A1 in Northumberland: Morpeth to Ellingham

Scheme Number: TR010041

6.8 Environmental Statement – Appendix 9.1 Habitats and Designated Sites

Part B

APFP Regulation 5(2)(a)

Planning Act 2008

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

June 2020

Infrastructure Planning

Planning Act 2008

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

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APPENDICES

APPENDIX A TARGET NOTES

1. INTRODUCTION

1.1.1. The A1 in Northumberland: Alnwick to Ellingham (Part B) aims to increase capacity along an approximately 8 km section of the existing A1 between Alnwick and Ellingham, in Northumberland. Part B includes widening the existing A1 from single carriageway to a dual carriageway. Part B also includes improving the existing junction at Charlton Mires with a new grade-separated junction and a new Heckley Fence Accommodation Overbridge. Part B aims to increase capacity, enhance resilience, improve safety and improve journey times along the route. Details of the Part B location are provided on the **Location Plan** of this Environmental Statement (ES) (**Application Document Reference: TR010041/APP/2.1**).

1.1.2. Part B comprises dualling of the existing A1 single carriageway; a new southbound carriageway would be constructed to the east of the existing A1, and the existing A1 would act as a new northbound carriageway. A number of private means of access would need to be stopped up and replaced with new access routes including new roads for East and West Linkhall, and from the B6347 and Rock South Farm. To facilitate the construction of Part B, sections of an extra high voltage cable, utility pipes and telecommunication cables would need to be diverted. Part B also includes new drainage features, new and extended culverts, and temporary and permanent Public Right of Way (ProW) diversions, together with new and/or improved ancillary features.

1.1.3. This appendix assesses the potential effects on botanical interest resulting from Part B. This appendix (and its associated figures) is not intended to be read as a standalone assessment and reference should be made to **Chapter 2: The Scheme, Volume 1** of this ES (**Application Document Reference: TR010041/APP/6.1**) which states the full details of the Scheme.

2. BASELINE IDENTIFICATION METHODOLOGY

2.1. DESK STUDY

2.1.1. A desk study was undertaken in 2019 to review available information pertaining to statutory and non-statutory designated sites of nature conservation importance within the Order Limits plus an additional Study Area (as defined below), depending on the ecological receptor and the impact factor considered. Study Areas employed complied with current guidance from the Chartered Institute of Ecology and Environmental Management (CIEEM) (**Ref. 1**) and were as follows:

a. 2 km for local and nationally designated sites (**Ref. 2**);
b. 10 km for European and Internationally designated sites[1]; and
c. 30 km for Special Areas of Conservation (SACs) designated for bats

2.1.2. Priority habitats were also identified within the Order Limits plus an additional Study Area. This included a review of Habitats of Principal Importance (HPI) and Ancient Woodland Inventory (AWI), with HPI identified up to 250 m beyond the Order Limits. The Study Area with regards to ancient woodland has been informed principally by the Zone of Influence (ZoI) for hydrological connection (refer to **Chapter 10: Road Drainage and the Water Environment, Volume 3** of this ES (**Application Document Reference: TR010041/APP/6.3**) for further details) and the air quality assessment (refer to **Chapter 5: Air Quality, Volume 3** of this ES (**Application Document Reference: TR010041/APP/6.3**)). The Study Area for ancient woodland with regards to hydrological connection was 1 km from the Order Limits. This encompasses both direct and indirect effects of changes in hydrology (further details presented in **Chapter 10: Road Drainage and the Water Environment, Volume 3** of this ES)**.**

2.1.3. Information regarding non-statutory designated sites and HPI was supplied by the Environmental Records Information Centre (ERIC) North East. All other data was collated from freely downloadable datasets, as well as the following online resources:

a. Multi-Agency Geographic Information for the Countryside (MAGIC) (**Ref. 3**); and
b. Northumberland Biodiversity Action Plan (BAP) (**Ref. 4**).

2.1.4. The desk study additionally incorporated a review of pre-existing information and baseline survey results gathered during the 2016 Phase 1 habitat survey of Part B options (**Ref. 5**).

2.1.5. This assessment also uses information from a National Vegetation Classification (NVC) survey undertaken in 2018 within semi-natural habitats, identified to potentially

[1] Special Area of Conservation (SAC), Special Protection Area (SPA) and Ramsar sites

be of conservation importance by virtue of their age and/or species composition (e.g. ancient woodlands listed within the AWI or HPI.

2.2. FIELD SURVEY

PHASE 1 HABITAT SURVEY

2.2.1. A Phase 1 habitat survey of Part B and land within 500 m of the existing A1 was undertaken in 2016 (**Ref. 5**) to aid selection of a finalised design for Part B. The survey data was updated in March 2019 within a refined survey area of the Order Limits plus 50 m (the Phase 1 Survey Area).

2.2.2. The Phase 1 Survey Area additionally includes a parcel of land located to the south-east of Alnwick, adjacent to Lionheart Enterprise Park. This land is the site of a proposed construction compound for Part B, referred to as Lionheart Enterprise Park Compound (**Chapter 2: The Scheme, Volume 1** of this ES) (**Application Document Reference: TR010041/APP/6.1**)). Another construction compound is proposed at West Moor Junction, at the junction of the A1 and the B6345. This Main Compound (**Chapter 2: The Scheme, Volume 1** of this ES) (**Application Document Reference: TR010041/APP/6.1**)) is to be used jointly by Part B and the A1 in Northumberland: Morpeth to Felton (Part A).

2.2.3. Within this Appendix the Part B Main Scheme Area (**Chapter 2: The Scheme, Volume 1** of this ES (**Application Document Reference: TR010041/APP/6.1**)) refers to the Order Limits north of Alnwick and south of Ellingham only. The Order Limits also includes the Lionheart Enterprise Park Compound (eastern and western sites), located to the south of Alnwick and the Main Compound, which is located within Part A.

