road Network (ARN), as established by air quality modelling and presented in **Chapter 5: Air Quality** of this ES. The Study Area has been applied to statutory and non-statutory sites, including ancient woodland sites, and includes sites beyond the Study Areas presented above. In accordance with IAN 174/13 (**Ref. 9.25**), affected roads are those that meet any of the following criteria:

a. Road alignment will change by 5 m or more; or
b. Daily traffic flows will change by 1,000 AADT[6] or more; or
c. Heavy duty vehicle flows will change by 200 AADT or more; or
d. Daily average speed will change by 10 km/hr or more; or
e. Peak hour speed will change by 20 km/hr or more.

9.6.7. For field surveys, including detailed species surveys, the Study Areas were based on a ZoI that varies for each resource and is influenced by the likely effects resulting from Part B[7]. These are detailed below in **Table 9-6** and are based upon professional judgement in accordance with CIEEM Guidelines for Preliminary Ecological Appraisal (**Ref. 9.35**) and species-specific guidance (references provided, as appropriate, within **Table 9-6**). Where historic survey results have been used to inform this assessment, these have been highlighted within the table.

9.6.8. The Study Areas have been refined as the Part B design process has progressed. This is reflected by the Study Areas for more recent surveys being narrower than for those surveys conducted in the earlier stages of the Part B design process.

[6] Annual Average Daily Traffic

[7] Including direct and indirect impacts

Table 9-6 – Survey Types, Dates of Survey and Study Areas

Ecological Receptor	Field Survey – Type and reference to species-specific guidance	Field Survey – Dates	Field Survey – Study Area	Relevant Appendix
Habitats	Phase 1 habitat survey (**Ref. 9.36**)	April to June 2016 March 2019	A1 carriageway within Part B + 500 m[8] Part B + 50 m	**Appendix 9.1: Habitats and Designated Sites**, **Volume 8** of this ES (**Application Document Reference: TR010041/APP/6.8**)
	National Vegetation Classification (NVC) (**Ref. 9.37** and **9.38**)	August 2018	Targeted semi-natural habitats – including woodland and grasslands within Part B + 250 m	
Badger	Walkover Survey during Phase 1 re-survey (**Ref. 9.39** and **9.40**)	March 2019 & September 2019	Part B + 50 m	**Appendix 9.1: Habitats and Designated Sites**, **Volume 8** of this ES (**Application Document Reference: TR010041/APP/6.8**)
	Re-survey of known setts within Part B and 100 m (**Ref. 9.39** and **9.40**)	August 2019	Part B + 100 m	**Appendix 9.2: Badger Report** – **Confidential**, **Volume 8** of this ES (**Application Document Reference: TR010041/APP/6.8**)
Otter and Water Vole	Detailed survey for evidence of presence (**Ref. 9.41**)	June 2018, September 2018, April 2019 & July 2019	Part B + 250 m upstream and downstream of watercourses	**Appendix 9.3: Otter and Water Vole Report**, **Volume 8** of this ES (**Application Document Reference: TR010041/APP/6.8**)
Red Squirrel	Habitat Suitability Assessment (**Ref. 9.42**, **9.43** and **9.44**)	August 2018 & July 2019 (Lionheart Enterprise Park Compound only)	Part B + 150 m	**Appendix 9.4: Red Squirrel Report**, **Volume 8** of this ES (**Application Document Reference: TR010041/APP/6.8**)
Bats	Preliminary Building Assessment (External assessment) (**Ref. 9.45**)	March, August & December 2016 Reassessment during surveys June 2018 Further assessments June/July 2019	Part B + 100 m[9] Part B + 50 m Part B + 50 m	**Appendix 9.5: Bat Report**, **Volume 8** of this ES (**Application Document Reference: TR010041/APP/6.8**)

[8] Survey area encompassed several Scheme options under consideration in 2016 plus a 500 m buffer, with areas surveyed beyond 500 m from the A1 carriageway.

[9] Survey area encompassed several Scheme options under consideration in 2016 plus a 100 m buffer, therefore encompassing features outwith the Order Limits and 50 m buffer utilised during this assessment of a final Scheme design.

Ecological Receptor	Field Survey – Type and reference to species-specific guidance	Field Survey – Dates	Field Survey – Study Area	Relevant Appendix
	Preliminary Tree Assessments (**Ref. 9.46**)	March, August & December 2016[Error! Bookmark not defined.] Reassessment March 2019 Arborist Survey March 2019 Assessment of flagged Arborist Trees May 2019	Part B + 50 m	
	Tree climbed aerial inspections	March 2019	Part B + 50 m	
	Buildings and tree activity surveys – dusk emergence and pre-dawn return activity surveys (**Ref. 9.45**)	May to September 2018 & May to September 2019	Part B + 50 m	
	Roost Monitoring Surveys (**Ref. 9.45**)	March to September 2019	Part B + 50 m	
	Walked Transect Surveys (**Ref. 9.45**)	June to September 2018 & April, May 2019	Part B + 100 m	
	Defra Transect Surveys (**Ref. 9.46**)	June to October 2018 & April, May 2019	Part B + 1 km	
	Crossing Point Surveys (**Ref. 9.46**)	June to August 2018	Part B	
	Static bat detector monitoring (**Ref. 9.45**)	June to October 2018 & April, May 2019	Part B + 50 m	
Ornithology	Breeding Bird Surveys[10] (**Ref. 9.47** and **9.48**)	March to July 2016	Part B + c. 500 m	**Appendix 9.6: Breeding and Wintering Birds Report**, **Volume 8** of this ES (**Application Document Reference: TR010041/APP/6.8**)
	Wintering Bird Survey (**Ref. 9.48** and **9.49**)	October 2016 to February 2017		
Barn Owl	Building Surveys (**Ref. 9.50**)	July 2018	Part B + 500 m	**Appendix 9.7: Barn Owl Survey Report**, **Volume 8** of this ES (**Application Document Reference: TR010041/APP/6.8**)
	Ground and aerial tree assessments for features with roost/nest potential	March 2019	Part B + 50 m	

[10] No breeding or wintering bird surveys have been completed beyond those undertaken in 2016/2017. In agreement with Natural England, the assessment of impacts of Part B on breeding and wintering birds has been completed using 2016/2017 survey data and supplemented with an updated desk study for records of bird species since the original survey period (records requested in 2019).

Ecological Receptor	Field Survey – Type and reference to species-specific guidance	Field Survey – Dates	Field Survey – Study Area	Relevant Appendix
	Vantage Point and Flight Activity Surveys (**Ref. 9.50**)	July to August 2018 May to June 2019	Part B + 500 m	
Great Crested Newts	Habitat Suitability Index (HSI) (**Ref. 9.51**)	April to May 2018	Part B + 250 m	**Appendix 9.8: Great Crested Newt Survey Report**, **Volume 8** of this ES (**Application Document Reference: TR010041/APP/6.8**)
	eDNA analysis (**Ref. 9.52**)	May 2018, April 2019 & July 2019		
	Presence/likely absence surveys (**Ref. 9.53**)	March to June 2018 & April 2019		
Reptiles	Presence/absence surveys (**Ref. 9.54** and **9.55**)	August to October 2018 & April to August 2019	Part B + 50 m	**Appendix 9.9: Reptile Assessment Report**, **Volume 8** of this ES (**Application Document Reference: TR010041/APP/6.8**)
Aquatic Habitats and Species	Aquatic Habitat Survey (**Ref. 9.56** and **9.57**)	September 2018	500 m upstream and downstream of 14 sections of watercourses crossed by A1 carriageway or Part B	**Appendix 9.10: Aquatic Ecology Assessment Report**, **Volume 8** of this ES (**Application Document Reference: TR010041/APP/6.8**)
	Aquatic Macroinvertebrate surveys (**Ref. 9.58**, **9.59** and **9.60**)	May 2019	Shipperton Burn (the only watercourse recommended for further survey following the Aquatic Habitat Assessment)	
	White-clawed crayfish eDNA survey (**Ref. 9.61**)	May 2019	Shipperton Burn (the only watercourse recommended for further survey following the Aquatic Habitat Assessment)	
	River Habitat Survey (**Ref. 9.62**)	May 2019	Shipperton Burn (the only watercourse recommended for further survey following the Aquatic Habitat Assessment)	
	Freshwater fish – electrofishing survey (**Ref. 9.63 to 9.66**)	June 2019	Shipperton Burn (the only watercourse recommended for further survey following the Aquatic Habitat Assessment)	

9.7. BASELINE CONDITIONS

DESIGNATED SITES

9.7.1. The desk study identified six European designated sites (Natura 2000 sites) within 10 km of Part B. These are Northumbria Coast SPA and Ramsar Northumberland Marine SPA, Berwickshire & North Northumberland Coast SAC, North Northumberland Dunes SAC, Newham Fen SAC and River Tweed SAC. The **Habitats Regulations Assessment** (**Application Document Reference: TR010041/APP/6.14**) concluded that no likely significant effects to European sites would arise because of Part B during the construction and operational stages. Therefore, European designated sites are not considered further in this assessment.

9.7.2. A single statutory designated site and three non-statutory designed sites are within 2 km of Part B. In addition, a single statutory designated site and a single non-statutory designed site are within 2 km of the Main Compound. A single non-statutory designated is within 2 km of Lionheart Enterprise Park Compound, however, there are no statutory designated sites within 2 km. These sites are described in **Table 9-7** below and shown on **Figure 9.1: Statutory Designated Sites**, **Volume 6** and **Figure 9.2: Habitats of Principal Importance and Non-Statutory Sites**, **Volume 6** of this ES (**Application Document Reference: TR010041/APP/6.6**).

Table 9-7 – Summary of National and Local Designated Sites Identified within the Study Area

Site Name	Statutory or Non-Statutory Designation	Reason for Designation	Distance from Part B	Nature conservation importance
Within 2 km of the Part B Main Scheme Area				
Longhoughton Quarry SSSI	Statutory	The site is primarily notified for its geological interest as a disused Whinstone quarry. Whilst Longhoughton Quarry SSSI is notified for its geological features, it also possesses likely associated botanical interest (for example Whin grassland) (6.8 ha).	1.9 km south east	National Importance
Hulne Park LWS	Non-statutory	Amenity parkland; mosaic of mature woodland and grassland.	1.0 km west	Local Importance
Littlemill Quarries LWS	Non-statutory	Former Whinstone quarry. Likely associated botanical interest (e.g. Whin grasslands).	1.8 km north east	Local Importance
Ratcheugh Crag-Pepper Moor LWS	Non-statutory	Whinstone crag with folly and associated grassland and scrub, designated for the presence of Whin grassland.	1.8 km east	Local Importance
Within 2 km of Lionheart Compound				
Cawledge Burn LWS	Non-statutory	Watercourse with associated mixed woodland along banks.	0.4 km south west	Local Importance
Within 2 km of the Main Compound				
River Coquet and Coquet Valley Woodlands SSSI (including Duke's Bank Wood)	Statutory	Designated for its woodland, river and stream habitat. The River Coquet is a relatively unmodified, fast flowing upland river supporting characteristic flora and fauna significant to national resource for natural conservation. Many of the woodlands are long-established with semi-natural plant communities, of which, few remain in Northumberland. (1,192.42 ha).	0.5 km north	National Importance
Coquet River Felton Park LWS	Non-statutory	Woodland (broad-leaved and coniferous), including an area of ancient semi-natural woodland.	0.5 km north	Local Importance

9.7.3. Ancient woodland[11], listed on the Ancient Woodland Inventory (AWI), is absent from Part B and no AWI listed woodland is located within 1 km of Part B. No AWI listed woodland is located within 1 km of Lionheart Enterprise Park Compound. A single AWI listed woodland, Duke's Bank Wood (part of the River Coquet and Coquet Valley Woodlands SSSI), is located approximately 0.5 km north of the Main Compound. However, this woodland does not have any hydrological connectivity with Part B.

FIELD SURVEY

Habitats

9.7.4. An extended Phase 1 habitat survey of land within 500 m of the existing A1 and the boundaries of a number of potential route options for Part B was undertaken in 2016 (**Ref. 9.32**) to aid selection of a preferred option for Part B. The survey data was updated in March 2019 within a refined survey area of Part B plus 50 m to ascertain any variations to baseline data recorded in 2016. A smaller survey area was used for the update survey owing to the known design of Part B and associated construction footprint. Full methodology and results are provided within **Appendix 9.1: Habitats and Designated Sites**, **Volume 8** of this ES (**Application Document Reference:TR010041/APP/6.8**). A full and final account of the baseline extended Phase 1 habitats across the Study Area is presented in **Appendix 9.1: Habitats and Designated Sites**, **Volume 8** of this ES (**Application Document Reference:TR010041/APP/6.8**). The extended Phase 1 habitat survey aimed to provide baseline information on the types and distribution of habitats present. Habitat types were determined according to standard definitions (**Ref. 9.36**) and their suitability to support protected and notable species was investigated.

9.7.5. **Table 9-8** below lists all habitats within the Phase 1 habitat survey Study Area, identifying whether they are HPI or listed within the LBAP

9.7.6. An area of mixed plantation woodland, 0.24 ha, identified during the Phase 1 habitat survey was assumed to be mixed semi-natural woodland within the biodiversity no net loss calculations (presented in **Appendix 9.11: Biodiversity No Net Loss Assessment Report**, **Volume 8** of this ES (**Application Document Reference: TR010041/APP/6.8**). This was based on publicly accessible Habitats of Principal Importance (HPI) inventory data obtained during the Phase 1 habitat assessment (refer to **Appendix 9.1: Habitats and Designated Sites**, **Volume 8** of this ES (**Application Document Reference:TR010041/APP/6.8**). As such, the 0.24 ha is assumed to be mixed semi-natural woodland, a HPI, within this assessment to ensure a worst-case scenario is assessed.

