A1 in Northumberland: Morpeth to Ellingham

Scheme Number: TR010041

6.2 Environmental Statement – Chapter 9 Biodiversity

Part A

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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Rev 0	June 2020	Application Issue

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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 A: Morpeth to Felton (Part A) on biodiversity.

9.1.2. The chapter is informed by baseline surveys for protected and notable species, habitats and designated sites (**Appendices 9.1** to **9.19** and **9.26**, **Volume 7** of this Environmental Statement (ES) (**Application Document Reference: TR010041/APP/6.7**)), **Appendix 7.5: Arboricultural Survey**, **Volume 7** and **Appendix 9.20: Biodiversity No Net Loss Assessment**, **Volume 7** of this ES). A full account of baseline conditions is presented in **Appendices 9.1** to **9.19** and **9.26**, **Volume 7** 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 A 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 A 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 and Part B: Alnwick to Ellingham (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 this chapter. The Part B appendices present full baseline results, potential impacts, mitigation and significance of effect. This is then summarised in **Chapter 9: Biodiversity, Volume 3** of this ES (**Application Document Reference: TR010041/APP/6.3**). 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.

9.1.5. The future traffic levels for the assessment of Part A are based upon an opening year predicted to be in 2023. Since the assessments reported in this ES were completed, the Part A opening year has been put back to 2024. The assessment is based on traffic modelling for an opening year of 2023 and reported on that basis. However, as explained in **Section 4.1** in **Chapter 4: Environmental Assessment Methodology, Volume 1** of this ES (**Application Document Reference: TR010041/APP6.1**) it is considered that the assessments remain valid for an opening year of 2024.

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	Relevant Experience
Jack Fenwick	Author	Bachelor of Science (Honours) Full Member of the Chartered Institute of Ecology and Environmental Management (MCIEEM)	Principal Ecologist Over seven years' experience in ecological consultancy and impact assessment. Other recent relevant experience includes: - Ecological coordinator for Elwick Road, Hartlepool; residential scheme - Ecological coordinator for 45 mw biomass development, Middlesbrough - Author for Habitats Regulations Assessment (HRA) screening for Elwick

Name	Role	Qualifications and Professional Membership	Relevant Experience
			Road and 45 mw biomass development
Emma Hatchett	Reviewer	- Bachelor of Science (Honours) - Full Member of the Chartered Institute of Ecology and Environmental Management (MCIEEM) - Chartered Ecologist	Associate Director 17 years' experience in ecological consultancy and impact assessment. Other recent relevant experience includes: - Technical expert providing ecological advice and assurance in the assessment of impact and delivery of mitigation for HS2 Phase 1 Area North - Technical reviewer for the A1 Birtley to Coal House scheme
Andy Bascombe	Reviewer/Approver	- Bachelor of Science (Honours) - Master of Science - Doctor of Philosophy - Full Member of the Chartered Institute of Ecology and Environmental Management (MCIEEM) - Member of the Chartered Institute of Water and Environmental Management (MCIWEM) - Chartered Scientist	Environmental Technical Director 28 years' experience in ecological consultancy and impact assessment. Other recent relevant experience includes: - Delivery of numerous road projects including the M1, M4, M6, M9, M18, M25, M27, M42, A249, A27, A5 Northern Ireland and other major infrastructure schemes

Name	Role	Qualifications and Professional Membership	Relevant Experience
		- Chartered Environmentalist	

9.3 LEGISLATIVE AND POLICY FRAMEWORK

LEGISLATION

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 to 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 Low Impact 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 an 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 an 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, 8 and 9 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 Hedgerow 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 the national is informed by the following:

a. Department of Transport 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 A (presented in **Section 9.10**).

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**)
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 A:

a. Former Castle Morpeth District Local Plan (**Ref. 9.16**).

9.3.24. The following local policies are applicable to Part A. 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 A (presented in **Section 9.10**).

Table 9-2 - National Planning Policy Relevant to Biodiversity

Policy	Relevant Policy Objectives	Significance of Part A 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, are clearly detailed 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 A, adheres to the NPS NN requirements. Part A takes into consideration appropriate ecological receptors, with reference to the NPS NN. This chapter provides mitigation requirements for Part A, 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. 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 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 to minimise impacts on biodiversity, in line with the NPPF requirements. Opportunities for enhancement are also identified. In addition, Part A would result in the loss of ancient woodland for which no satisfactory alternative was identified (unavoidable due to Part A's main alignment). An **Ancient Woodland Strategy** (**Appendix 9.21**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7)**) has been developed as a suitable compensation strategy, which has been agreed through consultation with statutory consultees.
Highways England Biodiversity Action Plan	The Highways England biodiversity 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 A 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 A takes into consideration priority habitats and species at both a national and local level, Part A 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 A on Policy Objective
Former Castle Morpeth District Local Plan		
C7 – Ramsar sites, Species Areas of Conservation and Special Protection Areas	Developments would not be permitted should they adversely affect the integrity of Ramsar sites, potential or designated Species Protection Areas (SPAs) or candidate or designated Special Areas of Conservation (SACs), except where the development is connected with or necessary to the management of the site, or there are imperative reasons of overriding public interest and there are no alternative solutions.	A **Habitats Regulations Assessment (HRA)** (**Application Document Reference: TR010041/APP/6.14**) has been completed for the Scheme and concluded no likely significant effects. Therefore, it is considered that Part A adheres to the policy.
C8 – Sites of Special Scientific Interest	Developments would not be permitted should they adversely affect the integrity of Sites of Special Scientific Interest (SSSIs), either directly or indirectly, unless it can be demonstrated that the development is of overriding national importance and no alternative site is available. Regard will be given to the particular importance of National Nature Reserves (NNRs). Where development is to be permitted which could adversely affect any such site, the developer would be required to include measures to conserve and enhance the nature conservation interest and, where practicable, to provide replacement habitats and features where damage is unavoidable. The council will impose conditions or seek obligations to secure the long-term management of sites.	Part A would result in the loss of a relatively small area of the River Coquet and Coquet Valley Woodlands SSSI to allow construction of the new bridge over the River Coquet. The development is of national importance and there is no alternative practical solution available. Refer to **Chapter 3: Assessment of Alternatives**, **Volume 1** of this ES (**Application Document Reference: TR010041/APP/6.1**) for further details. Part A has been designed to avoid and mitigate impacts to the SSSI where possible. Following this, compensation has been developed in consultation and agreement with Natural England to address the potential adverse impacts of Part A on the SSSI, as detailed within the **Ancient Woodland Strategy** (**Appendix 9.21**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**)). The Ancient Woodland Strategy ensures that the policy tests are engaged and met, providing measures to conserve and enhance the nature conservation interest of the SSSI, compensation habitat to address the loss and a long-term management plan. Therefore, it is considered that Part A adheres to the policy.
C9 – Sites of Nature Conservation Importance and Local Nature Reserves	Developments would not be permitted should they affect the integrity of Local Nature Reserves (LNRs) or Sites of Nature Conservation Importance (SNCIs), either directly or indirectly, unless it can be demonstrated that the development is of overriding importance and no alternative is available.	Part A has the potential to result in residual likely significant effects (following mitigation) to Borough Wood LNR as a result of changes in air quality. However, the predicted effects are slight adverse and therefore not significant. Overall, it is considered that Part A adheres to the policy.

Local Policy Reference	Policy Overview	Significance of Part A on Policy Objective
C10 – Sites of local conservation interest	Developments would not be permitted should they affect the integrity of sites of local conservation interest, unless it can be demonstrated that the benefits from the proposed development outweigh the need to safeguard the intrinsic nature conservation value of the site.	Part A would result in the loss of a relatively small area of the Coquet River Felton Park LWS to allow construction of the new bridge over the River Coquet. The development is of national importance and there is no alternative practical solution available. Refer to **Chapter 3: Assessment of Alternatives**, **Volume 1** of this ES (**Application Document Reference: TR010041/APP/6.1**) for further details. Part A has been designed to avoid and mitigate impacts to the LWS. Following this, compensation has been developed in consultation and agreement with Natural England to address the potential adverse impacts of Part A on the LWS. Part A has the potential to result in residual likely significant effects (following mitigation) to Wansbeck & Hartburn Woods LWS and Cawledge Burn LWS as a result of changes in air quality. However, the predicted significance of effects is slight adverse and therefore not significant. Therefore, it is considered that Part A adheres to the policy.
C11 – Protected species	Developments would not be permitted which would adversely affect protected species or their habitats.	Mitigation and compensation have been developed as part of Part A to address potential impacts to protected species, including the provision of EPS licences as necessary. Therefore, it is considered that Part A adheres to the policy.
C12 – Wildlife Corridors	Development proposed are expected to protect, maintain or enhance wildlife corridors where affects are identified.	The landscape design for Part A has incorporated linear and connective habitat throughout to maintain and, where possible, improve connectivity of habitats and green infrastructure. Connectivity has also been considered within the ecological mitigation plan, informing the design of Part A, such as maintaining passage for fish and mammals through culverts. Therefore, it is considered that Part A adheres to the policy.
C13 – Retention of linear features	Developments should make provision for the retention and proper management of linear features that have ecological value for the benefit of wildlife.	Part A has been designed to retain habitats where possible. The landscape design has identified retained habitats, as well as those to be reinstated following potential temporary loss during construction. The landscape plan considers and proposed appropriate management to maintain and improve the value of linear features for wildlife. Therefore, it is considered that Part A adheres to the policy.
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 A 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 A 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 A 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 A, such as maintaining passage for fish

Local Policy Reference	Policy Overview	Significance of Part A on Policy Objective
		and mammals through culverts. Therefore, it is considered that Part A 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 A incorporates mitigation and green infrastructure to support wildlife and a biodiversity assessment has been undertaken to understand the impacts of Part A in the context of achieving no net loss of biodiversity. Therefore, it is considered that Part A adheres to the policy (refer to **Section 9.9**, and **Appendix 9.20: Biodiversity No Net Loss Assessment Report**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**)).
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 A, 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 A 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 adverse impacts will be adequately mitigation or, as a last resort compensated for. - Securing net biodiversity gains and/or wider ecological enhancement through new development.	Part A incorporates mitigation to minimise adverse impacts on biodiversity and opportunities for enhancement have been identified within this chapter. Of particular note is the development of an **Ancient Woodland Strategy** (**Appendix 9.21**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**)) to address the loss of ancient woodland to Part A, which has been developed in consultation with statutory consultees. It is acknowledged that ancient woodland is an irreplaceable habitat and has not been considered in the context of the biodiversity no net loss assessment. A biodiversity assessment has been undertaken to understand the impacts of Part A in the context of achieving no net loss of biodiversity. In addition, ecological enhancements have been considered. Therefore, it is considered that Part A adheres to the policy (refer to **Section 9.9**, and **Appendix 9.20: Biodiversity No Net Loss Assessment Report**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**)).

9.4 ASSESSMENT METHODOLOGY

SCOPE OF ASSESSMENT

9.4.1. The scope of the assessment is to consider the likely effects of Part A upon sensitive ecological receptors within the Study Areas (defined in **Section 9.6** below) and in the wider area (where appropriate) identified during the 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 to the habitat and/or species.

9.4.3. The following ecological receptors were scoped in within the **Scoping Report** (**Application Document Reference: TR010041/APP/6.10**), and are within the scope of this assessment:

a. River Coquet and Coquet Valley Woodlands SSSI, which contains Dukes Bank Wood (ancient semi-natural woodland).
b. Coquet River Felton Park Local Wildlife Site (LWS).
c. Habitats of Principal Importance (HPI)[1] within the Order Limits.
d. 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 bird
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. Terrestrial invertebrates
xv. Brown hare *Lepus europaeus*
xvi. Hedgehog *Erinaceus europaeus*
xvii. Invasive non-native species

[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

9.4.4. Subsequent to the **Scoping Report** (**Application Document Reference: TR010041/APP/6.10**), statutory and non-statutory designated sites for nature conservation and ancient woodland within 200 m of the Affected Road Network (ARN) established by the air quality assessment[3] have been scoped in. This distance is the prescribed study area within the Design Manual for Roads and Bridges (DMRB) (**Ref. 9.17**). Beyond the distance of 200 m from an affected road, the accepted scientific evidence suggests that there would not be a significant impact on sensitive habitats or species (**Ref. 9.18**). This is as a result of the scoping response from the Planning Inspectorate in relation to the zone of influence applicable to designated sites and ancient woodland resulting from anticipated impacts from Part A.

9.4.5. An account of those ecological receptors scoped out from assessment is presented in the **Scoping Report** (**Application Document Reference: TR010041/APP/6.10**).

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

CONSULTATION

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

a. Natural England
b. Environment Agency
c. Northumberland County Council (NCC) – County Ecologist and Northumberland Coast Area of Outstanding Natural Beauty (AONB) Partnership
d. Forestry Commission
e. Woodland Trust
f. Northumberland National Park
g. Barn Owl Trust
h. Northumbria Bird Ringing Group

Natural England

9.4.8. Natural England provided comment on bridge options, construction methodology and ecological (and related landscape) mitigation proposals, following requests, on a continual basis. A draft ecological mitigation plan was presented during the meeting on 1 March 2019. This plan and the feedback provided has informed **Figure 9.2: Ecological Mitigation Plan**, **Volume 5** of this ES (**Application Document Reference: TR010041/APP/6.5**).

9.4.9. Natural England confirmed via email that, following a request for comment, the surveys for breeding birds, bats and barn owl, and the approach with regards to brown hare, are

[3] Defined in **Section 9.6** of this Chapter

sufficient to inform the impact assessment. Natural England also agreed to the approach taken with regards to the bat roost assessment of West Moor Cottage (referred to as building B101A) in the absence of access to complete the survey (refer to the email dated 04 October 2018 within the Biodiversity section of **Appendix 4.2: Environmental Consultation**, **Volume 1** of this ES (**Application Document Reference: TR010041/APP/6.1**)).

9.4.10. During consultation, Natural England confirmed that the location and size (8.16 ha) of the proposed woodland planting area to address the loss of ancient woodland (0.68 ha) was acceptable. Extensive feedback and comment on a draft Ancient Woodland Strategy was provided to assist in the development of this EIA, including the acknowledgement of the constraints presented by ash dieback, the steep topography of the River Coquet valley woodland and the parallel programme of construction and woodland creation. During a meeting on 1 March 2019, Natural England agreed to the approach taken within the Ancient Woodland Strategy, which was used to form the foundation of the **Ancient Woodland Strategy** presented in **Appendix 9.21**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**). An overview of the appendix is given in **Section 9.9** of this chapter.

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

9.4.12. 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

9.4.13. 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.

9.4.14. An overview of the **Aquatic Ecology Survey Report** (**Appendix 9.3**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**)) was provided for review prior to a meeting on 6 March 2018. Following this meeting, the Environment Agency agreed that the survey effort was suitable to inform the ecological impact assessment of Part A.

9.4.15. The Environment Agency also confirmed at this time that fish passage should be considered and maintained along all watercourses severed by Part A, rather than just those where fish were recorded during baseline surveys or identified within the desk study data. This advice has been considered during the design of Part A, with feature(s) incorporated into new (and existing, as required) culverts to maintain and improve fish passage.

9.4.16. During a meeting on 19 December 2018, the Environment Agency informed that the impact to fish as a result of the proposed sheet piling works (river training measures) to construct the southern pier of the new River Coquet Bridge may be minimal. This is due to the short duration of the works and on account of fish migration generally being undertaken during higher flows and at night. These comments have been considered within the impact assessment, development of appropriate mitigation and programme of works.

Northumberland County Council - County Ecologist

9.4.17. A request for comment was made to the County Ecologist at NCC in relation to the loss of approximately 0.41 ha of woodland habitat within the Coquet River Felton Park LWS. The LWS is not designated as ancient woodland. However, due to the ancient woodland indicator species exhibited by the LWS and its proximity to the adjacent SSSI, which supports ancient woodland, it was expressed by NCC that a 1:1 replacement would not be appropriate in this case. The **Ancient Woodland Strategy** (**Appendix 9.21**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**)) has considered this comment, treated the LWS as ancient woodland and applied the same ratio of compensation to loss (12:1) that has been applied to impacts in relation to designated ancient woodland (0.27 ha) impacted by Part A. In combination, this chapter has considered impacts to 0.68 ha of ancient woodland. The areas of ancient woodland are identified on **Figure 1** of **Appendix 9.21: Ancient Woodland Strategy**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**).

Forestry Commission and Woodland Trust

9.4.18. The Forestry Commission and Woodland Trust were consulted with regards to the impacts of Part A on ancient woodland, during meetings held on 31 October 2018 and 28 March 2019 respectively.

9.4.19. Natural England was also in attendance during the meeting with the Forestry Commission and both considered the loss of part of Duke's Bank Wood (ancient woodland) undesirable but accepted the impacts incurred by Part A on Duke's Bank Wood. The requirements for a management plan with regards to replacement planting was raised, which has been addressed within the **Ancient Woodland Strategy** (**Appendix 9.21**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**)). The constraints from ash die back were acknowledged but it was agreed that translocation of materials is desirable, and the risks of spread are low.

9.4.20. The Woodland Trust confirmed they do not support ancient woodland translocation or salvage as this inherently requires the damage of ancient woodland.

9.4.21. An account of consultation with the Forestry Commission and Woodland Trust is presented within the **Arboricultural Report** (**Appendix 7.5**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**).

Consultation Relating to Barn Owl Mitigation

9.4.22. The following organisations were contacted to request their assistance in identifying suitable receptor locations for barn owl mitigation boxes:

a. Barn Owl Trust
b. Northumberland National Park
c. Northumbria Bird Ringing Group
d. Northumberland County Council – County Ecologist Team/ Northumberland Coast AONB Partnership)

9.4.23. The Barn Owl Trust and the Northumberland National Park confirmed they were unable to aid with the matter, except for barn owl data provided by the former. Data alone was not considered to sufficiently assist the matter.

9.4.24. Contact with the Northumbria Bird Ringing Group and NCC resulted in correspondence with the Northumberland Coast AONB Partnership. The AONB Partnership aided in locating suitable receptor sites for mitigation features (through discussions with landowners) and facilitating agreements with landowners to accept mitigation features and provide future access for monitoring and management. The AONB Partnership also confirmed that they may be able to undertake future monitoring following agreement with the Applicant. Barn owl mitigation boxes were installed at suitable receptor sites as identified by the Applicant and the AONB Partnership, which are outside of the Order Limits.

METHODOLOGY

Guidance

9.4.25. The ecological assessment has been undertaken using the approach detailed in the CIEEM Guidelines for Ecological Impact Assessment (**Ref. 9.19**) and Interim Advice Note 130/10 (IAN 130/10) (**Ref. 9.20**), which supplements the Design Manual for Roads and Bridges (DMRB) Volume 11, Section 3, Part 4 (**Ref. 9.21**).

9.4.26. To characterise and assess the impacts of Part A, IAN 130/10 (**Ref. 9.20**) has been used, building on existing advice as set out in DMRB Volume 11, Section 3, Part 4 (**Ref. 9.21**).

9.4.27. 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. 9.22**).
b. DMRB Volume 10 Section 4 Nature Conservation (**Ref. 9.23**).
c. IAN 125/15: Environmental Assessment Update (**Ref. 9.24**).
d. Best Practice in Enhancement of Highways Design for Bats (March 2006) (**Ref. 9.25**).
e. IAN 116/08 Nature Conservation Advice in Relation to Bats (October 2008) (**Ref. 9.26**).
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. 9.27**).

Updated DMRB Guidance

9.4.28. 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 9.4.27** above were used in the preparation of this assessment.

9.4.29. 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. 9.28**) (superseded IAN 125/15)
b. DMRB LA 103 Scoping projects for environmental assessment (**Ref. 9.29**) (superseded IAN 125/15)
c. DMRB LA 104 Environmental assessment and monitoring (**Ref. 9.30**) (superseded IAN 125/15)
d. DMRB LA 105 Air Quality (**Ref. 9.31**) (superseded IAN 174/13)
e. DMRB LA 108 Biodiversity (**Ref. 9.32**) (superseded DMRB Volume 11 Section 3 Part 4 and IAN 130/10)
f. DMRB LD 118 Biodiversity design (**Ref. 9.33**) (superseded DMRB Volume 10 Section 4)

9.4.30. 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.

9.4.31. 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. 9.31**). With the exception of LA 105 Air Quality, the other updated DMRB guidance documents listed in **paragraph 9.4.29** 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.

9.4.32. 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 9.27: Biodiversity DMRB Sensitivity Test**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**).

Desk Study

9.4.33. A desk study was undertaken during April and June 2016 and updated in September 2018. The desk study reviewed existing ecological baseline information available in the public domain and obtained information held by relevant third parties in relation to Part A. 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 **9.19** and **9.26**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**).

9.4.34. Data was obtained 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

9.4.35. An extended Phase 1 habitat survey was undertaken in June 2016, which included recommendations for further targeted species and habitat surveys. Scheme design iterations increased the Study Area, with additional areas assessed in March, April and July 2018 through a combination of a targeted walkover survey (where access was permitted), desk-based assessment (review of aerial imagery and habitat inventories) and extrapolation of existing baseline data.

9.4.36. 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 9.19** and **9.26**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**) and noted where applicable in **Table 9-10**, which summarises the ecological baseline surveys completed to inform this assessment.

9.4.37. An arboricultural survey has also been completed, with full details presented in **Appendix 7.5: Arboricultural Report**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**).

Nature Conservation Evaluation

9.4.38. 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. 9.19**), IAN 130/10 (**Ref. 9.20**) 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.

9.4.39. 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: 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

Importance	Criteria
	or within undesignated areas that meet the criteria for such designation; or o The maintenance and restoration of biodiversity and ecosystems at a national level, as defined in the 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: - 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 stag 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:

Importance	Criteria
	- 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: 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.
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

9.4.40. CIEEM (**Ref. 9.19**) 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[4] 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.

9.4.41. Habitats and species that are considered to have a nature conservation importance of less than Local are not considered important ecological receptors[5] in the context of this assessment. Any impact on such a feature as a result of Part A 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.

9.4.42. 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 (**Ref. 9.20**), as well as others deemed appropriate (informed by CIEEM's Guidelines (**Ref. 9.19**). 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

9.4.43. 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.

9.4.44. 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. 9.19**)) 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

4 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.

5 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. 9.19**).

are neutral, slight, moderate, large or very large (Table 3 of IAN 130/10) and are reproduced in **Table 9-5** below.

9.4.45. 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 will also be considered (in lieu of comparable guidance in the DMRB).

Table 9-5 - Significance of Effects for 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 impact on one or more receptor(s) of Local Importance.
Neutral	No significant impacts on key nature conservation receptors.

AIR QUALITY AND ECOLOGICAL RECEPTORS

9.4.46. In accordance with IAN 174/13 (**Ref. 9.27**), for ecological receptors, concentrations of annual mean NO_x are used as the main basis for evaluating significant effects in relation to air quality. Where the annual mean NO_x concentration is below the 'critical level'[6] of 30 µg/m^3 with Part A, then significant impacts are not anticipated. Furthermore, if the critical level is exceeded with Part A but the change in concentration is less than 1% of the critical level, the impact is considered imperceptible and unlikely to be significant. However, where the critical level is exceeded and the change is greater than 1%, the impact on nitrogen

[6] APIS (**Ref. 9.35**) cites the definition of the critical level as "*concentrations of pollutants in the atmosphere above which direct adverse effects on receptors, such as human beings, plants, ecosystems or materials, may occur according to present knowledge*".

deposition needs to also be considered in order to determine the significance of effect. The relevant assessment criteria for nitrogen deposition impacts is the 'critical load'[7]. Significance of effects were considered where the change in total nitrogen deposition (kg N/ha/yr.) in comparison to the baseline was greater than 1% (rounded to the nearest whole number) critical load for the site/habitat. Critical loads for sites/habitat were ascertained from the Air Pollution Information System (APIS) database (**Ref. 9.34**). Where a range in the critical load was provided for a particular ecological receptor, the lowest value in the range was used to give a worst-case assessment (known as the lower critical load).

9.4.47. The magnitude of change with regards to changes in NO_x levels was ascertained using the criteria presented in **Table 9-6** below, informed by Table 2.1: Magnitude of Change Criteria of IAN 174/13 (**Ref. 9.27**).

Table 9-6 - Magnitude of Change and Air Quality

Magnitude of Change in Concentration	Change in Annual Mean Concentration ($\mu g/m^3$)
Large	>4
Medium	>2 – 4
Small	>0.4 – 2
Imperceptible	≤0.4

9.4.48. The air quality assessment modelled predicted changes in air quality at 5 m intervals along linear transects perpendicular to the affected road. Where critical loads/levels have been exceeded at 0 m from the affected road, these would not give rise to significant effects, given that they represent the road edge and not the designated site under review. Significant effects as a result of changes in air quality have been determined where critical loads/levels are exceeded from 5 m from the road (next incremental distance within the modelling). Further details and the findings of the air quality modelling are presented within **Chapter 5: Air Quality** of this ES and **Appendix 5.6: Operational Impacts - Ecological Receptors**, **Volume 7** (**Application Document Reference: TR010041/APP/6.7**).

9.4.49. Identification of ecological receptors requiring a nitrogen deposition calculation are presented in **Table 5-15** of **Chapter 5: Air Quality** of this ES. The significance of effect as a

[7] APIS (**Ref. 9.35**) cites the definition of the critical load as "*a quantitative estimate of exposure to one or more pollutants below which significant harmful effects on specified sensitive elements of the environment do not occur according to present knowledge*".

result of nitrogen deposition is presented within this chapter, **Section 9.10**. Whilst a nitrogen deposition calculation is not identified within **Chapter 5: Air Quality** of this ES for the River Coquet and Coquet Valley SSSI (including Duke's Bank Wood ancient woodland) and the Coquet River Felton Park LWS, these sites have been detailed within **Section 9.10** to present a description of the approach taken to the determination of significance of effects.

9.4.50. The significance of effects was determined through quantifying the area of the designated site impacted by the change in air quality (exceedance of the critical load/levels) and the potential impact this may have on the integrity of the site. Where compensation has been provided to address the loss of habitat within a designated site during construction, the area of habitat lost within the designated site has been excluded from the area that may be impacted by operation changes in air quality. This is because habitat that has been removed can no longer be affected by operational changes in air quality. Where compensation has been provided and considered within the assessment of significant effects, this is identified in **Section 9.10** of this chapter. The area of the designated site was calculated using Geographic Information System (GIS) software, by measuring the area of the designated site that falls within the distance from the affected road where the critical load/levels has been exceeded.

9.4.51. In accordance with IAN 174/13 (**Ref. 9.27**), the level at which an impact is deemed significant is based on professional judgement.

BIODIVERSITY NO NET LOSS CALCULATIONS

9.4.52. A biodiversity no net loss calculation has been carried out on Part A to quantify biodiversity losses and gains in terms of 'biodiversity units'. The calculation was undertaken in accordance with the Highways England approach[8] and consideration of the Defra metric (**Ref. 9.36**). 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 A 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 9.10.52** and **9.10.53** of this chapter, with full details and findings are presented in the **Biodiversity No Net Loss Assessment Report** (**Appendix 9.20**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**)).

[8] 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. 9.37**).

MITIGATION

9.4.53. 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

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

9.4.55. 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 adverse impacts of Part A. The mitigation measures include those required to reduce or avoid the risk of committing legal offences.

9.4.56. 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.

9.4.57. 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 A 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 where this is applicable.

9.5.4. Details of the limitations encountered during the baseline surveys are presented within the baseline reports in **Appendices 9.1 to 9.19** and **9.26, Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**). 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 static 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. The no net loss calculations are based on the Order Limits as shown on **Figure 4.1: Boundary Plan: Part A, Volume 1** of this ES (**Application Document Reference: TR010041/APP/6.1**). 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 these calculations.