2.2.4. The Phase 1 habitat survey of the Lionheart Enterprise Park Compound (eastern and western sites) was extended at the time of survey to include an assessment of habitats' suitability to support protected and/or notable species; subsequently informing requirements for further targeted species surveys.

2.2.5. Habitats were described and mapped following the standard Phase 1 habitat survey methodology (**Ref. 6**). Habitats were marked on a paper base map and were subsequently digitised using a Geographical Information System. The smallest area to be mapped was 0.03 ha (roughly 5 m x 5 m), which was selected as a suitable scale to sample the range of different vegetation types present. Target Notes were made to provide information on specific features of ecological interest or habitat features too small to be mapped. Target Notes are described in **Appendix A** and presented on **Figure 9.3: Phase 1 Habitat Survey, Volume 6** of this ES (**Application Document Reference: TR010041/APP/6.6**). Due to changes to the Order Limits, several Target Notes fall outside the 2019 Phase 1 Survey Area and are therefore no longer relevant. Where this is the case, these are identified in **Appendix A**. The locations of Wildlife & Countryside Act 1981 (as amended) Schedule 9 invasive non-native plant species were also recorded.

HEDGEROWS

2.2.6. As part of the Phase 1 habitat survey it was necessary to assess whether hedges and lines of hedges with trees were species-rich or species-poor. Joint Nature Conservation Committee (JNCC) guidance provides no definition for species-rich/species-poor; the only guidance within the Handbook for Phase 1 Habitat Survey states that species-rich hedges "*have a diversity of native woody species and a good hedgerow bottom flora*". There is no quantitative assessment recommended.

2.2.7. The Hedgerows Regulations 1997 (**Ref. 7**) provide criteria for determining "important hedgerows" including species-richness. Schedule I Part II of the Regulations states that, to be classed as important, a hedgerow should contain at least seven woody species (from a list given in Schedule 3) within a 30 m stretch. Where the hedgerow in question is situated wholly or partly in certain listed counties (including Northumberland) this is reduced to six species.

2.2.8. Hedgerows in Northumberland may also be classed as important, if they contain five woody species including black poplar *Populus nigra* ssp *betulifolia*, large-leaved lime *Tilia platyphyllos,* small-leaved lime *Tilia cordata* or wild service-tree *Sorbus torminalis.* Hedgerows with four woody species can still be classified as important if they are associated with at least four habitat features (from a list of nine) specified in paragraph 7, sub-paragraph (4) of The Hedgerows Regulations 1997 (**Ref. 7**).

2.2.9. The assessment of important hedgerows within this report uses only "Wildlife and Landscape" criteria (Schedule I Part II of The Hedgerows Regulations Sections 6-8). It does not consider "Archaeology and History" criteria (Schedule I Part II of the Regulations Sections 1-5). During the Phase 1 habitat survey, habitat condition data was concurrently collected to inform a Biodiversity No Net Loss (BNNL) assessment of habitat features and land parcels within the Order Limits. Data collected included a condition assessment of hedges, part of which was to count the number of woody species, from a list of UK native species within Chief Highway Engineer (CHE) Memorandum 422/18 Table 3 (**Ref. 8**), within a 30 m section of hedgerow. If the hedge contained four or more UK native woody species (not including bramble or climbing species) then it would pass the assessment for species-richness.

2.2.10. Therefore, this condition criterion was also used within this assessment to determine whether a hedgerow is species-rich or species-poor, with standard Joint Nature Conservation Committee (JNCC) (**Ref. 6**) symbology for each used on the Phase 1 habitat map to differentiate hedgerow species-richness.

NATIONAL VEGETATION CLASSIFICATION SURVEY

2.2.11. An NVC survey was undertaken in selected HPI within 250 m of the Order Limits (the NVC Survey Area) in August 2018. The Phase 1 habitat information collected during the 2016 survey (**Ref. 5**) was used to inform the NVC survey. Within the NVC Survey Area areas of semi-natural habitats, including woodland and grassland were identified to potentially be of conservation importance by virtue of their age and/or species composition (e.g. ancient woodlands listed within the AWI or grassland HPI).

2.2.12. Representative stands of the following vegetation types were subject to NVC survey:

a. Deciduous woodland mapped within the Priority Habitats Inventory (MAGIC mapping of HPIs); and

b. Grassland including field margins, larger areas of set-aside in arable fields and damp grassland/rush-dominated areas.

2.2.13. The objective of the surveys was not to map NVC communities across all representative habitats within the NVC Survey Area. Instead the aim of the NVC sampling was to qualitatively sample examples of semi-natural habitats within the NVC Survey Area to provide additional information by which to make a judgement regarding the importance of these habitat types.

2.2.14. Surveys were completed in line with NVC survey guidelines (**Ref. 9**), classifying plant communities in accordance with the NVC system (**Ref. 10**). The NVC survey methodology provides a standardised system for classifying and mapping plant communities and enables surveys to be carried out to a consistent level of detail and accuracy.

2.2.15. Within the NVC Survey Area, homogeneous stands and mosaics of vegetation were identified and mapped by eye and drawn as polygons on field survey maps; these polygons were surveyed qualitatively to record dominant and constant species, sub-dominant species, and other species present.

2.2.16. NVC communities were attributed to the mapped polygons using surveyor experience and matching field data against published floristic tables (Rodwell, 1991 – 2000). Wherever possible, communities were classified to sub-community level, although in many cases a community level classification was completed due to species-richness being insufficient to allow meaningful sub-community determination.

2.2.17. Quadrat sampling was not used in this survey as it is not always necessary if vegetation types can be reliably identified in the field using sufficient qualitative data as most NVC communities and sub-communities are defined by inter-stand frequency, not by the abundance of the constituent species. It is better in many cases to record several qualitative samples than one quantitative sample; furthermore, qualitative information can be vital for understanding the dynamics and trends in vegetation patterns (**Ref. 9**).