9.7.7. Habitats listed within the Northumberland Biodiversity Action Plan (BAP) and encountered within the Study Area included:

a. Rivers and streams

[11] Ancient woodland consists of both "ancient and semi-natural woodland" and "plantations of ancient woodland sites", both of which are afforded the same protection.

b. Brownfield land
c. Built environment
d. Fen, marsh and swamp
e. Gardens and allotments
f. Lowland heathland
g. Lowland meadows and pastures
h. Native woodland
i. Ponds, lakes and reservoirs
j. Recreational and amenity spaces
k. Reedbeds
l. Transport corridors
m. Trees and Hedges

Table 9-8 – Habitats within Study Area and their Importance

Phase 1 Habitat	HPI	LBAP Habitat
Broad-leaved semi-natural woodland A1.1.1	ü	ü
Broad-leaved plantation woodland A1.1.2		ü
Coniferous plantation woodland A1.2.2		ü
Mixed semi-natural woodland A1.3.1	ü	ü
Mixed plantation woodland A1.3.2		ü
Dense/continuous scrub A2.1		
Scattered scrub A2.2		
Broad-leaved parkland/scattered trees A3.1		ü
Mixed parkland/scattered trees A3.3		ü
Improved Grassland B4		
Marsh/marshy grassland B5		ü
Poor semi-improved grassland B6		
Tall ruderal C3.1		
Standing water G1		ü
Running water G2	ü	ü
Acid/neutral inland cliff I1.1		

Phase 1 Habitat	HPI	LBAP Habitat
Arable J1.1	P[12]	
Amenity grassland J1.2		
Ephemeral/short perennial J1.3		
Native species-rich intact hedge J2.1.1	ü	ü
Native species-poor intact hedge J2.1.2	ü	ü
Native species-rich defunct hedge J2.2.1	ü	ü
Native species-poor defunct hedge J2.2.2	ü	ü
Native species-rich hedge and trees J2.3.1	ü	ü
Native species-poor hedge and trees J2.3.2	ü	ü
Fence J2.4		
Wall J2.5		
Boundary removed J2.7		
Earth bank J2.8		
Buildings J3.6		
Bare ground J4		
Hard standing (no JNCC code)		

9.7.8. The majority of the Order Limits comprises arable farmland (c. 54%), poor semi-improved grassland (c. 6%) and improved grassland (c. 25%) of low conservation importance. However, some HPI are present within the Order Limits including deciduous woodland (c. 2%). Overall, the habitats within Part B are considered to be of **Local conservation importance**.

[12] Whilst arable fields themselves do not qualify as a HPI, arable field margins are listed as a HPI although are not afforded a separate JNCC Phase 1 habitat classification.

Terrestrial Habitats

9.7.9. A NVC survey (detailed within **Appendix 9.1: Habitats and Designated Sites**, **Volume 8** of this ES (**Application Document Reference:TR010041/APP/6.8**)) was undertaken in August 2018 within representative examples of the HPI deciduous woodland.

9.7.10. The NVC survey found that woodlands showed some level of management, evidenced by remnant tree guards, occasional planting of coniferous trees and being localised to blocks isolated within the landscape. Despite this, the mature canopies and established ground flora represented distinguishable NVC communities in keeping with the geographical setting and ground conditions (e.g. soil acidity/alkalinity). The majority of woodlands presented a species composition akin to W8 *Fraxinus excelsior – Acer campestre – Mercurialis perennis* woodland. This community is a dry, lowland woodland community common to calcareous soils in southern and eastern Britain. The remainder of the broadleaved or mixed woodlands are best described as W10 *Quercus robur – Pteridium aquilinum – Rubus fruticosus* woodland. This community is also common across lowland Britain, and found on dry, neutral to mildly acidic soils.

9.7.11. Findings of the Arboricultural Survey, including the presence of ash dieback within and surrounding Part B, are presented in **Appendix 7.1: Arboricultural Report**, **Volume 8** of this ES (**Application Document Reference: TR010041/APP/6.8**).

Aquatic Habitats

9.7.12. An aquatic habitat assessment was undertaken (refer to **Appendix 9.10: Aquatic Ecology Assessment Report**, **Volume 8** of this ES (**Application Document Reference: TR010041/APP/6.8**)) in September 2018 along watercourses crossed by Part B; in total, 14 watercourses were identified.

9.7.13. The assessment forms the preliminary phase of an aquatic ecology survey and was used to characterise watercourses and identify sites that were suitable for specific aquatic surveys, which included River Habitat Survey (RHS) (refer to **Appendix 9.10: Aquatic Ecology Assessment Report**, **Volume 8** of this ES (**Application Document Reference TR010041/APP/6.8**)).

9.7.14. Of the 14 watercourses identified and subject to habitat assessment, only the upstream and downstream sections of the Shipperton Burn were recommended to be subject to further surveys. All other watercourses were assessed to be unsuitable for further survey, primarily due to being dry. An RHS is used to assess overall habitat quality and degree of artificial modification present to a watercourse. Shipperton Burn was classed as obviously (upstream) and severely (downstream) modified and heavily impacted by a range of historical and present-day pressures, such as plantation, agricultural practices, and development. The RHS classification was also due to limited flow types recorded, limited depositional features and a lack of riparian habitats recorded.

SPECIES

9.7.15. The extended Phase 1 habitat survey identified habitats suitable for the following species or species groups:

a. Badger
b. Otter and water vole
c. Red squirrel
d. Bats
e. Breeding birds
f. Wintering birds
g. Barn owl
h. Great crested newts
i. Reptiles
j. Fish
k. White clawed-crayfish Austropotamobius pallipes
l. Aquatic macroinvertebrates
m. Terrestrial invertebrates

9.7.16. Following the extended Phase 1 habitat survey, species-specific surveys were completed to obtain baseline information relating to the presence of protected and notable species within the Study Area and to inform the impact assessment. A summary of key desk study results, field survey results, and nature conservation evaluation of protected and notable terrestrial species, searched for within the Study Area (encompassing Part B and all associated construction compounds), is provided in **Table 9-9**. This table cross-references **Appendices 9.1** to **9.10**, **Volume 8** of this ES (**Application Document Reference: TR010041/APP/6.8**) which detail full methods, survey results and nature conservation evaluation with accompanying figures.

9.7.17. Invasive non-native species were recorded where incidentally encountered throughout the suite of surveys undertaken within the Study Areas and are presented within the Phase 1 baseline survey report (refer to **Appendix 9.1: Habitats and Designated Sites**, **Volume 8** of this ES (**Application Document Reference: TR010041/APP/6.8**)). Himalayan balsam *Impatiens glandulifera* was the only invasive, non-native species recorded within Part B, which was present along bankside woodland habitat of the Shipperton Burn.

Table 9-9 – Protected and Notable Terrestrial Species; Key Desk Study and Field Survey Results and Nature Conservation Importance

Species or Species Group	Key Desk Study and Field Survey Results	Rationale for Valuation	Importance	Relevant Appendix and Figures
Badger	Desk Study The 2019 desk study returned 12 records of badger within 2 km of Part B, of which 10 records were of badger road casualties along the extent of the A1. Only one of these casualty records was within Part B; a record from 2018. There was a single record of a badger sett from 2009. This sett was identified within Duke's Bank Wood on the southern bank of the River Coquet, approximately 650 m north of the Main Compound. A separate record from 2015 was also returned, located approximately 1.5 km south of the Main Compound. Field Survey Surveys undertaken in 2016 and 2019 recorded a total of 19 setts. Surveys in 2016 recorded a total of 16 setts; three main setts, three annexes, three subsidiaries and seven outliers. Targeted surveys in 2019 revisited one sett within 100 m of Part B) to determine any change in activity status. The sett presented with recent badger activity with recent excavation activity recorded. Three additional setts were identified within approximately 100 m of the Lionheart Enterprise Park Compound during the 2019 survey. The distribution of setts would suggest three separate badger clans in proximity to Part B. A separate clan (by virtue of the distance from Part B) was also identified in proximity to the Lionheart Enterprise Park Compound, with one active and two partially active outlier setts recorded amongst dense gorse. The Study Area includes a range of habitats suitable for sett creation and foraging, including woodland, hedgerows, grassland, scrub and arable field margins.	Badgers and their setts are afforded protection within the UK under the Protection of Badgers Act 1992 and the WCA. However, badgers are not a priority species as identified in the Northumberland BAP. The valuation has taken into account the presence of setts beyond Part B and the propensity for badger to move across a landscape. The surrounding landscape additionally incudes extensive habitat with the potential to support, both foraging and sett creation.	Local	**Appendix 9.2: Badger Report** – **Confidential**, **Volume 8** of this ES (**Application Document Reference: TR010041/APP/6.8**)
Otter and Water Vole	Desk Study The 2019 desk study included a single record of water vole within the 2 km Study Area, at Rock Hall, located approximately 2 km east of Part B. Evidence of water vole presence in the form of latrines, burrows and prints was recorded during surveys in 2016 (**Ref. 9.67**). The 2019 desk study identified 13 records of otter within the 2 km Study Area. Two of these records were located adjacent to the north east of Part B, with the closest record (from 2012) being 15 m from Part B. The most recent of the 13 records recovered was	No evidence of otter or water vole was recorded during surveys in 2018 and 2019, despite the presence of habitat with the potential to support either species within Part B. Taking into consideration the potential (but unconfirmed) water vole field signs recorded during the 2016 surveys and the presence of mink (as confirmed through scat presence), water vole is considered likely absent from within Part B and Part B Survey Area. Whilst habitat with potential to support otter exists within Part B, and their historic presence confirmed within the	Less than Local	**Appendix 9.3: Otter and Water Vole Report**, **Volume 8** of this ES (**Application Document Reference: TR010041/APP/6.8**)

Species or Species Group	Key Desk Study and Field Survey Results	Rationale for Valuation	Importance	Relevant Appendix and Figures
	from 2015, where an otter was sited at Lime Kilns at the Rock Midstead Site. Field Survey No evidence of either otter or water vole activity or presence was recorded during surveys completed in 2018 and 2019 to inform this assessment.	wider landscape, owing to the absence of activity or evidence of otter during surveys they are considered likely absent from within Part B and Part B Survey Area.		
Red squirrel	Desk Study The 2019 desk study identified 13 records of red squirrel within 2 km of Part B, the closest of which was 400 m from Part B between Heiferlaw Bank and Holywell Cottage. Seventeen records were returned within 2 km of the Lionheart Enterprise Park Compound. The desk study undertaken as part of the extended Phase 1 report in 2016 returned no records of red squirrel within 1 km of Part B. One record of red squirrel returned from 2015 was noted 1.5 km east of the Lionheart Enterprise Compound. One record from 2012 of red squirrel was recorded 1.5 km north east of the Main Compound. Field Survey A red squirrel habitat assessment was complete across 15 woodland parcels within the Study Area in August 2018 and within the Study Area of the Lionheart Enterprise Park Compound in 2019. The total area of woodland assessed as Moderate suitability was 24.6 ha (eight blocks), Low suitability was 9.7 ha (six blocks) and areas of Negligible suitability 1.19 ha (one block). No woodland of High suitability to support red squirrel was identified. Evidence of squirrel activity was recorded in two woodland blocks; WB9 where a single drey (place of shelter) was recorded and WB15 where two signs of feeding were recorded, however, this could not be conclusively attributed to red squirrel presence.	Red squirrel and their dreys are afforded protection under the WCA (**Ref. 9.2**) within the UK. The red squirrel is also a SPI under Section 41 of the NERC Act 2006 (**Ref. 9.3**). Woodland habitat with suitability to support red squirrel is present within and adjacent to Part B although no conclusive proof of their presence was recorded during habitat assessment survey.	Local[13]	**Appendix 9.4: Red Squirrel Report**, **Volume 8** of this ES (**Application Document Reference: TR010041/APP/6.8**)
Bats	Desk Study The 2019 desk study identified a total of 480 bat records within 5 km of Part B. Of these, 126 related to roost records, including: common pipistrelle *Pipistrellus*, soprano pipistrelle *Pipistrellus*	All bat species in the UK are afforded protection as a European protected species under the Habitats Directive (**Ref. 9.1**) and protected under the WCA (**Ref. 9.2**). Noctule, soprano pipistrelle and brown long-eared bat	Local to Regional	**Appendix 9.5: Bat Report**, **Volume 8** of this ES (**Application Document Reference: TR010041/APP/6.8**)

[13] Of woodland habitat suitability to support red squirrel

Species or Species Group	Key Desk Study and Field Survey Results	Rationale for Valuation	Importance	Relevant Appendix and Figures
	pygmaeus, whiskered/Brandt's bat *Myotis mystacinus/brandtii*, Natterer's bat, brown long-eared bat *Plecotus auritus* and unconfirmed bat species. A total of 20 granted EPS licences for bats were also identified. These included licences pertaining to common and soprano pipistrelle, brown long-eared bat, whiskered/Brandt's bat, Daubenton's bat *Myotis daubentonii* and Natterer's bat. Field Survey Buildings and Structures In total, 43 structures were assessed to provide bat roost potential by virtue of features present following Habitat Suitability Assessment (HSA) and were subsequently subject to further survey (dusk emergence or pre-dawn return activity surveys). A total of 29 bat roosts were recorded within buildings/structures subject to survey (Buildings B10B, B4B, B102B, B6C, B6K, B6M, HF1, HH1, HH2, HH3, SF3, SF5, and wall near SF5), including roosts for common pipistrelle, soprano pipistrelle, mixed common/soprano pipistrelle roosts, noctule roost and an unconfirmed species roost. All roosts recorded were non-breeding, summer roosts. Trees Following ground-level assessment undertaken in March/April 2019 and information provided by arboricultural survey, 72 trees/woodland blocks were identified for further survey comprising a mixture of aerial tree-climbed inspections and activity surveys (dusk emergence/pre-dawn return surveys). A single bat roost, a noctule maternity roost supporting over 80 bats, was recorded within a tree (Tree G02) within Part B Survey Area beyond Part B. Bat Boxes A total of 16 bat boxes were identified within a woodland block at the northern end of Part B (directly adjacent to the A1 carriageway and within Part B) and were inspected and monitored during the bat activity season (May-September 2019) through aerial tree-climbed inspections. A Natterer's bat maternity roost, split between two adjacent bat boxes, was recorded with 25 bats split between the two boxes. Two instances of single soprano pipistrelle bats were also recorded within boxes, as well as a mating roost of 10 soprano pipistrelle bats recorded in a single box. DNA analysis of	are also SPI under Section 41 of the NERC Act 2006 (**Ref. 9.3**). Given the number and variety of roosts and features recorded, and species identified through surveys, each roost/feature has been assessed and attributed an individual valuation, ranging from Local to Regional importance. Latterly, valuations have been provided at species/species group level, to ensure a collective assessment of individual roosts/features for a given species. Providing valuation at species/species group level thereby ensures that species are not artificially under-valued through assessment and valuation of individual roosts/features alone.		