9.5.6. Following the completion of the calculations, the proposed habitat within detention basin DB17 (**Structures Engineering Drawings and Sections** (**Application Document Reference: TR010041/APP/2.8**)) was changed from swale/marginal planting to a grassland

mix in response to mitigation design in relation to birds and potential airstrike. The change was deemed negligible with respect to the no net loss calculations and their findings. As such, the calculation was not updated.

9.6 STUDY AREA

9.6.1. Different Study Areas for Part A, for the desk study and field surveys, have been used to assess different ecological receptors or issues in relation to Part A.

9.6.2. For the purpose of the desk study, the distances from the Part A[9] 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. 9.38**). The search areas within these distances are appropriate to the resources considered and the likely zone(s) of influence of Part A. The following search areas were used:

a. 2 km from Part A for protected species records.
b. 2 km from Part A for statutory and non-statutory designated sites.
c. 5 km from Part A for bat species records and local / national statutory and non-statutory designated sites for bats.
d. 10 km from Part A for European designated sites, although extended to include additional sites with a hydrological / air quality connection to Part A and extended to 30 km 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] Due to changes to the Order Limits during the assessment, desk study data was obtained from the centre line of the route alignment to ensure consistency.

9.6.6. The Study Area with regards air quality assessment is defined as within 200 m of the 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. 9.27**), 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[10] 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 the Part A[11]. These are detailed below and are based upon professional judgement in accordance with CIEEM Guidelines for Preliminary Ecological Appraisal (**Ref. 9.38**) and species-specific guidance (references provided, as appropriate, alongside the below):

a. Land within the Order Limits plus 500 m for the extended Phase 1 habitat survey, great crested newt *Triturus cristatus* surveys (**Ref. 9.39**); badger *Meles meles* survey; breeding and wintering bird[12] surveys; bat activity surveys (transects, static monitoring and crossing points) (**Ref. 9.40**), barn owl *Tyto alba* survey (**Ref. 9.41**), red squirrel *Sciurus vulgaris* survey, aquatic (including fish) survey, water vole *Arviciola amphibius* (**Ref. 9.42**) and otter *Lutra lutra* surveys.
b. Land within the Order Limits plus 100 m for the survey of bat roost potential (**Ref. 9.40**).
c. Land within the Order Limits plus 1 km for the bat Defra landscape study (**Ref. 9.43**).
d. Suitable habitats within the Order Limits plus 200 m for the National Vegetation Classification (NVC) survey.
e. Suitable habitats within the Order Limits plus 500 m for the terrestrial invertebrate surveys.
f. Two main setts and land within 500 m for the badger bait marking survey.
g. Land within the Order Limits plus 100 m for the bat roost surveys (buildings and trees) and reptile survey.

9.6.8. As the majority of proposed works associated with the de-trunked section of the existing A1 (as detailed in **Chapter 2: The Scheme, Volume 1** of this ES (**Application Document Reference: TR010041/APP/6.1**)) are low impact and confined to the road network, field surveys in relation to the de-trunked section encompass the Order Limits only.

[10] Average total daily traffic flow
[11] Including direct and indirect (disturbance) impacts
[12] Reduced to Order Limits plus 100 m for the 2020 verification survey (see **paragraph 9.7.69** for further details). The original 500 m Study Area allowed for design and alignment changes at the early stages of the design process. A 100 m Study Area captures the likely zone of influence given the refinement in Scheme design since the original 500 m Study Area.

9.7 BASELINE CONDITIONS

DESIGNATED SITES

9.7.1. The desk study identified three European designated sites (Natura 2000 sites) within 10 km of Part A: Northumbria Coast SPA and Ramsar[13], Northumberland Marine SPA and North Northumberland Dunes SAC. In addition, Coquet Island SPA (12.1 km from Part A) was identified for assessment due to its potential hydrological connection to Part A. 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 A during the construction and operational phases. Therefore, European designated sites are not considered further in this assessment.

9.7.2. In addition to the international statutory designated sites notes above, there are five statutory designated and five non-statutory designated sites within 2 km of Part A. An additional three statutory and six non-statutory designated sites are within 200 m of affected roads within the ARN (defined above and discussed in **Chapter 5: Air Quality** of this ES. These sites are described in **Table 9-7** below and shown on **Figure 9.3: Statutory Designated Sites** and **Figure 9.4: Non-Statutory Designated Sites**, **Volume 5** of this ES (**Application Document Reference: TR010041/APP/6.5**) of this ES.

[13] Classified as one European designated site.

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

Site Name	Reason for Designation	Distance from the Part A[14]	Distance from the ARN[15]	Nature conservation importance
Statutory Designated Sites (National and Local)				
River Coquet and Coquet Valley Woodlands (SSSI)	River Coquet is an unmodified, fast-flowing upland river of importance to migratory and spawning salmon. Woodlands near to the river include semi-natural and ancient woodland sites. SSSI Units 5 (Swarland Burn to Coquet Mouth) and 13 (Duke's Bank Wood) of the SSSI are within the Order Limits. Unit 13 is classified as 'broadleaved, mixed and yew woodland – upland' habitat in a favourable condition. The woodland is also designated as ancient woodland. Unit 5, 'rivers and stream' habitat is in an unfavourable recovering condition due to sources of diffuse pollution affecting water quality, woodland management practices and deer grazing.	Within the Order Limits.	0 m	National (High) Importance
Davies Wood (LNR)	Mature broadleaved woodland (ancient semi-natural) of value to nesting birds and small mammals.	1.3 km south-east of Part A	35 m south of the ARN	County (Medium) Importance
Bracken Bank (LNR)	Urban fringe site containing various flora, fauna and woodland trees.	1.3 km south-east of Part A	N/A	County (Medium) Importance
Longhorsley Moor (SSSI)	A site of sub-Atlantic heath dominated by dry heath surrounded by a mosaic of habitats (scrub, woodland, bracken and grassland).	1.8 km west of Part A	0 m	National (High) Importance
Scotch Gill Wood (LNR)	Mature broadleaved woodland site.	2 km south of Part A	N/A	County (Medium) Importance
Carlisle Park (LNR)	Deciduous woodland, including an area of ancient semi-natural woodland (Castle Wood), in addition to formal gardens and amenity space (bowling greens and tennis courts).	N/A	195 m south of the ARN	County (Medium) Importance
Ulgham Meadow (LNR)	Deciduous woodland and riparian habitat (River Lyne)	N/A	0 m	County (Medium) Importance
Borough Wood (LNR)	Area of ancient semi-natural woodland.	N/A	0 m	County (Medium) Importance
Non-Statutory Designated Sites				

[14] 'N/A' has been allocated for those sites that fall outside the desk study search radii, however, have been scoped in due to their proximity to the ARN and therefore potential of impacts because of changes in air quality.
[15] 'N/A' has been allocated for those sites that are further than 200 m from the ARN.

Site Name	Reason for Designation	Distance from the Part A[14]	Distance from the ARN[15]	Nature conservation importance
Coquet River Felton Park (LWS)	Parkland site contiguous with the River Coquet.	Within the Order Limits.	0 m	Local (Low) Importance
Cotting Woods (LWS)	Woodland (broadleaved and coniferous), including an area of ancient semi-natural woodland.	1.2 km south west of Part A.	65 m north of the ARN	Local (Low) Importance
Font River Woods (LWS)	Woodland lining the River Font between Mitford and Stanton.	1.7 km south west of Part A.	N/A	Local (Low) Importance
Coquet River Moldshaugh (LWS)	Parcel of land adjacent to right bank of the River Coquet at West Thirston.	1.9 km east of Part A.	N/A	Local (Low) Importance
Longhorsley Moor (LWS)	Mix of heathlands, scrub and woodland that adjoin Longhorsley Moor SSSI.	2 km west of Part A.	0 m	Local (Low) Importance
Wansbeck and Hartburn Woods (LWS)	Semi-natural and ancient woodland. White-clawed crayfish in the River Wansbeck and tributaries.	N/A	0 m	Local (Low) Importance
Cocklaw Dene (LWS)	Ancient and broadleaved woodland with marshy patches by the stream and lakeside.	N/A	0 m	Local (Low) Importance
Cawledge Burn (LWS)	Primarily designated for its geology, with some ornithological interest.	N/A	0 m	Local (Low) Importance
Coney Garth Pond (LWS)	Open water habitat supporting large numbers of wildfowl and wading birds.	N/A	10 m south of the ARN	Local (Low) Importance
Bothal Burn and River Wansbeck (LWS)	Ancient woodland along the River Wansbeck, known to support white-clawed crayfish.	N/A	35 m south of the ARN	Local (Low) Importance

9.7.3. Dukes Bank Wood, designated as ancient and semi-natural woodland, lies within the River Coquet and Coquet Valley Woodlands SSSI. This is the only ancient woodland site within the Order Limits. However, the woodland of the Coquet River Felton Park LWS that falls within the Order Limits has been treated as ancient woodland within this chapter. This is because the woodland exhibits ancient woodland indicator species and is adjacent to Dukes Bank Wood. NCC expressed that the ancient woodland characteristics exhibited by the LWS woodland should be taken into consideration.

9.7.4. Ancient woodland[16] within the Study Area (**Figure 9.4: Non-Statutory Designated Sites**, **Volume 5** of this ES (**Application Document Reference: TR010041/APP/6.5**) with a hydrological connection to the Order Limits or within 200 m of the ARN is presented in **Table 9-8** below. Ancient woodland is considered to be of National (High) Importance.

Table 9-8 – Summary of Ancient Woodland Sites identified within the Study Area

Ancient woodland Site Name	Associated statutory or non-statutory designation	Distance from Part A	Distance from the ARN
Duke's Bank Wood	River Coquet and Coquet Valley Woodlands SSSI	0 m	0 m
Park Wood/Bothal Banks	Bothal Burn & River Wansbeck LWS	1.5 km east of Part A	35 m south of the ARN
Cotting Wood	Cotting Wood LWS	1.2 km southwest of Part A	65 m north of the ARN
Davies Wood	N/A	1.5 km southeast of Part A	10 m south of the ARN
Unnamed (Scotch Gill Wood)	N/A	1.3 km south of Part A	180 m east of the ARN
Borough Wood	Borough Wood LNR and Wansbeck & Hartburn Woods LWS	N/A	0 m
Weldon Wood	N/A	N/A	20 m east of the ARN

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

Ancient woodland Site Name	Associated statutory or non-statutory designation	Distance from Part A	Distance from the ARN
Unnamed (Stobswood)	N/A	N/A	0 m
Burnie House Dean Wood	N/A	N/A	190 m west of the ARN
Well Wood	N/A	N/A	0m

FIELD SURVEY

Habitats

9.7.5. An extended Phase 1 habitat survey of the 500 m Study Area (**Appendix 9.1: Extended Phase 1 Habitat Survey Report**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**)) was undertaken in June 2016. Part A design iterations increased the Study Area, with additional areas assessed in March, April and July 2018 through a combination of a targeted walkover survey (where access was permitted), desk-based assessment (review of aerial imagery and habitat inventories) and extrapolation of existing baseline data. This followed the same methodology presented in **Appendix 9.1: Extended Phase 1 Habitat Survey Report**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**). The extended Phase 1 review also included a thorough, desk-based examination of the 2016 extended Phase 1 plan to ensure accuracy and to inform biodiversity calculations. A full and final account of the baseline extended Phase 1 habitats across the Study Area is presented on **Figure 9.1**: **Final Phase 1 Plan**, **Volume 5** of this ES (**Application Document Reference: TR010041/APP/6.5**). 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. 9.44**) and their suitability to support protected and notable species was investigated.

9.7.6. **Table 9-9** below lists all habitats within the Study Area, identifying whether they are HPI or listed within the LBAP.

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

a. Rivers and streams
b. Brownfield land
c. Built environment
d. Fen, marsh and swamp
e. Gardens and allotments
f. Lowland meadows and pastures
g. Native woodland
h. Ponds, lakes and reservoirs

i. Recreational and amenity spaces
j. Transport corridors
k. Trees and Hedges
l. Upland hay meadows

Table 9-9 – Habitat within the Study Area and their Importance

Habitat	HPI	LBAP Habitat
Broadleaved semi-natural woodland – A1.1.1	ü	ü
Broadleaved woodland – plantation – 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 and scattered scrub – A2.1		
Scattered broadleaved trees – A3.1	ü	ü
Recently felled broadleaved woodland – A4.1		
Neutral semi-improved grassland – B2.2	ü[17]	ü
Improved grassland – B4		
Marshy grassland – B5		ü
Poor semi-improved grassland – B6		
Continuous bracken – C1.1[18]		
Tall ruderal – C3.1		
Marginal vegetation – F2.1		
Standing water – G1	ü	ü

[17] B2.2 would only be classified as a HPI when this meets the criteria of 'Lowland Meadows' or 'Upland Hay Meadows' as outlined by JNCC
[18] Not shown on **Figure 9.1**: **Final Phase 1 Plan**, **Volume 5** of this ES (**Application Document Reference: TR010041/APP/6.5**) of this ES due to the small size of the habitat and resolution of the figure scale.

Habitat	HPI	LBAP Habitat
Running water – G2	ü	ü
Arable – J1.1	ü[19]	
Amenity grassland – J1.2		
Introduced shrub – J1.4		
Species-rich intact hedge – J2.1.1	ü	ü
Species-poor intact hedge – J2.1.2	ü	ü
Species-poor defunct hedge – J2.2.2	ü	ü
Species-poor hedge with trees – J2.3.2	ü	ü
Walls – J2.3.5		
Fence – J2.4		
Dry ditch – J2.6		
Bare ground - J4		

9.7.8. The majority of the Order Limits comprises arable farmland (37%), poor semi-improved grassland (17%) and improved grassland (15%) of low conservation importance. However, some HPI are present within the Order Limits. Overall, the Order Limits are considered of **Local conservation importance** for habitats, except for the ancient woodland areas, that are considered to be of **National conservation importance**.

Terrestrial Habitats

9.7.9. A NVC survey (detailed within **Appendix 9.2: NVC Survey Report**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**)) was undertaken in April 2017 within the woodland of the River Coquet valley. As recommended within **Appendix 9.2**, **Volume 7** of this ES, this included:

a. Duke's Bank Wood (contained within the River Coquet and Coquet Valley Woodlands SSSI), south of the river

[19] 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.

b. Coquet River Felton Park LWS, north of the river

9.7.10. Six woodland stands were surveyed (three on each side of the river) following standard NVC methodology as detailed in the NVC Users Handbook (**Ref. 9.45**).

9.7.11. Overall, the woodland was a good fit to W9 *Fraxinus excelsior – Sorbus aucuparia – Mercurialis perennis* woodland, typical sub-community. Duke's Bank Wood is designated as ancient and semi-natural woodland (ASNW). Past management regimes, including felling, have resulted in a generally even-aged stand. A total of nineteen ancient woodland indicator species were recorded, with greater numbers of indicator species recorded north of the river. Following the NVC survey, ancient woodland is considered to be of **National importance** consistent with the classification above.

9.7.12. Findings of the Arboricultural Survey, including the presence of ash dieback within and surrounding Part A, are presented in **Appendix 7.5: Arboricultural Report**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**).

Aquatic Habitats

9.7.13. An aquatic habitat assessment was undertaken (refer to **Appendix 9.3: Aquatic Ecology Survey Report**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**)) in May 2017 along watercourses anticipated to be crossed by Part A; in total, 17 watercourses were identified.

9.7.14. 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) and surveys for macrophytes and Exposed Riverine Sediment (ERS) (**Appendix 9.3: Aquatic Ecology Survey Report**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**)).

9.7.15. An RHS is used to assess overall habitat quality and the degree of artificial modification present to a watercourse. The watercourse locations surveyed using the RHS methodology included the River Coquet, Longdike Burn 1, Longdike Burn 2 and River Lyne. Both the River Coquet and River Lyne were classed as obviously modified, with Longdike Burn 1 and 2 classed as severely and significantly modified, respectively.

9.7.16. Watercourses surveyed for macrophytes included: Minto's Dean, Longdike Burn 1 and Longdike Burn 2. All sites were classed as Poor under Water Framework Directive (WFD) classification due to low abundances of macrophytes within the samples (refer to **Chapter 10: Road Drainage and the Water Environment** of this ES for further information). The overall ecological quality ratios (EQR) indicate that none of the macrophyte communities surveyed are comparable to what would be expected under pristine conditions and all three sites are impacted by nutrient input and/or altered flows. No species of conservation interest were recorded. The watercourses are therefore considered of **Local importance** for macrophytes.

9.7.17. ERS surveys determine the presence of unique beetle communities of conservation importance, which may be impacted by Part A. The ERS survey undertaken along the River

Coquet included a single sample taken on a small island[20]. Four species of ground beetle were recorded, as described in the Species section below.

9.7.18. Of the ponds surveyed by the Predictive System for Multimetrics (PSYM) assessment (five ponds within 300 m of Part A), none contained any species of conservation interest or met the criteria to be classed as a priority pond (**Ref. 9.46**). These are not considered further.

SPECIES

9.7.19. The 2016 extended Phase 1 habitat survey identified habitats suitable for the following species or species groups:

a. Great crested newt
b. Bats
c. Badger
d. Barn owl
e. Breeding birds
f. Wintering birds
g. Reptiles
h. Red squirrel
i. Water vole and otter
j. Fish
k. White clawed-crayfish Austropotamobius pallipes
l. Aquatic macroinvertebrates
m. Terrestrial invertebrates
n. Brown hare
o. Hedgehog

9.7.20. 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. Methods used are detailed within **Appendices 9.1** to **9.19** and **9.26**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**) of this ES and summarised in **Table 9-10** below.

9.7.21. Invasive non-native species were recorded incidentally throughout the suite of surveys undertaken within the Study Areas and a presented, where relevant, in the baseline survey reports (**Appendices 9.1** to **9.19** and **9.26**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**)) and detailed within this chapter.

9.7.22. Targeted surveys for brown hare and hedgehog were not undertaken. These species were recorded incidentally when encountered during the surveys completed, with the Order Limits comprising habitats suitable to support both species. Due to the distribution and abundance of suitable habitat in the wider area and the known widespread distribution of both species

[20] The only location deemed to be suitable for an exposed riverine sediment survey

nationally, survey effort was not considered necessary to inform mitigation design. This approach has been confirmed with Natural England.

Table 9-10 – Summary of Ecological Survey Methods and Dates of Surveys

Survey	Methods Used	Date(s) of Surveys	Relevant Appendix
Great crested newts	To identify the presence of suitable great crested newt habitat, a desk based search for waterbodies was completed. This was followed by Habitat Suitability Index (HSI) assessments and environmental DNA (eDNA) assessments where access was permissible to determine presence/ likely absence.	April 2016	**Appendix 9.4: Great Crested Newt Environmental DNA and Habitat Suitability Index Survey Report, Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**)
	Population size class surveys were undertaken at ponds where great crested newt presence was confirmed. Ponds that could not be accessed in 2017 were subject to HSI assessment, presence/ likely absence surveys and/or eDNA assessment in 2018. Surveys followed guidance from Oldham *et al*. (**Ref. 9.47**) and Langton *et al*. (**Ref. 9.48**).	April to June 2017 and March to June 2018	**Appendices 9.5: Great Crested Newt Survey Report 2017 and 9.6: Great Crested Newt Survey Report 2018, Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**)
Bats	Preliminary Roost Assessment: A ground-level inspection of trees and an external inspection of buildings within 100 m of Order Limits was undertaken. Surveys followed guidance from the Bat Conservation Trust (BCT) (**Ref. 9.40**). The 2018 survey assessed trees and buildings where access was restricted in 2016/2017, including: Blackwood Outbuilding (B112A), West Moor House (B113A), an electricity substation (B114A) and trees/ woodland blocks (trees T222 to T245).	March to December 2016 and June to July 2018	**Appendices 9.7: Bat Roost Potential Survey Report 2017 and 9.9: Bat Survey Report 2018, Volume 7** of this ES (**Application Document Reference: TR010041APP/6.7**)
	Internal Building Inspection: Where access was permitted, an internal inspection was undertaken to record signs of bat presence and identify potential access points into building voids.	August 2017	**Appendix 9.8: Bat Activity Survey Report, Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**)
	Tree Climb and Inspect Surveys: Following the ground-level inspection, as required and where safe to do so, trees were subject to a climb and inspect survey(s). This included the use of an endoscope to observe signs of roosting bats.	May to August 2017	**Appendix 9.8: Bat Activity Survey Report, Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**)
	Bat Dusk Emergence and Dawn Re-entry Surveys: Dusk and or dawn surveys were undertaken for buildings and trees supporting potential bat roost features. The surveys recorded bats emerging/ accessing the tree or structure as well as bat activity in the vicinity. Access was restricted to B101A for survey and therefore a precautionary approach has been taken to the impact assessment, as detailed below in the Bat baseline section and in **Appendix 9.9: Bat Survey Report 2018, Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**).	May to early October 2017 and June to September 2018	**Appendices 9.8: Bat Activity Survey Report and 9.9: Bat Survey Report 2018, Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**)
	Bat Activity Survey: A 49 km transect route that incorporated 124 five-minute point counts and covered all prominent habitat types within the surveyed area was walked by four or five teams of two ecologists. The transect route was surveyed over two consecutive nights during each survey month.	April to October 2017 inclusive	**Appendix 9.8: Bat Activity Survey Report, Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**)
	Static Automated Detector Monitoring: Twenty static detector locations were identified as representative of the habitats present within the surveyed area. Five locations were	April to October 2017 inclusive	**Appendix 9.8: Bat Activity Survey Report, Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**)

Survey	Methods Used	Date(s) of Surveys	Relevant Appendix
	surveyed for a minimum of five consecutive nights per month (April to October inclusive) using a Song Meter 2 (SM2), with all twenty locations surveyed using Peersonic IP67 detectors once per month from July to October 2017 (left to record until either the file limit was reached, or the batteries ran out).		
	Defra Landscape Scale Surveys: A Defra landscape scale study was undertaken, comprising ten linear landscape transects identified along the Order Limits. Each transect ran perpendicular to the existing A1 and included a minimum of eleven ten-minute point counts. Methods were conducted with reference to the Defra guidance (**Ref. 9.49**).	August 2017	**Appendix 9.8: Bat Activity Survey Report, Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**)
	Crossing Point Surveys (Defra Local Scale Survey): 15 potential commuting routes were identified and surveyed along the existing A1 road (which encompassed the Order Limits to the north of Burgham Park and to the south of Priest's Bridge). Each potential commuting route was surveyed on 3 occasions (March, July and September 2017), each survey commencing 30 minutes prior to sunset and continuing until 2 hours after sunset. A further 7 potential commuting routes were identified along the off-line section of Part A, which were surveyed in accordance with the Defra methodology (**Ref. 9.50**) in 2018. Two of the survey locations in 2017 (CP14 and CP15) were repeated using the Defra methods to obtain a complete and comparable data set that could be replicated using the Defra methods. The remaining potential commuting routes surveyed in 2017 would not have met the criteria for further survey under the Defra guidance and therefore surveys were not repeated.	March to September 2017 and August to September 2018	**Appendices 9.8: Bat Activity Survey Report and 9.9: Bat Survey Report 2018, Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**)
Badgers	A walkover survey of the Study Area was undertaken to identify and map any sett entrances and field signs of badger. This information was used to determine badger use of the setts.	November and December 2016	**Appendix 9.10: Badger Survey Report - Confidential, Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**)
	Targeted bait marking surveys were carried out to establish territorial boundaries of two main setts (Setts 4 and 22) and sett connectivity. Surveys were undertaken in accordance with standard methodologies set out in the DMRB Vol. 10 (**Ref. 9.51**) and Delahey *et. al.* (**Ref. 9.52**).	April 2017	**Appendix 9.11: Badger Bait Marking Survey - Confidential, Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**)
Barn owls	A barn owl habitat suitability assessment was undertaken based on information obtained from the extended Phase 1 survey. Buildings and trees suitable to support barn owl were identified from desk study data. External and internal inspections of buildings and trees suitable to support barn owl were carried out. Each building/ tree was categorised as either a breeding site, a regular roost or an occasional roost. Survey methods and habitat assessment methods were developed with consideration of best practice guidance (**Ref. 9.41**).	May to June 2017	**Appendix 9.12: Barn Owl Report, Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**)
Breeding birds	Three breeding bird surveys were undertaken along ten transect routes between mid-March and late May at approximately monthly intervals. An additional visit to areas omitted during one of the previous survey visits was made in early July to ensure that all	March to July 2016	**Appendix 9.13: Breeding Bird Survey Report, Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**)

Survey	Methods Used	Date(s) of Surveys	Relevant Appendix
	transects were walked on three occasions. The data collected was used to categorise the breeding status of birds observed. Surveys were based on the Common Bird Census (CBC) method and the Breeding Bird Survey (BBS) method (**Ref. 9.53**).		
Wintering birds	Five surveys were undertaken at monthly intervals along twelve transect routes. The routes were based on those used during the breeding bird surveys, but routes were modified and transects added to cover areas which were not previously accessible. A single verification survey was undertaken in February 2020, comprising nine transect routes. Surveys were carried out in accordance with the British Trust for Ornithology (BTO Wintering Farmland Bird Survey methodology (**Ref. 9.54**) and generic wintering bird monitoring methods **(Ref. 9.53**).	October 2016 to February 2017 February 2020	**Appendices 9.14: Wintering Bird Survey Report** and **9.26: Wintering Bird Verification Survey Report, Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**)
Reptiles	A qualitative assessment of the suitability of habitats to support reptile populations within the Study Area was made from Phase 1 habitat data and aerial imagery. Reptile presence/ absence surveys were carried out at 16 areas of suitable reptile habitat, with 7 visits made to each area where limitations permitted. Surveys were undertaken in accordance with good practice survey techniques (**Ref. 9.55** and **Ref. 9.56**).	April to October 2017	**Appendix 9.15: Reptile Survey Report, Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**)
Red squirrels	Ninety-six areas of woodland were surveyed during an initial walkover survey, with habitats assigned a carrying capacity value in accordance with their likely suitability to support this species. Surveys were based on methodologies described in the current best practice note (**Ref. 9.57**).	December 2016 to January 2017	**Appendix 9.16: Red Squirrel Survey Report, Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**)
	Of the 96 woodland parcels, 21 met the criteria for further survey. Field surveys were carried out, which included the use of basic visual, hair tube, whole maize baiting and trail camera methods.	July to September 2017	**Appendix 9.16: Red Squirrel Survey Report, Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**)
Water vole and otter	Water vole and otter surveys were undertaken at 31 watercourses. The surveys extended to 250 m either side of Part A options (survey area was developed at options stage when three scheme options were being considered, as detailed in **Chapter 2: The Scheme**). Indicative field signs were recorded and mapped in accordance with standard methodologies for water vole (**Ref. 9.42** and **Ref. 9.58**) and otter (**Ref. 9.59**). Field signs of American mink *Neovison vison* were also recorded. Whilst not detailed within the baseline report (**Appendix 9.17: Water Vole and Otter Survey Report**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**)), one potential holt identified along the River Coquet (National grid Reference: NZ 1745 9978) was monitored using a trail camera, deployed for approximately 10 days in September 2016.	September to October 2016, May to June 2017	**Appendix 9.17: Water Vole and Otter Survey Report, Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**)

Survey	Methods Used	Date(s) of Surveys	Relevant Appendix
	Two potential otter holts were monitored for a two-week period using trail cameras in 2018, to record sightings and behaviour of otter and use of the potential holt features. This included a repeat survey of the potential holt monitored in 2016.	August and September 2018	**Appendix 9.18: Otter Monitoring Survey Report, Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**)
Fish	The Aquatic Habitat Assessment identified 6 watercourses suitable for further survey. Freshwater fish were surveyed by electric fishing undertaken to the British Standard (BS) EN 14011:2003 (water quality – sampling of fish with electricity) and in compliance with fish monitoring requirements under the WFD.	July 2017	**Appendix 9.3: Aquatic Ecology Survey Report, Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**)
White-clawed crayfish	The Aquatic Habitat Assessment identified 4 watercourses requiring investigation, which were subsequently surveyed by habitat suitability assessment, manual searches and trapping. Trapping was authorised by the Environment Agency and undertaken by a licensed surveyor (Permit Number: EP/EW090-Q-184/9593/01). Surveys were undertaken in accordance with best practice (**Ref. 9.60**).	August 2017	**Appendix 9.3: Aquatic Ecology Survey Report, Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**)
Aquatic macroinvertebrates	The Aquatic Habitat Assessment identified 13 watercourses suitable for further survey. Samples were taken using the WFD compliant method; three-minute kick sample and a one-minute hand search at each site.	May and October 2017	**Appendix 9.3: Aquatic Ecology Survey Report, Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**)
Terrestrial invertebrates	4 survey areas were identified within the Study Area, although access to one of the survey areas was not permitted (Cuckoo Plantation (NZ 18486 91478). Surveys involved observational transects, sweep netting, spot-sweeping, beating, ground searching, pitfall trapping and aquatic sampling of suitable habitats in accordance with survey guidance (**Ref. 9.61**).	May to September 2017	**Appendix 9.19: Terrestrial Invertebrate Survey Report, Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**)

GREAT CRESTED NEWT

9.7.23. The desk study data set returned 5 records of great crested newts:

a. Three located within Burgham Park Golf Course
b. A single record located within 500 m of the Order Limits (count of three newts)
c. A single record located approximately 400 m to the west of the River Coquet Bridge ('unknown' abundance)

9.7.24. A total of 24 waterbodies[21] within the Study Area were identified for further investigation. Following the completion of HSI assessment, eDNA survey and presence/likely absence surveys, great crested newt populations were confirmed in 4 waterbodies (A11, A12, A19 and A21) and further surveys were carried out to enable population size class assessment. Ponds A11 and A12 support Medium and Low populations respectively, representing a Medium metapopulation. Ponds A19 and A21 both supported Low populations. A full account of the great crested newt baseline surveys is presented in **Appendices 9.5: Great Crested Newt Survey Report 2017** and **9.6: Great Crested Newt Survey Report 2018**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**) of this ES.