2.2.18. The results of the NVC survey are used in conjunction with Phase 1 habitat survey data, to inform the nature conservation importance of broad habitats across the combined Phase 1 and NVC Survey Areas. As such, the results are amalgamated in **Section 4.2**.

3. ECOLOGICAL IMPACT ASSESSMENT METHODOLOGY

3.1. OVERVIEW

3.1.1. This section describes the methodology used to identify significant effects of impacts on the relevant ecological receptor, latterly identifying mitigation to ameliorate/remove such effects or impacts. The EcIA adopts guidance from CIEEM (**Ref. 1**) and the Design Manual for Roads and Bridges (DMRB) Interim Advice Note (IAN) 130/10 'Ecology and Nature Conservation: Criteria for Impact Assessment' (**Ref. 11**).

3.1.2. Ecological features have been subject to nature conservation evaluation. The significance of effects has then been assessed taking into account the characterisation of potential impacts (including duration, extent and reversibility) and their consequent effects on important ecological features within a Zone of Influence (ZoI).

3.1.3. The ZoI is determined by understanding the activities associated with all stages of a scheme and making a comparative assessment of the desk study findings, consultations and field work records in relation to such activities. The ZoI varies for each ecological receptor due to the varying mobility range of the species or habitat being assessed, for example the ZoI for birds and mammals (which are more mobile) will be greater than the ZoI for habitats (which are sedentary).

3.1.4. For the purposes of this appendix, focusing solely on botanical interests, the ZoI is dependent on direct connectivity (i.e. overlaps within the Order Limits), and hydrological (indirect) connectivity.

3.2. NATURE CONSERVATION EVALUATION

3.2.1. The general approach to defining the importance of ecological features follows that of CIEEM (2018) (**Ref. 1**). The approach is also in line with advice given in IAN 130/10 'Ecology and Nature Conservation: Criteria for Impact Assessment (**Ref. 11**).

3.2.2. Habitats within the ZoI are assigned levels of importance for nature conservation based on the criteria set out in **Table 3-1** below.

3.2.3. The rarity, ability to resist or recover from environmental change, and uniqueness of an ecological feature, function/role within an ecosystem, and level of legal protection or designation afforded to a given ecological feature are all factors taken into account in determining its importance.

Table 3-1 - Importance Criteria

Importance	Criteria
International or European	Ecosystems and Habitats - Ecosystems or habitats essential for the maintenance of: - Internationally designated areas or undesignated areas that meet the criteria for designation; and/or - 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: - The loss of the population would adversely affect the conservation status or distribution of the species at this geographical stage; or - The population forms a critical part of a wider population at this scale; or - The species is at a critical phase of its life cycle at this scale
UK or 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: - The maintenance of qualifying habitats, communities and assemblages that occur within nationally designated sites or within undesignated areas that meet the criteria for such designation; or - The maintenance and restoration of biodiversity and ecosystems at a national level, as defined in the Natural Environment and Rural Communities (NERC) Act 2006 Section 41 requirements. - Resident, or regularly occurring, populations of species that may be considered at an International/European (as detailed above), National or UK level including those receiving legal

Importance	Criteria
	protection (listed within Schedules 1, 5 and 8 of the WCA) or listed for their principal importance for biodiversity or conservation status, where: - The loss of the population would adversely affect the conservation status or distribution of the species at this geographical stage; or - The population forms a critical part of a wider population at this scale; or - 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: - The loss of the population would adversely affect the conservation status or distribution of the species at this geographical stage; or - The population forms a critical part of a wider population at this scale; or - The species is at a critical phase of its life cycle at this scale.
County	Ecosystems and Habitats - Ecosystems or habitats essential for the maintenance of: - Populations of species of conservation concern within the authority area. Species: - Species whose presence contributes to the maintenance and restoration of biodiversity and ecosystems within a relevant area such as Northumberland. - Resident, or regularly occurring, populations of species that may be considered at an International, European, UK or National level (as detailed above), where: - The loss of the population would adversely affect the conservation status or distribution of the species at this geographical stage; or - The population forms a critical part of a wider population at this scale; or - The species is at a critical phase of its life cycle at this scale.

Importance	Criteria
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: - The loss of the population would adversely affect the conservation status or distribution of the species at this geographical stage; or - The population forms a critical part of a wider population at this scale; or - 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

3.3. IMPACT ASSESSMENT

CHARACTERISATION OF POTENTIAL IMPACTS

3.3.1. CIEEM (**Ref. 1**) 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[2] 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.

2 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.

3.3.2. Habitats and species that are considered to have a nature conservation importance of less than local are not considered important ecological receptors[3] in the context of this assessment. Any impact on such a feature as a result of Part B is considered unlikely to have a significant effect on the conservation status of such habitats or species on a local, regional, national or international scale. Therefore, features assessed to be of less than local nature conservation importance have been scoped out of the EcIA.

3.3.3. 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, as well as others deemed appropriate (informed by CIEEM's Guidelines). 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

3.3.4. Having characterised importance 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.

3.3.5. IAN 130/10 does not prescribe a method for determining the significance of ecological effects but does propose significant effect categories which are aligned with other topic areas in the DMRB. These are Neutral, Slight, Moderate, Large or Very Large (Table 3 of IAN 130/10) and are reproduced in **Table 3-2** below.

3.3.6. In all instances, when determining the level of significance of the ecological effect, **Table 3-2** has been used as a guide in association with professional judgement (this is consistent with guidance in IAN 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).

3 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 A Nature Conservation Review (Ratcliffe, 1977).

Table 3-2- Significance Categories of Effects on Ecological Receptors

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

3.4. MITIGATION

3.4.1. Mitigation is also designed to ensure no net loss of biodiversity where practicable in line with policy and guidelines.

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

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

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

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

3.4.5. 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 shall be used to inform a CEMP produced by the main contractor.

3.4.6. 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.