Species or Species Group	Key Desk Study and Field Survey Results	Rationale for Valuation	Importance	Relevant Appendix and Figures
	droppings taken from several of the bat boxes confirmed activity/occupation of boxes by common and soprano pipistrelle, Natterer's bat and noctule. Manual Transects A total of 891 bat calls were recorded from a minimum of nine bat species. Soprano pipistrelle, common pipistrelle, Nathusius' pipistrelle, noctule, Leisler's bat, *Nyctalus* species, *Myotis* species and brown long-eared bat were recorded at Point Count locations. During the bat activity transect surveys undertaken in 2018 and 2019 the most commonly recorded species was Soprano pipistrelle constituting 38.16% of all bat passes recorded at Point Count locations. Common pipistrelle was the second most commonly recorded species, constituting 32.66% of all bat passes recorded. Bat activity levels were highest within the months of May, August and October, with the lowest levels of bat activity being recorded during April. Automated Detectors During the 2018 to 2019 survey period over 2,625 hours of automated static monitoring surveys were undertaken at six locations, with a total of 53,204 bats passes, from a minimum of seven species groups: soprano pipistrelle, common pipistrelle, Nathusius' pipistrelle, noctule, Leisler's bat, brown long-eared bat and *Myotis* species The peak of bat activity levels, recorded across the whole survey area, were recorded during June 2018, with the lowest levels of bat activity recorded during April 2019. The highest level of bat activity related to common pipistrelle, which accounted for approximately 48% of all bat activity recorded. Soprano pipistrelle had the second highest level of bat activity, which accounted for approximately 27% of all bat activity recorded. Detector location P3 (located at a crossing point) had the peak level of bat activity with an average of 59.40 bat passes per hour (pph). The detector with the next highest level of activity was at P2 (located between a woodland and two water bodies) with an average of 36.57 pph. The lowest bat activity levels were recorded at static location P1 with only 1.11 pph, with the detector located in the open adjacent to the A1 (within Part B). Defra Local Scale Crossing Point Survey			

Species or Species Group	Key Desk Study and Field Survey Results	Rationale for Valuation	Importance	Relevant Appendix and Figures
	A total of 6 locations were surveyed as part of the Defra local scale survey. Following the completion of two initial surveys (in accordance with guidelines), none of the survey locations met the bat activity threshold (of 10 bat crossings within a single survey) to warrant further surveys. Defra Landscape Scale Transect Survey A total of 733 bat passes of a minimum of 5 species were recorded during the Defra Landscape Scale Surveys. Soprano pipistrelle and common pipistrelle were the most abundant species, accounting for 43.4% and 41.1% of the total bat passes, respectively. Other species and species groups recorded included *Myotis* species, brown long-eared bat and *Nyctalus* species.			
Breeding birds	Desk Study The 2019 desk study identified a total of 1,300 records within the 2 km Study Area of birds from the breeding period were provided by ERIC North East. In total, records of 111 species were obtained, of which 71 were species of conservation concern, including[14]: - Eight species listed on Annex 1 of the Birds Directive; - Eight species listed on Schedule 1 of the WCA 1981 (as amended); - Seventeen SPI (NERC Act 2006); - Twenty-one species in the Northumberland LBAP; - Twenty-six species on the Birds of Conservation Concern (BoCC) Red List; and - Forty-two species on the BoCC Amber list. Field Survey A total of 83 bird species were recorded within the Survey Area during surveys in 2016. These included 45 species of conservation concern including[14]: - One species listed on Annex 1 of the Birds Directive; - Five species listed on Schedule 1 of the WCA 1981 (as amended); - Sixteen SPI (NERC Act 2006);	The assessment of the importance of the breeding bird assemblage for the Survey Area has been made in reference to Fuller (**Ref. 9.68**). A total of 69 bird species were recorded as likely breeding within the Survey Area. Whilst the threshold for Regional level importance is stated as 70+ breeding species, these thresholds were set in 1980. As a result of falling bird populations across habitats, particularly agricultural, it is judged appropriate that the Regional importance level be assigned here. In addition, several species were recorded at levels that exceed 1% of their Northumbria (regional) population. Of particular interest was gadwall, which were recorded in numbers that represent almost 4% of the regional population. However, no species was recorded at levels that exceed 1% of their national population. As such, this further supports the Regional importance for the breeding bird assemblage.	Regional	**Appendix 9.6: Breeding and Wintering Birds Report**, **Volume 8** of this ES (**Application Document Reference: TR010041/APP/6.8**)

[14] It should be noted that bird species can appear on one or more of the schedules/lists identified above.

Species or Species Group	Key Desk Study and Field Survey Results	Rationale for Valuation	Importance	Relevant Appendix and Figures
	- Twenty-six species listed in the Northumberland LBAP; - Eighteen species on the BoCC Red list, and; - Twenty-two species on the BoCC Amber list. Of the 83 bird species recorded, 69 species were considered likely to be breeding (i.e. classified as confirmed, probable or possible breeding, with 23 species confirmed breeding, 34 probably breeding, and 12 possibly breeding.			
Wintering birds	Desk Study The 2019 desk study identified a total of 1,473 records were provided by ERIC North East for birds recorded during the winter period within the 2 km Study Area. of which 62 comprised species of conservation concern, including[14]: - Ten species listed on Annex 1 of the Birds Directive; - Three species listed on Schedule 1 of the WCA 1981 (as amended); - Nineteen SPI (NERC Act 2006); - Twenty-seven of the 67 species listed in the Northumberland LBAP; - Twenty-three species on the BoCC Red list; and - Thirty-eight species on the BoCC Amber list. Field Survey A total of 82 bird species were recorded within the survey area during survey visits 1-5 in 2016/17. These included 46 species of conservation concern including[14]: - Two species listed on Annex 1 of the Birds Directive; - Seven species listed on Schedule 1 of the WCA 1981 (as amended); - Eighteen SPI (NERC Act 2006); - Twenty-three of the 67 species listed in the Northumberland LBAP; - Twenty species on the BoCC Red list; and - Nineteen species on the BoCC Amber list Species included selection of waders, wildfowl, gulls, passerines and non-passerines.	The geographical importance of the wintering bird assemblage has been assessed in relation to Fuller (**Ref. 9.68**). A total of 82 bird species were recorded wintering within the Survey Area, which would suggest an assemblage of County importance. The lower threshold for Regional importance is a total of 85 wintering bird species. The Fuller thresholds are 40 years old and as a result of falling bird populations across habitats, particularly agricultural, it is judged appropriate to consider a Regional importance classification. Several species were recorded at levels that exceed 1% of their Northumbria (regional) population. However, no species was recorded at levels that exceed 1% of their national population. As such, this further supports a Regional importance classification for the wintering bird assemblage.	Regional	**Appendix 9.6: Breeding and Wintering Birds Report**, **Volume 8** of this ES (**Application Document Reference: TR010041/APP/6.8**)
Barn owl	Desk Study A desk study was undertaken in 2019, whereby information on the location of protected and notable species within 2 km of Part B was requested from the ERIC North East and Northumberland and	Barn owl is listed on Schedule 1 of the WCA (**Ref. 9.2**), which affords this species protection against disturbance whilst nesting. Barn owl is a priority bird species within the LBAP but is not listed as a SPI in England. Barn owl	Regional	**Appendix 9.7: Barn Owl Survey Report**, **Volume 8** of this ES (**Application Document Reference: TR010041/APP/6.8**)

Species or Species Group	Key Desk Study and Field Survey Results	Rationale for Valuation	Importance	Relevant Appendix and Figures
	Tyneside Bird Club (NTBC). The results of the desk study included records of barn owl in multiple tetrads within a 2 km desk Study Area. Additionally, an individual supplied their own personal database of barn owls picked up or observed dead alongside the existing A1. This included 19 dead barn owls recorded in the Survey Area between March 2017 and December 2018. Field Survey Type 1 and 2 foraging habitats, those with high to intermediate value to foraging barn owl amounted to approximately 7% of the habitat available in the Survey Area, with 93% of foraging habitat being of low to no value as foraging habitat for barn owl. No Observed Breeding Sites (OBSs) were recorded in the Survey Area. Combining records from activity surveys in 2018-2019 and from incidental sightings in 2018-2019 indicated three clusters of activity; in the north of the Survey Area between Chester Hill and North Charlton, at the start of the southern half of the Survey Area at South Rock farm (including a bird carrying prey) and at the southern end of the Survey Area, west and east of the existing A1 in the Heckley House to Broxfield farm area. In the last area a barn owl was observed on two occasions in June-July 2019 to cross the A1 to reach foraging habitat. Observations of barn owl hunting alongside the A1 was most prevalent in the north of the Survey Area between West Linkhall farm and North Charlton due to the presence of extensive verges comprising Type 1 habitat. These observations indicate that two to three barn owl home ranges incorporate Part B as a foraging resource, while nest sites are likely to be located at distance from Part B. As a result, the local breeding population is likely to be impacted from construction of Part B through vehicle collision fatalities when barn owl forage in the full extent of their home range. Two Active Roost Sites (ARSs) were identified within the Survey Area. One of the ARSs (ARS 2) would be permanently lost through construction of Part B. ARS are not nest sites and barn owls may have several roost sites within their home range.	is a Green List BoCC species with trends in England and the UK as a whole showing an increase in numbers (**Ref. 9.3**). Breeding barn owl are likely to be reliant on foraging resources within the Survey Area even if the young they are provisioning are located outside. Given that barn owl broods average four birds, then the number of young produced within home ranges relevant to the Survey Area is likely to constitute a significant contribution to the Northumberland population, with monitored pairs making breeding attempts in the county ranging from 30 nesting pairs in 2016, 64 in 2017 and 22 in 2018.		
Great crested newts	Desk Study The 2019 desk study returned 21 records of great crested newts within the 2 km Study Area, most of which were from surveys undertaken in 2017 at three specific locations. The specific locations listed for all 21 records included Burgham Park Golf Course, Park Wood and Tile Kiln Rush.	No evidence of great crested newt was recorded, and they are therefore considered likely absent from within Part B and the Survey Area.	N/A	**Appendix 9.8: Great Crested Newt Survey Report**, **Volume 8** of this ES (**Application Document Reference: TR010041/APP/6.8**)

Species or Species Group	Key Desk Study and Field Survey Results	Rationale for Valuation	Importance	Relevant Appendix and Figures
	The closest record to the Order Limits was 1.53 km from the Main Compound at Tile Kiln Rush. Field Survey In total, 10 waterbodies were identified within the Study Area and subject to a Habitat Suitability Index (HSI) assessment in May 2016 to identify their suitability for great crested newts. Seven of the waterbodies were subject to an environmental DNA (eDNA) survey in April 2016 to identify presence/likely absence of great crested newts. However, these surveys were updated in 2018/2019. Six of the waterbodies were subject to a presence/likely absence survey, consisting 4 survey visits in 2018. The remaining four waterbodies were subject to an eDNA survey, with three of the ponds supplemented by two presence/likely absence surveys, in 2019. No evidence of great crested newts was recorded during eDNA or presence/absence surveys and therefore are considered likely absent.			
Reptiles	Desk Study The 2019 desk study returned 64 records for reptiles within the 2 km Study Area; 46 of these were of common lizard *Zootoca vivipara* and 18 of adder *Vipera berus*. The dates for these records were between July and September 2014 and listed as the same 10 x 10 km grid reference (NU10). Specific locations listed for 40 of the recordings (Edlingham crags, Longframlington Common and Widehope wood) are over 8.5 km from the Order Limits. No specific locations within NU10 were listed for the remaining records. The minimum distance of NU10 from the Order Limits is 800 m north of the Main Compound and 1 km south of the Lionheart Enterprise Park Compound. Field Survey Habitats were assessed following interrogation of Phase 1 habitat survey data and sites selected on the suitability of habitats to support reptiles – e.g. woodland with clearings, scrub, rough grassland and field margins, etc. Nine survey sites were identified based on their habitat suitability for reptiles. No reptiles were recorded during reptile surveys in 2018 and 2019. However, an incidental sighting of a common lizard was recorded within survey Site 8 during ground level tree assessment in March 2019.	No evidence of reptiles was recorded during targeted surveys, and only a single common lizard incidentally recorded during other surveys on site. Reptiles are assessed as comprising a very small population in discrete pockets of suitable habitat.	Local	**Appendix 9.9: Reptile Assessment Report**, **Volume 8** of this ES (**Application Document Reference: TR010041/APP/6.8**)