9.7.25. Ponds within the Study Area support great crested newt populations of Low and Medium size class. Although none of these ponds are located within the Order Limits, terrestrial habitat that is present may support great crested newts.

9.7.26. Great crested newts are a European protected species (Annexes II and IV of the Habitats Directive (**Ref. 9.1**). The above great crested newt populations may meet the Local Wildlife Site selection criteria for Northumberland (**Ref. 9.62**), although would not meet the criteria for a SSSI (**Ref. 9.63**). The great crested newt populations within the Study Area are therefore considered of **Local importance**. A summary of the survey effort is provided within **Table 9-11**.

Table 9-11 – Summary of Great Crested Newt Survey Results

Waterbody	HSI Result	eDNA result	Presence/ Absence	Population Size Class (Peak Count)
	(Results from 2017 unless specified by * to indicate 2018)			
A1	Poor *	N/A	Scoped out in 2018 due to poor water quality and farm pollution.	N/A

[21] A total of 22 ponds identified in 2016 and surveyed in 2017 (A1 to A22); an additional pond identified and surveyed in 2017 (A20a) and a final pond surveyed in 2018 (Eshott Pond).

Waterbody	HSI Result (Results from 2017 unless specified by * to indicate 2018)	eDNA result	Presence/ Absence	Population Size Class (Peak Count)
A2	Below Average	N/A	Absent	N/A
A3	Good	Negative	Absent	N/A
A4	Poor *	N/A	Absent *	N/A
A5	Average	Negative	Absent	N/A
A6	Poor	N/A	Absent	N/A
A7	Good	N/A	Absent	N/A
A8	Average	Negative	Scoped out: outside 250 m of the Order Limits and separated from offline section by existing A1 carriageway (over 500 m from the offline section of Part A).	N/A
A9	Below Average	Negative	Absent	N/A
A10	Below Average	Negative	Absent	N/A
A11	Good	Negative	Present	Medium (16)
A12	Good	Negative	Present	Low (1)
A13	Below Average	Negative	Scoped out: dry at the time of survey.	N/A
A14	Good	N/A	Absent	N/A
A15	Poor	Negative	Scoped out: poor HSI score, wildfowl and fish present.	N/A
A16	Below Average	Negative	Scoped out: outside 250 m of Part A Order Limits.	N/A
A17	Excellent	Negative	Absent	N/A

Waterbody	HSI Result (Results from 2017 unless specified by * to indicate 2018)	eDNA result	Presence/ Absence	Population Size Class (Peak Count)
A18	Below Average	N/A	Absent	N/A
A19	Excellent	Negative	Present	Low (4)
A20a	N/A	N/A	Absent	N/A
A20b	Excellent	Negative	Absent	N/A
A21	Good	Positive	Present	Low (1)
A22	Poor	Negative	Scoped out: outside 250 m of Part A Order Limits and poor HSI score.	N/A
Eshott Pond	Good *	Negative *	Absent	N/A

BATS

9.7.27. The desk study identified a single designated site within the Order Limits that lists bats within its citation, the River Coquet and Coquet Valley Woodlands SSSI. The citation includes detail of nursery roosts of several species that have been recorded at Brinkburn Priory, approximately 6 km upstream of Part A. These are: Daubenton's bat *Myotis daubentonii*, Natterer's bat *Myotis nattereri*, noctule *Nyctalus noctula*, whiskered bat *Myotis mystacinus*, Brandt's bat *Myotis brandtii*, common pipistrelle *Pipistrellus pipistrellus* and soprano pipistrelle *Pipistrellus pygmaeus*. Brinkburn Priory also provides suitable foraging habitat for bats.

9.7.28. The desk study returned 186 bat roosts of at least 8 confirmed species including common pipistrelle, soprano pipistrelle, noctule, whiskered/ Brandt's bat, Daubenton's bat, Natterer's bat, brown long-eared bat *Plecotus auritus* and Nathusius' pipistrelle *Pipistrellus nathusii*. Leisler's bat *Nyctalus leisleri* was also present in the data set, although no roost records were indicated.

9.7.29. Trees and buildings surveyed within the Study Area are identified in **Figures 2.1 to 2.12** of **Appendix 9.7: Bat Roost Potential Survey Report 2017** and **Figures 2.1 to 2.11** of **Appendix 9.8: Bat Activity Survey Report**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**). Surveys identified 4 bat roosts within trees (T136A, T147A (two roosts) and T220A) and 4 roosts within buildings (B4A, B8A, B84A and B86A).

Due to access constraints a single building, B101A, could not be surveyed. At this location a precautionary approach has been taken and bat roosts are assumed to be present. The roosting status associated with the building has been assumed based on building type/ age/ construction, presence of roosting bats within nearby buildings (B84A) and the potential impacts as a result of Part A. A full description of the approach taken is outlined in **Appendix 9.9: Bat Survey Report 2018**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**), which has been agreed with Natural England.

9.7.30. **Table 9-12** below provides a summary of the bat roosts within buildings and trees. As low numbers of common species were recorded within each roost, which indicate day roosts likely to be in transient use, these bat roosts are considered to be of low conservation importance.

Table 9-12 – Summary of Bat Roosts Recorded

Tree / Building Reference	Grid Reference	Species	Peak Count	Roost Classification
B4A	NZ 18200 88667	Common pipistrelle	1	Day roost
B8A	NZ 18127 89651	Common pipistrelle	1	Day roost
T136A	NZ 17909 97095	Soprano pipistrelle	3	Day roost
B84A	NZ 17314 98710	Soprano pipistrelle	1	Day roost
		Common pipistrelle	1	Day roost
		Brown long-eared bat	1	Day roost
B101A	NZ 17303 98729	Soprano pipistrelle	1	Day roost
		Common pipistrelle	1	Day roost
		Brown long-eared bat	1	Day roost
T147A (2No. bat boxes)	NZ 17411 99685	Soprano pipistrelle	2	Day roost

Tree / Building Reference	Grid Reference	Species	Peak Count	Roost Classification
B86A	NZ 17442 99885	Soprano pipistrelle	2	Day roost
T220A	NZ 17521 00817	Soprano pipistrelle	2	Day roost

9.7.31. Overall, the roosts within the Study Area collectively support 4 common pipistrelle, 11 soprano pipistrelle and 3 brown long-eared bats. The roosting populations of each species are not considered significant to the conservation status of the species in the context of the Study Area in comparison to desk study data, which includes a single roost of common pipistrelle in excess of 100 individuals, a single roost of soprano pipistrelle with in excess of 260 individuals and a single roost of brown long-eared bats containing 26 individuals.

9.7.32. Two Schwegler 1FQ bat boxes were incidentally recorded mounted on the upstream headwall of Bockenfield Culvert (NZ 1784 9732) during site investigation works in June 2018. These bat boxes were not subject to assessment during the baseline surveys. Therefore, to inform this impact assessment it is assumed that the bat boxes could support roosting bats.

9.7.33. Bat activity surveys (transects) recorded common pipistrelle, soprano pipistrelle, noctule, brown long-eared bat and *Myotis* species. Soprano pipistrelle was the most commonly encountered species, accounting for approximately 45% of all passes. The second most commonly recorded species was common pipistrelle with activity at approximately 38%, followed by *Myotis* species, noctule and brown long-eared bat making up approximately 12%, 4% and 1%, respectively. The highest bat activity levels were recorded along the River Coquet corridor at the northern end of the Order Limits.

9.7.34. The static detector surveys recorded the same species list recorded[22] during the bat activity surveys. Soprano pipistrelle was recorded most commonly by both SM2 and Peersonic detectors, making up approximately 46% and 45% of total activity, respectively. Woodland and running water habitats along the River Coquet (NZ 17438 99810) and River Lyne (NZ 18553 91625) corridors recorded the highest level of activity. There was a peak in months May, June and August. A full account of static monitoring data is presented in **Appendix**

[22] Bat species were group into open habitat species (noctule and *Nyctalus* species), edge habitat species (common and soprano pipistrelle) and cluttered habitat species (*Myotis* species and brown long-eared bat).

9.8: Bat Activity Survey Report, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**) of this ES.

9.7.35. Of the 22 potential commuting routes surveyed, 6 met the criteria of a commuting route (referred to here as a 'Crossing Point') under the Defra guidance (**Ref. 9.50**), as detailed in **Table 9-13**. The locations of the 6 Crossing Points are shown in **Figure 6** of **Appendix 9.8: Bat Activity Survey Report**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**) and **Appendix 9.9: Bat Survey Report 2018**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**). Common and soprano pipistrelle were recorded crossing at all 6 locations and constituted the majority of bat crossing activity. *Myotis* sp., noctule, brown long-eared bat and an unconfirmed bat species[23] were also recorded at several of the locations.

9.7.36. CP14 (Park Wood Subway) recorded the highest level of bat activity, with 129 flight paths, and importantly represents the only survey location with an underpass[24] (linear feature). CP14 recorded the lowest percentage of unsafe crossing events (44.2%), defined as those crossing events between 0 and 5 m above ground level. The majority of bat crossing events recorded were using the underpass and therefore crossing safely (without risk of collision with vehicles).

9.7.37. The other commuting routes identified were along the offline section of Part A, representing linear features (hedgerows) in the absence of an existing road/ structure. As such, bat crossing events were not manipulated by a road or moving traffic and recorded much higher percentages of unsafe passes (between approximately 72% and 97%) as a result of bats foraging along the hedgerows (natural behaviour).

Table 9-13 – Summary of Defra Local Scale Survey Results

Crossing point	Species	Number of observed passes using the linear feature[25]	Number of unsafe passes (5 m or below)[26]
CP14	Common pipistrelle	10 (7.75%)	7 (70.00%)
	Soprano pipistrelle	85 (65.89%)	33 (38.82%)
	Myotis sp.	30 (23.26%)	14 (46.67%)

[23] Seen but not heard by surveyor and no data recording obtained.
[24] Beneath the A1.
[25] Brackets showing percentage of total observed passes using linear feature by particular species
[26] Brackets showing percentage of total observed passes using linear feature deemed "unsafe"

Crossing point	Species	Number of observed passes using the linear feature[25]	Number of unsafe passes (5 m or below)[26]
	Brown long-eared bat	3 (2.33%)	2 (66.67%)
	Unknown sp.	1 (0.78%)	1 (100.00%)
	Total	129	57 (44.19%)
CP17	Common pipistrelle	37 (53.62%)	37 (100.00%)
	Soprano pipistrelle	22 (31.88%)	22 (100.00%)
	Noctule	6 (8.70%)	4 (66.67%)
	Myotis sp.	4 (5.80%)	4 (100.00%)
	Total	69	67 (97.10%)
CP18	Common pipistrelle	22 (75.86%)	15 (68.18%)
	Soprano pipistrelle	7 (24.14%)	6 (85.71%)
	Total	29	21 (72.41%)
CP20	Common pipistrelle	66 (65.35%)	52 (78.79%)
	Soprano pipistrelle	33 (32.67%)	29 (87.88%)
	Noctule	1 (0.99%)	0 (0.00%)
	Myotis sp.	1 (0.99%)	1 (100.00%)
	Total	101	82 (81.19%)
CP21	Common pipistrelle	16 (32.65%)	16 (100.00%)
	Soprano pipistrelle	33 (67.35%)	28 (84.85%)
	Total	49	44 (89.80%)

Crossing point	Species	Number of observed passes using the linear feature[25]	Number of unsafe passes (5 m or below)[26]
CP22	Common pipistrelle	42 (58.33%)	40 (95.24%)
	Soprano pipistrelle	30 (41.67%)	21 (70.00%)
	Total	72	61 (84.72%)

9.7.38. A total of 779 bat passes were recorded during the Defra Landscape Scale transects. Six species/ genera were recorded in total (noctule, common pipistrelle, soprano pipistrelle, Nathusius' pipistrelle, *Myotis* bat species and brown long-eared bat). Of these, noctule, common pipistrelle, soprano pipistrelle and *Myotis* species were recorded at more than 20% of the point counts. Distance from Part A was not found to have a statistically significant effect on the level of common pipistrelle or noctule activity. However, the model indicated a low-level but statistically significant positive effect on the level of *Myotis* species and soprano pipistrelle activity with increasing distance from Part A. Overall, distance was found to have a statistically significant positive effect on the level of bat activity with increasing distance from Part A.

9.7.39. The majority of habitats within the Study Area comprises large, open arable fields and improved grassland pasture of sub-optimal value to bats, other than *Nyctalus* species. However, the Order Limits also includes optimal foraging habitat (including woodland and hedgerows with associated grassland/ grass verges) and linear habitats (hedgerows and tree lines) used for commuting.

9.7.40. All bats species are afforded protection as a European protected species under the Habitats Directive (**Ref. 9.1**). The species recorded within the Study Area range between common and rare at both a local and national distribution/ abundance (as outlined in **Table** 9-14 below). Large numbers of common and soprano pipistrelle were recorded throughout the Study Area and both species are also confirmed to roost in low numbers (including within the Order Limits). These species accounted for the majority of activity recorded during the crossing point surveys, with significant east-west movement throughout the landscape, particularly along the River Coquet corridor. Both species are common and widespread locally and nationally. The common and soprano pipistrelle populations within the Study Area are considered of **County importance**. A single Nathusius' pipistrelle pass was recorded during a Defra transect survey, the individual bat concerned thought to have been passing through. However, due to the rarity of this species both locally and nationally, the Nathusius' pipistrelle population within the Study Area is considered to be of **County importance**.

9.7.41. Brown long-eared bats were recorded roosting in two buildings adjacent to the Order Limits, but activity was recorded in relatively low levels within the Study Area during the transect and static detector surveys. However, it is acknowledged that it is unlikely that all brown long-eared bat calls were recorded as the species echolocates very quietly. The brown long-eared bat population within Study Area is considered to be of **Local importance**.

9.7.42. Noctules were recorded in relatively low levels across the Study Area, although not all *Nyctalus* calls could be identified to species level. Noctules are considered nationally rare but widespread, with a scattered local distribution. Overall, the noctule population within the Study Area is considered of **Local importance**.

9.7.43. *Myotis* species were recorded across the Study Area, with higher levels recorded locally in two areas (River Coquet and River Lyne). Taking into account the level of activity across the Study Area together with the number of bats recorded crossing the Part A route, the *Myotis* populations within the Study Area are considered to be of **County importance**.

Table 9-14 – National and Local Distribution of Bat Species Recorded Within the Study Area

Species		National Distribution and Abundance (Ref. 9.64)	Local Distribution and Abundance (Ref. 9.65)
Common pipistrelle		Common and widespread	Common
Soprano pipistrelle		Common and widespread	Common
Nathusius' pipistrelle		Rare but widespread	Rare
Nyctalus species	Noctule	Common and widespread	Scattered
	Leisler's bat	Insufficient data	Rare
Brown long-eared bat		Common and widespread	Frequent
Myotis species*	Daubenton's bat	Common and widespread	Frequent on water
	Natterer's bat	Locally common and widespread	Uncommon
	Whiskered/ Brandt's bat	Uncommon but widespread	Uncommon

* Because of the geographic location of Part A, the *Myotis* species recorded are likely to be either Daubenton's bat, Natterer's bat or whiskered/ Brandt's bat. As such, impacts upon all three species are considered within the impact assessment.

BADGER

9.7.44. Detailed information relating to the presence and distribution of badger within the Study Area is presented in **Appendix 9.10: Badger Survey Report - Confidential** and **Appendix 9.11: Badger Bait Marking Survey Report - Confidential**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**). The desk study and field surveys demonstrate that badger were localised but widespread throughout the Study Area.

9.7.45. The 2016 and 2017 badger surveys identified a total of 30 setts within the Study Area: 9 main setts; 5 annexes; 5 subsidiaries; and 11 outliers. A total of 3 outlier setts are located within 50 m of Part A .

9.7.46. The badger bait marking surveys (April 2017) (**Appendix 9.11: Badger Bait Marking Survey - Confidential**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**)) identified a single definitive badger territory between 3 of the setts recorded. A second inconclusive territory was also identified, although this was not confirmed by the bait marking study as no pellets were recorded beyond the immediate vicinity of the setts.

9.7.47. Badgers and their setts are afforded protection within the UK under the Protection of Badgers Act 1992 (**Ref. 9.6**) and the WCA (**Ref. 9.2**). The Study Area includes a range of habitats suitable for sett creation and foraging, including woodland, hedgerows, grassland, scrub and arable field margins. Given the level of badger activity and the amount of suitable habitat present, the population within the Study Area is considered of **Local importance**.

BARN OWL

9.7.48. The desk study data included 6 records of barn owl. One of these, which dates from 2006, was located adjacent to the existing A1, near to Causey Park. All other records were located between 1 km and 2 km east or west of the Study Area.

9.7.49. A total of 69 trees, buildings and structures within the Study Area were identified as suitable to support nesting or roosting barn owl (**Appendix 9.12: Barn Owl Report**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**)). These locations were subject to field survey, which identified 12 that were likely to support barn owl. These comprised 3 active breeding sites, 3 active roosting sites (1 with potential breeding), 5 occasional roosting sites and 1 potential roost site.

9.7.50. The majority of the Study Area provides very poor foraging habitat for barn owl, identified as Type 3 habitat (1522 ha, representing 91.65% of the total Study Area). Optimal Type 1 grassland habitat was limited to approximately 28.1 ha (1.70%) with sub-optimal Type 2 grassland habitats representing 110 ha (6.65). The habitat composition of the wider

landscape (up to 1.5 km from Order Limits) is similar to the Study Area and the above percentages of Types 1, 2 and 3 habitats are representative of the wider area[27].

9.7.51. Barn owl is listed on Schedule 1 of the WCA (**Ref. 9.2**), which affords them 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 is a Green List Birds of Conservation Concern (BoCC) species with trends in England and the UK as a whole showing an increase in numbers (**Ref. 9.66**). None of the breeding or roosting sites recorded are located within the Order Limits. Given the current status of barn owl nationally and the relatively low distribution and abundance recorded, the population is considered of **Local importance**.

BREEDING BIRDS

9.7.52. Records of 115 species were returned from within the desk study data, of which 69 were of BoCC. The River Coquet and Coquet Valley Woodlands SSSI within the Order Limits lists birdlife within its citation, although breeding birds are not an interest feature of the SSSI. The Longhorsley Moor SSSI, located 1.8 km west of Order Limits, lists breeding birds within its citation.

9.7.53. The Study Area is predominantly a mixture of improved grassland and arable farmland with patches of woodland, and occasional other habitats such as semi-improved grasslands, amenity grassland, scrub, small waterbodies and watercourses.

9.7.54. Including incidental observations, a total of 90 bird species were recorded during the 2016 survey period, including 50 BoCC. These included:

a. 3 species listed on Annex 1 of the Birds Directive
b. 6 species listed on Schedule 1 of the WCA 1981 (as amended)
c. 21 SPI
d. 31 of the 70 species in the LBAP
e. 23 species on the BoCC Red List
f. 21 species on the BoCC Amber List

9.7.55. Of the species recorded, 76 were considered likely to be breeding, 32 species were confirmed breeding, 30 probably breeding and 14 possibly breeding (in accordance with BTO's Bird Atlas 2007 – 2011 (**Ref. 9.67**)). The breeding assemblage includes 2 confirmed Schedule 1 species (Wildlife and Countryside Act 1981); barn owl (probably breeding), common crossbill *Loxia curvirostra* (probable breeding); plus possible breeding kingfisher *Alcedo atthis* (possible breeding). Common crossbill is the only Schedule 1 species suspected to have bred within the Study Area. A single kingfisher was recorded along the

[27] Assessed from aerial imagery and OS mapping, however, not subject to ground truthing.

River Coquet. This is significant as it represents 1.47% of the Northumbria population (**Ref. 9.68**).

9.7.56. Of the qualifying species of the Northumbria Coast SPA and Ramsar or the Northumberland Marine SPA, the only species recorded during the breeding bird surveys was black-headed gull *Chroicocephalus ridibundus*[28]. This species was recorded with a maximum count of 194 birds during any one survey and a maximum flock size of 35. Evidence of breeding was not recorded although the peak count numbers represent 2% of the population breeding within the Northumberland Marine SPA (**Ref. 9.69**) and approximately 0.14% of the UK population (138,000 birds) (**Ref. 9.70**). That said, the majority of birds were recorded flying over the surveyed area.

9.7.57. Golden plover *Pluvialis apricaria*, a non-qualifying species of interest described in the Northumbria Coast Ramsar site (9.8 km to the east) citation as having high peak counts during the Spring and Autumn (not listed for its breeding assemblages), was recorded during the 2016 surveys. A peak count of 95 golden plover was recorded during Visit 2, representing 3.26 % of the Ramsar site population (2,911 birds (**Ref. 9.71**)). This species was only observed on three occasions and in all cases the birds were flying above rather than using the habitats within the survey area. Consequently, the survey area is considered to be of limited importance for the species during spring passage.

9.7.58. Several species associated with the River Coquet and Coquet Valley Woodlands SSSI were recorded during the surveys (grey wagtail *Motacilla cinerea*, yellow wagtail *Motacilla flava*, oystercatcher *Haematopus ostralegus*, lapwing *Vanellus vanellus*, dipper *Cinclus* and kingfisher), although few of these species were recorded in close proximity to the SSSI.

9.7.59. In general, the assemblage of species recorded within the 500 m field survey Study Area was typical of the habitat composition, although woodland BoCC were relatively scarce. In general, the numbers of BoCC recorded within the Study Area were typical for the range of habitats present or low in relation to their Northumbria populations (as defined by NTBC population data). Whilst some areas of extensive woodland and pasture supported few BoCC, others, such as areas of arable farmland, supported high numbers.

9.7.60. The bird species richness of the Study Area would suggest an assemblage of National importance (**Ref. 9.72**). However, generally the numbers of each species did not represent a significant proportion of the UK or Northumbria populations (outlined in **Appendix F** of the baseline report, **Appendix 9.13: Breeding Bird Survey Report**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**)). Peak counts of only 3 BoCC likely to have bred within the Study Area exceeded 1% of their Northumbria breeding populations (**Ref. 9.68**). This included black-headed gull (194 birds, representing 2.55% of

[28] Assemblage qualification of the Northumberland Marine SPA

the Northumbria population), mallard *Anas platyrhynchos* (25 birds, representing 1.04% of their Northumbria population) and mute swan *Cygnus olor* (3 birds, representing 1.07% of their Northumbria population).

9.7.61. Considering the numbers of breeding species and the number of each species in relation to their UK and Northumbria populations, the breeding bird assemblage of the Study Area is considered to be of **County importance**.

WINTERING BIRDS

9.7.62. Records of 100 species of wintering bird were presented in the desk study data set, of which 57 were BoCC. The Northumbria Coast SPA and Ramsar and Northumberland Marine SPA[29] are designated for their national wintering bird assemblages. Except for black-headed gull, the wintering bird surveys did not record any of the selection criteria species of the coastal European designations.

9.7.63. A total of 80 wintering bird species were recorded within the Study Area during the 2016/17 surveys, including 46 BoCC:

a. 5 species listed on Annex 1 of the Birds Directive[30]
b. 8 species listed on Schedule 1 of the WCA 1981 (as amended)
c. 17 SPI
d. 24 of the 67 species in the LBAP
e. 19 species on the BoCC Red List
f. 21 species on the BoCC Amber List

9.7.64. **Table 9-15** shows the 15 wintering bird species that occurred in numbers exceeding 1% of their Northumbria populations.

Table 9-15 – Wintering Bird Species Recorded Within the Study Area Greater than 1% of their Northumbria Population

Species	Peak Count within the Study Area	% of Northumbria Population	Conservation Status*
Redwing Turdus iliacus	992	9.92	Red list, Sch 1
Pink-footed goose Anser brachyrhynchus	600	9.84	Amber list, LBAP
Lapwing	801	9.42	Red list, LBAP, SPI

[29] Approximately 10 km from Part A.
[30] Council Directive 2009/147/EC (as amended) on the conservation of wild birds (the 'Birds Directive').

Species	Peak Count within the Study Area	% of Northumbria Population	Conservation Status*
Fieldfare Turdus pilaris	1505	8.85	Red list, Sch 1
Willow tit Poecile montanus	7	7.78	Red list, LBAP, SPI
Herring gull Larus argentatus	650	4.64	Red list, NERC
Peregrine Falco peregrinus	2	3.13	LBAP, Sch 1, Annex 1
Greylag goose *Anser anser*	77	2.96	Amber list
Mallard	255	2.90	Amber list
Golden plover	193	2.61	LBAP, Annex 1
Lesser black-backed gull *Larus fuscus*	1	2.04	Amber list
Starling Sturnus vulgaris	1228	1.57	Red list, LBAP, SPI
Kingfisher	1	1.47	Amber list, Sch 1, Annex 1
Common gull *Larus canus*	345	1.23	Amber list
Tree sparrow Passer montanus	121	1.10	Red list, LBAP, SPI

* Conservation Status:

Red and Amber List – BoCC Red and Amber Lists

Sch 1 – Schedule 1, Wildlife and Countryside Act 1981

Annex 1 – of the Birds Directive

9.7.65. Several other species; including black-headed gull, barn owl and short-eared owl *Asio flammeus*, also occurred in notable numbers in the context of their county populations but did not exceed the 1% threshold.

9.7.66. The species assemblage was typical of the habitats present, which formed a mosaic across much of the survey area, particularly the northern half. The Study Area is predominantly a mixture of improved grassland and arable farmland with patches of woodland, and occasional other habitats such as semi-improved grasslands, amenity grassland, scrub, small waterbodies and watercourses.

9.7.67. BoCC were recorded widely across the Study Area, with arable farmland and hedgerows recording relatively higher abundance. Extensive areas of woodland[31] tended to support high numbers of birds, but relatively few BoCC.

9.7.68. The single verification survey in February 2020 recorded fewer bird species (49 in total, including 25 BoCC) in lower numbers than the 2016/17 surveys (refer to **Appendix 9.26: Wintering Bird Verification Survey Report**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**). This is likely to be a result of the lower survey effort (in terms of fewer survey visits than the 2016/17 surveys) rather than indicating significant change in bird populations.