3.5. ASSUMPTIONS AND LIMITATIONS

3.5.1. The Phase 1 habitat survey was undertaken at a sub-optimal time of year for botanical surveys (March 2019) when a large proportion of the plant species, within the Phase 1 Survey Area, would not have been evident, due to their main growth and flowering season occurring after the survey dates (surveys were completed without the optimal survey season due to programme of works, and results requiring to feed into the forward programme of ecological surveys across the season). This is not considered to be a significant limitation given that it was still possible to reliably assign habitat types to the habitats present within the Phase 1 Survey Area. Further targeted NVC surveys were also undertaken of woodland habitats during an optimal botanical survey period (August 2018).

3.5.2. The results from the NVC survey represent a current plant community evaluation. This does not seek to describe what the community was before any human interference (or may become in the future). In the absence of changes in land use, hydrology, or otherwise, and depending on the sensitivity and condition of communities identified, it is likely that data remains valid for up to five years.

3.5.3. The majority of woodland mapped from the NVC Survey Area is of plantation origin. Typically, the NVC seeks to identify plant communities based upon naturally occurring species composition. With this in mind, the NVC communities were only assigned to plantation woodland of mature age where a ground flora typical of the locality and canopy species had established.

3.5.4. The NVC survey was undertaken across pre-defined Phase 1 habitats up to 250 m from the Order Limits at the time of survey (August 2018). The Order Limits have since been subject to minor design changes; consequently, the NVC Survey Area has extended and a number of semi-natural habitats within 250 m of the latest design have not been subject to detailed botanical assessment. Acknowledging the limited extent of changes in the Order Limits, it is assumed that the characteristics of habitats are the same as those of similar surveyed habitats within the vicinity. Given that habitats across the entire Survey Area are homogeneous, this is not considered to limit the assessment or conclusions of this impact assessment.

3.5.5. Third party data has been used to inform the type of habitats present at the Main Compound through a desk study approach. Whilst re-survey of this area was not completed during the survey of Part B, given the small footprint of the compound and the types of habitats recorded and reported, this is not considered to have limited the assessment or conclusions of this impact assessment.

4. RESULTS

4.1. DESK STUDY

DESIGNATED SITES

4.1.1. The locations and extents of all statutory designated sites up to 10 km from the Order Limits and associated compounds are shown on **Figure 9.1: Statutory Designated Sites, Volume 6** of this ES (**Application Document Reference: TR010041/APP/6.6**).

4.1.2. **Table 4-1** presents information on all local and national statutory and non-statutory designated sites located within 2 km of the Part B Main Scheme Area.

Table 4-1 - Statutory and Non-Statutory Designated Sites within 2 km of Part B Main Scheme Area

Site Details (Name, Designation)	Reasons for Designation and Area of Site	Distance and Direction from Part B Main Scheme Area	Connectivity to Part B Main Scheme Area
Hulne Park Local Wildlife Site (LWS)	Amenity parkland; mosaic of mature woodland and grassland.	1.0 km west	No connectivity
Littlemill Quarries LWS	Former Whinstone quarry. Likely associated botanical interest (e.g. Whin grasslands)	1.8 km north east	No connectivity
Ratcheugh Crag-Pepper Moor LWS	Whinstone crag with folly and associated grassland and scrub, designated for the presence of Whin grassland.	1.8 km east	No connectivity
Longhoughton Quarry Site of Special Scientific Interest (SSSI)	This site is primarily notified for its geological interest as a disused Whinstone quarry. Whilst Longhoughton Quarry SSSI is notified for its geological features, it also possesses likely associated botanical interest (e.g. Whin grasslands). (6.8 ha)	1.9 km south-east	No connectivity

4.1.3. **Table 4-2** presents information on all statutory and non-statutory designated sites within 2 km of Lionheart Enterprise Park Compound (eastern and western sites).

Table 4-2 - Statutory and Non-Statutory Designated Sites within 2 km of Lionheart Enterprise Park Compound

Site details (name, designation)	Reasons for designation and area of site	Distance and direction from Lionheart Enterprise Park Compound	Connectivity to Lionheart Enterprise Park Compound
Cawledge Burn LWS	Watercourse with associated mixed woodland along banks.	0.4 km south-west	No connectivity

4.1.4. **Table 4-3** presents information on all statutory and non-statutory designated sites within 2 km of the Main Compound.

Table 4-3 – Statutory and Non-Statutory Designated Sites within 2 km of the Main Compound

Site Details (Name, Designation)	Reasons for Designation and Area of Site	Distance and Direction from Main Compound	Connectivity to Main Compound
Coquet River-Felton Park LWS	Watercourse with associated woodland along banks.	0.5 km north	No connectivity
River Coquet and Coquet Valley Woodlands (including Duke's Bank Wood) SSSI 1006298	Designated for its woodland, river and stream habits. The River Croquet is a relatively unmodified fast flowing upland river supporting characteristic flora and fauna significant to national resource for nature conservation. Many of the woodlands are long-established with semi-natural plant communities, of which, few remain in Northumberland. (1,192.42 ha)	0.5 km north	No connectivity

4.1.5. **Table 4-4** presents information on all European designated sites located within 10 km of Part B Main Scheme Area.