Species or Species Group	Key Desk Study and Field Survey Results	Rationale for Valuation	Importance	Relevant Appendix and Figures
Fish	Desk Study Records of fish within the last 10 years for watercourses identified for Aquatic Habitat Survey were extracted from the National Fish Population Database in September 2019. Two surveys were carried out on the Denwick Burn in 2012; the first reported 15 brown / sea trout *Salmo trutta,* two European eel *Anguilla anguilla* and three-spined stickleback *Gasterosteus aculeats*, the second; five Atlantic salmon *Salmo salar*, 54 brown / sea trout and three European eel. Field Survey The 2018 Aquatic Habitat Survey identified one watercourse within the Study Area requiring further survey. A total of eight brown trout were caught during electric fishing surveys of Shipperton Burn.	Atlantic salmon, brown/sea trout and European eel are listed as SPI under Section 41 of the NERC Act 2006 (**Ref. 9.3**) and are also LBAP species within Northumberland. Atlantic salmon is also listed in Annex II of the Habitats Directive (**Ref. 9.1**) (European protection)/ European eel is protected under the Eels (England & Wales) Regulations 2009 (**Ref. 9.69**), which requires eel passage to be considered and the Environment Agency to be notified of any development likely to affect passage of eels. The presence of European protected species downstream of Part B would indicate an International importance of the fish population in Denwick Burn. However, due to the fact that the nearest records are over 1 km downstream of the Order Limits, and that the watercourse was recorded as ephemeral where it passes under the A1 and that there are pre-existing culverts under the A1, the populations are unlikely to be adversely affected by Part B and are assessed as having National importance. Low abundance of brown trout within Shipperton Burn is assessed to be of Local importance and is not thought to represent a key feature for fish populations at a county level. This is due to the presence of culverts within the burn presenting a barrier to fish migration, meaning that the connectivity with the rest of the catchment is poor.	National Local	**Appendix 9.10: Aquatic Ecology Assessment Report**, **Volume 8** of this ES (**Application Document Reference: TR010041/APP/6.8**)
White-clawed crayfish	Desk Study The 2019 desk study results provided by ERIC NR contained one unconfirmed records of white-clawed crayfish from 2016 within the Study Area, at Alnwick Lion Bridge (at Ordnance Survey (OS) grid reference NU 18617 13811), approximately 1.9 km southwest of Part B's southern extent. Field Survey The 2018 Aquatic Habitat Survey identified one watercourse for crayfish survey, which was subsequently surveyed in May 2019 through the collection and analysis of an eDNA sample. A negative result was returned for the presence of white-clawed crayfish in Shipperton Burn.	Aside from a single unconfirmed record, no records of white-clawed crayfish were returned for the Study Area. No evidence of white-clawed crayfish was observed during the targeted surveys and they are therefore considered likely absent from the Order Limits and Survey Area.	N/A	**Appendix 9.10: Aquatic Ecology Assessment Report**, **Volume 8** of this ES (**Application Document Reference: TR010041/APP/6.8**)
Aquatic macroinvertebrates	Desk Study	No species of conservation interest were identified in Shipperton Burn, however, both the upstream and	Local	**Appendix 9.10: Aquatic Ecology Assessment Report**, **Volume 8** of

Species or Species Group	Key Desk Study and Field Survey Results	Rationale for Valuation	Importance	Relevant Appendix and Figures
	No records of protected or notable aquatic macroinvertebrates were identified within the last 10 years within the 2019 desk study. Field Survey One watercourse was identified for further survey following the 2018 Aquatic Habitat Assessment. Both the upstream and downstream site of the Shipperton Burn achieved 'Good Ecological Status' for the macroinvertebrate biological quality element.	downstream invertebrate assemblages were assessed as having 'Good Ecological Status'. It is therefore afforded Local importance and does not represent a key feature to support macroinvertebrate biodiversity at county level.		this ES (**Application Document Reference: TR010041/APP/6.8**)
Terrestrial invertebrates	Desk Study The 2019 desk study data records were cross-checked with the Pantheon invertebrate database. Records of 22 species of invertebrate were returned, of which two were notable (SPI Section 41 NERC Act 2006 (**Ref. 9.3**)). These include: - Small heath butterfly *Coenonympha pamphilus* - Wall butterfly *Lasiommata megera*	The habitats within the Order Limits are not considered suitable to support a population of Local importance for the three notable species and the habitats are subjected to frequent disturbance.	Less than Local	N/A

FUTURE ECOLOGICAL BASELINE

9.7.18. The information presented within supporting appendices (refer to **Appendices 9.1** to **9.12, Volume 8** of this ES (**Application Document Reference: TR010041/APP/6.8**)) and discussed within **Section 9.7** of this chapter describe the ecological conditions as they were at the time of the surveys. However, conditions are subject to change over time, both with or without Part B. The following paragraphs consider how ecological conditions might change within the Study Area by 2021 (assumed start date for construction), 2023 (assumed year in which Part B would be open to traffic) (refer to **Chapter 2: The Scheme, Volume 1** of this ES (**Application Document Reference: TR010041/APP/6.1**) and 2038 (the 'future year' or 'design year', when environmental mitigation would reach maturity).

9.7.19. Given that the Study Area is predominantly agricultural land (arable and grazed pasture), ecological conditions are unlikely to have significantly changed by 2021 or 2023 in the absence of development. However, changes in farming practices could occur in response to changes in agricultural economics, farming policy, agri-environment proposals and climate change. These changes may result in variation (both positive and negative) to the species diversity, assemblage and distribution within the Study Area. Although distribution and abundance of fauna are likely to fluctuate, it is assumed that there would be no significant changes to species or habitat status by design year. It is not possible to accurately predict farming practices in the survey area in 2038 (future year).

9.7.20. The consent and completion of development within and around the Study Area may result in changes in land-use and associated changes to flora and fauna assemblages. This may result in cumulative impacts, which are considered in **Chapter 15: Assessment of Combined Effects** of this ES and in **Chapter 16: Assessment of Cumulative Effects**, **Volume 4** of this ES (**Application Document Reference: TR010041/APP/6.4**).

9.8. POTENTIAL IMPACTS

9.8.1. A detailed impact assessment is provided within each species or species groups' (refer to **Appendices 9.1** to **9.10**, **Volume 8** of this ES (**Application Document Reference: TR010041/APP/6.8**), however, potential impacts identified during construction and operation are provided in **Table 9-10** below.

9.8.2. Impacts are not predicted during construction or operation on the below ecological receptors which have subsequently been scoped out from further assessment:

a. European/internationally designated sites – sites are of sufficient distance from the Order Limits to not be subject to direct or indirect impacts during construction or operation
b. Great crested newt – species is assessed as absent from the Order Limits
c. Otter and water vole – species are assessed as absent from the Order Limits
d. White-clawed crayfish – species is assessed as absent from the Order Limits
e. Terrestrial invertebrates – assemblage within the Order Limits is of Less than Local importance and therefore scoped out of further assessment as the assemblage is not an important ecological feature in the context of the Scheme (in accordance with **Section 9.4** of this chapter)

9.8.3. There are no locally or nationally designated sites or areas of ancient woodland within 200 m of the ARN, as detailed in **Chapter 5: Air Quality** of this ES. Due to distance from Part B, no other impacts are predicted during construction or operation. As such locally and nationally designated sites are scoped out from further assessment.

Main Compound

9.8.4. The Main Compound would be used by both Part A and Part B and is located within the Order Limits of Part A. As detailed in **Section 2.8** in **Chapter 2: The Scheme**, **Volume 1** of this ES (**Application Document Reference: TR010041/APP/6.1**), the use of the Main Compound for Part B would lead to additional activities. However, as the limited increase in personnel and vehicle movements would be minimal, along with the footprint for the compound remaining the same, there would be a negligible impact on biodiversity.

9.8.5. As there would be a negligible impact on biodiversity as a result of using the Main Compound for Part B, this is not discussed further within this chapter. The effects of the Main Compound on biodiversity are reported in Part A **Chapter 9: Biodiversity**, **Volume 2** of this ES (**Application Document Reference: TR010041/APP/6.2**).

Table 9-10 – Summary of Potential Impacts on Ecological Receptors

Ecological receptor	Nature Conservation Importance	Stage	Potential Impact(s) in the absence of mitigation
Broad-leaved and mixed semi-natural woodland	Local	Construction	- Permanent and temporary loss of woodland through land clearance and earthworks to accommodate construction - Fragmentation of woodland due to land clearance - Damage to retained woodland due to changes in hydrological conditions
		Operation	- Permanent damage and degradation through changes in airborne pollutant levels
Hedgerows	Local	Construction	- Permanent and temporary loss of hedgerow through land clearance and earthworks to accommodate construction - Severance of retained sections of hedgerow due to land clearance
		Operation	- Permanent damage and degradation through changes in airborne pollutant levels
Waterbodies and Watercourses (standing water and running water)	Local	Construction	- Realignment of Kittycarter Burn result in potential degradation and pollution events of an established watercourse. - Pollution of watercourses through sediment run-off and other pollutants - Increase of pH through use of concrete, accidental pollution events or run-off into watercourses - Loss of habitat through installation and extension of culverts
		Operation	- Run-off from the carriageway (fuel/oil spillages) polluting nearby watercourses - Increased shading from culvert widening potentially causing negative effects to flora and fauna
Badger	Local	Construction	- Permanent loss of foraging habitat through land clearance and earthworks to accommodate construction - Temporary loss of foraging habitat through land clearance and earthworks to accommodate construction - Loss of commuting habitat through land clearance and earthworks to accommodate construction - Habitat fragmentation or through land clearance and earthworks to accommodate construction - Injury/mortality of individual badger through collision with construction traffic - Disturbance from high noise/vibration activities
		Operation	- Fragmentation and severance of habitat - Injury and mortality from vehicle and traffic collisions - Disturbance from increase in vehicle noise
Red squirrel	Local	Construction	- Permanent loss of foraging and commuting habitat such as the removal of woodland - Temporary loss of foraging and commuting habitat such as the removal of woodland - Damage, loss or disturbance of resting sites through loss of supporting habitat

Ecological receptor	Nature Conservation Importance	Stage	Potential Impact(s) in the absence of mitigation
			- Habitat fragmentation and severance through clearance of land to facilitate construction - Injury/mortality of individual red squirrel through collision with construction traffic - Disturbance from high noise/vibration activities
		Operation	- Injury and mortality from vehicle and traffic collisions - Fragmentation and severance of habitat
Bats	Local to Regional	Construction	- Loss of transitory roosts utilised by soprano pipistrelle, common pipistrelle and noctule associated with the demolition of buildings to accommodate the new Charlton Mires Junction - Disturbance and effective 'loss' of roosts associated with the required translocation of bat boxes with known breeding, maternity and transitory bat roosts - Disturbance to bat roosts, including a noctule maternity roost, through construction affiliated activities and vehicle movements - Habitat fragmentation affecting commuting and foraging habitat through clearance of land to facilitate construction - Habitat degradation through pollution, discharge of materials or hydrological impacts - Injury/mortality from tree felling and direct collision with traffic
		Operation	- Disturbance of individuals within roosts due to road noise levels - Disturbance of individuals whilst commuting and foraging due to road noise levels - Habitat degradation, severance and fragmentation associated with the widening of the A1 carriageway, junctions, access tracks - Mortality/injury to bats through collision with vehicles and traffic
Breeding birds	Regional	Construction	- Permanent loss of woodland and scrub habitat with the potential to support nesting birds - Habitat fragmentation through land clearance and earthworks to accommodate construction - Habitat degradation through pollution, discharge of materials or hydrological effects - Disturbance from increased human activity, noise, light and vibration disturbance
		Operation	- Disturbance from increase in vehicle noise - Mortality/injury through collision with vehicles and traffic
Wintering birds	Regional	Construction	- Permanent loss of habitat with the potential to support wintering birds - Habitat fragmentation through land clearance and earthworks to accommodate construction - Habitat degradation through pollution, discharge of materials or hydrological effects - Disturbance from increased human activity, noise, light and vibration disturbance
		Operation	- Disturbance from increase in vehicle noise - Mortality/injury through collision with vehicles and traffic

Ecological receptor	Nature Conservation Importance	Stage	Potential Impact(s) in the absence of mitigation
Barn owl	Regional	Construction	- Direct loss of nest/roost sites through tree felling - Permanent loss of foraging habitat through land clearance and earthworks to accommodate construction - Disturbance from increased human activity and noise disturbance during construction
		Operation	- Mortality/injury to birds through collision with vehicles and traffic - Disturbance from increased vehicle noise - Disturbance from increased lighting due to increased traffic use
Reptiles	Local	Construction	- Injury/mortality through collision with construction traffic - Loss of habitat for basking sites, such as the loss of a small area of suitable reptile habitat associated with land adjacent to the carriageway at Site 8, through land clearance and earthworks to accommodate construction - Disturbance from light, noise and vibration associated with construction affiliated activities
		Operation	- Mortality/injury through collision with vehicles and traffic
Fish	Local to National	Construction	- Pollution of watercourses through sediment run-off and other pollutants. Potential to smother fish spawning grounds and impact animals directly - Disturbance through light, noise and vibration associated within construction activities may result in avoidance behaviour - Increase of pH through use of concrete, accidental pollution events or run-off into watercourses - Loss of habitat through installation and extension of culverts
		Operation	- Increased noise and vibration from traffic - Increased run-off from the carriageway (fuel/oil spillages) polluting nearby watercourses - Increased shading from culvert widening potentially causing negative effects to flora and fauna - Physical barriers to movement up and downstream through bridges, culverts and elevation drops - Water being too shallow to allow fish passage due to oversized crossings - Installation of an undersized structure in relation to discharge levels in a watercourse may increase velocity and erosion and block animal passage.
Aquatic macroinvertebrates	Local	Construction	- Pollution of watercourses through sediment run-off and other pollutants - Increase of pH through use of concrete, accidental pollution events or run-off into watercourses
		Operation	- Increased run-off from the carriageway (fuel/oil spillages) polluting nearby watercourses - Increased shading from culvert widening potentially causing negative effects to flora and fauna

9.9. DESIGN, MITIGATION AND ENHANCEMENT MEASURES

DESIGN

9.9.1. The following are measures incorporated into the design of Part B. However, these measures also represent, or document, avoidance and mitigation measures in relation to impacts to ecological receptors. Further information is provided, as necessary, in **Table 9-12**:

a. Implementation of 'Delivery Mechanisms and Preliminary Activities' set out within the **Outline CEMP** (**Application Document Reference: TR010041/APP/7.3**) that has been produced and accompanies the DCO application.
b. Construction lighting design (if applicable, to be confirmed at detailed design). No operational lighting is currently proposed for Part B.
c. Adherence to pollution prevention guidance (**Ref. 9.70**) during construction and appropriate road drainage and runoff treatment.
d. Creation of detention basins along Part B (however, their design to address impacts to ecological receptors is assessed as mitigation (items **EC14** and **AQ11** in **Table 9-12**)).
e. Construction of culverts (however, their design to address impacts to ecological receptors is assessed as mitigation (items **AQ009** and **AQ010** in **Table 9-12**).

MITIGATION

9.9.2. Within this section, the terms 'mitigation' and 'compensation' are defined as follows:

a. Mitigation – the methods, processes and actions put in place to avoid or reduce the potential adverse impacts of Part B on ecological receptors.
b. Compensation – the measures taken to offset the effects as a result of the loss of, or permanent damage to, ecological receptors despite mitigation.

Habitats

9.9.3. Construction of Part B would result in the loss of habitat, for which compensatory habitat creation would be required. Habitat creation has been developed and incorporated into **Figure 7.10: Landscape Mitigation Plan, Volume 6** of this ES (**Application Document Reference: TR010041/APP/6.6**). The landscape design incorporates ecological mitigation measures to reduce the significance of effects, maintain and improve connectivity along and around Part B and to mitigate the effects of fragmentation and displacement. The landscape design aims to integrate Part B into the wider landscape.