9.7.69. Birds recorded during the verification survey were those typical of arable, woodland and garden habitats, with a relatively even distribution across the Study Area. The majority of notable bird species recorded during the verification survey were of birds flying over, not utilising the habitats within and adjacent to the Order Limits. The 2020 verification survey did not identify any significant changes to the 2016/17 surveys. As such, the 2016/17 survey data is considered accurate and reliable.

9.7.70. Although many of the BoCC were recorded in low numbers in 2016/17 in the context of their county populations, a relatively high proportion occurred in numbers that either exceeded or were close to 1% of their Northumbria populations (detailed in Appendix F of the baseline report, **Appendix 9.14: Wintering Bird Survey Report**, **Volume 7**of this ES (**Application Document Reference: TR010041/APP/6.7**) of this ES). No species occurred in numbers greater than 1% of their national populations. Consequently, the wintering bird assemblage within the Study Area is considered of **County importance**[32].

REPTILES

9.7.71. The desk study data set returned 31 records of common lizard *Zootoca vivipara* and 9 records of adder *Vipera berus*. None of the records were located within the Order Limits.

9.7.72. Suitable habitats within the Order Limits comprise woodland, scrub and tussocky grasslands that provide possible foraging and sheltering locations. No reptiles were recorded during the 2017 survey (**Appendix 9.15: Reptile Survey Report**, **Volume 7** of this ES (**Application**

[31] For example, around Felton Park and the River Coquet
[32] In accordance with Fuller (1980) (**Ref. 9.72**).

Document Reference: TR010041/APP/6.7)). Part A is not anticipated to impact reptiles and therefore they are not considered further within this chapter.

RED SQUIRREL

9.7.73. The desk study returned 338 records of red squirrel. The River Coquet and Coquet Valley Woodlands SSSI is the only designated site of those considered in this study that includes red squirrel within its citation.

9.7.74. In total, 96 woodlands within the Study Area were assessed for their carrying capacity to support red squirrel. Of these, 21 woodlands met the criteria for further survey (as discussed in **Appendix 9.16: Red Squirrel Survey Report**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**)).

9.7.75. No red squirrels were observed during the 2017 survey, however, their presence within 3 woodlands was confirmed by analysis of hair samples. These woodlands were WA54 (NZ 1860 9652), WA68 (NZ 1776 9712) and WA86 (NU 1776 0026), which were assessed as of moderate, high and moderate suitability respectively (as detailed on **Figure 2.2** of **Appendix 9.16: Red Squirrel Report**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**)). All 3 woodlands are within 150 m of the Order Limits.

9.7.76. Grey squirrel *Sciurus carolinensis* was also recorded within 14 of the 21 surveyed woodlands, including all 3 woodlands where red squirrel was present. Many scientific studies show that the introduction of grey squirrel has been a major factor in the decline of red squirrel, through competition for food and shelter and infection by the squirrel pox virus (SQPV). Squirrel pox was recorded in a population of red squirrels near Morpeth in 2010 (**Ref. 9.73**), approximately 5.4 km south of the nearest red squirrel population recorded during the 2017 survey.

9.7.77. Red squirrel and their dreys (place of shelter) 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**). Whilst abundance could not be confirmed from the survey data, the distribution of red squirrels across the Study Area is localised to the north of the Order Limits (Burgham Park representing the most southerly population). The presence of grey squirrel is also considered to be a significant factor in limiting the distribution and abundance of red squirrel within the Study Area. Taking this into account, the red squirrel population within the Study Area is considered of **Local importance**.

WATER VOLE AND OTTER

Water Vole

9.7.78. The desk study data set did not include any records of water vole.

9.7.79. Potential water vole field signs were recorded along 4 watercourses in 2016: River Coquet, Earsdon Burn, Fenrother Burn and Longdike Burn. Potential field signs were only recorded along Longdike Burn during the 2017 survey (**Appendix 9.17: Water Vole and Otter Survey Report**, **Volume 7** of this ES **(Application Document Reference:**

TR010041/APP/6.7)). The findings along the River Coquet included two locations with droppings and single location with feeding remains over 100 m from the Order Limits. Such limited findings are indicative of movement of an individual animal through the area, rather than evidence of a resident population.

9.7.80. The findings along Earsdon Burn include a single latrine, two locations with droppings and a mammal run. The latter could have been caused by other small mammals[33] and is not definitive of water vole presence. One record of a mink spraint was recorded to the east. Presence of mink is a significant factor reducing the likelihood of water vole occurring (**Ref. 9.74** and **Ref. 9.75**). Because of the absence of any water vole field signs in 2017, it is highly likely that the population of water voles is no longer present. No water vole field signs were recorded within 50 m of the Order Limits along Earsdon Burn.

9.7.81. Latrines and feeding remains were recorded along Fenrother Burn in 2016, however, no field signs were recorded in 2017. No burrows were recorded along the watercourse, evidence of which would be expected if a resident population of water vole was present. The limited field signs recorded are indicative of movement of an individual animal through the area. Fenrother Burn is located approximately 2.5 km south of the nearest mink field signs (Earsdon Burn) and 4 km south of a positive sighting (2018) and numerous field signs along Longdike Burn. Mink are known to have territory sizes up to 6 km (**Ref. 9.76**) radius and may therefore be present on Fenrother Burn. As detailed above, presence of mink is a significant factor reducing the likelihood of water vole occurring and may explain the absence of field signs in 2017. No field signs along Fenrother Burn were located within 200 m of Part A.

9.7.82. Potential water vole prints, and burrows were recorded along Longdike Burn in 2016 and 2017, although no definitive evidence of their presence was identified. Mink spraints and scats were recorded along the watercourse in 2016, and a single mink was captured on the 2018 otter monitoring trail camera. Because mink is confirmed to be present and in the absence of movement barriers, it is concluded that the water vole population along Longdike Burn is either already absent or likely to be lost in the near future.

9.7.83. Water voles are not considered a constraint to Part A. Given the length of time between the survey and construction and field signs indicative of an individual moving through an area, best practice would be adopted, to include a pre-commencement survey to confirm no changes to the current baseline.

Otter

9.7.84. The desk study data returned 18 records of otter within the last 10 years. These included records along Longdike Burn and the River Coquet. Road traffic accident records were

[33] Such as bank or field vole

returned at Duke's Bank Wood (River Coquet Bridge) and Earsdon Moor Farm (NZ 1891 9348) and other locations without specific grid references.

9.7.85. Otter field signs were recorded along 3 watercourses during the 2016/17 surveys: River Coquet, Longdike Burn and Earsdon Burn (**Appendix 9.17: Water Vole and Otter Survey Report**, **Volume 7** of this ES **(Application Document Reference: TR010041/APP/6.7**)).

9.7.86. The surveys recorded 4 potential otter holts: 2 along the River Coquet and 2 along Longdike Burn. Of the 2 potential holts recorded along the River Coquet, 1 was within the Order Limits (adjacent to the southern pier of the existing River Coquet Bridge) and the other approximately 140 m to the east of the Order Limits. Of the 2 potential holts recorded along Longdike Burn, 1 was within the Order Limits (adjacent to the north of Burgham Culvert) and the other approximately 300 m to the east of the Order Limits. The monitoring surveys in 2016 and 2018 did not identify otter use of any of the 4 potential holt locations. Because of their distance from Part A and/or the absence of activity at these locations during the monitoring surveys (**Appendix 9.18: Otter Monitoring Survey Report**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**)), Part A is not anticipated to impact otter resting or sheltering places and therefore they are not considered further within this chapter.

9.7.87. Otter and their holts are protected under the Habitats Regulations (**Ref. 9.1**) and the WCA (**Ref. 9.2**). Otter is also a SPI under Section 41 of the NERC Act 2006 (**Ref. 9.3**). Although no resting or sheltering places are located within the Order Limits, otter are known to be present within the Study Area. Because of the relatively low level of field signs recorded, however, the otter population of the Study Area is considered of **Local importance**.

FISH

9.7.88. Data obtained from the Environment Agency returned records of fish as shown in **Table 9-16** below (extracted from **Appendix 9.3: Aquatic Ecology Survey Report, Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**)).

Table 9-16 - Fish Species recorded by the Environment Agency

Species	River Coquet	Longdike Burn	River Lyne
Atlantic salmon *Salmo salar*	ü		
Brown/ sea trout *Salmo trutta*	ü	ü	ü
European eel *Anguilla*	ü	ü	ü
Lampetra sp.	ü	ü	ü
Bullhead Cottus gobio			ü
Stone loach Barbatula barbatula	ü	ü	ü

Species	River Coquet	Longdike Burn	River Lyne
Minnow Phoxinus phoxinus	ü	ü	ü
3-spined stickleback Gasterosteus aculeatus	ü	ü	ü

9.7.89. As detailed in **Appendix 9.3: Aquatic Ecology Survey Report**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**), given the known sensitivity of fish species in the River Coquet, the assumed presence of migratory species passing through the Study Area to reach spawning grounds in the tributaries and the large size of the River Coquet within the Study Area, it was deemed unnecessary to assess fish populations as part of the study.

9.7.90. Fish were present in 4 of the 6 watercourses surveyed in 2017, with Longdike Burn containing greater numbers and diversity of fish species, including juvenile lamprey (*ammocoetes*) and European eel. The populations of fish recorded within the River Lyne and Floodgate Burn were lower in number and less diverse in comparison to the other watercourses surveyed. Floodgate Burn recorded low numbers of a common species (3-spined stickleback) only. **Table 9-17** below summarises the results of the 2017 fish survey.

Table 9-17 – Number of fish Captured along each Surveyed Water Course, including Size Range (mm) in brackets

Watercourse	Brown trout	Lamprey	European eel	Stone loach	3-spined stickleback	Minnow	Bullhead
Longdike Burn 1	14	8	0	19	60	53	0
Longdike Burn 2	56	12	1	2	70	164	0
River Lyne	0	0	0	0	16	0	6
Floodgate Burn	0	0	0	0	10	0	0

Watercourse	Brown trout	Lamprey	European eel	Stone loach	3-spined stickleback	Minnow	Bullhead
Back Burn Tributary	0	0	0	0	0	0	0
Minto's Dean	0	0	0	0	0	0	0

9.7.91. Although the survey was undertaken during the optimal period[34], no salmon were recorded at any of the sites surveyed. However, an incidental capture of a juvenile salmon was recorded during the crayfish surveys on the River Coquet. A juvenile chub was recorded during an invertebrate survey of the River Lyne.

9.7.92. Atlantic salmon, brown/ sea trout[35] 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 and all three species of lamprey are 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. 9.77**), which requires eel passage to be considered and the Environment Agency to be notified of any development likely to affect passage of eels. The River Coquet and Coquet Valley Woodlands SSSI lists spawning salmon and sea trout and breeding lamprey species (brook and sea) of significance within the citation. The citation also lists the following species found regularly: stone loach, eel, minnow and stickleback.

9.7.93. Most watercourses within the Study Area[36] are unsuitable for fish for the majority of the year, representing shallow ditches with low water levels. As such, these watercourses are only likely to support fish during extended periods of heavy rain or flood. The most recent results of WFD monitoring for fish classified the River Lyne as Poor (**Ref. 9.78**), with only common species (3-spined stickleback) recorded during the 2017 survey. Similar results were recorded for Floodgate Burn, a tributary of the River Lyne. Generally, fish populations of watercourses within Part A are considered of **Local importance**.

[34] Salmon survey period is July, August and September. Salmon spawn between October and February. Eggs and fry can remain in the gravel until June. Therefore, survey in July is considered optimal.
[35] Represent the same species, *Salmo trutta*.
[36] Those watercourses not subject to survey and not identified as important through desk study information.

9.7.94. The importance is increased in relation to Longdike Burn and the River Coquet, as discussed below.

9.7.95. Longdike Burn is a tributary of the River Coquet and has Moderate (**Ref. 9.79**) ecological classification under the WFD. The watercourse supports migratory species (lamprey and European eel), as confirmed by the 2017 survey. A review of Environment Agency historic data for the last 10 years (**Ref. 9.80**) indicates that lamprey and eel densities within Longdike Burn are comparable to that for other waterbodies within the NZ grid square. All lamprey recorded were ammocoetes (larval stage), indicating spawning habitat is present within or in close proximity to Part A. The watercourse also supports brown trout, with the sizes of fish recorded indicating that spawning grounds for this species are also likely to be present within or near Part A. The Environment Agency's historic data indicates that Longdike Burn supports higher densities of brown trout, a species of national significance, in comparison to other waterbodies in the grid square (0.4 fish/m^2 in relation to mean of 0.2 fish/m^2). Given the fish species assemblage, nearby presence of spawning habitat and its connectivity to the River Coquet, the fish population of Longdike Burn is considered of **National importance**.

9.7.96. The River Coquet is designated as a SSSI and is reported to be one of the best known migratory fisheries in north England, supporting several migratory species (lamprey, European eel, sea trout and salmon). The river has a Good (**Ref. 9.81**) ecological classification under the WFD and, given the species present, the fish population is considered of **National importance**.

WHITE-CLAWED CRAYFISH

9.7.97. No records of white-clawed crayfish were returned from within the last 10 years.

9.7.98. White-clawed crayfish were not recorded in any of the 4 surveyed watercourses (River Coquet, Longdike Burn 1, Longdike Burn 2 and River Lyne). Signal crayfish *Pacifastacus leniusculus* were positively identified in the River Lyne.

9.7.99. Although white-clawed crayfish have been recorded historically in the River Coquet and at least one of its tributaries, this species is not listed on the SSSI citation sheet and there is no recent evidence of its presence in the river.

9.7.100. Evidence indicates that white-clawed crayfish is not present. As such, Part A is not anticipated to impact the species and therefore white-clawed crayfish are not considered further within this chapter.

AQUATIC MACROINVERTEBRATES

9.7.101. The desk study identified that the habitats in the Study Area are suitable for a range of aquatic invertebrate species, with Environment Agency macroinvertebrate sampling for WFD monitoring indicating that the River Coquet and Longdike Burn have a classification of High and the River Lyne a classification of Moderate (**Ref. 9.82**). The caddisfly *Polycentropus kingie*, valued as of Local conservation interest (**Ref. 9.83**), but relatively

common, has been recorded along the River Coquet at Felton, approximately 1.2 km downstream of the Study Area.

9.7.102. The majority of watercourses within the Study Area provide sub-optimal habitat for macroinvertebrates, being ephemeral and heavily overgrown or shaded. Four macroinvertebrate species of conservation interest were identified during the 2017 survey. These include the relatively common mayfly *Ecdyonurus insignis* and caddis flies *Athripsodes bilineatus* and *Beraeodes minutus*. The regionally notable, although widespread, scarce olive mayfly *Baetis buceratus* was also recorded within one watercourse (Back Burn Tributary).

9.7.103. None of the species of conservation interest are afforded legal protection in the UK or listed as SPI under Section 41 of the NERC Act 2006 (**Ref. 9.3**). The macroinvertebrate assemblage of the Study Area is considered of **Local importance**.

TERRESTRIAL INVERTEBRATES

9.7.104. The desk study data set included 22 terrestrial invertebrate records of SPI, including 1 ground beetle species, 1 butterfly species and 20 moth species. The habitats within the Study Area are considered suitable to support 20 of these species. A further 8 invertebrate species sightings were obtained incidentally during other species surveys; including 4 ground beetle species, 3 moth species and 1 butterfly species; although only the butterfly species is listed as SPI.

9.7.105. The River Coquet and Coquet Valley Woodlands SSSI riverine habitat contained the highest quality invertebrate species assemblage of the three 2017 surveyed areas (150 species total), including two nationally scare species of mayfly and the cinnabar moth *Tyria jacobaeae*. A site east of Burgham Park Golf Course held a relatively diverse number of species (111 species total), particularly within its grassland areas where three SPI were recorded. Causey Park Farm (Causey Park Hag) held the lowest species diversity of the three surveyed areas (53 species total) and no species of conservation importance were recorded. An overview of species of conservation importance recorded within the Study Area during the survey is presented in **Table 9-18**, with full details presented in **Appendix 9.19: Terrestrial Invertebrate Survey Report**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**) of this ES.

Table 9-18 – Terrestrial Invertebrates of Conservation Importance Recorded

Species	Study Area Location	Designation/Conservation Status
Upland summer mayfly *Ameletus inopinatus*	River Coquet and Coquet Valley Woodlands	Nationally scarce * Listed on River Coquet and Coquet Valley Woodlands SSSI citation
Yellow hawk mayfly *Ephemerella notata*	River Coquet and Coquet Valley Woodlands	Nationally scarce *

Species	Study Area Location	Designation/Conservation Status
		Listed on River Coquet and Coquet Valley Woodlands SSSI citation
Small heath butterfly *Coenonympla pamphilus*	Burgham Park Golf Course	Near Threatened ** SPI
Ghost moth Hepialus humuli	Burgham Park Golf Course	SPI
Cinnabar moth	River Coquet and Coquet Valley Woodlands & Burgham Park Golf Course	SPI

* Taxa which are recorded in 16 – 100 hectads (10 km squares) in Great Britain but are not included in one of the Red List Categories

** IUCN Red List (**Ref. 9.84**)

9.7.106. The Study Area comprises largely habitats of low value to terrestrial invertebrates (open arable and improved grassland fields), although these are interspersed with a range of habitats offering value to terrestrial invertebrates, including: tall sward and scrub, running water, woodland/ trees and wetland. This is also reflected within the Order Limits. Habitats of importance to SPI are not widely distributed within the Order Limits. Given the expanse of sub-optimal habitat within the Order Limits that is of value to a common terrestrial invertebrate assemblage only, although taking into account the low numbers of species of conservation importance, the terrestrial invertebrate assemblage of the Study Area is considered of **Local importance**.

BROWN HARE AND HEDGEHOG

9.7.107. The desk study data set included 14 records of brown hare and 58 records of hedgehog.

9.7.108. The Study Area includes suitable habitat for both species, including woodland, hedgerows, scrub, neutral semi-improved grassland and arable farmland; which are well connected within the wider landscape. Both species are widespread across Northumberland.

9.7.109. Brown hare was also incidentally recorded during other species surveys (1 or 2 individuals on 3 to 4 occasions), distributed across the Study Area. No observations of hedgehog were made during any of the field surveys.

9.7.110. Both species are listed as SPI under Section 41 of the NERC Act 2006 (**Ref. 9.3**). The populations of brown hare and hedgehog within the Study Area are considered, at most, of **Local importance**.

INVASIVE SPECIES

9.7.111. The Phase 1 habitat survey in June 2016 identified a stand of Japanese knotweed *Fallopia japonica* within Blubbery Wood (NZ 1936 9039) that had previously been cut. Rhododendron was recorded within broadleaved semi-natural woodland to the north-west of the River Coquet Bridge (NU 1710 0054) and within a small woodland adjacent to Earsdon Hill Farm (NZ 1978 9512).

9.7.112. The 2017 aquatic surveys recorded Himalayan balsam *Impatiens glandulifera* within marginal vegetation of Minto's Dean. New Zealand pigmyweed *Crassula helmsii* and curly waterweed *Lagarosiphon major* were also recorded in Pond A17 (grid reference NZ 1759 9818).

9.7.113. As discussed in **paragraphs 9.7.82** and **9.7.83** above, American mink was recorded along two watercourses within the Study Area; Longdike Burn and Earsdon Burn.

9.7.114. As discussed in **paragraph 9.7.78** above, grey squirrel were recorded throughout the Study Area, including within the three woodlands where red squirrel are present.

9.7.115. As discussed in **paragraph 9.7.99** above, a significant population of signal crayfish (total of 31 individuals) was recorded in the River Lyne.

FUTURE ECOLOGICAL BASELINE

9.7.116. The information presented within supporting appendices (refer to **Appendices 9.1 to 9.19** and **9.26**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**)) 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 A. The following paragraphs consider how ecological conditions might change within the Study Area by 2021 (assumed start date for construction), 2024 (assume year in which Part A 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).

9.7.117. Given that the Study Area is predominantly agricultural land (arable and grazed pasture), ecological conditions are unlikely to have significantly changed by 2021 or 2024 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").

9.7.118. 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

STATUTORY AND NON-STATUTORY DESIGNATED SITES

9.8.1. A summary of potential impacts, direct and indirect, on statutory and non-statutory sites is provided in **Table 9-21**.

9.8.2. The air quality assessment (**Chapter 5: Air Quality** of this ES) identified potential impacts as a result of changes to traffic densities to statutory and non-statutory designated sites along Part A and within 200 m of the ARN. This includes:

a. River Coquet and Coquet Valley Woodlands SSSI
b. Longhorsley Moor SSSI and LWS
c. Borough Wood LNR
d. Carlisle Park LNR
e. Davies Wood LNR
f. Ulgham Meadows LNR
g. Bothal Burn & River Wansbeck LWS
h. Cawledge Burn LWS
i. Coquet River Felton Park LWS
j. Cocklaw Dene LWS
k. Coney Garth Pond LWS
l. Cotting Woods LWS
m. Wansbeck & Hartburn Woods LWS

9.8.3. The assessment considered increased nitrogen deposition. Nitrogen is a major growth nutrient and changes in nitrogen deposition can result in negative impacts on biodiversity, including: loss of sensitive species, changes to habitat structure and function, the homogenisation of vegetation types, changes in soil chemistry and an increased sensitivity abiotic and biotic stresses (such as pests and climate) (**Ref. 9.85**).

ANCIENT WOODLAND

9.8.4. Part A would result in the loss of approximately 0.68 ha of ancient woodland to facilitate the construction of the new River Coquet Bridge, calculated as all ancient woodland located within the Order Limits. This includes 0.27 ha of ancient woodland within Duke's Bank Wood located within the River Coquet and Coquet Valley Woodlands SSSI. Part A would also result in the loss of approximately 0.41 ha of broadleaved woodland within Coquet River Felton Park LWS that has characteristics of and supports indicator ancient woodland (refer to **Appendix 9.2: NVC Survey Report**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**)). Whilst not designated as such, for the purposes of this assessment, the woodland of Coquet River Felton Park LWS has been treated as ancient woodland. Hereafter, these two combined areas are referred to as the 'Ancient Woodland'.

9.8.5. The air quality assessment (**Chapter 5: Air Quality** of this ES) identified potential impacts as a result of changes to traffic densities to ancient woodland sites along Part A and within 200 m of the ARN. This includes:

a. Duke's Bank Wood.
b. Park Wood/Bothal Banks.
c. Cotting Wood.
d. Davies Wood.
e. Unnamed (Scotch Gill Wood).
f. Borough Wood.
g. Weldon Wood.
h. Unnamed (Stobswood).
i. Burnie House Dean Wood.
j. Well Wood.

9.8.6. The significance of effects to biodiversity as a result of changes in nitrogen deposition are detailed in **Section 9.10** below.

HABITATS OF PRINCIPAL IMPORTANCE

9.8.7. Part A would result in the permanent loss of habitat within the area of permanent works and, with reinstatement and landscape mitigation planting, the temporary loss of habitat for temporary works, such as construction compounds, storage areas and construction access roads.

9.8.8. **Table 9-19** below shows the areas of area-based HPI that would be lost as a result of Part A, with linear HPI detailed in **Table 9-20.** The values presented in **Table 9-19** and **Table 9-20** are in accordance with the biodiversity no net loss assessment, presented in **Appendix 9.20: Biodiversity No Net Loss Report**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**). Habitat loss has been calculated as the total area of habitat pre-development minus the area of retained habitat.

9.8.9. With regards to potential impacts to watercourses (running water – G2), excluding ditches, Part A would result in the direct, permanent loss of approximately 750 m of watercourse. Loss would occur to facilitate the construction/extension of culverts. This includes the loss of approximately 715 m of watercourses considered of Local importance and approximately 35 m of watercourse considered of National importance, Longdike Burn.

Table 9-19 - Baseline Loss of Area-based HPI

HPI	Total Area of Habitat (ha) Pre-development	Habitat Loss (Permanent and Temporary) (ha)
Broadleaved woodland – semi-natural – A1.1.1[37]	0.12	0.0
Mixed woodland – semi-natural – A1.3.1	0.6	0.38
Neutral grassland – semi-improved – B2.2	4.85	3.37
Arable field margins – J1.1	4.91	3.02
Standing water – G1	0.29	0.0

Table 9-20 – Baseline Loss of Linear HPI

HPI	Total Length of Habitat (m) Pre-development	Habitat Loss (Permanent and Temporary) (m)
Species-rich intact hedge – J2.1.1	241.5	159.0
Species-poor intact hedge – J2.1.2	18778.5	13348.0
Species-poor defunct hedge – J2.2.2	4833.0	3340.0
Species-poor hedge with trees – J2.3.2	9392.0	6416.0
Total Hedgerow	**33245.0**	**23263.0**

[37] Except for ancient woodland habitat, which is addressed separately due to the age and ecological importance of this habitat.

SUMMARY OF POTENTIAL IMPACTS ON ECOLOGICAL RECEPTORS

9.8.10. **Table 9-21** below provides an overview of the likely potential impacts as a result of Part A during the construction and operational phases in the absence of mitigation. The potential impacts identified have been considered during the design of Part A and development of mitigation and compensation (detailed in **Section 9.9** of this chapter).