Table 4-4 - European Designated Sites within 10 km of Part B Main Scheme Area

Site Details (Name, Designation, EU code)	Reasons for Designation and Area of Site	Distance and Direction from Part B Main Scheme Area	Connectivity to Part B Main Scheme Area
Newham Fen SAC UK0012890	**Annex I habitats that are a primary reason for selection:** - 7230 Alkaline fens. **Annex I habitats present as a qualifying feature, but not a primary reason for selection:** - Not applicable. **Annex II species that are a primary reason for selection:** - Not applicable. **Annex II species present as a qualifying feature, but not a primary reason for selection:** - Not applicable. (13.5 ha)	6.1 km north	No connectivity
Berwickshire and North Northumberland Coast SAC UK0017072	**Annex I habitats that are a primary reason for selection:** - 1140 Mudflats and sandflats not covered by seawater at low tide, - 1160 Large shallow inlets and bays, - 1170 Reefs, - 8330 Submerged or partially submerged sea caves. **Annex I habitats present as a qualifying feature, but not a primary reason for selection:** - Not applicable. **Annex II species that are a primary reason for selection:** - Not applicable. **Annex II species present as a qualifying feature, but not a primary reason for selection:** - Not applicable. No noteworthy flora are described. (65,274.4 ha)	4.7 km north east	No connectivity
Northumbria Coast Ramsar UK11049	**Ramsar criterion 6 – species/populations occurring at levels of international importance.** The site consists mainly of areas of rocky shore with associated boulder and cobble beaches. These support a rich algal flora and associated fauna and form an important feeding area for wading birds. The areas of sandy beach within the site support a flora which includes marram *Ammophila arenaria* and sea sandwort. No noteworthy flora are described. (1,059.9 ha)	4.7 km north east	No connectivity
Northumbria Coast SPA	**EC Directive 79/409 on the Conservation of Wild Birds** **Article 4.1 species that are a primary reason for selection during the breeding season:**	4.7 km north east	No connectivity

Site Details (Name, Designation, EU code)	Reasons for Designation and Area of Site	Distance and Direction from Part B Main Scheme Area	Connectivity to Part B Main Scheme Area
UK9006131	- Little tern *Sterna albifrons* 1.7% of the GB breeding population over 5-year peak mean (1993-1997) **Article 4.2 species that are a primary reason for selection during the wintering season:** **-** Turnstone *Arenaria interpres* (Western Palearctic - wintering) 2.6% of biogeographic population over 5-year peak mean (1992/3-1996/7) - Purple sandpiper *Calidris maritima* 1.6% of biogeographic population over 5-year peak mean (1992/3-1996/7) (1,097.5 ha)		
Northumberland Marine SPA UK9020325	**EC Directive 79/409 on the Conservation of Wild Birds** **Article 4 Qualifying species** Sandwich tern *Sterna sandvicensis* 19.66% of the GB population over 5-year peak mean (2010-2014) Common tern *Sterna hirundo* 12.86% of the GB population over 5-year peak mean (2010-2014) Arctic tern *Sterna paradisaea* 9.02% of the GB population over 5-year peak mean (2010-2014) Roseate tern *Sterna dougallii* 93.02% of the GB population over 5-year peak mean (2010-2014) Little tern *Sterna albifrons* 2.37% of the GB population over 5-year peak mean (2010-2014) **Regular occurring migratory species** Puffin *Fratercula artica* 1.05% of the bio-geographic population over 5-year peak mean (2008-2013) Guillemot *Uria aalge* 1.72% of the bio-geographic population over 5-year peak mean (2010-2014) (88,495.35 ha)	4.7 km east	No connectivity
North Northumberland Dunes SAC UK0017097	**Annex I habitats that are a primary reason for selection:** - 2110 Embryonic shifting dunes. - 2120 'Shifting dunes along the shoreline with *Ammophila arenaria* ('white dunes')'. - 2130 'Fixed coastal dunes with herbaceous vegetation (grey dunes')' ***Priority Feature**. - 2170 Dunes with *Salix repens* ssp. *argentea* (Salicion arenariae). - 2190 Humid dune slacks. **Annex I habitats present as a qualifying feature, but not a primary reason for selection:** - Not applicable. **Annex II species that are a primary reason for selection:** - 1395 Petalwort *Petalophyllum ralfsii*. **Annex II species present as a qualifying feature, but not a primary reason for selection:** - Not applicable.	5.8 km south-east	No connectivity

Site Details (Name, Designation, EU code)	Reasons for Designation and Area of Site	Distance and Direction from Part B Main Scheme Area	Connectivity to Part B Main Scheme Area
	(1,127.3 ha)		
River Tweed SAC UK0012691	**Annex I habitats that are a primary reason for selection:** - 3260 Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation. **Annex I habitats present as a qualifying feature, but not a primary reason for selection:** - Not applicable. **Annex II species that are a primary reason for selection:** - 1106 Atlantic salmon *Salmo salar*. **Annex II species present as a qualifying feature, but not a primary reason for selection:** - 1095 Sea lamprey *Petromyzon marinus,* - 1096 Brook lamprey *Lampetra planeri*, - 1099 River lamprey *Lampetra fluviatilis.* (3,742.7 ha)	8.6 km west	No connectivity

4.1.6. **Table 4-5** presents information on all European designated sites located within 10 km of the Lionheart Enterprise Park Compound (eastern and western sites) .

Table 4-5 - European Designated Sites within 10 km of the Lionheart Enterprise Park Compound.

Site Details (Name, Designation, EU Code)	Reasons for Designation and Area of Site	Distance and Direction from Lionheart Enterprise Park Compound	Connectivity to Lionheart Enterprise Park Compound
Berwickshire and North Northumberland Coast SAC UK0017072	**Annex I habitats that are a primary reason for selection:** - 1140 Mudflats and sandflats not covered by seawater at low tide, - 1160 Large shallow inlets and bays, - 1170 Reefs, - 8330 Submerged or partially submerged sea caves. **Annex I habitats present as a qualifying feature, but not a primary reason for selection:** - Not applicable. **Annex II species that are a primary reason for selection:** - Not applicable. **Annex II species present as a qualifying feature, but not a primary reason for selection:** - Not applicable.	5 km east	No connectivity

Site Details (Name, Designation, EU Code)	Reasons for Designation and Area of Site	Distance and Direction from Lionheart Enterprise Park Compound	Connectivity to Lionheart Enterprise Park Compound
	No noteworthy flora are described. (65,274.4 ha)		
North Northumberland Dunes SAC UK0017097	**Annex I habitats that are a primary reason for selection:** - 2110 Embryonic shifting dunes. - 2120 'Shifting dunes along the shoreline with *Ammophila arenaria* ('white dunes')'. - 2130 'Fixed coastal dunes with herbaceous vegetation (grey dunes')' ***Priority Feature**. - 2170 Dunes with *Salix repens* ssp. *argentea* (Salicion arenariae). - 2190 Humid dune slacks. **Annex I habitats present as a qualifying feature, but not a primary reason for selection:** - Not applicable. **Annex II species that are a primary reason for selection:** - 1395 Petalwort *Petalophyllum ralfsii*. **Annex II species present as a**	3.8 km east	No connectivity