9.9.4. The landscape Plan (**Figure 7.10: Landscape Mitigation Plan**, **Volume 6** of this ES (**Application Document Reference: TR010041/APP/6.6**)) includes the habitat creation/reinstatement set out in **Table 9-11** to mitigate and compensate for the loss of HPI.

Table 9-11 - Mitigation for Loss of HPI

HPI	HPI Total Area/ Length Lost (Permanent and Temporary)	Habitat Creation/Reinstatement - Area/ Length
Broadleaved woodland – semi-natural – A1.1.1	0.45 ha	10.13 ha created
Mixed woodland – semi-natural – A1.3.1	0.24 ha	0.01 ha reinstated
Running water – G2	976.27 m	365.32 m reinstated
J2.1.1 Hedgerow – native species rich (intact)	185.6 m	0 m
J2.1.2 Hedgerow – native species poor (intact)	9,934 m	2,617.96 m reinstated
J2.2.1 Hedgerow – native species rich (defunct)	151.4 m	30.7 m reinstated
J2.2.2 Hedgerow – native species poor (defunct)	933.5 m	845.28 m reinstated
J2.3.1 Hedgerow with trees – native species rich (intact)	1,673.6 m	19.92 m reinstated 12,499.3 m created
J2.3.2 Hedgerow with trees – native species poor (intact)	4,339 m	1,115.32 m reinstated

9.9.5. Created habitats would be managed so that they develop into their respective HPI quality and condition, in accordance with the biodiversity no net loss calculations (refer to **Appendix 9.11: Biodiversity No Net Loss Assessment Report**, **Volume 8** of this ES (**Application Document Reference: TR010041/APP/6.8**)). The management and monitoring of habitats would be completed as detailed within **Chapter 7: Landscape and Visual** of this ES and/or documented in the proposed Ecological/Environmental Management Plan (**EC15**, **Table 9-12**), which would be developed at detailed design.

Species

9.9.6. Whilst terrestrial invertebrates are scoped out from the impact assessment, the **Landscape Mitigation Plan** (**Figure 7.10**, **Volume 6** of this ES (**Application Document Reference: TR010041/APP/6.6**)) incorporates compensatory habitats, such as woodland and species rich grasslands, that are of higher value to terrestrial invertebrates than those habitats lost in

the aim of providing no net loss of biodiversity (refer to **Chapter 7: Landscape and Visual** of this ES). A diverse range of floral species would be incorporated into the landscape design, providing larval and adult food plants for a range of invertebrate species, including species of conservation importance highlighted within the desk study results.

Other mitigation

9.9.7. **Table 9-12** below details a suite of design and mitigation/compensation measures that have been developed for Part B relating to ecology during the construction and operational phases. The table also details appropriate delivery mechanisms or preliminary activities for the successful implementation of ecological mitigation and compensation. Mitigation has been developed through an iterative process as Part B has evolved to reduce the impacts of Part B. Mitigation is therefore not considered embedded within the design, although it is acknowledged that elements of ecological mitigation have been incorporated into the Scheme design of Part B.

9.9.8. Mitigation would be secured and delivered as part of a CEMP to be developed by the main contractor. Mitigation detailed in **Section 9.9** has been captured within the **Outline CEMP** (**Application Document Reference: TR010041/APP/7.3**).

Table 9-12 - Design and Mitigation Measures and their Delivery Mechanisms

Approximate Location	Timing of Measure	Measure Reference	Description	Mitigation Purpose or Objective
Delivery mechanism and Preliminary Activities				
Throughout Part B	Pre-Construction	EC01	All permits and assents would be requested and granted prior to the commencement of works. This may include for example, but not limited to, an Environment Agency Permit for works in and around watercourses.	To protect sites, habitats and fauna.
Throughout Part B	Pre-Construction	EC02	Pre-construction surveys would be undertaken to verify and, where required, update the baseline ecological conditions set out in this ES. The scope of the pre-construction surveys would be discussed with Natural England prior to being undertaken and would be specific to each ecological receptor under consideration.	To update the baseline ecological conditions set out in this ES.
Throughout Part B	Pre-Construction	EC03	Prior to construction a suitably qualified (or team of suitably qualified) Ecological Clerk of Works (ECoW) and a named bat licensed ecologist would be appointed and would be responsible for implementation of the Ecological Management Plan (EMP) and measures within the **Outline CEMP** (**Application Document Reference: TR010041/APP/7.3**) and subsequent CEMP prepared by the main contractor. The ECoW would: - Provide ecological advice over the entire construction programme, at all times as required; - Undertake or oversee pre-construction surveys for protected species in the areas affected by Part B; - Monitor ecological conditions during construction to identify additional constraints that may arise as a result of natural changes to the ecological baseline over time; - Provide an ecological toolbox talk to site personnel to make them aware of ecological constraints and information, identify appropriate mitigation developed do minimise impacts and make site personnel aware of their responsibility with regards to wildlife. The toolbox talk would include, as required, all ecological receptors considered within this ES; - Monitor the implementation of mitigation measures during construction to ensure compliance with protected species legislation and commitments within this ES. - The ECoW would have previous experience in similar ECoW roles, be approved by the Applicant, and be appropriately qualified for the role. The ECoW would be appointed in advance of the main construction programme commencing to ensure pre-construction surveys are undertaken and any advance mitigation measures required are implemented.	To ensure the implementation of the EMP.
Throughout Part B	Pre-Construction	EC04	The main contractor would obtain and comply with the requirements of any protected species derogation licences in respect of works that have the potential to breach	To comply with conservation legislation.

Approximate Location	Timing of Measure	Measure Reference	Description	Mitigation Purpose or Objective
			applicable conservation legislation necessary to construct Part B. Licensing may be for UK and/or European protected species.	
Throughout Part B	Pre-Construction & Construction	EC05	Any tree felling would be carried out by experienced contractors to reduce direct mortality of protected species according to agreed felling methods between contractors and the ECoW.	To protect fauna during removal of habitat.
Throughout Part B	Pre-Construction	EC06	A pre-commencement inspection by the ECoW would be undertaken within woodland prior to any felling to confirm the absence of dreys between February to September. Where deemed necessary, felling would be supervised by the ECoW.	To protect red squirrel.
Throughout Part B	Pre-Construction and Construction	EC07	Implementation of and adherence to the measures contained within the **Outline CEMP** (**Application Document Reference: TR010041/APP/7.3**) that details efforts taken to avoid, minimise and reduce impacts as a result of Part B construction. This is considered particularly important for works in and around watercourses. This includes measures to avoid disturbance of sensitive species and habitats by noise, dust and air pollution. A pre-commencement walkover survey would be undertaken to confirm the absence of invasive non-native species. Should invasive species be recorded within the construction area, this would be addressed through implementation of the Biosecurity Method Statement (EC08), to be developed at detailed design. These measures have been included within the **Outline CEMP**.	To protect flora and fauna.
Throughout Part B	Construction	EC08	Given the presence of Schedule 9 invasive non-native species, a Biosecurity Method Statement would be developed and implemented throughout construction. The Method Statement would detail the location and extent of any invasive species or other biosecurity concerns, appropriate measures to control or eradicate the species from an area (if applicable), measures to prevent the spread of the species and good site hygiene practices (such as 'Check, Clean, Dry' (**Ref. 9.71**)).	To prevent the spread of invasive species.
General Mitigation				
Throughout Part B	Pre-Construction & Construction	EC09	Site/ vegetation clearance and tree felling would be kept to a minimum and only where essential to facilitate construction, to reduce the impacts of habitat loss and fragmentation. Areas of clearance, particularly those within temporary works, shall be identified within a method statement and agreed with the ECoW. Site clearance of dense vegetation would be undertaken carefully (use of hand tools) and by experienced contractors to reduce the risk of mortality to wildlife. Care should be afforded to dense stands of bramble or similar vegetation, which may be used by sheltering hedgehog or other wildlife, particularly during the winter months.	To reduce the impact to fauna and flora.
Throughout Part B	Pre-Construction, Construction & Post-Construction	EC10	Plant, personnel and site traffic would be constrained to a prescribed working corridor through the use of, where practicable, temporary barriers to minimise damage to habitats, encroachment of the construction zone, potential direct mortality and disturbance to fauna located within and adjacent to Part B.	To protect habitats and fauna.

Approximate Location	Timing of Measure	Measure Reference	Description	Mitigation Purpose or Objective
Throughout Part B	Pre-Construction & Construction	EC11	Stand-off distances around watercourses and other sensitive habitats (such as woodland) would be implemented prior to commencement of works and clearly demarked on site through the use of physical barriers (fencing, tape or similar). The buffer around trees/ woodland/ hedgerows would be in accordance with good practice (**Ref. 9.72**) to take into account root protection zones.	To protect habitats and fauna.
Throughout Part B	Construction	EC12	- Works during the construction period would be undertaken during daylight hours (07:00 to 19:00), Monday to Friday to reduce the impact to nocturnal and crepuscular species; particularly bats, barn owl and badger. However, extended hours, including nighttime, would be required for some construction operations. Should night working be required, this would be discussed with the ECoW and appropriate mitigation put in place (particularly concerning lighting). Appropriate mitigation would be determined by the ECoW but is likely to include: Avoidance of direct lighting on any buildings or trees that contain bat roosts or barn owl nest/ roost sites; - Avoidance of artificial lighting of watercourses, particularly during the hours of darkness to prevent impacts to fish behaviour or passage; - Avoidance of light spill using directional and or baffled lighting; - The use of movement triggers, thus lighting only turns on when people (large objects) move through the area (use within compound); - Reducing the height of lighting columns to reduce light spill onto adjacent habitats; - Variable lighting regimes (VLR) - switching off when human activity levels are low i.e. 21:00 to 05:30; and/or - Avoid use of blue-white short wavelength lights and high UV content. Work during hours of darkness would be avoided as far as practicable and where necessary directed lighting would be used to minimise light pollution/glare; - Temporary lighting used for construction would be switched-off when not in use and positioned so as not to spill on to adjacent land, sensitive receptors or retained vegetation within the area surrounding the works; - Directed lighting would be used to minimise light; pollution/glare, including for construction compounds; - Lighting levels would be kept to the minimum necessary for security and safety.	To reduce disturbance impacts during construction.
Throughout Part B	Construction	EC13	To prevent entrapment of wildlife, any trenches or voids would be excavated and infilled within the same working day. If this is not possible, the void would be securely covered overnight, or a suitable means of escape provided (such as a ramp at no greater than a 45^{o} angle). Any void would then be visually inspected prior to re-starting works to confirm the absence of entrapped wildlife. All escape measures would be discussed and agreed with the ECoW to ensure they are suitable for the size of void and wildlife that may become trapped. If deemed appropriate, the ECoW may enforce	To protect wildlife.

Approximate Location	Timing of Measure	Measure Reference	Description	Mitigation Purpose or Objective
			additional measures, such as the installation of temporary amphibian/reptile fencing around the void to prevent entry.	
Throughout Part B	Construction & Post-Construction	EC14	Planting of detention basins to include a diverse floral community and enhance their attraction to wildlife. A diverse floral community refers to providing a range and mixture of floral species, including flowering plants and grasses, that provide resources and niches to a variety of invertebrates which in turn provide a resource for species that prey on the invertebrates. This would be achieved using a native and locally appropriate seed mix.	To improve the value of detention basins to support biodiversity.
Throughout Part B	Operation	EC15	Implementation of an Ecological/Environmental Management Plan to detail the monitoring and maintenance of habitat and mitigation/compensation features following creation and installation. The Ecological/Environmental Management Plan would be developed at detailed design. The requirement for an Ecological/Environmental Management Plan is captured within the **Outline CEMP** (**Application Document Reference: TR010041/APP/7.3**).	To maintain the ecological value of retained and created habitats long-term.
Ecological Receptor Specific Mitigation				
Locations of broad-leaved semi-natural woodland A1.1.1	Pre-Construction & Construction	HAB01	The design of Part B would seek to minimise the amount of broad-leaved semi-natural woodland which would be subject to direct loss. Prior to construction, this would include a reassessment of whether the removal of trees earmarked for felling is essential to facilitate construction.	To retain the largest amount possible of those woodlands of semi-natural origin and with associated ground flora containing typical woodland plant species. These types of woodlands are often irreplaceable in the short/medium term and loss would be avoided wherever possible.
Throughout Part B	Pre-construction	HAB02	Species-rich grassland creation would be designed to replace areas of poor semi-improved grassland which would be subject to direct loss. Seed mixes would comprise native species of local origin and context.	To compensate for losses with a greater amount of higher quality grassland creation.
Throughout Part B	Pre-construction	HAB03	Overall connectivity of new and existing habitats within the Order Limits would be increased to link up with the wider landscape including woodland, hedgerows, watercourses and ponds, where possible.	To link up existing and newly created areas of valuable habitat to allow increased movement of species between habitat parcels.
Throughout Part B	Pre-construction & Construction	B01	A Species Protection Plan (SPP) for badgers would be produced in consultation with Natural England during detailed design. The SPP would form the basis of a 'toolbox talk' to be given to contractors to increase awareness of potential badger presence and detail typical activity, field signs and setts. The SPP is identified within the **Outline CEMP** (**Application Document Reference: TR010041/APP/7.3**).	To protect badgers.
Throughout Part B	Pre-construction	B02	Prior to any works commencing, a pre-works walkover survey of the Order Limits (including construction compound locations) would be undertaken to a distance of 30 m beyond the Order Limits, to search for evidence of badger activity/presence and	To protect badger setts.