Table 9-21 - Summary of Potential Impacts on Ecological Receptors

Ecological Receptor	Nature Conservation Importance	Stage	Potential Impact(s) in the absence of mitigation
River Coquet and Coquet Valley Woodlands SSSI - Woodland, includes Duke's Bank Wood ancient woodland	National	Construction	- Permanent, direct loss of habitat to facilitate installation of new bridge over River Coquet (0.27 ha) - Temporary direct and indirect damage to retained ancient woodland (including soil compaction and root damage) - Temporary indirect impacts (such as noise, dust, light, vibration, compaction, windthrow, changes to microclimate shading and nutrient inputs)
		Operation	- Permanent damage and degradation of woodland habitat through changes in airborne pollutant levels and shading from the new bridge - Facilitation of access associated with the diversion of the Public Right of Way (PRoW) footpath beneath the bridge: increased effects of trampling, potential littering, changes to nutrient levels as a result of dog mess (dog walkers gaining access) changing the floral community
River Coquet and Coquet Valley Woodlands SSSI – river course	National	Construction	- Temporary damage of habitat during the construction of the southern pier of the River Coquet Bridge. - Temporary, indirect damage or degradation of watercourse due to hydrological changes
		Operation	- Permanent, indirect damage or degradation of watercourse due to hydrological changes or changes in airborne pollutant levels
Adopted ancient woodland within the Coquet River Felton Park LWS	National	Construction	- Permanent, direct loss of habitat to facilitate installation of new bridge over River Coquet (0.41ha) - Temporary direct and indirect damage of retained woodland - Temporary indirect impacts (noise, dust, light, vibration, compaction)
		Operation	- Permanent damage and degradation of woodland habitat through changes in airborne pollutant levels
Other statutory and non-statutory designated sites within 200 m of ARN	Local[38] to National[39]	Operation	- Damage and degradation of habitat through changes in airborne pollutant levels
Ancient woodland within 200 m of the ARN, (excluding Duke's Bank Wood)[40]	National	Operation	- Permanent, indirect damage and degradation due to changes in airborne pollutant levels
HPI (excluding aquatic environments)	Local	Construction	- Permanent direct habitat loss - Temporary direct and indirect habitat loss

[38] LWS
[39] SSSI
[40] Addressed above

Ecological Receptor	Nature Conservation Importance	Stage	Potential Impact(s) in the absence of mitigation
			- Permanent fragmentation - Permanent and temporary alteration (both degradation/ damage and improvement) through changes in habitat type and management practices - Habitat creation and management (permanent positive impact)
		Operation	- Permanent damage and degradation of habitats through changes in airborne pollutant levels - Permanent fragmentation - Permanent and temporary alteration (both degradation and improvement) through changes in habitat type, management practices or hydrological value - Habitat creation and management (permanent positive impact)
Watercourses (aquatic environments)	Local to National	Construction	- Permanent direct habitat loss - Temporary direct and indirect habitat loss - Permanent and temporary alteration (both degradation/ damage and improvement) through modification of watercourses and hydrological changes - Habitat creation and management (permanent positive impact)
		Operation	- Permanent and temporary damage or degradation of watercourse due to hydrological changes - Spread of invasive species
Great crested newt	Local	Construction	- Permanent and temporary direct loss of habitat within 500 m of the four great crested newt ponds (A11, A12, A19 and A21) - Direct mortality of individual newts during site clearance, due to entrapment in voids/ trenches or due to vehicle movements - Temporary indirect disturbance (noise, dust, light, vibration, visual) - Permanent severance of terrestrial habitat - Permanent and temporary habitat degradation, fragmentation or alteration
		Operation	- Direct mortality of individual newts supported by ponds A11 and A12 due to alignment of the off-line section closer to the great crested newt ponds - Permanent disturbance (noise, light, visual) - Permanent habitat degradation, fragmentation or alteration through changes in airborne pollutant levels and hydrological changes
Bats	Local to County	Construction	- Permanent direct loss of common pipistrelle day roost used in the summer within building B4A - Potential temporary significant indirect disturbance of the bat boxes on tree T147A due to their proximity to Part A - Temporary indirect disturbance and potential functional loss of remaining roosts - Permanent and temporary direct loss of foraging/ commuting habitat across Part A (including hedgerows, woodland, grassland, arable field margins)

Ecological Receptor	Nature Conservation Importance	Stage	Potential Impact(s) in the absence of mitigation
			- Temporary indirect disturbance and displacement (due to noise, dust, light, vibration, visual). - Permanent and temporary habitat degradation, fragmentation or alteration - Permanent direct severance of landscape and loss of connectivity (particularly at existing commuting routes)
		Operation	- Direct mortality due to collision risk, particularly at existing commuting routes - Permanent indirect disturbance (noise, light, visual) - Permanent habitat degradation, fragmentation or alteration through changes in airborne pollutant levels and hydrological changes
Badger	Local	Construction	- Permanent direct loss of two outlier setts (active and inactive) - Permanent and temporary direct loss of habitat (for foraging and sett building) - Direct mortality due to entrapment in voids and vehicle collision risk - Temporary indirect disturbance and displacement (noise, dust, light, vibration, visual) - Permanent and temporary habitat degradation, fragmentation or alteration (loss of connectivity)
		Operation	- Direct mortality due to collision risk - Reduction in traffic levels along the existing A1, thereby reducing the future likelihood of collision (permanent positive impact) - Permanent indirect disturbance (noise, light, visual) - Permanent habitat degradation, fragmentation or alteration through changes in airborne pollutant levels and hydrological changes
Barn owl	Local	Construction	- Temporary functional loss of nesting and roosting sites across Part A - Permanent and temporary direct loss of foraging habitat - Direct mortality due to collision risk - Temporary indirect disturbance and displacement (noise, dust, light, vibration, visual), potentially leading to reduced breeding success - Permanent and temporary habitat degradation, fragmentation or alteration
		Operation	- Direct mortality due to collision risk. Increased risk identified between chainage 16,000 to 16,400 and 16,700 to 16,900 where the offline section of Part A would sever potential connection between a confirmed nesting site and a roosting site that may be used by fledglings - Permanent indirect disturbance (noise, light, visual) - Permanent habitat degradation, fragmentation or alteration through changes in airborne pollutant levels and hydrological changes
Breeding birds	County	Construction	- Permanent and temporary direct loss of habitat - Direct mortality due to collision risk

Ecological Receptor	Nature Conservation Importance	Stage	Potential Impact(s) in the absence of mitigation
			- Temporary indirect disturbance and displacement (noise, dust, light, vibration, visual), potentially leading to reduced breeding success - Permanent and temporary habitat degradation, fragmentation or alteration
		Operation	- Direct mortality as a result of increased risk of collision with vehicles (offline section of Part A) and bird strike due to the proximity of detention basins DB15, DB15a and DB17 to the Eshott Airfield - Permanent indirect disturbance (noise, dust, light, vibration, visual), potentially leading to reduced breeding success - Permanent habitat degradation, fragmentation or alteration through changes in airborne pollutant levels and hydrological changes
Wintering birds	County	Construction	- Permanent and temporary direct loss of habitat - Direct mortality due to collision risk - Temporary indirect disturbance and displacement (noise, dust, light, vibration, visual), potentially leading to reduced breeding success - Permanent and temporary habitat degradation, fragmentation or alteration
		Operation	- Direct mortality as a result of increased risk of collision with vehicles (offline section of Part A) and bird strike due to the proximity of planes detention basins DB15, DB15a and DB17 to the Eshott Airfield - Permanent indirect disturbance (noise, dust, light, vibration, visual), potentially leading to reduced breeding success - Permanent habitat degradation, fragmentation or alteration through changes in airborne pollutant levels and hydrological changes
Red squirrel	Local	Construction	- Permanent and temporary direct loss of habitat - Temporary indirect disturbance (noise, light, vibration, visual)
		Operation	- Direct mortality due to collision risk - Permanent disturbance (noise, dust, light, vibration, visual) - Permanent habitat degradation or alteration through changes in airborne pollutant levels and hydrological changes (River Coquet valley woodland)
Otter	Local	Construction	- Permanent and temporary direct loss of habitat. - Temporary indirect disturbance and displacement (noise, dust, light, vibration, visual). - Temporary obstruction of movement (removal, realignment and modifications to culverts).
		Operation	- Direct mortality due to collision risk - Permanent fragmentation and severance (impassable culverts or underpasses)
Fish	Site to National	Construction	- Permanent and temporary direct loss of habitat

Ecological Receptor	Nature Conservation Importance	Stage	Potential Impact(s) in the absence of mitigation
			- Permanent direct and indirect damage and degradation to habitats through changes in airborne pollutant levels and hydrological changes - Temporary indirect disturbance (noise, dust, light, vibration, visual). Particularly important in relation to sheet piling (river training measures) required to construct the southern pier of the River Coquet Bridge - Temporary entrapment in dewatered watercourses during culvert installation - Temporary obstruction of migratory route (in relation to salmon and trout in the River Coquet) - Temporary reduction in population due to mortality
		Operation	- Permanent damage and degradation to habitats through changes in airborne pollutant levels and hydrological changes - Permanent reduction in population due to mortality - Permanent indirect disturbance (noise, dust, light, vibration, visual)
Terrestrial invertebrates	Local	Construction	- Permanent and temporary direct loss of habitat - Permanent direct and indirect damage and degradation to habitats through changes in airborne pollutant levels and hydrological changes - Temporary reduction in population due to mortality
		Operation	- Permanent damage and degradation to habitats through changes in airborne pollutant levels and hydrological changes - Permanent reduction in population due to mortality
Aquatic invertebrates	Local	Construction	- Permanent and temporary direct loss of habitat - Permanent direct and indirect damage and degradation to habitats through changes in airborne pollutant levels and hydrological changes - Temporary reduction in population due to mortality
		Operation	- Permanent damage and degradation to habitats through changes in airborne pollutant levels and hydrological changes - Permanent reduction in population due to mortality
Brown hare and hedgehog	Local	Construction	- Permanent and temporary direct loss of habitat - Direct mortality due to collision risk - Temporary indirect disturbance and displacement (noise, dust, light, vibration, visual) - Permanent and temporary habitat degradation, fragmentation or alteration
		Operation	- Direct mortality due to collision risk along offline section - Permanent indirect disturbance (noise, dust, light, vibration, visual) - Permanent habitat degradation, fragmentation or alteration through changes in airborne pollutant levels and hydrological changes

Ecological Receptor	Nature Conservation Importance	Stage	Potential Impact(s) in the absence of mitigation
Invasive species	N/A	Construction	- Permanent direct spread of invasive species - Removal/ control of invasive species (permanent or temporary positive impact)
		Operation	No operational impacts identified

9.9 DESIGN, MITIGATION AND ENHANCEMENT MEASURES

DESIGN

9.9.1. The following are assessed as measures embedded into the design of Part A. 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 9-23**:

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) and avoidance of operational lighting along the majority of Part A (except for operational lighting at West View).
c. Adherence to pollution prevention guidance (**Ref. 9.86**) during construction and appropriate road drainage and runoff treatment.
d. Installation of anti-glare fencing near the proposed West Moor Junction
e. Creation of detention basins along Part A (however, their design to address impacts to ecological receptors is assessed as mitigation).
f. Construction of culverts (however, their design to address impacts to ecological receptors is assessed as mitigation).
g. Siting of the new River Coquet bridge close to the existing River Coquet Bridge, would reduce land-take (habitat loss) and the extent of potential indirect impacts.

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 A 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 A would result in the loss of habitat, for which compensatory habitat creation would be required. Habitat creation has been developed and incorporated into **Figure 7.8: Landscape Mitigation Masterplan**, **Volume 5** of this ES (**Application Document Reference: TR010041/APP/6.5**). The landscape design incorporates ecological mitigation measures to reduce the significance of effects, maintain and improve connectivity along and around Part A and to mitigate the effects of fragmentation and displacement. The landscape design aims to integrate Part A into the wider landscape.

9.9.4. The ecological measures incorporated into the landscape design include the following, which are detailed as appropriate in **Table 9-23**:

a. Retention of existing vegetation, where possible, to reduce impacts relating to habitat loss and ecosystem services (includes the retention of all ponds).
b. Reinstatement of habitat features within the same geographical area, where possible, maintaining connectivity to existing retained habitat features.

c. Habitat creation to compensate for habitat loss, in relation to impacts to HPI and species
d. Use of native species and plant stock of local provenance within the mitigation planting design.
e. Omission of ash *Fraxinus excelsior* from all planting mixes due to the biosecurity risk of ash dieback.
f. Creation of linear features (hedgerows and tree lines) using native species along much of the length of Part A, on both east and west sides of the carriageway.
g. Woodland planting to create connectivity between existing woodland, for example between the River Coquet valley and Felton Park.
h. Planting of trees and shrubs on the approach to wildlife crossings (culverts, underpasses and tunnels) to encourage use.
i. Avoiding planting of trees immediately adjacent to overbridges to discourage, primarily bats, crossing the road network at areas of high risk. Also avoiding of planting trees and shrubs to the east of Part A between chainage 20,000 and 20,400 due to the increased risk of bird mortality from road vehicle and air traffic collision.
j. Creation of bunds near Causey Park to raise the profile of the road margins and encourage barn owl flight at a safe height over the road.
k. A diversity of habitat creation across Part A, including grasslands, scrub and woodland.
l. Planting of detention basins to enhance their value for wildlife, with the exception of those located within junctions or near Eshott Airfield (DB15, DB15a and DB17), to deter wildlife as to reduce mortality risk through vehicle and plane strike.

9.9.5. **Table 9-22** below details the areas of habitat creation included within the landscape plan (**Figure 7.8 Landscape Mitigation Masterplan**, **Volume 5** of this ES (**Application Document Reference: TR010041/APP/6.5**)) to mitigate and compensate for the loss of HPI. 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 (**Appendix 9.20: Biodiversity No Net Loss Assessment**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**)). 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 (DM011,**Table 9-23**), which would be developed at detailed design of Part A.

9.9.6. With regards to watercourses (running water – G2), Part A includes the creation of several new channels as part of watercourse diversion works (refer to **Chapter 10: Road Drainage and the Water Environment** of this ES). Watercourse creation would be a total of approximately 540 m.

Table 9-22 - Mitigation for Loss of HPI (excluding ancient woodland)

HPI	Total Area/ Length Lost (Permanent and Temporary)[41]	Habitat Creation - Area/ Length
Broadleaved woodland – semi-natural – A1.1.1[42]	0.0 ha	25.3 ha
Mixed woodland – semi-natural – A1.3.1	0.38 ha	0.0 ha
Neutral grassland – semi-improved – B2.2	3.37 ha	40.64 ha
Arable field margins – J1.1	3.02 ha	0.0 ha
Standing water – G1	0.00 ha	0.09 ha
Hedgerow – J2	23,263 m	32,594.5 m

Ancient Woodland

9.9.7. Ancient woodland, due to its age and ecological value/ function, cannot be mitigated or compensated for. Part A would result in the loss of approximately 0.68 ha of the Ancient Woodland along the River Coquet. An **Ancient Woodland Strategy** (**Appendix 9.21**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**) has been developed in consultation with Natural England to address the loss of ancient woodland habitat and impacts to retained woodland as a result of Part A . An overview of the Strategy is detailed below:

a. Avoidance measures, including siting of the Part A route alignment to reduce land take and increase retention of ancient woodland:

i. Construction design, including citing of compound and storage areas

[41] Values taken from

Table 9-19 - Baseline Loss of Area-based HPI and
Table 9-20 – Baseline Loss of Linear HPI**.**

[42] Except for ancient woodland habitat, which is addressed separately due to the age and ecological importance of this habitat.

b. Construction mitigation and delivery requirements:

i. Implementation of the measures within a CEMP.
ii. Buffer/stand-off distances.
iii. Implementation of an arboriculture method statement.
iv. Access and construction traffic movements.
v. Implementation of a Biosecurity Method Statement, as Himalayan balsam is known to be present downstream in Felton and the ancient woodland is infected with ash dieback.

c. Woodland Creation Area identified to the southwest of the River Coquet Bridge.
d. Preparation of the Woodland Creation Area, including soil testing and preparation, as required.
e. Salvage of woodland soils and flora, where access permits.
f. Establishment of 8.16 ha of woodland, using native species of local provenance
g. Establishment of hay meadow ground flora with provenance to the Coquet Valley, using locally sourced green hay or an appropriate hay meadow mix.
h. Sensitive sapling and seed collection from wider ancient woodland as stock plants for the woodland planting area.
i. Monitoring and management.

Other Mitigation

9.9.8. **Table 9-23** below details a suite of design and mitigation/compensation measures that have been developed for the Part A 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 A has evolved to reduce the impacts of Part A. Mitigation is therefore not considered embedded within the design, although it is acknowledged that elements of ecological mitigation have been incorporated into the design of Part A.

9.9.9. Mitigation would be secured and delivered as part of a CEMP to be developed by the main contractor. Mitigation detailed in **Table 9-23** has been captured within the **Outline CEMP** (**Application Document Reference: TR010041/APP/7.3**).

Table 9-23 - Design and Mitigation Measures and their Delivery Mechanisms

Approximate Location	Timing of Measure	Measure Reference[43]	Description	Mitigation Purpose or Objective
Delivery Mechanisms and Preliminary Activities				
Throughout Part A	Pre-construction	DM001	All permits and assents would be requested and granted prior to the commencement of works. This would include, but not limited to, an Environment Agency Permit for works in and around watercourses and SSSI Assent from Natural England for works within and adjacent to the River Coquet and Coquet Valley Woodlands SSSI.	To protect sites, habitats and fauna.
Throughout Part A	Pre-construction	DM002	Prior to construction, a suitably qualified and experienced (or team of suitably qualified/experienced) Ecological Clerk of Works (ECoWs) would be appointed and would support the main contractor with the implementation of the measures within the **Outline CEMP** (**Application Document Reference: TR010041/APP/7.3**). The ECoW would: - Provide ecological advice to the main contractor 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 A. - Monitor ecological conditions during the construction phase to identify additional constraints that may arise as a result of natural changes to the ecological baseline over time. Of particular importance would be the monitoring of badger activity within and in close proximity to the works area. - 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 the ES. - Monitor the implementation of the mitigation measures during the construction phase to ensure compliance with protected species legislation and commitments within the ES. The ECoW will have previous experience in similar ECoW roles, be approved by the Applicant and be appropriately qualified for the role. ECoWs 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 implementation of mitigation measures and legal requirements.
Throughout Part A	Pre-construction	DM003	Prior to any works commencing, a badger pre-commencement walkover survey of the works area and a 30 m buffer would be undertaken by the ECoW to confirm that the baseline remains accurate and relevant. It is recommended that this is undertaken at least 3 months in advance of works commencing (a requirement for the badger licence, EM010).	To obtain update baseline data suitable for a badger licence application and protect badger from impacts.

[43] DM = delivery mechanism/process, EM = ecological mitigation or design

Approximate Location	Timing of Measure	Measure Reference[43]	Description	Mitigation Purpose or Objective
			Should badger activity be confirmed within the Order Limits or within a zone of influence determined by the ECoW, a Natural England licence would be applied for/ mitigation developed, as required, in advance of the commencement of Part A.	
Ponds A11, A12, A19 and A21	Pre-construction	DM004	The construction programme indicates that works within 500 m of the great crested newt ponds (**Appendix 9.5: Great Crested Newt Survey Report 2017**, **Volume 7** of Volume 3 of this ES (**Application Document Reference: TR010041/APP/6.7**)) are to occur, at the earliest, in December 2021. Given that the existing baseline data would be 4 years old, update great crested newt surveys of ponds A11, A12, A19 and A21[44] would be required to inform the European Protected Species (EPS) Licence application (refer to EM006). The EPS Licence would need to be in place prior to construction commencing within 500 m of the great crested newt ponds. This would consist of 6 surveys undertaken by experienced and licensed surveyors between mid-March and mid-June, with at least 3 surveys undertaken within the peak period (mid-April to mid-May).	To obtain update great crested newt baseline data suitable for an EPS Licence application.
Building B4A	Pre-construction	DM005	Update baseline surveys of building B4A to support a bat EPS or Bat Mitigation Class Licence application (refer to EM008). The EPS Licence would need to be in place prior to the demolition of building B4A. This would consist of 3 surveys undertaken between May and September, with at least 2 surveys completed within the peak period of May to August. Surveys would be completed in accordance with best practice (**Ref. 9.40**).	To obtain update bat roost baseline data suitable for an EPS Licence application.
Throughout Part A	Pre-construction	DM006	Trees proposed for felling that recorded Low, Moderate or High suitability for roosting bats (**Appendices 9.8: Bat Activity Survey Report** and **9.9: Bat Survey Report 2018**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**)) or identified as ancient/veteran (**Appendix 7.5: Arboricultural Report**, **Volume 7** of this ES), would be subject to an ecological inspection and/or dusk/dawn re-entry survey (as determined by the ECoW) no more than 24 hours prior to pruning/felling to confirm that baseline conditions remain the same. Should a bat roost be recorded, Natural England would be consulted, and appropriate measure taken to enable the works, including licensing where required.	To confirm the absence of roosting bats.
Felton Park and River Coquet Woodland	Pre-construction	DM007	A pre-commencement inspection by the ECoW would be undertaken within woodland where red squirrels are known to be present or those connected (woodlands to the north of the River Coquet and around Felton Park) prior to any felling to confirm the absence of dreys. Where deemed necessary, felling would be supervised by the ECoW.	To protect red squirrel.
All watercourses	Pre-construction	DM008	A pre-commencement walkover survey for otter in watercourses crossed by Part A would be undertaken prior to construction to confirm that baseline conditions remain accurate and affirm mitigation proposals. The walkover survey would also include field signs for water vole as best practice. This may include the installation of a temporary mink raft to confirm whether the invasive species remains.	To protect riparian mammals (otter and water vole).

[44] Pond A21 included in the update surveys as it forms a metapopulation with pond A19, although impacts within 500 m of pond A21 would be addressed separately to the licence.

Approximate Location	Timing of Measure	Measure Reference[43]	Description	Mitigation Purpose or Objective
Throughout Part A	Pre-construction & Construction	DM009	Implementation of and adherence to the measures contained within the CEMP to be developed by the main contractor that details efforts taken to avoid, minimise and reduce impacts as a result of the construction of Part A. This is considered particularly important for works in and around watercourses. 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 (DM010), to be developed at detailed design. These measures have been included within the **Outline CEMP** (**Application Document Reference: TR010041/APP/7.3**).	To protect flora and fauna.
Throughout Part A	Pre-construction & Construction	DM010	Given the presence of Schedule 9 invasive non-native species and ash dieback, a Biosecurity Method Statement would be developed and implemented throughout construction of Part A. 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. 9.87**). The latter measures would also be applied to prevent the spread of ash dieback and bullhead. Good site hygiene practices would include implementation of Check, Clean, Dry. Bullhead were recorded within the River Lyne. As informed by Natural England, this species has not been recorded within any of the other tributaries and particularly in the Coquet catchment, although there is one as yet unconfirmed report of this species from the main river at Guyzance (4.6 km north east of the Order Limits). Although this species is native to the UK, there are a very limited number of rivers in Northumberland where it is present. At the request of Natural England, biosecurity would also consider bullhead to eliminate the risk of the species being accidentally introduced to other watercourses where in river works are proposed.	To prevent the spread of invasive species.
Throughout Part A	Operation	DM011	Implementation of an Ecological/Environmental Management Plan to detail the monitoring and maintenance of habitat and mitigation/compensation features following creation and installation. The management plan would be developed at detailed design of Part A.	To maintain the ecological importance of retained and created habitats long-term.
Design and Mitigation				
Throughout Part A	Pre-construction & Construction	EM001	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 of clearance works commencing to confirm the absence of active nests. If an active nest is recorded, a minimum buffer of 5 m should be implemented (as determined by 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.

Approximate Location	Timing of Measure	Measure Reference[43]	Description	Mitigation Purpose or Objective
Throughout Part A	Pre-construction & Construction	EM002	Site/ vegetation clearance and tree felling would be kept to a minimum as far as practicable to reduce the impacts of habitat loss and fragmentation. Areas of clearance, particularly those within temporary works, shall be identified within a works plan 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 A	Pre-construction & Construction	EM003	Plant, personnel and site traffic would be constrained to a prescribed working corridor through the use of temporary barriers, where practicable, to minimise the damage to habitats, encroachment of the construction zone, potential direct mortality and disturbance of fauna located within and adjacent to the construction zone.	To protect habitats and fauna.
Throughout Part A	Pre-construction & Construction	EM004	Following the last harvest of arable fields within the works area, 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 and brown hare. This may cause dispersal during the construction phase, 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 and brown hare.
Throughout Part A	Pre-construction & Construction	EM005	If lighting is required during construction, a suitable lighting design would be developed for implementation across Part A in accordance with BS5489 Code of Practice for the Design of Road Lighting and best practice guidance on lighting with regards to protected species. This would 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 construction compound); - Positioning of lighting columns away from habitats of value to foraging and commuting bats (hedgerows, trees, woodland); - 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. The lighting design would be developed at detailed design based on guidance for lighting with regards to protected species (**Ref. 9.88** and **Ref. 9.89**).	To reduce the disturbance to fauna and flora.
Within 500 m of ponds A11&A12 and A19	Pre-construction & Construction	EM006	Given the confirmed presence of great crested newts within ponds A11 and A12 (medium metapopulation) and A19 (low population) a European Protected Species (EPS) Licence	To comply with conservation legislation, protect great crested newt habitat and prevent an impact to the Favourable

Approximate Location	Timing of Measure	Measure Reference[43]	Description	Mitigation Purpose or Objective
			application(s) and associated mitigation and compensation requirements would be required to enable the construction of Part A. Full details of mitigation and compensation are presented within the EPS Method Statements (draft licence documents) of **Appendices 9.24: Great Crested Newt Method Statement - River Coquet** (pond A19) and **9.25: Great Crested Newt Method Statement - Burgham Park** (ponds A11 and A12), **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**). As an overview, mitigation would include the retention of all great crested newt ponds and installation of exclusion fencing to enclose the construction works area within 500 m of the great crested newt pond. This would be followed by a capture and translocation period, to move newts out of the works area prior to construction. This process would also include hand and destructive searches of habitats within the excluded area. Compensation would include terrestrial habitat creation for the benefit of great crested newts, the creation of refugia/hibernacula and, for ponds A11 and A12, the creation of two new ponds and installation of an amphibian underpass. **Timing of works:** Subject to timeframes agreed with Natural England as part of the licence application and depending on the timing for receipt of the licence, licensable works (including exclusion fence installation, trapping period and hand/ destructive searches) would be undertaken between March and November, during suitable weather conditions. Works cannot be undertaken during winter hibernation or dormancy periods[45]. **Amphibian underpass:** An amphibian underpass has been incorporated into the design of Part A design beneath the east-west road of the Burgham Park Underbridge (NZ 1784 9681) to improve connectivity for great crested newts in ponds A11 and A12 to retained and created habitats to the south of the road (referred to as Wildlife Burgham Culvert in **Chapter 2: The Scheme**, **Volume 1** of this ES (**Application Document Reference: TR010041/APP/6.1**)). The underpass would be created through the installation of a 900 mm wide, 600 mm high box-culvert under the road. Further design features recommended at detailed design stage are as follows: - A shallow gradient to the culvert to assist free-drainage and prevent excessive waterlogging within the tunnel; - Creation of wing-walls at either entrance to the culvert, to increase the capture area and encourage use of the culvert; - Avoidance of dense planting at the openings to the culvert to increase natural light entering the internal space; and - Inclusion of a layer of soil and debris within the culvert to create a natural bed to encourage use	Conservation Status of the local great crested newt population.

[45] On-set of winter hibernation is defined following 3 consecutive days where temperatures are 5ºC or below. These temperatures can make newt dormant. Hibernation may last from October to February.

Approximate Location	Timing of Measure	Measure Reference[43]	Description	Mitigation Purpose or Objective
			Management and Monitoring: Habitats would be established and managed for a minimum of 5 years, with grasslands managed as hay meadows (i.e. a single summer hay cut following seed production with cuttings removed). Woodland and scrub would be managed in accordance with the detail in **Chapter 7: Landscape and Visual** of this ES. Post-construction population monitoring requirements are detailed in **Section 9.11** of this chapter.	
Within 500 m of pond A21	Pre-construction & Construction	EM007	Given the distance between pond A21 and works area (approximately 450 m) and the low level of habitat loss anticipated, the likelihood of an offence is considered highly unlikely[46]. As such, works within 500 m of pond A21 would be undertaken under Precautionary Working Methods (PWM). Below is an overview of the mitigation measures required: **Timing of works**: Site clearance within 500 m of pond A21 is recommended during the optimal period of mid-April to mid-June, the period when the majority of newts would have returned to their breeding ponds. Given the habitats are also suitable for nesting birds, clearance within this period should be preceded by a nesting bird check (in accordance with the measures outlined in EM001). Habitat clearance would be avoided during the newt hibernation/dormancy period; November to February inclusive (weather dependent). **Toolbox talk**: Prior to commencement on site, it is recommended all site operatives attend a briefing from the ECoW. The briefing would include a description of the location of known great crested newt populations in proximity to the works area, the legal protection afforded to great crested newts, tips on identification of great crested newts (and other amphibians), how works should proceed (PWMS) and what actions to take in the event that a great crested newt (or other wildlife) is encountered during the works. **Ecological supervision**: Immediately prior to and within 24 hours of the works commencing, suitable habitat within the works area would be thoroughly hand searched by the ECoW. If deemed necessary, ecological supervision from the ECoW would be provided during works.	To protect great crested newt from potential impacts during construction
Building B4A	Pre-construction & Construction	EM008	Given the presence of a confirmed bat roost within building B4A (North Gate House), which would be demolished to facilitate Part A, an EPS Licence application or Bat Mitigation Class Licence (BMCL) would be required. The licensed ecologist would determine the suitability of either licence application following the completion of the update baseline surveys. Full details of mitigation and compensation are presented within the EPS Method Statement (draft licence documents) of **Appendix 9.22: Bat Method Statement**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**). As an overview, mitigation would include exclusion of bats from the buildings and/or an ecologically supervised soft strip of the building prior to demolition. Compensation would include the installation of three bat boxes on suitable trees to the southwest.	To comply with conservation legislation, protect roosting bats and prevent an impact to the Favourable Conservation Status of the local common pipistrelle population.

[46] Verified using the Natural England Rapid Risk Assessment tool.