Site Details (Name, Designation, EU Code)	Reasons for Designation and Area of Site	Distance and Direction from Lionheart Enterprise Park Compound	Connectivity to Lionheart Enterprise Park Compound
	qualifying feature, but not a primary reason for selection: - Not applicable. (1,127.3 ha)		
Northumberland Marine SPA UK9020325	**Article 4 Qualifying species** Sandwich tern *Sterna sandvicensis* Common tern *Sterna hirundo* Arctic tern *Sterna paradisaea* Roseate tern *Sterna dougallii* Little tern *Sterna albifrons* **Regular occurring migratory species** Puffin *Fratercula artica* Guillemot *Uria aalge* (88,495.35 ha)	3.6 km east	No connectivity
Northumbria Coast Ramsar UK11049	**Ramsar criterion 6 – species/populations occurring at levels of international importance:** The site consists mainly of areas of rocky shore with associated boulder and cobble beaches. These support a rich algal flora and associated	5.1 km east	No connectivity

Site Details (Name, Designation, EU Code)	Reasons for Designation and Area of Site	Distance and Direction from Lionheart Enterprise Park Compound	Connectivity to Lionheart Enterprise Park Compound
	fauna and form an important feeding area for wading birds. The areas of sandy beach within the site support a flora which includes marram *Ammophila arenaria* and sea sandwort. No noteworthy flora are described. (1,059.9 ha)		

4.1.7. **Table 4-6** presents information on all European designated sites located within 10 km of the Main Compound.

Table 4-6 - European Designated Sites within 10 km of the Main Compound

Site Details (Name, Designation, EU Code)	Reasons for Designation and Area of Site	Distance and Direction from Main Compound	Connectivity to Main Compound
Northumberland Marine SPA UK9020325	**Article 4 Qualifying species** Sandwich tern *Sterna sandvicensis* Common tern *Sterna hirundo* Arctic tern *Sterna paradisaea* Roseate tern *Sterna dougallii*	9.0 km east	No connectivity

Site Details (Name, Designation, EU Code)	Reasons for Designation and Area of Site	Distance and Direction from Main Compound	Connectivity to Main Compound
	Little tern *Sterna albifrons* **Regular occurring migratory species** Puffin *Fratercula artica* Guillemot *Uria aalge* (88,495.35 ha)		

PRIORITY HABITATS

4.1.8. There is one woodland listed as AWI within 1 km of the Main Compound , situated approximately 500 m north of the Main Compound as shown in **Table 4-7** below. There are no AWI listed within 1 km of the Lionheart Enterprise Park Compound (eastern and western sites) or Part B Main Scheme Area.

Table 4-7 – AWI within 1 km of the Main Compound

AWI ID Number /Name	Description and Size	Distance and direction from Main Compound	Connectivity Main Compound	Area within Main Compound (ha)	Area within Main Compound and 250 m buffer (ha)
28856 Dukes Bank Wood	4.03 ha of ancient semi-natural woodland	0.5 km north	No connectivity	0	0

4.1.9. Multiple distinct un-named parcels of HPI are present within Part B and 250 m buffer and are set out in **Table 4-8**. The locations and extents of such priority habitats are shown on **Figure 9.2: Habitats of Principal Importance and Non-Statutory Sites, Volume 6** of this ES (**Application Document Reference: TR010041/APP/6.6**).

Table 4-8 - HPI within 250 m of Part B Main Scheme Area

HPI Name	Description	Distance and Direction from Part B Main Scheme Area	Connectivity to Part B Main Scheme Area	Area within Part B Main Scheme Area (ha)	Area within Part B Main Scheme Area and 250 m buffer (ha)
Deciduous woodland	Approximately 25 distinct parcels, scattered throughout the Study Area	Between 0 m and 250 m north, south, east and west	Direct connectivity in north where woodland parcels occur within Order Limits. Multiple other parcels immediately adjacent.	10.43	35.69
Traditional orchard	A single area near Heckley House, in south-west of the Study Area	50 m south	No direct connectivity; indirect connectivity through adjacent deciduous woodland	0	0.23

4.1.10. Four distinct un-named parcels of HPI are present within 250 m of the Lionheart Enterprise Park Compound (eastern and western sites) (**Table 4-9**) The locations and extents of such priority habitats are shown on **Figure 9.2: Habitats of Principal Importance and Non-Statutory Sites, Volume 6** of this ES (**Application Document Reference: TR010041/APP/6.6**).

Table 4-9 – HPI within 250m of Lionheart Enterprise Park Compound

HPI Name	Description	Distance and direction from Lionheart Enterprise Park Compound	Connectivity to Lionheart Enterprise Park Compound	Area within Lionheart Enterprise Park Compound (ha)	Area within Lionheart Enterprise Park Compound and 250 m buffer (ha)
Deciduous woodland	Four distinct parcels to the east and south of the compound	Immediately adjacent to the east and south	Connectivity to the north east woodland as it leads directly to the un-named HPI.	0	5.0

4.1.11. A single distinct un-named parcel of HPI is present within 250 m of the Main Compound (**Table 4-10**). The location and extent of the priority habitat is shown on **Figure 9.2: Habitats of Principal Importance and Non-Statutory Sites, Volume 6** of this ES (**Application Document Reference: TR010041/APP/6.6**).