Approximate Location	Timing of Measure	Measure Reference	Description	Mitigation Purpose or Objective
			confirm that baseline results remain accurate and relevant. This survey would be undertaken at least three months in advance of works commencing, to allow any requirement for application of licensing to Natural England prior to works commencement. Should badger activity be confirmed within the Order Limits, or within 30 m of the Order Limits, a Natural England licence may be required and be applied for alongside appropriate mitigation in advance of commencement of construction.	
Throughout Part B	Pre-Construction	B03	Vegetation/earth removal would, where practical, be undertaken outside the badger breeding season recognised as December to April.	To protect breeding badgers.
Construction Compounds and Spoil Heaps	Construction	B04	Due to the known presence of badger, temporary badger-resistant fencing would be provided around construction compounds and storage areas. This is particularly important for areas of temporary spoil storage, which may be used by badger for sett creation. Where possible, spoil would be stored in heaps with shallow angles to help prevent badgers creating setts.	To avoid mammals becoming trapped within compound areas.
Throughout Part B	Pre-construction & Construction	RS01	A SPP would be produced in consultation with Natural England during detailed design. The SPP would form the basis of a 'toolbox talk' to be given to contractors to increase awareness of potential red squirrel presence and detail typical activity, feeding signs, and drey presence within woodlands. The SPP would detail the methodology for managing any red squirrels or dreys encountered during works. The SPP is identified within the **Outline CEMP** (**Application Document Reference: TR010041/APP/7.3**).	To protect red squirrel.
Throughout Part B	Pre-construction	RS02	A pre-works inspection would be undertaken by the ECoW in all areas of woodland within 50 m from the works/ construction compounds boundary, in search of evidence of squirrel activity/presence, prior to any works taking place in any woodland habitat.	To protect red squirrel and their dreys.
Throughout Part B	Pre-Construction	RS03	Tree felling within WB9, or any other woodland subsequently identified with dreys, would be timed out with the red squirrel breeding season recognised as between February to September inclusive. Where this cannot be achieved, all works would be discussed with, and overseen by, the ECoW prior to commencement.	To protect red squirrel.
Throughout Part B	Construction	BAT01	The use of construction lighting would be in accordance with BS5489 Code of Practice for the Design of Road Lighting and follow best available guidance on lighting with regards to protected species (Ref. 9.73). The construction lighting design would take into account the need to avoid illuminating sensitive mammal habitats (e.g. for bats and badgers) in locations such as: adjacent to watercourses; along woodland edges; and, where there is known activity identified through pre-construction ecological surveys (refer to Mitigation Item EC02). Where this is not possible the main contractor would consult with the ECoW on any exceptions in advance of construction activities.	To protect sensitive mammal habitats from illumination.
Throughout Part B	Construction	BAT02	Construction works to be undertaken taking into account sensitive ecological seasons (e.g. breeding, hibernation or migration seasons) and the potential impact that the type of construction work could have on bats within that season.	To protect bats during construction works.

Approximate Location	Timing of Measure	Measure Reference	Description	Mitigation Purpose or Objective
			The key sensitive periods for bats are between May-August (inclusive) when bats form maternity roosts; and between November-February (sometimes extending into October and March dependent on weather conditions) when bats occupy hibernation roosts.	
Throughout Part B	Pre-Construction & Construction	BAT03	An SPP to be produced in consultation with Natural England during detailed design. Where appropriate, the SPP would include monitoring regimes during construction. The SPP would cover mitigation and compensation for known roosts to be affected by Part B which would require licensing, citing any necessary licences obtained and the conditions associated with such licensing. The SPP is identified within the **Outline CEMP** (**Application Document Reference: TR010041/APP/7.3**).	To comply with conservation legislation and to protect bats.
Throughout Part B	Construction	BAT04	No construction works (including enabling works) would take place within 30 m of known roost locations that are not to be lost directly to Part B. Where essential works are required, the nature of the works would be discussed with the ECoW to establish what mitigation measures are required. Works would only take place with the agreement of the ECoW and following any application for necessary licensing/adherence to licence conditions.	To prevent disturbance to bats leaving/entering roosts.
Throughout Part B	Construction	BAT05	All trees assessed with bat roost potential (Low, Moderate or High) that require to be pruned or felled to accommodate Part B would be subject to a pre-felling inspection and/or dusk/dawn re-entry survey (as determined by the ECoW) no more than 24 hours prior to works in search of roosting bats. Upon completion, those trees where suitability for roosting bats remains (Moderate or High potential), although presence of a roost has not been confirmed, should be soft-felled under ecological supervision (by the ECoW (suitably experienced and licensed)). This would consist of the removal of major branches and limbs followed by section felling of the main trunk, with these lowered to the floor for inspection by the ECoW.	To comply with conservation legislation and protect roosting bats.
Throughout Part B	Construction	BAT06	Any bats present within roosts would be translocated to bat boxes erected to mitigate the loss of the roost and proportionate to the type of roost to be lost (refer to BAT09). Location of bat box placement would be under direction and guidance of a bat licensed ecologist. Thereafter, the roost and any features within 10 m (in all directions) would be filled/blocked appropriately.	To comply with conservation legislation and protect roosting bats.
Throughout Part B	Construction	BAT07	Where possible, trees would be retained and pruned/modified so as not to pose a health and safety concern for the new road layout. Pruning of any retained trees should reduce limbs and retain parts of the tree which can be utilised by wildlife. Suitable features for roosting bats can then be created. This would be carried out under the guidance of a bat licensed ecologist.	To provide bat roosting habitat and ensure future viability of roosting bats in the area. Measure would contribute to ameliorating the loss of roosting opportunities (trees/buildings).
Throughout Part B Bat Roosts at Charlton Mires Farm Complex (B6C, B6K and B6M) and East Cottage B102B	Pre-Construction & Construction	BAT08	EPS licences would be obtained for all bat roosts to be lost or disturbed during construction. Any bat roosts to be lost would be mitigated through the erection of bat boxes (or other suitable roosting features), prior to the loss of any roost. The requirement for replacement roosts would be determined following pre-construction surveys (refer to EC02). Where roosts have already been identified during baseline	To comply with conservation legislation and protect roosting bats. To replace bat roosting habitat.

Approximate Location	Timing of Measure	Measure Reference	Description	Mitigation Purpose or Objective
			surveys, locations for compensatory bat boxes have been identified and are presented within **Figure 7.10: Landscape Mitigation Plan**, **Volume 6** of this ES (**Application Document Reference: TR010041/APP/6.6**). However, their ultimate placement within those predefined areas would be completed under guidance of a Suitably Qualified Ecologist/ECoW. The specification of mitigation bat box would be proportionate to that of the roost to be lost and selected by the suitably qualified ecologist/ECoW, with two suitable bat boxes provided for each roost lost.	
Northern Woodland Roosts (Bat Boxes)	Pre-Construction & Construction	BAT09	The woodland to the north of Part B (Central OS Grid Ref: NU 17110 21927) would be lost to facilitate the construction of Part B This woodland has 12 recorded bat roosts within it including roosts of Regional importance. All 12 bat roosts are within bat boxes which would be translocated to an adjacent woodland (Central OS Grid Ref: NU 17216 21929) by an experienced bat licensed ecologist and under a Natural England licence. Further details can be found in the **Consents and Agreements Position Statement** (**Application Document Reference: TR010041/APP/3.3**). In addition to boxes being translocated, the area next to the A1 where trees are to be replanted, adjacent to where the woodland is being lost (near central OS Grid Ref: NU 17111 21977), 12 rocket style bat boxes on poles (Nestbox, Eco Rocket Bat Box with 6 m Pole) would be installed in amongst the newly planted woodland. A further 12 bat boxes would be installed within the existing adjacent woodland that extends eastwards from Part B. As the area supports a significant number of bat roosts, this increased mitigation and compensation would help to ensure when boxes are translocated, ample roosting opportunities are present for bats within the area. Areas have been identified for these bat boxes and are presented within the **Figure 7.10**: **Landscape Mitigation Plan**, **Volume 6** of this ES (**Application Document Reference: TR010041/APP/6.6**).	To comply with conservation legislation and protect roosting bats. To enhance bat roosting habitat and ensure future viability of roosting bats in the area.
Throughout Part B	Pre-Construction & Construction	BAT10	To further increase suitable roosting locations for bats and compensate for the loss of roosting opportunities within trees being felled to facilitate Part B, a minimum of five rocket style bat boxes[15] (Nestbox, Eco Rocket Bat Box, two as cavity option, three as crevice, with 6 m Pole) would be erected between the noctule maternity roost and a known foraging location at Heckley Fence, as shown within **Figure 7.10: Landscape Mitigation Plan**, **Volume 6** of this ES (**Application Document Reference: TR010041/APP/6.6**) (near central OS Grid Ref: NU 19117 16651). The siting of the bat boxes would be determined by the appointed Suitably Qualified Ecologist/ECoW.	To provide bat roosting habitat and ensure future viability of roosting bats in the area. Measure would contribute to ameliorating the loss of roosting opportunities (trees/buildings).
Tree G02 (OS Grid Ref: NU 18588 16149)	Pre-Construction & Construction	BAT11	Construction of and access along the proposed access track (entering the field around OS Grid Ref: NU 18558 16175) in proximity to tree G02 should be undertaken outside	To comply with conservation legislation and protect roosting bats.

[15] https://www.nestbox.co.uk/products/eco-rocket-bat-box

Approximate Location	Timing of Measure	Measure Reference	Description	Mitigation Purpose or Objective
			the bat maternity season (mid-May to mid-August inclusive) to ensure the noctule maternity roost present is not disturbed by construction works. Camera trap monitoring of the roost would be implemented continuously throughout the construction stage (using a suitably high trigger speed camera, with the camera trap installed and checked with as little disturbance and noise as possible). Camera trap footage would be reviewed monthly to ensure bats are not leaving the roost due to noise disturbance as a result of construction traffic/works. Camera trap monitoring would be further supplemented with activity surveys of the roost conducted once a month in the active bat season (May to September). Activity surveys would be undertaken by an experienced bat licensed ecologist, taking counts of the number of bats emerging/re-entering the roost. The results of the activity surveys would be compared to the 2019 survey results to discern whether there is any reduction in the numbers of bats, which may indicate that construction has compromised the use of the roost by bats. If bats' behaviour is observed to deviate from anticipated norms (e.g. emergence and flight activity during daylight hours), or if there is a drastic difference in the range of numbers of roosting bats utilising the roost compared to data accumulated across surveys in 2019, additional mitigation would be required. Any further mitigation requirements would be determined by an experienced bat licensed ecologist and in liaison with Natural England.	
Throughout Part B	Construction	BI01	Vegetation and site clearance works would be undertaken outside the bird nesting period, March to August inclusive, to avoid damage or destruction of nests. Where this is not possible, site clearance would be preceded by an inspection from an experienced ecologist within 24 hours prior to clearance works commencing to confirm the absence of active nests. If an active nest is recorded, a minimum buffer of 5 m would be implemented (the buffer size at the discretion of the ecologist) and remain in place until the nest is confirmed as inactive. All cleared vegetation would be rendered unsuitable for nesting birds, for example, by covering or chipping depending on the end purpose of the vegetation or would be removed from the works area.	To protect nesting birds.
Throughout Part B	Pre-Construction	BI02	Following the last harvest of arable fields within Part B, the area would be sprayed with a non-residual and neonicotinoid-free herbicide to prevent regrowth, rendering the arable habitat of negligible value to wintering birds. This may cause dispersal during construction, however, impacts as a result of dispersal are not considered significant due to the substantial distribution of arable farmland in the wider landscape.	To reduce the impact to wintering birds.
Throughout Part B	Post-Construction	BI03	Thick screening planting of native, scrubby species adjacent to the widened carriageway. This would be as dense as possible.	To provide suitable habitat to support nesting birds.

Approximate Location	Timing of Measure	Measure Reference	Description	Mitigation Purpose or Objective
Throughout Part B	Post-Construction	BI04	Landscape planting associated with Part B would include native species of local origin and include berry bearing shrubs. This is in order to provide food resources for thrushes and finches and cover for species such as dunnock (SPI, BoCC amber list, UKBAP) and compensate for the loss of hedgerows and scrub habitat, where this is unavoidable to enable construction of Part B. Wherever possible new habitats would be designed as connective corridors, linking to other habitat areas, rather than in isolated parcels.	To provide foraging resources for wintering birds.
Throughout Part B	Construction & Post-Construction	BI05	Habitat compensation for breeding birds would be implemented and is incorporated into the **Landscape Mitigation Plan** (**Figure 7.10**, **Volume 6** of this ES (**Application Document Reference: TR010041/APP/6.6**)), including hedgerows, woodland, scrub and grassland. The baseline surveys identified that farmland habitats were of particular importance to wintering birds across the Study Area. Farmland would be re-instated and habitat loss kept to a minimum. Farmland boundary features, such as hedgerows, would be reinstated and created within the Order Limits to provide these habitats of value.	To compensate for the loss of breeding bird habitat.
Throughout Part B	Construction & Post-Construction	BO01	Where trees are removed to facilitate construction, these would be replaced, to encourage safe bird/barn owl/bat flight lines at height over the carriageway, above potential collision height with traffic. Tree and hedge planting have been included within **Figure 7.10: Landscape Mitigation Plan, Volume 6** of this ES **(Application Document Reference: TR010041/APP/6.6**) at all possible considered locations bounding Part B, irrespective of whether trees were originally present. Tree and hedge planting has been designed to provide thick screening using native, scrubby species adjacent to the widened carriageway. This would be as dense as possible.	To reduce potential traffic collisions and risk of barn owl mortality. To prevent barn owl foraging adjacent to the carriageway, and if flying across the carriageway, flight lines would be over traffic and reduce the likelihood of mortality through collision.
Throughout Part B	Construction & Post-Construction	BO02	In any instances where roadside tree planting is not feasible, roadside verges would be planted with scrub species (e.g. gorse, broom, hawthorn) to discourage barn owl foraging. This is a recognised effective method for reducing barn owl mortality.	To reduce potential traffic collisions and risk of barn owl mortality.
Throughout Part B	Pre-Construction, Construction & Post-Construction	BO03	In the absence of tree or scrub planting and where seeding mixes are utilised along roadside verges, regular mowing would be undertaken to maintain a short sward, thereby reducing the suitability of habitat to support barn owl prey species.	To reduce potential traffic collisions and risk of barn owl mortality.
Throughout Part B	Pre-Construction, Construction & Post-Construction	BO04	In the event of a previously unknown/new barn owl roost/nest site being discovered within the Order Limits, or beyond Part B at such a distance as to be judged at risk of disturbance by a Suitably Qualified Ecologist (SQE) using recognised guidance; any such sites discovered would be protected from works by a buffer, the extent of which would be as deemed appropriate by the SQE. The buffer would remain in place until any dependent young had left the site and/or until an appropriate course of action had been determined.	To prevent the loss of active barn owl nest and roost sites.
Reptile Survey Site Location 8 – Rock Midstead	Construction	RE01	A Precautionary Method of Works (PMW) would be developed for enabling works and construction associated with the vegetation clearance at Rock Midstead shelterbelt (approximate chainage 58300) (refer to **Figure 9.20: Reptile Survey Site Locations –**	To protect reptiles, present within suitable supporting habitat.