Approximate Location	Timing of Measure	Measure Reference[43]	Description	Mitigation Purpose or Objective
			Timing of works: Subject to agreement with Natural England as part of the licence application, the capture and exclusion of bats and the removal of the roost prior to the demolition of Building B4a would be undertaken between September and April, avoiding the summer period during which the bats are known to occupy the roost. The building is currently occupied and considered of low risk during the winter (hibernation) period. Timings would be confirmed following the completion of the baseline surveys and to reflect conditions at the time of works. **Toolbox talk:** Prior to commencement, the Named Ecologist (or accredited agent) would provide a briefing to the site contractors to outline the proposed works, actions to take if a bat is encountered and their legal responsibility regarding bats and their roosts.	
Buildings B8A, B84A, B101A and B86A. Trees T136A, T147A and T220A.	Pre-construction & Construction	EM009	As the roosts within buildings B8A, B84A, B101A and B86A and trees T136A, T147A and T220A would be retained and works are considered temporary during the construction phase, works within proximity to the roosts shall be conducted under a Precautionary Working Method Statement (PWMS). A toolbox talk would be provided to all on site personnel to make them aware of the location of the bat roosts and their proximity to the works area. The toolbox talk would also present the following precautionary working methods: The works area would be kept to a minimum, aiming to achieve maximum distance between the works area and bat roost. The duration of works within close proximity to the roosts (within 100 m) would be kept to a minimum and shall be restricted to daylight hours. Activities that may result in heavy disturbance (noise and vibration), such as piling or intrusive ground works, shall be conducted during the periods March to May and September to November, to avoid sensitive periods for bat ecology (maternity and hibernation). A physical barrier (such as Heras fencing) would be installed between the works area and any trees containing a bat roost (at least 10 m distance from the tree where possible), to prevent accidental damage or destruction of the bat roost. Any artificial lighting would be designed and erected in accordance with the details presented in EM005, which would include avoidance of direct lighting on roosting features and design of lighting columns to reduce light spill onto both roosting features and habitats of value to foraging and commuting bats. To compensate for the potential temporary functional loss of these roosts during the construction phase, the following features are recommended. The proposed locations are either in close proximity to the existing roosts and/or in locations of high bat activity, as recorded during the baseline surveys: 2 tree mounted ‘woodcrete’ bat box (Schwegler 1FF or similar) on mature trees at Burgham Park; and 5 tree mounted ‘woodcrete’ bat box (Schwegler 1FF or similar) on mature trees along the edge of the River Coquet valley woodland to the west of the River Coquet Bridge. These features would be erected prior to any works commencing to provide roosting opportunities during and post-completion of Part A. The features would remain in place for a	To protect roosting bats from potential disturbance impacts during construction

Approximate Location	Timing of Measure	Measure Reference[43]	Description	Mitigation Purpose or Objective
			minimum of 5 years and can only be removed after this time should there be no evidence of use during this period (to be confirmed by an experienced ecologist). However, it is recommended that the features are permanent to provide ecological enhancement and opportunities for roosting bats over an extended period.	
Location confidential	Pre-construction & Construction	EM010	Given the loss of two outlier setts, a badger licence to interfere with setts would be required to enable Part A. As the setts to be lost are classified as outlier setts, including one inactive sett, and given the expanse of suitable habitat in the wider area for sett creation, artificial setts would not be considered necessary. Full details of mitigation and compensation are presented within the **Badger Method Statement – Confidential (Appendix 9.23, Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**)). As an overview, mitigation would include the exclusion of badgers from the sett during the appropriate period (July to November, inclusive) followed by an ecologically supervised excavation of the sett. Methods would be in compliance with Natural England requirements.	To comply with conservation legislation and protect badger.
Bockenfield Culvert	Pre-construction & Construction	EM011	Given the extension of the Bockenfield Culvert on the upstream side, the two bat boxes mounted on the headwall would need to be relocated. There is no record of the bat boxes on the Highways England Environment Database and no known record of installation as part of a mitigation project. Prior to works commencing, an inspection by a licensed ecologist would need to be undertaken to confirm an absence of signs of roosting bats. If no signs are recorded, the bat boxes would be removed and placed into temporary storage on site until the culvert extension is completed. Once completed, the bat boxes shall be installed back onto the upstream headwall to reinstate the features. In the event that roosting bats or their signs are recorded within either bat boxes during the inspection, a EPS Licence application would be required to enable the culvert extension. Subject to agreement with Natural England, the licence would include the removal and temporary storage of the bat boxes during culvert construction, with these to be reinstated following completion of the culvert extension. The provision of 1 tree mounted 'woodcrete' bat box (Schwegler 1FF or similar) is considered necessary mitigation/compensation as part of the licence. This feature would be erected on a suitable mature tree to the west of the culvert prior to any works commencing to provide roosting opportunities during and post-completion of the culvert extension works. The feature would remain in place for a minimum of 5 years and could only be removed after this time should there be no evidence of use during this period (to be confirmed by an experienced ecologist). However, it is recommended that the feature is permanent to provide ecological enhancement and opportunities for roosting bats over an extended period.	To comply with conservation legislation and protect roosting bats.
Within proximity of a barn owl roost/ nest	Pre-construction & Construction	EM012	No site personnel shall enter a space or building occupied by a barn owl. Construction in proximity to barn owl roost and nest sites would be temporally and spatially restricted to avoid or reduce impacts of disturbance in accordance with the table below (developed in accordance with best practice (**Ref. 9.41**)). It is assumed that works would be	To protect barn owl.

<table>
<tr><th>Approximate Location</th><th>Timing of Measure</th><th>Measure Reference[43]</th><th>Description</th><th>Mitigation Purpose or Objective</th></tr>
<tr><td></td><td></td><td></td><td>undertaken during daylight hours. Where works need to be conducted within the minimum protection zone, they are to be conducted outside peak nesting season (March to August), most importantly outside the sensitive period (March to June).
<table>
<tr><th>Activity Type</th><th>Examples</th><th>Disturbance Risk</th><th>Minimum protection zone (m)</th></tr>
<tr><td>Pedestrian movement</td><td>Site personnel walking near nests/ roosts</td><td>Low/ medium</td><td>20</td></tr>
<tr><td>Artificial lighting</td><td>Illumination of works area (no direct lighting or nest/ roost)</td><td>Low/ medium</td><td>30</td></tr>
<tr><td>Vehicular movements</td><td>Vehicles or heavy plant moving past nest/ roost sites</td><td>Medium</td><td>40</td></tr>
<tr><td>General light building and landscape works</td><td>Laying concrete, bricks, roofing using mechanised plant</td><td>Medium/ high</td><td>60</td></tr>
<tr><td>Heavy construction</td><td>Piling or compaction works, ground levelling, crushing of materials</td><td>High</td><td>175</td></tr>
</table></td><td></td></tr>
<tr><td>Felton Park and River Coquet woodland</td><td>Pre-construction & Construction</td><td>EM013</td><td>Tree felling within woodland where red squirrels are known to be present or those connected (woodlands to the north of the River Coquet and around Felton Park) would be conducted outside the breeding season (February to September).

Tree felling within these areas would be immediately preceded by an inspection by the ECoW and if a drey is recorded, works would cease temporarily, and Natural England contacted for advice and to confirm how to proceed.

Should, at any time prior to or during felling works a red squirrel is identified or considered potentially present then works should cease and the ECoW contacted for advice prior to works re-commencing.</td><td>To protect red squirrel.</td></tr>
<tr><td>River Coquet</td><td>Pre-construction & Construction</td><td>EM014</td><td>As detailed within Chapter 2: The Scheme, Volume 1 of this ES (Application Document Reference: TR010041/APP/6.1) (paragraphs 2.8.125 and 2.8.128), in order to construct the southern pier base, a sheet piled cofferdam would be installed avoiding the requirement to enter the watercourse. This would be installed with a tracked piling rig and, dependant on the quality of the underlying rock, some pre-augering may be needed to allow the piles to be driven to the required level.

Temporary works would comprise the installation of sheet piled retaining walls prior to excavating the north and south abutments, to retain the existing carriageway. These would</td><td>To reduce the impacts to fish, including salmon and brown trout.</td></tr>
</table>

Approximate Location	Timing of Measure	Measure Reference[43]	Description	Mitigation Purpose or Objective
			be installed with a tracked piling rig and piles installed to a depth of approximately 8 m below ground level. These sheet piles would then serve two functions: firstly, as a cofferdam to create a dry working area for construction [river training measures]; and, secondly, would form part of the permanent framework for the new pile cap. Once constructed, the sheet piles would be burnt off to the pile cap level. Installation of the river training measures is proposed outside the 'in river works' period (end April to end September). As such, to reduce the impact to migratory and spawning salmon and brown trout, installation would be in accordance with the following: - Works would be undertaken in accordance with the mitigation measures contained within the CEMP and additional measures outlined in **Section 10.9** of **Chapter 10: Road Drainage and the Water Environment** of this ES. - In river works would be restricted to daylight hours. - In river works are anticipated to be short in duration (2-3 weeks). - Supervision to be provided by the ECoW throughout installation (fish rescue to be implemented as required, EM018). The ECoW may also temporarily suspend works should evidence be obtained to suggest works may impact fish migration/spawning (such as migration during the period of works). - Soft-start and intermittent working techniques would be applied.	
River Coquet, Longdike Burn and River Lyne	Pre-construction & Construction	EM015	The installation/extension of culverts along Longdike Burn and the River Lyne would be undertaken outside the period of March to May (inclusive), to avoid the optimal spawning period for lamprey. Measures in relation to pollution prevention are identified in **Chapter 10: Road Drainage and the Water Environment** of this ES.	To prevent impacts to lamprey.
Longdike Burn	Pre-construction & Construction	EM016	In addition to EM015 above, the extension of culverts along Longdike Burn would be undertaken outside the period September to April to avoid the spawning period for migratory and non-migratory brown trout. Measures in relation to pollution prevention are identified in **Chapter 10: Road Drainage and the Water Environment** of this ES.	To reduce the impacts brown trout.
Watercourses	Pre-construction & Construction	EM017	During any river dewatering and/or in-channel working, an ecological watching brief and fish rescue plan would be instigated. Where areas are required to be temporarily dewatered to permit construction activities, fish would be removed by means of electrofishing and relocated upstream prior to dewatering. Suitable temporary channels may be implemented to divert water during culvert construction works. Any environmental permit(s) shall be obtained and in place prior to the creation of a temporary channel. The construction of a temporary channel shall be undertaken in accordance with the mitigation measures contained within the CEMP and any other relevant measures outlined within this document and supervised by the ECoW. A pump may be required to divert flows during extension of culverts along the online route. Where this occurs, the ECoW shall be in attendance and a mesh or cover shall be used to prevent small fish or other aquatic life from being drawn into the pump system.	To protect fish (including eel).

Approximate Location	Timing of Measure	Measure Reference[43]	Description	Mitigation Purpose or Objective
			Additional measures are identified in Chapter 10: Road Drainage and the Water Environment **of this ES.**	
Throughout Part A	Pre-construction & Construction	EM018	Where appropriate, 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). A minimum of 10 m would be recommended around watercourses. The buffer around trees/ woodland/ hedgerows shall be in accordance with best practice (**Ref. 9.90**) to take into account root protection zones. Additional measures are identified in **Chapter 10: Road Drainage and the Water Environment** of this ES**.** Water quality will 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.	To protect habitats.
Close proximity to watercourses	Pre-construction & Construction	EM019	To minimise the impact to fish from disturbance (including noise, light and vibration), works outside of watercourses shall be set back from the watercourse by a minimum of 10 m, where possible. Additional measures are identified in **Chapter 10: Road Drainage and the Water Environment** of this ES**.**	To reduce the impacts on fish.
Compounds and storage areas	Pre-construction & Construction	EM020	Due to the widespread distribution of badger across Part A, 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 A	Pre-construction & Construction	EM021	The arboricultural design and mitigation measures prescribed within the CEMP shall be implemented. These measures have been included within the **Outline CEMP** (**Application Document Reference: TR010041/APP/7.3**).	To avoid or reduce impacts on trees and woodland.
PRoW beneath River Coquet Bridge (south)	Construction	EM022	The design of the diverted PRoW footpath to the south of the River Coquet, at detailed design, would enclose the footpath and deter access into the SSSI.	To avoid impacts to the SSSI.
Throughout Part A	Construction	EM023	Works during the construction period shall 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, may be required for some construction operations. Should night working be required, these would be discussed with the ECoW and appropriate mitigation put in place (particularly concerning lighting, EM005).	To reduce disturbance impacts during construction.
Trees with Moderate or High suitability for roosting bats (but no confirmed roost)	Construction	EM024	Upon completion of the update pre-construction baseline surveys, those trees where suitability for roosting bats remains (Moderate or High suitability), 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	To protect roosting bats.

Approximate Location	Timing of Measure	Measure Reference[43]	Description	Mitigation Purpose or Objective
			branches and limbs followed by section felling of the main trunk, with these lowered to the floor for inspection by the ECoW.	
Culverts – Throughout Part A	Construction	EM025	Where possible, crossing point structures for bats along the offline section of Part A have been incorporated into the design of Part A at the location of the bat crossing points recorded by the baseline surveys. These are primarily associated with culverts (embedded) designed for their hydrological function. However, culverts would also serve a dual purpose in maintaining connectivity for wildlife. The culverts beneath the new A1 carriageway range in dimensions between 3 m span by 2.1 m internal height to 4 m span by 3.75 m internal height. Full details on dimensions are presented within the **Chapter 10: Road Drainage and the Water Environment** of this ES.	To mitigate the effects of fragmentation on protected and notable species.
		EM026	The existing culvert at Burgham Park (Burgham Culvert) is retained and unmodified (other than minor works to headwalls) to maintain a crossing structure under a side road of the A1 for bats. Vegetation at the culvert entrances would be modified and managed to create a graded vegetation height leading down to the entrance to encourage passage within the culvert (as detailed within the landscape mitigation masterplan, **Figure 7.8 Landscape Mitigation Masterplan**, **Volume 5** of this ES (**Application Document Reference: TR010041/APP/6.5**)).	
		EM027	A culvert has been incorporated at chainage 18,300 as part of bat mitigation, with an internal diameter of 1.5 m (circular) (referred to as Wildlife Eshott Burn Culvert on **Figure 9.2: Ecological Mitigation Plan**, **Volume 5** of this ES (**Application Document Reference: TR010041/APP/6.5**) and described in **Chapter 2: The Scheme**, **Volume 1** of this ES (**Application Document Reference: TR010041/APP/6.1**). The size of the culvert is constrained by the topography and level of cover (space between the top of the culvert and road above). Due to the reduced dimensions, there is potential that bats may not use the feature.	
		EM028	Landscape planting has been designed to create linear features, such as hedgerows and tree lines, to direct and guide wildlife parallel to Part A and to suitable crossing points incorporated into the design of Part A. Landscape planting would also be used at the entrances of culverts, creating a graded height of vegetation to encourage flights lines of bats towards and into the culverts. Further details are presented within the **Landscape Mitigation Masterplan** (**Figure 7.8**, **Volume 5** of this ES (**Application Document Reference: TR010041/APP/6.5**). Fencing has also been proposed, where necessary, to guide wildlife (mainly badger and otter) towards crossing points (EM035). Whilst otter have a large home range and may use habitat away from main watercourses, generally otter use watercourses as their primary commuting routes. As such, it was considered unnecessary to install fencing along the entire length of Part A given the provision of landscape planting and mitigation features associated with culverts to maintain mammal passage (EM029). Inclusion of additional fencing (above that in EM035) to guide wildlife to culverts would be considered at detailed design.	

Approximate Location	Timing of Measure	Measure Reference[43]	Description	Mitigation Purpose or Objective
		EM029	Mammal ledges have been incorporated into the culverts design, where possible[47], to provide safe passage beneath the A1 carriageway (reduce risk of collision with vehicles) and maintain connectivity for mammals (including otter and badger) throughout the landscape (**Chapter 10: Road Drainage and the Water Environment** of this ES). The mammal shelf would be designed in accordance with the DMRB (**Ref. 9.91**). Where constraints do not allow for a mammal ledge, a separate mammal underpass / culvert has been provided, where possible, with a minimum diameter of 600 mm (detailed in EM032). The exception to this is where there is insufficient cover to provide a separate culvert. In these instances, free passage is available to mammals except when in flood. Further details are presented in **Chapter 10: Road Drainage and the Water Environment** of this ES. All culverts beneath the main alignment of Part A (the A1) that may be used by badger or otter[48] include a mammal ledge or separate underpass. All other culverts where installation of a mammal ledge/separate wildlife culvert has not been possible represent culverts beneath private means of access/minor access roads where the risk of vehicle collision is low, existing culverts where there would be no chance to current circumstance or culverts associated with dry ditches where evidence of otter or badger was not recorded during baseline surveys.	
		EM030	Culverts have been designed, where possible[49], to include natural beds (between 100 mm and 250 mm) to maintain and assist fish passage. The natural bed of Bockenfield Culvert would also be maintained within the extension.	
		EM031	To mitigate for potential downstream impacts and maintain fish passage along watercourses, baffles or similar structures would be installed within the existing culvert along the River Lyne (Priest's Bridge Culvert). In addition, the wooden baffles currently installed within the retained Burgham Culvert would be replaced with more permanent structures to improve the lifespan of the feature and maintain fish passage in the long-term.	
Throughout Part A	Construction	EM032	Suitable crossing points have been incorporated into the design of Part A (wildlife culverts), with a diameter of 600 mm minimum in accordance with guidance (**Ref. 9.51**). These would be secured through the **Structures Engineering Drawings and Sections** (**Application Document Reference: TR010041/APP/2.8**). These are suitable for badger and other mammals and have been incorporated beneath slip roads at junctions to provide safe passage across the network and, where possible, beneath the off-line section and/or side roads. In addition, where achievable given topographical constraints, mammal shelves have been incorporated into culverts along watercourses, providing safe passage under Part A (detailed in EM029).	To maintain connectivity for wildlife, including badger and otter.

[47] Subject to topography and design constraints.
[48] This includes all culverts under the A1 except for South Longdike Culvert (**Figure 9.2: Ecological Mitigation Plan**, **Volume 5** of this ES **(Application Document Reference: TR010041/APP/6.5)**. South Longdike Culvert relates to a surface water flow path that, whilst it may be used for mammal passage, is not in an area of concern for otter/badger passage beneath Part A.
[49] Subject to topography and design constraints.

Approximate Location	Timing of Measure	Measure Reference[43]	Description	Mitigation Purpose or Objective
			Culverts specific to wildlife are presented in **Chapter 2: The Scheme**, **Volume 1** of this ES (**Application Document Reference: TR010041/APP/6.1**) and shown on **Figure 9.2: Ecological Mitigation Plan**, Volume 5 of this ES (**Application Document Reference: TR010041/APP/6.5**), as follows: - Wildlife Fenrother Culvert - Wildlife Causey Park Culvert - Wildlife Eshott Burn Culvert - Wildlife Burgham Culvert	
Park Wood Subway	Construction	EM033	The construction of the extension of Park Wood Subway would be restricted to daylight hours (07:00 to 19:00) due to its importance as a crossing feature for nocturnal wildlife (particularly bats and badger). The underpass would be closed temporarily during installation of bridge beams and finishing of the road surface, however, this would also be restricted to daylight hours to maintain the crossing point feature during night hours.	To maintain a crossing point of significance for protected/ notable species (including bats and badger).
		EM034	The subway would not be artificially lit during the hours of darkness (taken as sunset to sunrise). Any lighting within proximity of the subway would be developed in accordance with the lighting strategy (EM005).	
Highlaws Junction and Causey Park	Construction	EM035	Badger exclusion fencing would be installed along highway boundary features (hedgerows or fence lines) to discourage crossing Part A at specific locations to reduce the risk of collision and mortality. This would include: - Along both sides of the Part A carriageway to the north of Highlaws Junction. - Along both sides of the Part A carriageway at Causey Park. The badger fencing would be maintained for the life of Part A. Following construction, the badger fencing would be maintained in an effective condition, with any repairs as a consequence of wear and tear or damage undertaken in a timely manner. Inclusion of additional fencing to guide wildlife to culverts would be considered at detailed design.	To protect badger.
Throughout Part A	Construction	EM036	To prevent entrapment of wildlife, any trenches or voids should be excavated and infilled within the same working day. If this is not possible, the void should be securely covered overnight or a suitable means of escape provided (such as a ramp at no greater than a 45º angle). Any void should 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 additional measures, such as the installation of temporary amphibian/reptile fencing around the void to prevent entry.	To protect wildlife.
Within 200 m of a badger sett	Construction	EM037	Works likely to generate significant disturbance (such as noise from piling or compaction activities) within 200 m of a badger sett would be conducted within the period July to November inclusive (to avoid the breeding period). Locations are presented in **Appendices 9.10: Badger Survey Report – Confidential** and **9.11: Badger Bait Marking Survey –**	To protect badger.

Approximate Location	Timing of Measure	Measure Reference[43]	Description	Mitigation Purpose or Objective
			Confidential, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**).	
Between chainage 16,000 to 16,400 and 16,700 to 16,900	Construction	EM038	The **Landscape Mitigation Masterplan** (**Figure 7.8**, **Volume 5** of this ES (**Application Document Reference: TR010041/APP/6.5**)) includes bunding either side of the carriageway along the off-line section between chainage 16,000 to 16,400 and 16,700 to 16,900 to raise the profile of the landscape either side of the road and encourage barn owl to fly higher over the road, thereby reducing the risk of collision with vehicles. The bunding would also be planting with trees and woodland planting on the outer slope (away from the road) to increase the height and success of the bunding with regards to the safe crossing for barn owl.	To reduce the risk of vehicle collision with barn owl.
Throughout Part A	Construction	EM039	The majority of the Study Area encompasses very poor habitat for barn owl. To compensate for the loss of Type 1 and Type 2 linear and grassland habitat, the **Landscape Mitigation Masterplan** (**Figure 7.8**, **Volume 5** of this ES (**Application Document Reference: TR010041/APP/6.5**)) incorporates species-rich hedgerows, arable field margins (up to a width of 10 m) and open grassland.	To compensate for the loss of barn owl foraging habitat.
Throughout Part A	Construction	EM040	Habitat compensation for breeding birds is incorporated into the **Landscape Mitigation Masterplan** (**Figure 7.8**, **Volume 5** of this ES (**Application Document Reference: TR010041/APP/6.5**)), including hedgerows, woodland, scrub and grassland. The baseline surveys identified that farmland habitats were of particular importance to wintering birds across the Study Area. Where possible, farmland would be retained and habitat loss kept to a minimum. Farmland boundary features, such as hedgerows, would be reinstated within the design of Part A, where permissible and achievable, to retain these habitats of value.	To compensate for the loss of breeding bird habitat.
Throughout Part A	Construction	EM041	Part A includes approximately 800 m of new or reinstated watercourse, the most significant being an approximate 429 m new channel at Fenrother Junction. Where watercourses are reinstated (primarily due to relocation of culverts), this would be designed in keeping with the wider watercourse, including bed and bankside structure and riparian vegetation composition. New channels are designed to increase their biodiversity value, with the inclusion of rock armour to vary the substrate features, create natural meanders and facilitate the movement of aquatic species (in accordance with **Chapter 10: Road Drainage and the Water Environment** of this ES). The channels would also be planted with aquatic vegetation consistent with the existing floral community of the watercourse/catchment. The sourcing of any plants would be confirmed at detailed design but would be from suppliers that are free from aquatic invasive non-native species. Advice would be sought from the Environment Agency, if required, about relevant protocols for the sourcing of aquatic plants.	To mitigate for the loss of aquatic (running water) habitat.
Throughout Part A	Construction	EM042	The **Landscape Mitigation Masterplan** (**Figure 7.8**, **Volume 5** of this ES (**Application Document Reference: TR010041/APP/6.5**)) incorporates compensatory habitat, such as woodland and species rich grasslands, that is of higher value to terrestrial invertebrates than those habitats lost in the aim of providing a net gain (**Chapter 7: Landscape and Visual** of this ES). A diverse range of floral species would be incorporated into the landscape design,	To compensate for the loss of terrestrial invertebrate habitat.

Approximate Location	Timing of Measure	Measure Reference[43]	Description	Mitigation Purpose or Objective
			providing larval and adult food plants for a range of invertebrate species, including species of conservation importance recorded during the baseline surveys.	
Throughout Part A	Construction	EM043	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. In addition, the shape of the detention basins will be considered and explored at detailed design. Excluding the exceptions named above, it will be recommended that these could be designed to be ecologically sympathetic shapes rather than oval indentations. Proposed for all detention basins within the exception of those located within junctions (includes Highlaws and West Moor Junctions) and near to Eshott Airfield (DB15, DB15a and DB17), due to the increased risk of mortality from road vehicle and air traffic collision (**Chapter 7: Landscape and Visual** of this ES). The exceptions detailed above would be established with grassland flora and maintained at a short sward height. In addition, the shape of the detention basins shall be considered and explored at detailed design. Excluding the exceptions named above, it would be recommended that these could be designed to be ecologically sympathetic shapes rather than oval indentations.	To improve the value of detention basins.
West Moor Junction	Construction	EM044	The anti-glare fencing proposed near West Moor Junction would be created from inert materials to avoid an attraction to wildlife that may encourage movement into the road network and increase the risk of mortality.	To mitigate potential impacts of vehicle collision.
Throughout Part A	Construction	EM045	Mitigation measures to avoid or reduce potential impacts on surface waters would be employed, including adherence to Pollution Prevention Guidance (PPG) (**Ref. 9.86**) during construction and appropriate road drainage and runoff treatment. Further information is presented in **Chapter 10: Road Drainage and the Water Environment** of this ES.	To protect fauna and habitats from pollution of surface waters during construction.
Throughout Part A	Construction	EM046	Mitigation and compensation for the loss of ecologically important habitats (those classified as HPI) would occur through habitat creation. This would include roadside planting, where appropriate, as shown on the **Landscape Mitigation Masterplan** (**Figure 7.8**, **Volume 5** of this ES (**Application Document Reference: TR010041/APP/6.5**)). Where feasible, HPI would be replaced on a like-for-like (1:1) basis or greater (as detailed within **Chapter 7: Landscape and Visual** of this ES and informed by the biodiversity no net loss calculations, **Appendix 9.20: Biodiversity No Net Loss Assessment**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**)), with habitats of a similar type and character to be created within the vicinity of the area where the loss has occurred. Where this is not possible, habitat creation would occur within other suitable areas identified within Part A. Landscape planting and newly created habitat would comprise of locally native species of local provenance and would comprise a mixture of species.	To compensate for the loss of habitats

Approximate Location	Timing of Measure	Measure Reference[43]	Description	Mitigation Purpose or Objective
			Sowing/planting should be undertaken in the appropriate planting season but as soon as possible following completion of the works to reduce the likelihood of the areas being colonised by invasive, non-native species, which are of lower value to wildlife. Replacement habitats would be monitored and managed during the aftercare and operation phase of Part A in accordance with the detail of **Chapter 7: Landscape and Visual** of this ES.	
Longdike Burn (Bockenfield Culvert)	Construction	EM047	To compensate for the direct loss of approximately 35 m of Longdike Burn as part of the Bockenfield Culvert extension, the approximate 850 m length of the watercourse that falls within the temporary boundary shall be improved. This would include nutrient management measures to address adverse impacts of run-off from agricultural land, aquatic planting and bankside stabilisation. Measures shall be developed further at detailed design, supported by a target walkover survey to confirm appropriateness of enhancement opportunities. Actions would be developed in partnership with the Environment Agency, with reference to the WFD status and reasons for deterioration (**Ref. 9.79**).	To compensate for the loss of aquatic habitat associated with Longdike Burn.
Over 1 km from Part A and other major roads (**Figure 9.5**)	Operation	EM048	Whilst no barn owl breeding sites would be directly lost as a result of Part A, their proximity to Part A could result in functional loss. To compensate for the loss of the 3 active breeding sites within the Study Area, 3 compensatory roosting features (preferably barn owl boxes installed within suitable buildings, or alternatively tree-mounted) have been installed at suitable receptor sites, located over 1 km from any major roads (**Figure 9.5: Barn Owl Mitigation Sites**, **Volume 5** of this ES (**Application Document Reference: TR010041/APP/6.5**)). Given the offline section of Part A would result in the potential fragmentation of a connection between an occupied breeding site and active roost/potential breeding site near Causey Park (approximately chainage 16,100), a single additional compensatory roost feature has been installed at a suitable receptor site, located over 1 km from any major roads (**Figure 9.5: Barn Owl Mitigation Sites**, **Volume 5** of this ES (**Application Document Reference: TR010041/APP/6.5**)). Through consultation and collaboration with the Northumberland Coast AONB Partnership, the barn owl boxes have been installed at the following locations outside of the Order Limits: Longhirst – NZ247903 Ulgham – NZ229913 Acklington – NU221017 Morwich – NU223033 Annual monitoring would be undertaken for a minimum period of 5 years to confirm that the barn owl boxes remain intact and inspect the barn owl boxes for use. The monitoring would be undertaken by a licensed person appointed by the Applicant. Monitoring may involve multiple visit throughout the year. Whilst close inspection of occupied nest sites should be avoided during the period March to May inclusive (**Ref. 9.41**), local knowledge from licensed barn owl surveyors has identified that it is best to undertake the first nest box check in the second half of May to avoid missing early breeding.	To compensate for the loss of barn owl nesting sites.