Table 4-10 – HPI within 250 m of the Main Compound

HPI Name	Description	Distance and Direction from Main Compound	Connectivity to Main Compound	Area within Main Compound (ha)	Area within Main Compound and 250 m buffer (ha)
Deciduous woodland	Southern edge of a parcel to the north of the compound	206 m to the north	No connectivity	0	0.06

4.1.12. Habitats listed on the Northumberland BAP and likely to be encountered within the Phase 1 Survey Area, based on a review of the Phase 1 habitat survey data, include:

a. Rivers and streams;
b. Brownfield Land;
c. Built Environment;
d. Fen, Marsh and Swamp;
e. Gardens and Allotments;

f. Lowland Heathland;
g. Lowland Meadows and Pastures;
h. Native Woodland;
i. Ponds, Lakes and Reservoirs;
j. Recreational and Amenity Spaces;
k. Reedbeds;
l. Transport Corridors; and
m. Trees and Hedges.

4.2. FIELD SURVEY

MAIN COMPOUND

4.2.1. Habitats within and immediately adjacent to the main site compound are set out in **Table 4-11** below.

Table 4-11 - Phase 1 Habitats mapped at Main Compound

Phase 1 Habitat	Equivalent NVC community	Area or length within Main Compound (ha or m)	Area or length within Main Compound and 50 m buffer (ha or m)
Coniferous plantation woodland A1.2.2	n/a	0 ha	0.07 ha
Dense/continuous scrub A2.1	W21-W25	0.18 ha	0.20 ha
Improved Grassland B4	MG6, MG7	0.36 ha	4.56 ha
Poor semi-improved grassland B6	MG1, MG6	0.76 ha	0.98 ha
Standing water G1	n/a	0.09 ha	0.12 ha
Arable J1.1	OV1, 3, 4, 7, 9, 10, 12, 13, 18, 19	5.45 ha	7.18 ha
Native species-poor intact hedge J2.1.2	W21, W22	981 m	1257 m
Fence J2.4	n/a	1436 m	2266 m
Hard standing (no JNCC code)	n/a	0.26 ha	0.31 ha

PART B MAIN SCHEME AREA AND LIONHEART ENTERPRISE PARK COMPOUND

4.2.2. The Phase 1 habitat map, **Figure 9.3: Phase 1 Habitat Survey, Volume 6** of this ES (**Application Document Reference: TR010041/APP/6.6**), and associated Target Notes, located in **Appendix A** of this document, should be consulted for a comprehensive account of all Phase 1 habitats mapped within 50 m of the Order Limits. Phase 1 habitats mapped from the Survey Area are listed below in **Table 4-12**, with a summary description of each habitat type given below. Alpha-numeric codes used in the table cross-refer to the JNCC Phase 1 habitat survey classification (**Ref. 6**). The order of the habitat descriptions below reflects their ordering in the Phase 1 habitat survey manual and does not reflect habitat importance.

4.2.3. Arable and improved grassland habitats dominated within the Phase 1 Survey Area; bounded by linear features including fences, walls, hedgerows, tree lines, and ditches. Isolated stands of broadleaved, coniferous, and mixed woodland, both plantation and semi-natural, were scattered within the otherwise open landscape. Amenity grassland and bare ground was associated with residential properties and other buildings.

4.2.4. Relatively small extents of semi-natural habitats occurred within the Phase 1 Survey Area, including marshy grassland, broadleaved woodland, scrub, tall ruderal vegetation, and poor semi-improved neutral grassland.

4.2.5. Five distinct areas of standing water were mapped within the Phase 1 Survey Area, with two lying within the current Order Limits. Running water bisects the Phase 1 Survey Area, generally from west to east, including drainage ditches and small streams but with no rivers recorded within 50 m of the Order Limits.

Table 4-12 - Phase 1 Habitats Mapped from Part B Main Scheme Area and Lionheart Enterprise Park Compound Phase 1 Survey Areas

Phase 1 Habitat	Equivalent NVC Community	Area or length within Order Limits (ha or m)	Area or Length within Order Limits and 50 m buffer (ha or m)
Broad-leaved semi-natural woodland A1.1.1	W8, W10	1.55 ha	3.13 ha
Broad-leaved plantation woodland A1.1.2	W8, W10	5.43 ha	9.34 ha
Coniferous plantation woodland A1.2.2	n/a	0.32 ha	4.92 ha
Mixed plantation woodland A1.3.2	n/a	0.77 ha	8.47 ha

Phase 1 Habitat	Equivalent NVC Community	Area or length within Order Limits (ha or m)	Area or Length within Order Limits and 50 m buffer (ha or m)
Dense/continuous scrub A2.1	W21-W25	0.15 ha	0.99 ha
Scattered scrub A2.2	W21-W25	Not present	0.13 ha
Broad-leaved parkland/scattered trees A3.1	n/a	0.01 ha	0.34 ha
Mixed parkland/scattered trees A3.3	n/a	<0.01 ha	0.52 ha
Improved Grassland B4	MG6, MG7	34.71 ha	120.8 ha
Marsh/marshy grassland B5	MG9, MG10, M23	0.21 ha	2.23 ha
Poor semi-improved grassland B6	MG1, MG6	17.15 ha	26.58 ha
Tall ruderal C3.1	OV24-27	1.02 ha	1.06 ha
Standing water G1	n/a	1.17 ha	1.40 ha
Running water G2	n/a	1059 m	4374 m
Acid/neutral inland cliff I1.1	n/a	Not present	41 m
Arable J1.1	OV1, 3, 4, 7, 9, 10, 12, 13, 18, 19	35.82 ha	162.41 ha
Amenity grassland J1.2	MG6, OV23	4.30 ha	7.12 ha
Ephemeral/short perennial J1.3	OV18-OV22	2.10 ha	2.12 ha
Native species-rich intact hedge J2.1.1	W21, W22	186 m	442 m
Native species-poor intact hedge J2.1.2	W21, W22	13,086 m	20,911 m