Approximate Location	Timing of Measure	Measure Reference	Description	Mitigation Purpose or Objective
			Sheet 9, **Volume 6** of this ES (**Application Document Reference: TR010041/APP/6.6**)). The PMW is identified within the **Outline CEMP** (**Application Document Reference: TR010041/APP/7.3**). The PMW would detail a prescribed works method to ensure the safety of any reptiles that might be present, which is likely to include: - Hand search for reptiles in area to be cleared; - Strim of vegetation to 10 cm; - Second search by hand for reptiles; - Strim of vegetation to ground level; and - Removal by hand, any features with potential to support reptiles (e.g. log piles, rubble piles, stone walls). In the event that reptiles are encountered at any time, they would be captured by hand and translocated away from the construction area to a predefined release area within suitable supporting habitat. The release site shall be identified by the ECoW.	
In or in close proximity to waterbodies/watercourses	Construction	AQ01	Construction materials would be stored and maintained away from watercourses and waterbodies. Silt fences or similar would be placed around exposed ground and stockpiles, and early re-vegetation of the completed elements of Part B would be undertaken to reduce erosion.	To protect aquatic habitats and species from pollution.
In or in close proximity to waterbodies/watercourses	Construction	AQ02	Chemicals and fuels must be stored in secure containers located away from watercourses and waterbodies. No refuelling of plant and machinery would take place near watercourses.	To protect aquatic habitats and species from chemical and fuel pollution.
In or in close proximity to waterbodies/watercourses	Construction	AQ03	Lighting used for construction would be switched-off when not in use and, where possible, positioned so as not to spill on to watercourses.	To protect aquatic habitats and species from light pollution.
In or in close proximity to waterbodies/watercourses	Construction	AQ04	Any construction works (including enabling works) would be conducted from the bank and tracking within the channel would be avoided. Where work needs to be carried out within a watercourse, then tracking would be minimised and sediment trapping equipment (hessian mats or similar), would be deployed and appropriately maintained. Any displaced substrate would be returned to as close to its original condition as possible upon completion of the works.	To protect aquatic habitats and species from pollution through physical disruption of sediments.
In or in close proximity to waterbodies/watercourses	Construction	AQ05	Water quality would be monitored throughout construction works where working with concrete in or within close proximity (within 10 m) to waterbodies or watercourses is required. Monitoring would be undertaken by suitably trained personnel, with the use of a multiparameter probe that can accurately detect changes in pH. Should a rise in pH be detected then work would stop until the cause has been identified and resolved. Appropriate arrangements would be made for the cleaning of equipment that comes into contact with concrete and suitable arrangements would be made for the disposal of cementitious waste. No cementitious materials would enter watercourses.	To protect aquatic habitats and species from concrete pollution.

Approximate Location	Timing of Measure	Measure Reference	Description	Mitigation Purpose or Objective
			Appropriate sediment management systems would be deployed and maintained throughout the works to prevent suspended sediment being transported downstream (potentially affecting spawning grounds or causing wider pollution).	
In or in close proximity to waterbodies/watercourses	Construction	AQ06	Carrying out construction works (including enabling works) within waterbodies during the brown trout spawning season, between September and March, would be avoided. For works within or in close proximity to Denwick Burn (within 10 m), this period would be extended to the end of May16 (September to May inclusive).	To protect fish species of conservation importance.
Waterbodies/watercourses	Construction	AQ07	Should any part of any watercourse need to be impounded during the works, then a fish translocation would be carried out to remove fish from the impoundment. Fish translocation operations would require a permit from the Environment Agency in order to use electric fishing and ancillary equipment (such as hand nets). It should be noted that it can take as long as 20 days to obtain a permit. Such an operation would require careful planning to set-up and drain any coffer dam used.	To protect fish species of conservation importance and to adhere to Environmental Permitting best practice.
Waterbodies/watercourses	Construction	AQ08	Should a crayfish of any species be found during any subsequent works then work would cease and a suitably licensed ecologist be consulted, to identify any crayfish found to species level, and if necessary, to formulate a suitable mitigation plan, should the presence of white-clawed crayfish be confirmed.	To protect species of conservation importance and to comply with conservation legislation.
Culverts	Construction	AQ09	New culvert structures (including the Kittycarter Burn) would be designed and installed to modify the current characteristics, to produce a variable flow rate and reduce overall speed of water flow. Roughened beds (addition of rocks and boulders), baffles and refuge areas (such as masonry with cavities) would achieve this.	To facilitate the movement of fish, macroinvertebrates and other aquatic species through the culverts.
Culverts	Operation	AQ10	Periodic removal of debris from culverts would be undertaken.	To prevent blockage and ensure maintenance of hydraulic capacity and movement of animals, sediment and woody / large debris downstream.
Throughout Part B	Operation	AQ11	A surface water drainage system would be installed with a robust treatment system using filter drains, grassed detention basins, swales and reed beds would achieve sufficient sediment and pollutant removal.	Prevent pollution of watercourse by hydrocarbons and sediments from carriageway.
Throughout Part B	Pre-Construction and Construction	AQ12	To minimise the impact to fish from disturbance (including noise, light and vibration), works outside of watercourses would be set back from the watercourse by a minimum of 10 m, where possible.	To reduce the impacts on fish.

[16] Owing to the known presence of brown trout and salmon records in this watercourse as provided by the EA.

ENHANCEMENT

9.9.9. Enhancement opportunities would be considered further at detailed design but may include the following:

a. Where possible, cleared deadwood, felled trees and arisings from site clearance works would be used in a variety of locations to benefit wildlife. These locations would be determined by the ECoW and based on site conditions at the time. Materials would be stored in a suitable location away from the working area to prevent risk of damage and then placed within areas of retained woodland or woodland planting at an appropriate time.

b. Additional bat and bird nest boxes could be installed on suitable mature trees/structures or mounted on poles. Bat boxes would be installed in unlit areas on multiple aspects (including facing south, west or east) at a height of 3 m plus and have a clear flight path to the access point. The bat boxes would be located within existing or newly created suitable foraging and commuting habitats. The requirements of the bird boxes would be specific to the type installed and manufacturers advice would be followed. The bat and bird boxes could be placed within existing retained woodlands, during construction or once mature, the boxes could be placed within newly created woodlands, (on poles or mature existing trees along the edge), post-construction.

c. Enhancement of detention basins through aquatic, marginal and adjacent terrestrial planting to improve their suitability for wildlife, including amphibians and aquatic invertebrates. Enhancing these habitats for invertebrates would, in turn, increase the suitability for foraging bats and birds.

d. Installation of energy dissipaters at box culvert outlets. Dissipaters can include riprap, vegetated ditches, and concrete and steel baffles. The inclusion of these would seek to reduce harmful impacts to the receiving channel and for minimising natural substrate loss through scour and erosion. This would prevent the culvert outlet becoming 'perched'" above a lowered streambed.

9.10. ASSESSMENT OF LIKELY SIGNIFICANT EFFECTS

9.10.1. This section identifies any residual effects that may constitute Likely Significant Effects following the implementation of the design and mitigation measures outlined in this chapter and supporting appendices. Proposed enhancement measures have not been considered when assessing the significance of effects. Unless an explanation is considered necessary, where mitigation is considered successful and effects would be Neutral (not significant), these have not been documented below. A summary of assessment of likely significant effects classifications and the measures employed to reduce the likely significant effects is presented in **Table 9-13** below.

CONSTRUCTION

Habitats

9.10.2. Part B would result in the loss of broad-leaved and mixed semi-natural woodland, a HPI, to facilitate construction. However, Part B includes the reinstatement/creation of compensatory woodland at a quantity significantly greater than that lost (10.14 ha created in comparison to 0.69 ha lost). As such, Part B would result in a **Moderate** beneficial effect.

9.10.3. Part B would result in a net loss of hedgerow due to the permanent loss of 17,217 m of hedge/hedge with trees and the reinstatement/creation of 17,128 m of intact hedgerow. The decrease in hedgerow linear length would result in a **Slight** adverse, permanent effect (**not significant**).

9.10.4. Part B would result in a net loss of length of watercourse (rivers, burns and streams) as a result of the installation of new culverts and, realignments and extensions to existing culverts; an approximate net loss of 611 m. In relation to direct impacts to watercourses of Local importance, Part B would result in **Slight** direct, permanent adverse effect (**not significant**).

9.10.5. Indirect effects may arise during construction from dust deposition, surface water run-off and pollution events. Species that use these watercourses may be temporarily disturbed by works, however, with implementation of mitigation and adherence to best practice construction methods, the effect of indirect impacts to watercourses during construction would be **Neutral** (**not significant**).

Bats

9.10.6. Part B would result in the permanent loss of bats roosts as a result of the demolition of buildings B102B (East Cottage), B6C, B6K, and B6M (buildings associated with Charlton Mires Farm). Whilst the bat roosts all comprise non-breeding roosts composed of less than five individual bats in a single roost, eight separate roosts were identified across the complex of buildings. With the implementation of mitigation, the loss of these roosts represents a **Slight** direct, permanent adverse effect during construction (**not significant**).

9.10.7. Twelve roosts would be lost through the removal of woodland required at the northern end of Part B, containing bat boxes. A mixture of roosts were recorded, comprising maternity, non-breeding, and mating roosts of varying species. The bat boxes would be translocated from the woodland to be lost to Part B and erected on trees within established woodland c. 100 m east of their current location. With the accompaniment of mitigation, the translocation of bat boxes from their current location (effectively lost to Part B) represents a **Slight** direct, permanent adverse effect (**not significant**) during construction.

9.10.8. Ten non-breeding roosts comprising common and soprano pipistrelle, and unspecified bat species (likely common or soprano pipistrelle), lie within 30 m of Part B and may be subject to disturbance during construction. With the implementation of mitigation, disturbance impacts to these known roosts is assessed to be **Neutral** (**not significant**) during construction.

Birds

9.10.9. Construction may result in noise levels greater than existing levels. However, this would represent a temporary impact that is relatively short in duration. In addition to measures detailed within **Table 9-12**, measures to reduce construction noise levels are presented in **Chapter 6: Noise and Vibration** of this ES. This includes (but is not limited to) applying the principles of best practicable means as to avoid or reduce any disturbance from noise as far as is practicable, use of plant or machinery that complies with the relevant EC/UK noise limits, timing of activities and use of acoustic barriers and other noise containment measures. Following the implementation of mitigation, increased disturbance as a result of

noise would result in a **Slight** temporary adverse effect **(not significant)** during construction.

9.10.10. No other significant residual impacts are predicted to breeding or wintering birds.

Fish

9.10.11. Part B would result in the permanent loss of watercourse habitat during the extension and realignment of culverts and the permanent loss of watercourse habitat during construction of new culverts. As this would result in a permanent loss of viable habitat through culvert extension, with regard for proposed culverts in Shipperton Burn, Kittycarter Burn tributary and the tributary of Embleton Burn, the effect is assessed to be of **Moderate** adverse permanent effect.

9.10.12. The culvert works may also incur temporary disturbance or displacement during construction. Following successful implementation of mitigation, Part B would result in a **Slight** temporary, adverse effect to fish (**not significant**) during construction through noise and vibration disturbance.

Aquatic Invertebrates

9.10.13. Part B would result in the temporary loss of watercourse habitat during culvert extensions, realignments and installations, and the permanent loss of watercourse habitat during construction of new culverts/other culvert extensions. The culvert works may also incur temporary disturbance or displacement during construction. Following successful implementation of mitigation, Part B would result in **Slight** temporary, adverse effects to aquatic invertebrates (**not significant**) during construction.

OPERATION

9.10.14. The ARN did not identify any sensitive designated sites or habitats that may be impacted by the operation of Part B (refer to **Chapter 5: Air Quality** of this ES). Pollution in the form of NOx deposition and road-spray would occur during operation of Part B, however, such impacts would affect a small area along the immediate corridors of the widened carriageway and fail to exceed threshold levels for further consideration.

9.10.15. Operational impacts upon species and species groups are likely to be restricted to the passage of fauna across the widened carriageway. The inclusion of hedge, shrub and tree planting along the carriageway embankments has been designed to encourage flight lines of birds, barn owl, and bats above potential collision height with traffic. Species present beyond the existing single carriageway boundary would be habituated to noise associated with the passage of traffic and intermittent presence of light sources associated with car lights during nighttime hours. This habituation would continue post-construction and during operation of Part B, with a likely minimal discernible variation in noise levels experienced and is considered to represent a **Neutral** (**not significant**) effect.

9.10.16. Extant culverts with mammal ledges would be extended to accommodate the widened carriageway, with mammal ledges additionally extended in the same fashion. These would continue to provide commuting routes for mammals. Where new culverts are installed, mammal ledges have not been included primarily due to their profile/circumference,

however, this has also taken into account the presence and location of extant culverts with mammal ledges that would be extended would ensure that potential crossing points beneath the carriageway would be maintained. The new culverts proposed are situated in locations where there is an absence of species requiring the installation of such measures, or where ample opportunity exists for alternative passage. As such, Part B is considered to have **Neutral** (**not significant**) effect on species passage.

SUMMARY OF ASSESSMENT OF LIKELY SIGNIFICANT EFFECTS

9.10.17. **Table 9-13** below summarises the assessment of likely significant effect classifications for ecological receptors and the measures employed to reduce the significance of effect. Measure references correspond to those presented in **Table 9-12**.