Approximate Location	Timing of Measure	Measure Reference[43]	Description	Mitigation Purpose or Objective
			Damaged or missing barn owl boxes within the 5 year monitoring period would be replaced like-for-like.	
Throughout Part A	Operation	EM049	Part A would not be lit by artificial lighting upon completion of construction, except for replacement of existing lighting along the residential street at West View. The lighting at West View would be replaced with a like-for-like design.	To mitigate the effects of artificial lighting.
Throughout Part A	Operation	EM050	Habitats would be managed in accordance with the following principles: - Maintenance of a short vegetation sward for those detention basins contained within junctions and the two detention basins to the southwest of Eshott Airfield to reduce the attraction for wildlife and the potential for bird strike with vehicles and planes - Maintenance of a short vegetation sward along roadside verges (within 4 m of the carriageway) to reduce the value for foraging bats and barn owl and decrease the likelihood of vehicle strike Further details are presented in **Chapter 7: Landscape and Visual** of this ES.	To reduce the impacts of vehicle strike on fauna.
Throughout Part A	Operation	EM051	In the event that badgers are killed by traffic along Part A over a 5-year period following construction completion, requirements for additional/alternative fencing would be discussed and agreed with a suitably experienced ecologist to reduce badger mortality.	To address impacts of mortality to badger.

ENHANCEMENT

9.9.11. Enhancement opportunities 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 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. Bat boxes (Schwegler 1FQ or similar) or integrated bat roost features (Schwegler 1FR or similar) would be incorporated onto/into the piers of the existing and proposed River Coquet Bridge, on elevations facing onto the watercourse.

c. Bat and bird nest boxes would be installed on suitable mature trees/structures or mounted on poles. If installed, 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 should be followed. The bat and bird boxes could be placed within existing retained woodlands, during construction. Additionally, once mature, the boxes could be placed within the newly created woodlands, (on poles or mature existing trees along the edge), post-construction.

d. Enhancement of detention basins (excluding those within junctions or adjacent to Eshott airfield) 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.

e. Potential enhancements for the Woodland Creation Area are presented in the **Ancient Woodland Strategy** (**Appendix 9.21**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**)).

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 the section above. Proposed enhancement measures documented in **Section 9.9** of this chapter 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 are presented in **paragraph 9.10.45** and **Table 9-24** of this chapter.

CONSTRUCTION

Statutory Sites, Non-Statutory Sites and Ancient Woodland

9.10.2. Part A would result in the loss of 0.27 ha of ancient woodland associated with the River Coquet and Coquet Valley Woodlands SSSI. The mitigation strategy provides compensatory woodland planting (12:1 ratio) within the **Ancient Woodland Strategy**

(**Appendix 9.21**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**)). However, given that ancient woodland is an irreplaceable habitat and the time to re-establish a woodland of similar ecological function, Part A would incur a **Very Large** direct, permanent adverse effect to the River Coquet and Coquet Valley SSSI (encompassing Dukes Bank Wood ancient woodland).

9.10.3. Part A would also result in the loss of 0.41 ha of woodland within the Coquet River Felton Park LWS. Whilst not designated as ancient woodland, the broadleaved woodland of the LWS supports ancient woodland indicator species. Therefore, for the purposes of the assessment, the LWS woodland was treated as ancient woodland and impacts addressed within the **Ancient Woodland Strategy** (**Appendix 9.21**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**)). As such, the Ancient Woodland Strategy proposes compensatory woodland planting at a ratio of 12:1, greater than that proposed for loss of other broadleaved woodland as a result of Part A. The mitigation afforded is therefore considered above and beyond that conventionally required for a LWS. Whilst the DMRB would require a significant effect of Very Large due to impacts to a habitat of National importance (ancient woodland), as this is based on a value greater than its designation (LWS, typically Slight effect), Part A is considered to incur a **Moderate** direct, permanent adverse effect to the Coquet River Felton Park LWS.

Habitats (Excluding Ancient Woodland)

9.10.4. Part A would result in a loss of mixed woodland – semi-natural habitat compared to the baseline (detailed in **Table 9-22**). However, as a HPI (lowland mixed deciduous woodland), this Phase 1 habitat is grouped with broadleaved woodland – semi-natural. Part A includes significantly greater woodland creation than that lost to Part A, in the form of broadleaved semi-natural woodland. As such, the loss of mixed woodland – semi-natural habitat is considered **Neutral** (**not significant**), with a **Moderate** beneficial effect in relation to broadleaved woodland – semi-natural.

9.10.5. Part A provides more neutral grassland – semi-improved habitat in comparison to that lost; 3.02 ha lost to 40.64 ha created. This would result in a **Moderate** permanent beneficial effect.

9.10.6. Part A results in a loss of arable field margins. Where possible, arable field margins have been retained within **Figure 7.8: Landscape Mitigation Masterplan**, **Volume 5** of this ES (**Application Document Reference: TR010041/APP/6.5**) of this ES. Reinstatement and creation of this habitat is constrained given that it must be associated with the margin of an arable field. However, it should be noted that the assessment of arable field margin HPI was based on the assumed presence of a 2 m strip around each arable field boundary. As such, the baseline is likely to be an overestimate and could be refined at detailed design. Given that this habitat is well represented within the wider local landscape, the loss of arable field margin would result in a **Slight** direct, adverse but reversible effect (**not significant**).

9.10.7. Part A includes hedgerow creation at a ratio of approximately 1.4:1 to that lost. The increase in hedgerow linear length would result in a **Slight** beneficial effect (**not significant**).

9.10.8. Part A would result in a net loss of watercourse (rivers, burns and streams) as a result of culvert installation. Excluding ditches, Part A would result in the direct, permanent net loss of approximately 200 m of watercourse length. This includes the loss of approximately 165 m of watercourses of Local importance and approximately 35 m of watercourse of National importance, of Longdike Burn. In relation to direct impacts to watercourses of Local importance, Part A would result in a **Slight** direct, permanent adverse effect (**not significant**).

9.10.9. In relation to direct impacts on Longdike Burn, the DMRB significance of effects criteria would require a classification of Very Large, given an impact to a feature of National importance. However, only a small length of Longdike Burn would be lost to Part A (approximately 35 m), adjacent to the existing culvert, and the loss would not result in the severance of the watercourse for its significance criteria (namely fish – lamprey, European eel and brown trout). In addition, as mitigation it is proposed to improve the length of Longdike Burn that passes within the temporary boundary of Part A (approximately 850 m). Following implementation of mitigation, Part A would result in a **Slight** direct, permanent adverse effect (**not significant**) in relation to the loss of habitat associated with Longdike Burn.

9.10.10. Additionally, indirect effects may arise during construction from dust deposition and surface water run-off. Species that use these watercourses may be temporarily disturbed by the works. Following the implementation of mitigation, the risk of indirect effects to watercourses during construction would be **Neutral** (**not significant**).

Fish

9.10.11. Part A would result in the temporary loss of watercourse habitat during the extension of the culvert along Longdike Burn 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 A would result in a **Slight** temporary, adverse effect to fish (**not significant**) during construction.

Aquatic Invertebrates

9.10.12. Part A would result in the temporary loss of watercourse habitat during the extension of the culvert along Longdike Burn 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 A would result in a **Slight** temporary, adverse effect to aquatic invertebrates (**not significant**) during construction.

OPERATION

Statutory Sites, Non-Statutory Sites and Ancient Woodland

River Coquet & Coquet Valley Woodlands SSSI

9.10.13. Air quality modelling (**Chapter 5: Air Quality** of this ES) showed that there would be an increase in nitrogen deposition as a result of Part A. The River Coquet and Coquet Valley Woodlands SSSI is located within 200 m of the ARN at three locations, hereafter referenced as Eco1, Eco9 and Eco12 (**Figure 5.2: Human and Ecological Receptors Assessed**, **Volume 5** of this ES (**Application Document Reference: TR010041/APP/6.5**)). The SSSI is located both east and west of the ARN at each of the 3 locations.

9.10.14. A critical load cannot be given for nitrogen with respect to rivers, as quantitative relationships between biology and nitrogen concentrations are poorly understood. The River Coquet is surrounded by arable farmland and therefore likely subject to water-run off and introduction of nutrients. As such, nitrogen is unlikely to be the limiting nutrient and increased aerial nitrogen deposition is therefore unlikely to be of significance. On this basis, the below impact assessment, which assesses against the critical load for the woodland habitat of the SSSI, can be extrapolated to encompass the watercourse. Potential impacts to the watercourse due to nutrient enrichment or sedimentation from surface water runoff would be mitigated through measures embedded within the drainage design. Such measures are detailed in full within **Chapter 10: Road Drainage and the Water Environment** of this ES but include appropriate pollution prevention and control measures deployed during construction (presented within the **Outline CEMP** for the Scheme (**Application Document Reference: TR010041/APP/7.3**)) and vegetated detention basins with sediment forebays to mitigate potential operational impacts. As such, **Chapter 10: Road Drainage and the Water Environment** of this ES concludes **Neutral** effects (**not significant**) in relation to drainage.

Eco1

9.10.15. At Eco 1, results in predicted NO_x levels above the critical level (30 µg/m^3) to the east of the existing A1 (affected road) in comparison to the future baseline (without Part A), where levels are below the critical level (**Appendix 5.6: Operational Impacts - Ecological Receptors**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**)). NO_x levels to the west are only exceeded at 0 m from the road, both with or without Part A, and therefore not considered further.

9.10.16. At Eco1, Part A addresses the loss of all SSSI woodland (ancient woodland) within the Order Limits adjacent to the existing A1 (0.27 ha) and provides woodland planting as compensation (detailed within the **Ancient Woodland Strategy** (**Appendix 9.21**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**)). In accordance with the methodology presented in **paragraph 9.4.62**, the area for which compensation has been provided is excluded from the assessment. As such, the closest point affected by increased NO_x levels from the existing A1 is at the Order Limits boundary, approximately

25 m distance. At this distance, NO_x levels do not exceed the critical level (30 µg/m^3). Therefore, in accordance with DMRB (**Ref. 9.17**), no further assessment in terms of impact is required at Eco1.

9.10.17. It is considered valid to take the compensatory planting into account within the assessment of likely significant effects, given that this provision is afforded to compensate for habitat lost as a result of Part A during construction. Therefore, woodland that has been removed can no longer be affected by operational changes in air quality. If not all of the SSSI habitat within the Order Limits was removed, this would lessen overall impacts on the SSSI, given that the construction impacts would be reduced. Any retention of the SSSI habitats within the Order Limits would not reduce the provision of compensatory planting. Therefore, impacts to retained SSSI habitat within the Order Limits due to changes in air quality would be compensated by the woodland planting proposed. The proposed compensatory habitat for SSSI habitat loss (Woodland Creation Area) would also be located in an area that would not experience air quality impacts in excess of 1% of critical load. As such, a worst-case scenario has been assessed. This approach has also been taken for other ecological receptors, discussed below.

Eco9

9.10.18. At Eco9, NO_x levels do not exceed the critical level to the east or west of the ARN (**Appendix 5.6: Operational Impacts - Ecological Receptors**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**)). In addition, total nitrogen deposition loads are decreased because of Part A, with this modelled as significant (reduction by greater than 1% of lower critical load) within 0 m east and west of the ARN only (**Appendix 5.6: Operational Impacts - Ecological Receptors**, **Volume 7** (**Application Document Reference: TR010041/APP/6.7**) of this ES). The decrease in total nitrogen deposition is due to the ability of Part A (A1) to draw traffic from other roads within the local network. Therefore, this causes a reduced traffic flow on some roads radiating from the A1, thereby a reduction in associated nitrogen deposition. As such, Part A would potentially result in a slight beneficial effect to the SSSI.

Eco12

9.10.19. At Eco12, NO_x levels exceed the critical level at 0 m east of the ARN in the absence of Part A (**Appendix 5.6: Operational Impacts - Ecological Receptors**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**)). However, implementation of Part A reduces NO_x levels below the critical level, incurring a positive effect (**Appendix 5.6: Operational Impacts - Ecological Receptors**, **Volume 7** of this ES). In addition, total nitrogen deposition loads exceed the lower critical load without Part A but are decreased as a result of construction. The model shows that the decrease in total nitrogen deposition is significant within 0 m east and west of the ARN only (**Appendix 5.6: Operational Impacts - Ecological Receptors**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**)). As such, Part A would potentially result in a slight beneficial effect to the SSSI.

Summary of Air Quality Assessment for River Coquet and Coquet Valley Woodlands SSSI

9.10.20. In-combination, following successful implementation of compensatory woodland planting, Part A would potentially result in a slight beneficial effect at two locations (Eco9 and Eco12) of the SSSI. Although, these are only detectable at 0 m from the affected road. As such, it is considered that Part A would result in a **Neutral** effect (**not significant**) to the River Coquet and Coquet Valley Woodlands SSSI as a result of changes in air quality.

Duke's Bank Wood Ancient Woodland

9.10.21. Air quality modelling (**Chapter 5: Air Quality** of this ES) showed that there would be an increase in nitrogen deposition as a result of Part A. Duke's Bank Wood ancient woodland is 9.43 ha in size and located within the boundaries of the SSSI. In relation to air quality, the Ancient Woodland site is located east and west of the existing A1 at Eco1 (**Figure 5.2: Human and Ecological Receptors Assessed**, **Volume 5** of this ES (**Application Document Reference: TR010041/APP/6.5**)). In accordance with the air quality changes presented above in relation to Eco1, the area of the ancient woodland affected by a significant increase in nitrogen deposition is captured within the **Ancient Woodland Strategy** (**Appendix 9.21**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**)), which provides compensatory woodland planting to address the direct loss of 0.27 ha of Duke's Bank Wood as a result of Part A.

9.10.22. As the area impacted by increased nitrogen deposition has been captured within the mitigation strategy for the construction of Part A, the effects in relation to air quality and Duke's Bank Wood ancient woodland are considered **Neutral** (**not significant**).

Coquet River Felton Park LWS

9.10.23. Air quality modelling (**Chapter 5: Air Quality** of this ES) showed that there would be an increase in nitrogen deposition as a result of Part A. Coquet River Felton Park LWS is 18.02 ha in size and located to the east and west of the existing A1 (ARN) where it crosses the River Coquet, model reference of Eco1 (**Figure 5.2: Human and Ecological Receptors Assessed**, **Volume 5** of this ES (**Application Document Reference: TR010041/APP/6.5**)). The LWS includes the woodland on the northern bank of the river that has been considered as ancient woodland within this ES.

9.10.24. Part A addresses the loss of all LWS woodland within the Order Limits adjacent to the existing A1 (0.41 ha) and provides woodland planting as compensation (detailed within the **Ancient Woodland Strategy** (**Appendix 9.21**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**)). As such, the closest point affected by increased NO_x levels from the existing A1 is at the Order Limits boundary, approximately 15 m distance. At this distance, NO_x levels do not exceed the critical level (30 µg/m^3). As the area impacted by increased nitrogen deposition has been captured within the mitigation strategy for the construction of Part A, the effects in relation to air quality and Coquet River Felton Park LWS are considered **Neutral** (**not significant**)**.**

Wansbeck and Hartburn Woods LWS/Borough Wood ancient woodland/Borough Wood LNR

9.10.25. Air quality modelling (**Chapter 5: Air Quality** of this ES) showed that there would be an increase in nitrogen deposition as a result of Part A (Eco7). Wansbeck and Hartburn Woods LWS (161.6 ha), which encompasses Borough Wood ancient woodland (16.1 ha), is bisected by the existing A1 (affected road) to the south of Part A. As such, modelling was undertaken to both the east and west of the existing A1. Borough Wood LNR (18.35 ha) is only located to the east of the existing A1.

9.10.26. A critical load cannot be given for nitrogen with respect to rivers/streams, as quantitative relationships between biology and nitrogen concentrations are poorly understood. The River Wansbeck is surrounded by arable farmland and therefore likely subject to water-run off and introduction of nutrients. As such, nitrogen is unlikely to be the limiting nutrient and increased nitrogen deposition is therefore unlikely to be of significance. On this basis, the below impact assessment, which assesses against the critical load for the woodland habitat, can be extrapolated to encompass the watercourse.

9.10.27. Total nitrogen deposition loads are predicted to exceed the lower critical load (10 kgN/ha/yr.[50]) without Part A, although construction of Part A results in increases of significance from the future baseline up to 5 m east of the affected road (**Appendix 5.6: Operational Impacts - Ecological Receptors**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**)). Modelling on the western side shows that the increase from the future baseline is only significant at 0 m from the road (**Appendix 5.6: Operational Impacts - Ecological Receptors**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**)).

9.10.28. Modelling shows that NO_x levels are predicted to be double the critical level at 0 m to the east of the existing A1 without Part A, although construction of Part A incurs a large magnitude of change (**Ref. 9.27**) at 0 m from the future baseline (**Appendix 5.6: Operational Impacts - Ecological Receptors**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**)). Both the future baseline and Part A construction models show that the critical level is exceeded up to 10 m east of the road in either scenario. However, Part A results in a large magnitude of change to the baseline at 5 m (43.0 µg/m^3 to 46.5 µg/m^3) that reduces to a medium magnitude at 10 m (33.3 µg/m^3 to 35.9 µg/m^3) (**Appendix 5.6: Operational Impacts - Ecological Receptors**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**)). From 15 m east, the NO_x levels fall below the critical level. NO_x levels to the west only exceed the critical level at 0 m from the road, both with or without Part A (**Appendix 5.6: Operational Impacts -**

[50] **Table 5-12** of **Chapter 5: Air Quality** of this ES.

Ecological Receptors, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**)), and therefore are not of significance with regards to the LWS/LNR/ancient woodland.

9.10.29. The area of the LWS affected by a significant increase in nitrogen deposition (greater 1% of the lower critical load) would be 0.05 ha (representing 5 m to the east of the existing A1). The area of ancient woodland affected would be 0.02 ha. The area of LNR affected would be 0.03 ha. This equates to 0.03% of the LWS, 0.12% of the ancient woodland and 0.16% of the LNR.

9.10.30. In accordance with the DMRB (**Ref. 9.21**), Part A would result in a **Slight** indirect, permanent adverse effect (**not significant**) to the Wansbeck and Hartburn Woods LWS as a result of changes in air quality.

9.10.31. DMRB impact criteria would require a significance effect of Very Large in relation to the ancient woodland, due to an impact to a habitat of National importance. However, this is not considered comparable to the impact level given the small area of ancient woodland impacted by the changes in air quality and the exceedance of the critical level/critical loads without Part A. As such, the significance is downgraded on the basis of professional judgement. It is considered that Part A would, at worst, result in a **Slight** indirect, permanent adverse effect (**not significant**) to Borough Woods ancient woodland as a result of changes in air quality.

9.10.32. DMRB impact criteria would require a significance effect of Moderate in relation to the LNR, due to an impact to a site of County importance. However, this is not considered comparable to the impact level given the small area of the designation potentially impacted by the changes in air quality and the exceedance of the critical level/critical loads without Part A. As such, the significance is downgraded on the basis of professional judgement. It is considered that Part A would result in a **Slight** indirect, permanent adverse effect (**not significant**) to Borough Woods LNR as a result of changes in air quality.

Cawledge Burn LWS

9.10.33. Air quality modelling (**Chapter 5: Air Quality** of this ES) showed that there would be a potential increase in nitrogen deposition as a result of Part A (Eco18). Cawledge Burn LWS (approximately 10 ha in size) is located either side of the existing A1 (affected road) to the south of Alnwick (10 km north of Part A). The LWS is designated primarily for its geological interest, although the citation does include biological features of interest. DMRB states that sites designated for geological purposes need not be assessed, however, given that the LWS supports biological interest, the site has been scoped in to ensure a robust assessment.

9.10.34. Total nitrogen deposition loads are predicted to exceed the lower critical load (10 kgN/ha/yr.[51]) without Part A (**Appendix 5.6: Operational Impacts - Ecological Receptors**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**)). Construction of Part A only results in an increase of significance at 0 m from the affected road (Eco18) (**Appendix 5.6: Operational Impacts - Ecological Receptors**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**)).

9.10.35. Modelling shows that NO_x levels would exceed the critical level without Part A up to 5 m to the east of the existing A1, with the construction of Part A, resulting in a medium increase above the future baseline (32.1 µg/m^3 to 34.8 µg/m^3) (**Appendix 5.6: Operational Impacts - Ecological Receptors**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**)). The model shows that the construction Part A would result in an increase in NO_x levels above the critical level in comparison to the future baseline up to 5 m west of the affected road, with a moderate increase calculated (29.1 µg/m^3 to 31.4 µg/m^3) (**Appendix 5.6: Operational Impacts - Ecological Receptors**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**)).

9.10.36. The area of the LWS affected by increased NO_x levels above the critical level would be 0.17 ha (0.1 ha representing 5 m to the west of the existing A1 and 0.07 ha representing 5 m to the east). This equates to 1.7% of the LWS. Part A is considered to incur a **Slight** indirect, permanent adverse effect (**not significant**) to Cawledge Burn LWS as a result of changes in air quality.

Well Wood Ancient Woodland

9.10.37. Air quality modelling (**Chapter 5: Air Quality** of this ES) shows that there would be a potential increase in nitrogen deposition as a result of Part A (Eco8). Well Wood ancient woodland (52.7 ha in size) is located to the east of the existing A1 (affected road) to the south of Morpeth (approximately 10 km to the south of Part A).

9.10.38. Total nitrogen deposition loads are predicted to exceed the lower critical load (10 kgN/ha/yr.[52]) without Part A (**Appendix 5.6: Operational Impacts - Ecological Receptors**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**) of the ES). Construction of Part A does not result in an increase of significance (i.e. change in comparison to the baseline is less than 1%).

9.10.39. Modelling shows that NO_x levels would exceed the critical level without Part A up to 25 m to the east of the existing A1, with the construction of Part A resulting in a small increase above the future baseline (30.2 µg/m^3 to 31.1 µg/m^3) (**Appendix 5.6: Operational Impacts**

[51] **Table 5-11** of **Chapter 5: Air Quality** of this ES.
[52] **Table 5-11** of **Chapter 5: Air Quality** of this ES.

- Ecological Receptors, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**)).

9.10.40. The area of ancient woodland affected by increased NO_x levels above the critical level would be 0.3 ha (representing 25 m to the west). This equates to 0.6% of the total ancient woodland of Well Wood. DMRB impact criteria would require a significance effect of Very Large in relation to the ancient woodland, due to an impact to a site of National importance. However, this is not considered comparable to the impact level given the small area of the designation potentially impacted by the changes in air quality and the exceedance of the critical level / critical loads without Part A. As such, the significance is downgraded on the basis of professional judgement. Part A is considered to incur a **Slight** indirect, permanent adverse effect (**not significant**) to Well Wood ancient woodland as a result of changes in air quality.

Ulgham Meadow LNR

9.10.41. Air quality modelling (**Chapter 5: Air Quality** of this ES) showed that there would be a decrease in nitrogen deposition as a result of Part A (Eco10). Ulgham Meadow LNR (approximately 3.7 ha) is located to the immediate east of the B1337 to the northeast of the village of Ulgham.

9.10.42. Total nitrogen deposition loads are predicted to exceed the lower critical load (10 kgN/ha/yr.[53]) without the Part A. However, construction of Part A results in decreased levels of deposition compared to the future baseline, with significance (change greater than 1% of the lower critical load) up to 10 m from the affected road (**Appendix 5.6: Operational Impacts - Ecological Receptors**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**)). NO_x levels do not exceed the critical level in either the future baseline of Part A construction models (**Appendix 5.6: Operational Impacts - Ecological Receptors**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**).

9.10.43. The area of the LNR affected by a significant decrease in nitrogen deposition would be 0.11 ha (representing 10 m from the affected road), which equates to 3% of the LWS. DMRB impact criteria would require a significance effect of Moderate in relation to the LNR, due to an impact to a site of County importance. However, this is not considered comparable to the impact level given the small area of the designation potentially impacted by the changes in air quality and the exceedance of the critical level / critical loads without Part A. As such, the significance is downgraded on the basis of professional judgement. Part A is considered to incur a **Slight** indirect, permanent beneficial effect (**not significant**) to Ulgham Meadow LNR as a result of changes in air quality.

[53] **Table 5-12** of **Chapter 5: Air Quality** of this ES.

Bats

9.10.44. Part A would incorporate a bat culvert at chainage 18,300 as part of mitigation to maintain bat flight paths across Part A. Common and soprano pipistrelle were recorded along the commuting features (hedgerows) in the vicinity. The size of the culvert is constrained by the topography and level of cover (space between the top of the culvert and road above). Due to the reduced dimensions, there is potential that bats may not use the feature. In the event that the culvert is not used by bats, Part A would result in a permanent severance of a bat flight path. The landscape plan does accommodate linear habitat creation parallel with Part A, providing connectivity to the wider landscape and to other culverts embedded within the design of Part A of dimensions that are considered conducive to bat usage. It is therefore considered that Part A would result in a **Slight** adverse effect (**not significant**).

SUMMARY OF ASSESSMENT OF LIKELY SIGNIFICANT EFFECTS

9.10.45. **Table 9-24** 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 9-23**. In addition to the measures identified in **Table 9-24** below, the following items are considered 'general' and apply to the majority, if not all, ecological receptors assessed: DM002, DM009, DM011, EM003, EM005, EM028, EM043, EM044, EM049 and measures embedded within the design of Part A.