Table 9-13 - Summary of Assessment of Impact Characterisation and Significance to Ecological Receptors

Ecological Receptor		Measures to Reduce the Significance of Effects		Impact Characterisation and Impact Significance		Significant Effects (yes/no)
		Construction	Operation	Construction	Operation	
European designated sites		N/A – no potential impacts during construction	No mitigation proposed.	Neutral	Neutral	No
Statutory and non-statutory designated sites		N/A – no potential impacts during construction	No mitigation proposed.	Neutral	Neutral	No
Habitats of Principal Importance (HPI)	Broad-leaved woodland – semi-natural	EC01, EC02, EC05, EC07, EC08, EC09, EC10, HAB01, HAB03	Design measures. EC15	Moderate beneficial	Neutral	Yes
	Hedgerow	EC01, EC02, EC05, EC07, EC08, EC09, EC010, HAB03	Design measures. EC15	Slight adverse	Neutral	No
	Watercourses	EC01, EC02, EC03, EC04, EC07, EC08, EC10, EC11, HAB03, AQ01, AQ02, AQ03, AQ04, AQ05, AQ10, AQ11	Design measures. EC15	Slight adverse	Neutral	No
Badger		EC02, EC03, EC04, EC05, EC06, EC07, EC08, EC09, EC010, EC014, EC015, EC016, EC018, HAB03, B01, B02, B03, B04	No mitigation proposed.	Neutral	Neutral	No
Water Vole		EC02, EC03, EC04, EC05, EC07, EC08, EC09, EC016	No mitigation proposed.	Neutral	Neutral	No
Otter		EC02, EC03, EC04, EC05, EC08, EC10, EC13	No mitigation proposed.	Neutral	Neutral	No
Red Squirrel		EC02, EC03, EC04, EC05, EC06, EC08, EC09, EC10, EC011, EC012, EC013, HAB03, RS01, RS02, RS03	No mitigation proposed.	Neutral	Neutral	No
Bats		EC01, EC02, EC03, EC04, EC05, EC07, EC08, EC09, EC10, EC11, EC012, EC014, HAB03, BAT01, BAT02, BAT03, BAT04, BAT05, BAT06, BAT07, BAT08, BAT09, BAT10, BAT11	EC15	Slight adverse	Neutral	No
Breeding and wintering birds		EC02, EC03, EC05, EC07, EC08, EC09, EC10, EC11, EC14, BI01, BI02, BI03, BI04, BI05	EC15	Neutral	Neutral	No
Barn owl		EC02, EC03, EC04, EC05, EC07, EC08, EC09, EC10, EC11, EC012, BI01, BI05, BO1, BO2, BO3, BO4	EC15	Neutral	Neutral	No
Great Crested Newt		EC02, EC03, EC04, EC05, EC08, EC09, EC10, EC13	EC15	Neutral	Neutral	No

Ecological Receptor	Measures to Reduce the Significance of Effects		Impact Characterisation and Impact Significance		Significant Effects (yes/no)
	Construction	Operation	Construction	Operation	
Reptiles	EC02, EC03, EC04, EC05, EC08, EC09, EC10, EC13, HAB03, RE1	EC15	Neutral	Neutral	No
Fish	EC01, EC02, EC03, EC04, EC07, EC10, EC11, EC12, AQ03, AQ04, AQ05, AQ06, AQ07, AQ009, AQ12	EC15	Moderate adverse	Neutral	Yes
Aquatic invertebrates (incl. white clawed crayfish)	EC01, EC02, EC03, EC04, EC07, EC10, EC11, EC15, AQ01, AQ02, AQ03, AQ04, AQ05, AQ06, AQ09, AQ12	EC15	Slight adverse	Neutral	No

ASSESSMENT PARAMETERS

9.10.18. The Assessment Parameters are presented in **Chapter 2: The Scheme**, **Volume 1** of this ES (**Application Document Reference TR010041/APP/6.1**), would incur changes to temporary and/or permanent habitat loss (habitat type and quantity) and therefore impact the accuracy of the biodiversity assessment calculations. **Table 9-14** below considers these in relation to the potential for each assessment parameter to change the conclusions of this chapter. However, based on professional judgement, the parameters are not anticipated to alter the significance of effects of the biodiversity assessment as a result of Part B.

Table 9-14 – Consideration of Assessment Parameters

Assessment Parameter	Brief Description	Justification
Parameter 1:	Up to a 650 mm increase or 250 mm decrease in height for Heckley Fence Accommodation Overbridge has been considered in order to accommodate a 400 mm increase in the depth of the structural beam and a 250 mm increase or decrease in the finished road levels on the A1.	The parameter would incur changes to temporary and/or permanent habitat loss and habitat creation (habitat type and quantity) and therefore impact the accuracy of the biodiversity assessment calculations. However, based on professional judgement, the parameters are not anticipated to alter the significance of effects of the biodiversity assessment documented in this chapter.
Parameter 2:	Up to a 900 mm increase or 500 mm decrease in height of Charlton Mires Junction Overbridge has been considered in order to accommodate a 400 mm increase in the depth of the structural beam and a 500 mm increase or decrease in the finished road levels on the A1.	The parameter would incur changes to temporary and/or permanent habitat loss and habitat creation (habitat type and quantity) and therefore impact the accuracy of the biodiversity assessment calculations. However, based on professional judgement, the parameters are not anticipated to alter the significance of effects of the biodiversity assessment documented in this chapter.
Parameter 3:	Realignment of the Northern Powergrid Circuit 7.5 km of 66 kV EHV transmission cable may be provided within the new highway boundary, which would entail a greater amount of permanent land take but remove the need to interfere	The parameter would incur changes to the **Biodiversity No Net Loss Assessment Report** (refer to **Appendix 9.11**, **Volume 8** of this ES (**Application Document Reference: TR010041/APP/6.8**)) calculations. However, based on

Assessment Parameter	Brief Description	Justification
	with private land after completion of the works as a result of the operation or maintenance of the cable. This option would mean a slightly different landscaping treatment within the wider highway boundary.	professional judgement, the parameters are not anticipated to alter the significance of effects of the biodiversity assessment documented in this chapter, for both construction and operation of Part B.

UPDATED DMRB GUIDANCE

9.10.19. The sensitivity test as discussed in **Section 9.4** has determined that the application of the updated guidance would potentially change the assessment in relation to operational effects from air quality only, as a result of LA 105 Air Quality (**Ref. 9.29**). With the application of the updated guidance, the conclusions of the assessment in relation to other potential impacts and their likely significance would remain unchanged. As explained in **paragraph 9.4.27**, the updated DMRB guidance primarily references best practice, CIEEM guidelines and standing advice, which were used to inform the assessment presented within this chapter.

9.10.20. In relation to operational effects from air quality, it has been identified that LA 105 Air Quality (**Ref. 9.29**) includes a number of key changes in the assessment methodology compared to the guidance (HA 207/07 (**Ref. 9.74**) and IAN 174/13 (**Ref. 9.25**)) that it replaces. Most of the identified changes are considered unlikely to affect the conclusions of the operational effects of air quality assessment presented in this chapter, and the reasons for this are summarised in **Appendix 4.5: DMRB Sensitivity Test**, **Volume 1** of this ES (**Application Document Reference: TR010041/APP/6.1**). However, **Table 9-15** identifies the changes considered to warrant further assessment.

Table 9-15 – Changes in Assessment Methodology in LA 105 Air Quality and Approach Taken

Topic	Change in Assessment Methodology	Approach Taken in Sensitivity Test
Designated habitats	LA 105 Air Quality requires that an assessment is undertaken for Nature Improvement Areas and veteran trees within 200 m of the ARN, which were not considered within the assessment presented within this chapter.	The assessment conducted as a result of the sensitivity test included an assessment of the potential for likely significant environmental effects of Part B on Nature Improvement Areas and veteran trees within 200 m of the ARN.
Assessment of impacts	LA 105 Air Quality simplifies the assessment and no longer requires consideration to the change in	The assessment conducted as a result of the sensitivity test had due regard to Figure 2.98 of LA 105 Air

Topic	Change in Assessment Methodology	Approach Taken in Sensitivity Test
	annual mean NOx in relation to the critical level. The assessment focuses on change in nitrogen deposition with new deposition rates specified for grassland and forest type habitats.	Quality, which uses nitrogen deposition as the main basis for evaluating significant effects in relation to air quality.

9.10.21. As part of the sensitivity test, the operational nitrogen deposition has been remodelled in accordance with LA 105 Air Quality (**Ref. 9.29**) and is presented in **Appendix 5.7: Air Quality DMRB Sensitivity Test**, **Volume 8** of this ES (**Application Document Reference: TR010041/APP/6.8**). Full details of the assessment are presented in **Appendix 9.12: Biodiversity DMRB Sensitivity Test**, **Volume 8** of this ES (**Application Document Reference: TR010041/APP/6.8**). In summary, four ancient/veteran trees were identified for assessment under LA 105 Air Quality. However, the modelling showed that none of the trees would experience a change in nitrogen deposition with the potential to result in a significant effect. The sensitivity test has determined that the application of the updated guidance (**Ref. 9.29**) would not change the likely significance of effects and therefore the conclusions of the assessment would remain unchanged.

BIODIVERSITY NO NET LOSS

9.10.22. Part B would result in a net loss of biodiversity through the removal of hedgerows to facilitate construction of Part B; and loss of running open water habitat, primarily through the extension of existing culverts. However, the reinstatement/creation of hedgerows is only approximately 89 m less than that lost to Part B (approximately 17,128 m reinstated/created in comparison to 17,217 m lost), with the majority of hedgerows lost comprising native, species-poor hedgerow. However, reinstated/created hedgerows would comprise native species-rich and therefore be of arguably greater ecological importance. Additionally, Part B is in line to deliver a net gain in biodiversity units of HPI broadleaved woodland and also area based non-HPI habitats.

9.10.23. The full findings of the biodiversity no net loss calculations are presented in **Appendix 9.11: Biodiversity No Net Loss Assessment Report**, **Volume 8** of this ES (**Application Document Reference: TR010041/APP/6.8**), which also provides conclusions of Part B's likely impact to biodiversity in line with the Defra metric (**Ref. 9.33**) and the Highways England memorandum (**Ref. 9.34**).

9.11. MONITORING

CONSTRUCTION MONITORING

9.11.1. Monitoring requirements during construction are detailed within this chapter (**Table 9-12**, as appropriate) and supporting **Appendices 9.1** to **9.10**, **Volume 8** of this ES (**Application Document Reference: TR010041/APP/6.8**) in relation to protected species licensing.

Details can also be found in the **Consents and Agreements Position Statement** (**Application Document Reference: TR010041/APP/3.3**).

9.11.2. Monitoring would be undertaken throughout the construction period by a site-based Ecological Clerk of Works (ECoW). The ECoW would ensure construction works remain compliant with mitigation measures prescribed within this chapter and its supporting appendices, which is captured within the **Outline CEMP** (**Application Document Reference: TR010041/APP/7.3**) that has been produced and accompanies the DCO application. The Outline CEMP would additionally identify the monitoring requirements of environmental best practice, for example, waste management processes, pollution and siltation events upon watercourses/waterbodies, and dust management. The ECoW would additionally monitor works and ensure compliance with any protected species licence conditions. Examples of ecological receptor-specific monitoring include:

a. Monitoring of the *Nyctalus* roost to ensure no adverse disturbance effects upon roosting bats.
b. Monitoring of spoil heaps for the presence of badger activity/sett building and excavation.
c. Inspections and monitoring of vegetation (hedgerows, trees, grassland) for the presence of nesting birds during the breeding season.

POST-CONSTRUCTION MONITORING – GENERAL

9.11.3. Monitoring upon completion of construction would be undertaken to confirm the successful establishment of habitats or use of ecological mitigation features. Post-construction monitoring would be undertaken in accordance with the proposed Ecological / Environmental Management Plan (Mitigation reference **EC15**), to be developed at detailed design. The Ecological / Environmental Management Plan would be included within the Handover Environment Management Plan (HEMP), provided to the Applicant post-construction.

9.11.4. The HEMP would be developed from the CEMP, and detail monitoring and management, including future maintenance arrangements, that must be adhered to throughout the future operation of Part B.

PROTECTED SPECIES LICENSING – POST-COMPLETION

9.11.5. Any protected species licences required to facilitate construction of Part B would likely require some form of monitoring to ensure mitigation prescribed and enacted performs as required. Post-completion monitoring survey requirements have been identified for the loss of bat roosts associated with the demolition of Charlton Mires Farm buildings, adjacent East Cottage to the south, and the translocation of bat boxes from the woodland at the northern end of Part B to a receptor woodland.

9.11.6. Monitoring and inspections of bat boxes would, as a minimum, be undertaken twice a year during May and August, during the first, third and fifth years after translocation of boxes (to their receptor location) or newly erected mitigation boxes (this minimum monitoring program may be otherwise altered dependent on specific licence conditions) by a suitably qualified and bat licensed surveyor. Missing features would be replaced, like-for-like. Damaged features would be assessed/surveyed by a licensed ecologist and replaced if not in use.

This would be secured within the CEMP, as part of the DCO process. The level of post-completion monitoring would be agreed with Natural England and secured through the licensing process.

9.11.7. Any licences required to facilitate construction of Part B would generally include conditions for monitoring of features/mitigation/compensation post-construction and are specific to the receptor and/or feature.

DEFRA BAT STUDY

9.11.8. In accordance with Defra guidance (**Ref. 9.46**), Defra Landscape Scale transects would be subject to repeated survey effort during and post-construction. Transects would be replicated in accordance with the methodology presented in **Appendix 9.5: Bat Report**, **Volume 8** of this ES (**Application Document Reference: TR010041/APP/6.8**). It is recommended that a single year of monitoring is completed during the construction period and monitoring visits are completed annually over a 4-year period post-construction.

9.11.9. The monitoring would be undertaken by a suitably experienced consultant appointed by the Applicant/main contractor. Following completion of each monitoring period, an interim assessment of the mitigation design would be undertaken.

9.11.10. Following completion of the entire monitoring period, a final review would be undertaken. The review stage would include any statistical analysis of the data and consider the success of the mitigation implemented, in line with the standards detailed within the Defra guidelines (**Ref. 9.46**). The results of monitoring undertaken would inform any alterations to the designed mitigation system(s) in place, if required.

9.11.11. The Applicant/main contractor would identify a suitable body to ensure any alterations required are implemented and completed.

9.11.12. These commitments are included within the **Outline CEMP** (**Application Document Reference: TR010041/APP/7.3**) and would also be documented within the proposed Ecological / Environmental Management Plan (Mitigation reference EC020) developed at detailed design.

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