Table 9-24 – Summary of Assessment of Likely Significant Effects to Ecological Receptors

Ecological Receptor		Measures to Reduce the Significance of Effects		Assessment of Likely Significant Effects	
		Construction	**Operation**	**Construction**	**Operation**
European designated sites		No mitigation proposed.	No mitigation proposed.	Neutral (not significant)	Neutral (not significant)
Statutory and non-statutory designated sites	River Coquet and Coquet Valley Woodlands SSSI	DM001, EM018, EM021, EM022, **Ancient Woodland Strategy (Appendix 9.21, Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**))	Embedded mitigation within the design of Part A.	Very Large adverse	Neutral (not significant)
	Coquet River Felton Park LWS	DM001, EM018, EM021, EM022, **Ancient Woodland Strategy (Appendix 9.21, Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**))	Embedded mitigation within the design of Part A. EM022	Moderate adverse	Neutral (not significant)
Statutory and non-statutory designated sites	Wansbeck and Hartburn Woods LWS/Borough Wood LNR	N/A – no potential impacts during construction	No mitigation proposed.	Neutral (not significant)	Slight adverse (not significant)
	Cawledge Burn LWS	N/A – no potential impacts during construction	No mitigation proposed.	Neutral (not significant)	Slight adverse (not significant)
	Ulgham Meadow LNR	N/A – no potential impacts during construction	No mitigation proposed.	Neutral (not significant)	Slight positive (not significant)
	Other statutory and non-statutory sites assessed	N/A – no potential impacts during construction	No mitigation proposed.	Neutral (not significant)	Neutral (not significant)
Ancient woodland	Duke's Bank Wood ancient woodland	DM001, EM018, EM021, EM022, **Ancient Woodland Strategy (Appendix 9.21, Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.**7))	Embedded mitigation within the design of Part A. EM022	Very Large adverse	Neutral (not significant)
Ancient woodland	Borough Wood ancient woodland	N/A – no potential impacts during construction	No mitigation proposed.	Neutral (not significant)	Slight adverse (not significant)

Ecological Receptor		Measures to Reduce the Significance of Effects		Assessment of Likely Significant Effects	
		Construction	Operation	Construction	Operation
	Ancient woodland sites, excluding those above	N/A – no potential impacts during construction	No mitigation proposed.	Neutral (not significant)	Neutral (not significant)
Habitats of Principal Importance (HPI)	Mixed woodland – semi-natural habitat	EM002, EM018, EM021, EM046	Embedded mitigation within the design of Part A. EM046	Neutral (not significant)	Neutral (not significant)
	Broadleaved woodland – semi-natural	EM002, EM018, EM021, EM046	Embedded mitigation within the design of Part A. EM046	Moderate beneficial	Neutral (not significant)
	Neutral grassland – semi-improved	EM002, EM046	Embedded mitigation within the design of Part A. EM046	Moderate beneficial	Neutral (not significant)
	Arable field margins	EM002, EM046	Embedded mitigation within the design of Part A. EM046	Slight adverse (not significant)	Neutral (not significant)
	Hedgerow	EM002, EM018, EM046	Embedded mitigation within the design of Part A. EM046	Slight beneficial (not significant)	Neutral (not significant)
Habitats of Principal Importance (HPI)	Watercourses	DM001, DM009, EM002, EM018, EM045, EM046, EM047	Embedded mitigation within the design of Part A. EM041, EM046, EM047.	Slight adverse (not significant)	Neutral (not significant)
	Other HPIs assessed	EM002, EM046	Embedded mitigation within the design of Part A. EM046	Neutral (not significant)	Neutral (not significant)
Great crested newt		DM004, EM002, EM006, EM007, EM036	EM006	Neutral (not significant)	Neutral (not significant)
Bats		DM005, DM006, EM002, EM008, EM009, EM011, EM023, EM024, EM033, EM034, EM036	EM008, EM025, EM026, EM027, EM050	Neutral (not significant)	Slight adverse (not significant)
Badger		DM003, EM002, EM010, EM020 EM023, EM033, EM034, EM035, EM036, EM037	EM029, EM032, EM035, EM051	Neutral (not significant)	Neutral (not significant)
Barn owl		EM012, EM002, EM023, EM038	EM038, EM039, EM048, EM050	Neutral (not significant)	Neutral (not significant)
Breeding and wintering birds		EM001, EM002, EM004	EM040, EM050	Neutral (not significant)	Neutral (not significant)
Red squirrel		DM007, EM002, EM013, EM036	No mitigation proposed other than landscape planting.	Neutral (not significant)	Neutral (not significant)
Otter		DM008, EM002, EM036, EM045	EM029, EM032	Neutral (not significant)	Neutral (not significant)

Ecological Receptor	Measures to Reduce the Significance of Effects		Assessment of Likely Significant Effects	
	Construction	Operation	Construction	Operation
Fish	EM014, EM015, EM016, EM017, EM019, EM030, EM045	EM031, EM041	Slight adverse (not significant)	Neutral (not significant)
Terrestrial invertebrates	EM002	EM042	Neutral (not significant)	Neutral (not significant)
Aquatic invertebrates	EM045	EM041	Slight adverse (not significant)	Neutral (not significant)
Brown hare	EM002, EM004, EM036	No mitigation proposed other than landscape planting.	Neutral (not significant)	Neutral (not significant)
Hedgehog	EM002, EM036	No mitigation proposed other than landscape planting.	Neutral (not significant)	Neutral (not significant)
Invasive species	DM009, DM010, EM002	No mitigation proposed.	Neutral (not significant)	Neutral (not significant)

ASSESSMENT PARAMETERS

9.10.46. The Assessment Parameters, as presented in **Chapter 2: The Scheme**, **Volume 1** of this ES (**Application Document Reference: TR010041/APP/6.1**), would result in changes to temporary and/or permanent habitat loss (habitat type and quantity) and therefore impact the detail of the biodiversity assessment calculations. Based on professional judgement, the parameters are not anticipated to alter the significance of effects of the biodiversity assessment as a result of Part A.

9.10.47. Parameter 10 would allow the alteration of the location of the proposed River Coquet Bridge piers. This would include movement of the southern and northern piers to the north. The movement of the southern pier would be located outside the normal flow of water. As this would result in only a small change to the area of habitat loss (habitat type and quantity) and would not cause an obstruction to fish passage, the parameter would not alter the significance of effects of the biodiversity assessment for Part A. There would be no change to the conclusions of the assessment as a result of the proposed movement of the northern pier or the abutments.

UPDATED DMRB GUIDANCE

9.10.48. The sensitivity test as discussed in **Section 9.4** 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. 9.31**). 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 9.4.31**, the updated DMRB guidance primarily references best practice, CIEEM guidelines and standing advice, which were used to inform the assessment presented within this chapter.

9.10.49. In relation to operational effects from air quality, it has been identified that LA 105 Air Quality (**Ref. 9.31**) includes a number of key changes in the assessment methodology compared to the guidance (HA 207/07 (**Ref. 9.17**) and IAN 174/13 (**Ref. 9.27**)) 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 9-25** identifies the changes considered to warrant further assessment.

Table 9-25 – 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	The assessment conducted as a result of the sensitivity test included an assessment of the

Topic	Change in Assessment Methodology	Approach Taken in Sensitivity Test
	within 200 m of the ARN, which were not considered within the assessment presented within this chapter.	potential for likely significant environmental effects of Part A 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 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.	The assessment conducted as a result of the sensitivity test had due regard to Figure 2.98 of LA 105 Air Quality, which uses nitrogen deposition as the main basis for evaluating significant effects in relation to air quality.

9.10.50. As part of the sensitivity test, the operational nitrogen deposition has been remodelled in accordance with LA 105 Air Quality (**Ref. 9.31**) and is presented in **Appendix 5.8: Air Quality DMRB Sensitivity Test**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**). Full details of the updated biodiversity assessment in relation to operational air quality (nitrogen deposition) are presented in **Appendix 9.27: Biodiversity DMRB Sensitivity Test**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**).

9.10.51. In summary, the sensitivity test determined that the application of the updated guidance (**Ref. 9.31**) would not change the likely significance of effects and therefore the conclusions of the assessment would remain unchanged.

BIODIVERSITY NO NET LOSS

9.10.52. The biodiversity no net loss assessment considered whether Part A would result in an overall loss of biodiversity. Overall, Part A would result in a net loss of biodiversity due to the loss of ancient woodland (which is an irreplaceable habitat, therefore unable to achieve no net loss) as well as other habitat types such as hedgerows and arable field margins. However, Part A is in line to deliver a net gain in biodiversity units of area-based HPI (with the exception of arable field margins). Whilst a net loss of hedgerow units is predicted, the linear length of hedgerow planting within the **Landscape Mitigation Masterplan** (refer to **Figure 7.8**, **Volume 5** of this ES (**Application Document Reference: TR010041/APP/6.5**)) is greater than that lost to Part A.

9.10.53. The full findings of the biodiversity no net loss calculations are presented in **Appendix 9.20: Biodiversity No Net Loss Report**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**), which also provides conclusions on the likely impact to

biodiversity of Part A, in line with the Defra metric (**Ref. 9.43**) and the Highways England memorandum (**Ref. 9.37**).

9.11 MONITORING

CONSTRUCTION MONITORING

9.11.1. Monitoring requirements during construction are detailed within this chapter (**Table 9-23**, as appropriate), **Appendices 9.22 to 9.25**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**) of this ES in relation to protected species licensing and **Appendix 9.21: Ancient Woodland Strategy**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**) in relation to ancient woodland.

POST-CONSTRUCTION MONITORING – GENERAL

9.11.2. 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 (DM011, **Table 9-23**), to be developed at detailed design.

9.11.3. A bird survey would be included within the Ecological/Environmental Management Plan to assess the effectiveness of the mitigation measures (EM043, **Table 9-23**) associated with detention basins DB15, DB15a and DB17 (those near Eshott Airfield).

9.11.4. The Ecological/Environmental Management Plan would be included within a Handover Environment Management Plan (HEMP), provided to the Applicant post-construction.

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

ANCIENT WOODLAND STRATEGY – WOODLAND CREATION AREA

9.11.6. Details of preliminary monitoring and management of the Woodland Creation Area over a 50-year period are presented in the **Ancient Woodland Strategy** (**Appendix 9.21**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**)). The Strategy would be finalised at detailed design.

PROTECTED SPECIES LICENSING – POST-COMPLETION

9.11.7. Subject to agreement with Natural England, no post-completion monitoring survey requirements have been identified for the loss of the bat roost in Building B4A as part of the EPS Licence. It would be recommended that all mitigation and compensation features are subject to an annual visual check by a licensed bat ecologist for at least 5 years following installation for damaged or missing features. Missing features would be replaced, like-for-like. Damaged features would be assessed/surveyed by a licensed ecologist and replaced if not in use.

9.11.8. Subject to agreement with Natural England, no post-completion monitoring requirements have been identified for the loss of the two outlier badger setts as part of the badger licence.

9.11.9. Subject to agreement with Natural England, no post-completion monitoring requirements have been identified for pond A19. It would be expected that 4 years post-completion monitoring would be required for ponds A11 and A12, proportionate to the impact type and size and the population size class within each pond. This level of post-completion monitoring is in accordance with best practice (**Ref. 9.39**). The monitoring surveys would consist of 6 survey visits each year (population size class survey).

DEFRA BAT STUDY

9.11.10. In accordance with Defra guidance (Berthinussen and Altringham, 2015) (**Ref. 9.43**) in relation to the Local Scale study, all locations identified as bat Crossing Points would be subject to repeated survey effort during and post-construction. It is recommended that this takes the form of:

a. Six survey visits per year, undertaken as closely as possible to the timeframes of the baseline surveys (**Appendix 9.9: Bat Survey 2018 Report**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**)).
b. The six visits to consist of the same number of dusk and dawn visits.
c. A single year of monitoring completed during the construction period.
d. Monitoring visits completed annually over a 4-year period post-construction.

9.11.11. In addition, the Defra Landscape Scale transects would be subject to repeated survey effort during and post-construction. Transect would be replicated in accordance with the methodology presented in **Appendix 9.8: Bat Activity Survey Report**, **Volume 7** of this ES (**Application Document Reference: TR010041/APP/6.7**). A single year of monitoring would be completed during the construction period and monitoring visits would be completed annually over a 4-year period post-construction.

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

9.11.13. 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 (Berthinussen and Altringham, 2015) (**Ref.9.43**). The results of the monitoring undertaken would determine the effectiveness of proposed mitigation and inform any alterations to the designed mitigation system(s) in place, if required.

9.11.14. The Applicant would identify a suitable body to ensure any alterations required were completed.

9.11.15. These commitments have been included within the **Outline CEMP** for the Scheme (**Application Document Reference: TR010041/APP/7.3**) and would also be documented within the proposed Ecological/Environmental Management Plan (DM011, **Table 9-23**) developed at detailed design.

REFERENCES

Ref. 9.1 Her Majesty's Stationary Office (HMSO) (2017). *The Conservation of Habitats and Species Regulations 2017 (as amended) (the 'Habitats Regulations').* HMSO, London.

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

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

Ref. 9.4 HMSO (1981). Countryside and Rights of Way Act 2000. HMSO, London.

Ref. 9.5 HMSO (1996). Wild Mammals (Protection) Act. HMSO, London.

Ref. 9.6 HMSO (1992). The Protection of Badgers Act. HMSO, London.

Ref. 9.7 Natural England (2009). Guidance on 'Current Use' in the definition of a Badger Sett. June 2009.

Ref. 9.8 HMSO (1997). The Hedgerows Regulations, SI 1997/1160. HMSO, London.

Ref. 9.9 Department for Transport (2014). National Policy Statement for National Networks. London: HMSO.

Ref. 9.10 Ministry of Housing, Communities & Local Government (2019). National Planning Policy Framework. February 2019. London: HMSO.

Ref. 9.11 Highways England (2015). Our plan to protect and increase biodiversity - https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/441300/N150146_-_Highways_England_Biodiversity_Plan3lo.pdf [Accessed March 2019].

Ref. 9.12 Office of the Deputy Prime Minister (ODPM) (2005). Government Circular: Biodiversity and Geological Conservation – Statutory Obligations and their Impacts within the Planning System.

Ref. 9.13 Northumberland County Council (2019). Northumberland Consolidated Planning Policy Framework. Version 27, May 2019.

Ref. 9.14 Northumberland County Council (2019). Northumberland Local Plan – Draft Plan for Regulation 19 Consultation. January 2019.

Ref. 9.15 Northumberland Wildlife Trust (NWT). http://www.nwt.org.uk/northumberland-BAP [Accessed 28th September 2018]

Ref. 9.16 Former Castle Morpeth Borough Council (2003). Castle Morpeth District Local Plan, 1991 – 2006. Adopted February 27th, 2003, Published July 2003.

Ref. 9.17 Highways Agency. Design Manual for Roads and Bridges, Volume 11 Section 3 Part 1 Air Quality.

Ref. 9.18 Air Quality Consultants Ltd. (2008). Nitrogen Dioxide Concentrations and Distance from Roads, Issue No. 3.

Ref. 9.19 CIEEM (2018) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine version 1.1. Chartered Institute of Ecology and Environmental Management, Winchester.

Ref. 9.20 Highways England (2010). Interim Advice Note 130/10. Ecology and Nature Conservation: Criteria for Impact Assessment.

Ref. 9.21 Highways Agency (2018). Design Manual for Roads and Bridges, Volume 11 Section 3 Part 4 Ecology & Nature Conservation.

Ref. 9.22 Natural England. Ancient woodland and veteran trees: protecting them from development. Last update 5 November 2018. https://www.gov.uk/guidance/ancient-woodland-and-veteran-trees-protection-surveys-licences [Accessed September 2018]

Ref. 9.23 Highways Agency. Design Manual for Roads and Bridges, Volume 10 Section 4 Nature Conservation.

Ref. 9.24 Highways England (2015). Interim Advice Note 125/15. Environmental Assessment Update.

Ref. 9.25 Halcrow Group Limited (2006). Highways Agency. Best practice in enhancement of highway design for bats. Literature review report. Commissioned by the Highways Agency.

Ref. 9.26 Highways England (2008). Interim Advice Note 116/08. Nature Conservation Advice in Relation to Bats.

Ref. 9.27 Highways England (2013). Interim Advice Note 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. 9.28 Highways Agency et. al. Design Manual for Roads and Bridges (2019). LA 101 Introduction to environmental assessment. Revision 0, July 2019. Available at: https://www.standardsforhighways.co.uk/dmrb/search?q=LA%20101&pageNumber=1

Ref. 9.29 Highways Agency et. al. Design Manual for Roads and Bridges (2020). LA 103 Scoping projects for environmental assessment. Revision 1, January 2020. Available at: https://www.standardsforhighways.co.uk/dmrb/search?q=LA%20103&pageNumber=1

Ref. 9.30 Highways Agency et. al. Design Manual for Roads and Bridges (2019). LA 104 Environmental assessment and monitoring. Revision 1, July 2019. Available at: https://www.standardsforhighways.co.uk/dmrb/search?q=LA%20104&pageNumber=1

Ref. 9.31 Highways Agency et. al. Design Manual for Roads and Bridges (2019). LA 105 Air Quality. Revision 0, November 2019. Available at: https://www.standardsforhighways.co.uk/dmrb/search?q=LA%20105&pageNumber=1

Ref. 9.32 Highways Agency et. al. Design Manual for Roads and Bridges (2020). LA 108 Biodiversity. Revision 1, March 2020. Available at: https://www.standardsforhighways.co.uk/dmrb/search?q=LA%20108&pageNumber=1

Ref. 9.33 Highways Agency et. al. Design Manual for Roads and Bridges (2020). LD 118 Biodiversity design. Revision 0, March 2020. Available at: https://www.standardsforhighways.co.uk/dmrb/search?q=LA%20118&pageNumber=1

Ref. 9.34 Air Pollution Information System (APIS) website. http://www.apis.ac.uk/ [Accessed February 2019].

Ref. 9.35 APIS website, Critical Loads and Critical Levels – a guide to the data provided in APIS. http://www.apis.ac.uk/critical-loads-and-critical-levels-guide-data-provided-apis#_Toc279788050 [Accessed February 2019].

Ref. 9.36 Defra (2012). Biodiversity Offsetting Pilots: Technical Paper – the Metric for the Biodiversity Offsetting Pilots in England.

Ref. 9.37 Highways England (2018). Chief Highway Engineer (CHE) Memorandum 422/18, Supporting Transparency around our Biodiversity Performance. March 2018. [Not publicly accessible].

Ref. 9.38 CIEEM (2017) Guidelines for Preliminary Ecological Appraisal, 2nd edition. Chartered Institute of Ecology and Environmental Management, Winchester.

Ref. 9.39 English Nature (2001). Great crested newt mitigation guidelines. August 2001.

Ref. 9.40 Collins, J. (ed.) (2016). Bat Surveys – Good Practice Guidelines. Third Edition. Bat Conservation Trust, London.

Ref. 9.41 Shawyer, C.R. (2011). Barn Owl Tyto alba Survey Methodology and Techniques for use in Ecological Assessment: Developing Best Practice in Survey and Reporting. IEEM, Winchester.

Ref. 9.42 Dean, M., Strachan, R., Gow, D. and Andrews, R. (2016). The Water Vole Mitigation Handbook (The Mammal Society Mitigation Guidance Series). Eds Fiona Matthews and Paul Chanin. The Mammal Society, London.

Ref. 9.43 Berthinussen, A and Altringham, J (2015). WC1060 Development of a cost-effective method for monitoring the effectiveness of mitigation for bats crossing linear transport infrastructure. University of Leeds, UK.

Ref. 9.44 Joint Nature Conservation Committee (JNCC) (2010). Handbook for Phase 1 habitat survey – a technique for environmental audit. JNCC, Peterborough.

Ref. 9.45 Rodwell, J. S. (2006). National Vegetation Classification: User's Handbook. JNCC, Peterborough.

Ref. 9.46 JNCC (2016). UK Biodiversity Action Plan Priority Habitat Descriptions. Ponds. Available Online at http://jncc.defra.gov.uk/page-5706 [Accessed November 2018]

Ref. 9.47 Oldham, R.S., Keeble, J., Swan, M.J.S. & Jeffcote, M. (2000). Evaluating the suitability of habitat for the Great Crested Newt (Triturus cristatus). Herpetological Journal 10, 143-155.

Ref. 9.48 Langton, T.E.S., Beckett, C.L., and Foster, J.P. (2001). Great Crested Newt Conservation Handbook. Froglife, Halesworth.

Ref. 9.49 Berthinussen, A. & Altringham, J. (2015). WC1060 Development of a cost-effective method for monitoring the effectiveness of mitigation for bats crossing linear transport infrastructure. Appendix E. Landscape scale effects of transport infrastructure: Best practice survey protocol and data analysis.

Ref. 9.50 Berthinussen, A. & Altringham, J. (2015). WC1060 Development of a cost-effective method for monitoring the effectiveness of mitigation for bats crossing linear transport infrastructure. Appendix G. local effects of transport infrastructure & mitigation: Best practice survey protocol and data analysis.

Ref. 9.51 Highways Agency. Design Manual for Roads and Bridges, Volume 10. Environmental Design and Management, Section 4. Nature Conservation, Part 2 HA 59/92. Mitigating Against Effects on Badgers.

Ref. 9.52 Delahey, R.J., Brown, J.A., Mallinson, P.J., Spyvee, P.D., Handoll, D., Rodgers L.M. and Cheeseman, C.L. (2000). The use of marked bait in studies of the terrestrial organization of the European Badger (Meles meles). Mammal Review 30 (2). p.73-87.

Ref. 9.53 Gilbert, G., Gibbons, D.W. & Evans, J. (1998). Bird Monitoring Methods. RSPB, Sandy.

Ref. 9.54 Gillings, S., Wilson, A.M., Conway, G.J., Vickery, J.A., Fuller, R.J., Beavan, P., Newson, S.E., Noble, D.G. & Toms, M.P. (2008) Winter Farmland Bird Survey. BTO Research Report No. 494. British Trust for Ornithology, Thetford.

Ref. 9.55 Highways Agency. Design Manual for Roads and Bridges, Volume 10 Section 4 Part 7 Nature Conservation Advice in Relation to Reptile and Roads.

Ref. 9.56 Froglife (1999). Reptile survey: an introduction to planning, conducting and interpreting surveys for snake and lizard conservation. Froglife Advice Sheet 10. Froglife.

Ref. 9.57 Gurnell, J., Lurz, P., McDonald, R. and Pepper, H. (2009). Practical Techniques for Surveying and Monitoring Squirrels. Practice Note. Forestry Commission, Edinburgh.

Ref. 9.58 Strachan, R., Moorhouse, T. and Gelling, M. (2011). Water Vole Conservation Handbook 3rd Ed. Wildlife Conservation Research Unit, WildCRU. Oxford, UK.

Ref. 9.59 National Rivers Authority (1993). Otters and River Habitat Management. Conservation Technical Handbook Number 3.

Ref. 9.60 Peay, S. (2003). Monitoring the White-clawed Crayfish *Austropotamobius pallipes*. Conserving Natura 2000 Rivers Monitoring Series No. 1, English Nature, Peterborough.

Ref. 9.61 Drake, C. M., Lott, D. A., Alexander, K. N. A. and Webb, J. (2007). Surveying terrestrial and freshwater invertebrate for conservation evaluation. Natural England.

Ref. 9.62 Northumberland Local Wildlife Site selection criteria. https://www.nwt.org.uk/sites/default/files/2018-11/Local%20Sites%20Guidelines%20February%202014.pdf [Accessed November 2018]

Ref. 9.63 SSSI selection criteria. http://jncc.defra.gov.uk/pdf/SSSIs_Chapter15.pdf [Accessed November 2018]

Ref. 9.64 Bat Conservation Trust, Latest Statistics Pages - http://www.bats.org.uk/pages/uk_bats.html [Accessed September 2018]

Ref. 9.65 Northumberland Biodiversity Action Plan - https://www.nwt.org.uk/sites/default/files/2018-10/Nland_Biodiversity_Action_Plan.pdf Accessed September 2018]

Ref. 9.66 Harris, S.J., Massimino, D., Gillings, S., Eaton, M.A., Noble, D.G., Balmer, D.E., Procter, D., PearceHiggins, J.W. & Woodcock, P. (2018). The Breeding Bird Survey 2017. BTO Research Report 706 British Trust for Ornithology, Thetford.

Ref. 9.67 Balmer, D.E., Gillings, S., Caffrey, B.J., Swann, R.L., Downie, I.S. & Fuller R.J. (2013). Bird Atlas 2007 – 2011: The Breeding and Wintering Birds of Britain and Ireland. BTO Books, Thetford.

Ref. 9.68 Dean, T., Myatt, D., Cadwallender, M. & Cadwallender, T. (2015). Northumbria Bird Atlas. Northumberland & Tyneside Bird Club, Newcastle upon Tyne.

Ref. 9.69 Northumberland Marine SPA Citation. http://publications.naturalengland.org.uk/file/5472332442763264 [Accessed November 2018]

Ref. 9.70 Joint Nature Conservation Committee (JNCC), Black-headed Gull. Available at: http://jncc.defra.gov.uk/page-2882 [Accessed March 2019]

Ref. 9.71 JNCC, Northumbria Coast Information Sheet on Ramsar Wetlands. http://jncc.defra.gov.uk/pdf/RIS/UK11049.pdf [Accessed September 2018]

Ref. 9.72 Fuller, R.J. (1980). A method for assessing the ornithological interest of sites for conservation. Biological Conservation, 17, 229-239.

Ref. 9.73 Red Squirrels Northern England (RSNE) - https://www.rsne.org.uk/ [Accessed September 2018]

Ref. 9.74 Woodroffe, G.L., Lawton, J.H. & Davidson, W.L. (1990). The impact of feral mink Mustela vison on water voles Arvicola terrestris in North Yorkshire Moors National Park (England UK), Biological Conservation, 51, 49-62.

Ref. 9.75 Halliwell, E.C. and Macdonald, D.W. (1996). American mink Mustela vison in the upper Thames catchment: relationship with selected prey species and den availability. Biological Conservation 76, 51-56.

Ref. 9.76 The Mammal Society. Species Factsheet: American mink Neovison vison http://www.mammal.org.uk/sites/default/files/factsheets/american_mink_complete.pdf [Accessed September 2018]

Ref. 9.77 HMSO (2010). The Eels (England and Wales) Regulations 2009. HMSO, London.

Ref. 9.78 Environment Agency (EA) Catchment Data Explorer: Lyne from source to tidal limit http://environment.data.gov.uk/catchment-planning/WaterBody/GB103022076820 [Accessed October 2018]

Ref. 9.79 EA Catchment Data Explorer: Longdike Burn Catchment (trib of Coquet) http://environment.data.gov.uk/catchment-planning/WaterBody/GB103022076550 [Accessed October 2018]

Ref. 9.80 Environment Agency (2018) National Fisheries Populations Database. Available online: https://data.gov.uk/dataset/d129b21c-9e59-4913-91d2-82faef1862dd/nfpd-freshwater-fish-survey-relational-datasets [Accessed November 2018].

Ref. 9.81 EA Catchment Data Explorer: Coquet from Forest Burn to Tidal Limit

http://environment.data.gov.uk/catchment-planning/WaterBody/GB103022076693 [Accessed October 2018]

Ref. 9.82 EA Catchment Data Explorer: Northumberland Rivers

http://environment.data.gov.uk/catchment-planning/ManagementCatchment/3067 [Accessed October 2018]

Ref. 9.83 Chadd, R. and Extence, C. (2004). The conservation of freshwater macro-invertebrate populations: a community based classification scheme. Aquatic Conservation: Marine and Freshwater Ecosystems, 14, 597-624.

Ref. 9.84 IUCN (2012), IUCN Red List Categories and Criteria: Version 3.1. Second edition, Gland, Switzerland and Cambridge, UK.

Ref. 9.85 Whitfield, C. (2014). Nitrogen deposition impacts on biodiversity. JNCC, November 2014.

Ref. 9.86 Guidance for Pollution Prevention. Available online. http://www.netregs.org.uk/environmental-topics/pollution-prevention-guidelines-ppgs-and-replacement-series/guidance-for-pollution-prevention-gpps-full-list/ [Accessed October 2018]

Ref. 9.87 GB Non-Native Species Secretariat Check, Clean, Dry campaign. http://www.nonnativespecies.org/checkcleandry/ [Accessed August 2019].

Ref. 9.88 Stone, E.L. (2013) Bats and lighting: Overview of current evidence and mitigation

Ref. 9.89 Bat Conservation Trust (2018). Bats and artificial lighting in the UK: Bats and the Build Environment series.

Ref. 9.90 British Standards Institution (2012). BS5837:2012 Trees in relation to design, demolition and construction. Recommendations. April 2012.

Ref. 9.91 Highways Agency. Design Manual for Roads and Bridges, Volume 10, Section 4, Part 4 – Nature Conservation Advice in Relation to Otters.

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