Phase 1 Habitat	Equivalent NVC Community	Area or length within Order Limits (ha or m)	Area or Length within Order Limits and 50 m buffer (ha or m)
Native species-rich defunct hedge J2.2.1	W21, W22	151 m	223 m
Native species-poor defunct hedge J2.2.2	W21, W22	1,090 m	2,198 m
Native species-rich hedge and trees J2.3.1	n/a	1,674 m	2,348 m
Native species-poor hedge and trees J2.3.2	n/a	4496 m	5,794 m
Fence J2.4	n/a	13,982 m	24,813 m
Wall J2.5	n/a	2,562 m	3,934 m
Boundary removed J2.7	n/a	611 m	663 m
Earth bank J2.8	n/a	Not present	46 m
Buildings J3.6	n/a	0.23 ha	2.46 ha
Bare ground J4	n/a	4.36 ha	2.99 ha
Hard standing (no JNCC code)	n/a	15.50 ha	18.08 ha

BROAD-LEAVED SEMI-NATURAL WOODLAND A1.1.1

4.2.6. There are no AWI woodlands within the Phase 1 Survey Area. The nearest stand of AWI woodland is located 1.6 km to the north east and is comprised of 5.18 ha of ancient and semi-natural woodland at Swineclose Wood.

4.2.7. There are approximately 25 distinct parcels of HPI deciduous woodland, as mapped within MAGIC, scattered throughout the Study Area. Parcels within 50 m of the Order Limits were visited during the Phase 1 habitat survey. Further details of canopy and ground-layer species can be found in Target Notes 9, 47, 59 and 95.

4.2.8. Overall the most frequent canopy species were ash *Fraxinus excelsior,* sycamore *Acer pseudoplatanus* and pedunculate oak *Quercus robur.* The field-layer diversity and coverage was variable between stands with the most species-rich ground flora occurring at Target Note 9 which included wood avens *Geum urbanum*, dog's mercury *Mercurialis perennis*, moschatel *Adoxa moschatellina*, herb-Robert *Geranium robertianum*, cleavers *Galium aparine*, common nettle *Urtica dioica*, red campion *Silene dioica*, male fern *Dryopteris filix-mas*, broad buckler-fern *Dryopteris*

dilatata, primrose *Primula vulgaris*, lesser celandine *Ficaria verna* and bluebell *Hyacinthoides non-scripta.*

4.2.9. Representative examples of the HPI deciduous woodland were subject to further botanical assessment during the NVC survey, to inform their nature conservation importance. It was found that woodlands showed some level of management, evidenced by remnant tree guards, occasional planting of coniferous trees, and being localised to blocks isolated within the landscape. Despite this, the mature canopies and established ground flora represented distinguishable NVC communities in keeping with the geographical setting and ground conditions (e.g. soil acidity/alkalinity).

4.2.10. The majority of woodlands presented a species composition akin to W8 *Fraxinus excelsior – Acer campestre – Mercurialis perennis* woodland. This community is a dry, lowland woodland community common to calcareous soils in southern and eastern Britain. The W8 community has eight sub-communities, highlighting its wide floristic variation. The canopy was broadly dominated by sycamore and ash, with occasional elm *Ulmus* sp. in the understory. Elder *Sambucus nigra* was occasionally present in the shrub-layer. The field-layer generally aligned with the W8e typical sub-community, whereby dog's mercury was constant, and common nettle, herb-Robert, and red campion were frequent. Enchanter's nightshade *Circaea lutetiana*, common dog violet *Viola riviniana*, lesser celandine and wood avens were also common. Grasses, bracken *Pteridium aquilinum* and bulky bryophytes were notably reduced in coverage or absent altogether from some areas.

4.2.11. The remainder of the broadleaved or mixed woodlands are best described as W10 *Quercus robur – Pteridium aquilinum – Rubus fruticosus* woodland. This community is also common across lowland Britain, and found on dry, neutral to mildly acidic soils. Pedunculate oak was constant within the canopy, however, some variation was also observed including beech *Fagus sylvatica*, silver birch *Betula pendula*, sycamore and ash (however not as common as within W8). Additionally, larch *Larix decidua,* pine *Pinus* sp. and spruce *Abies spp.* were localised; it is not uncommon for planted conifers to be present within this woodland type.

4.2.12. Bramble *Rubus fruticosus* agg. was frequent, with bracken dominating in clearings. The field-layer was generally species-poor, and often bare-ground/leaf litter was most abundant. Here, wood sorrel *Oxalis acetosella* was locally abundant and greater stitchwort *Stellaria holostea* was common in places. Grasses were prevalent in some areas (but never dominant), including Yorkshire fog *Holcus lanatus* and cock's foot *Dactylis glomerata*. This community is well defined from areas of W8 woodland by an absence of dog's mercury.

4.2.13. A few woodlands appeared to be an intermediate between W8 and W10 woodlands, where ivy *Hedera helix* became frequent and, as soils became more acidic, the species typical of W8 were lost.

BROAD-LEAVED PLANTATION WOODLAND A1.1.2 AND MIXED PLANTATION WOODLAND A1.3.2

4.2.14. The majority of woodland within the Phase 1 Survey Area comprised broad-leaved and mixed plantation. Plantation woodland is often difficult to differentiate from semi-natural woodland although the majority of examples within the Phase 1 Survey Area showed clear signs of plantation origin including;

a. Tree guards remaining in place;
b. An even age structure of trees with no signs of regeneration;
c. Trees planted in straight lines or in regular species groups; and
d. Presence of a high proportion of non-native shrubs within the understorey.

4.2.15. Broad-leaved and mixed plantation woodland occurred throughout the Phase 1 Survey Area as small blocks within arable and improved grassland fields or as narrow bands running along verges directly adjacent to the A1 carriageway.

CONIFEROUS PLANTATION WOODLAND A1.2.2

4.2.16. Plantation woodlands comprised predominantly of coniferous trees (10% or less of broad-leaved trees within the canopy) occurred across the Phase 1 Survey Area. Further details of canopy and ground-layer species in stands within 50 m of the Order Limits can be found in Target Notes 13, 26, 50, 55, 68 and 69.

4.2.17. Dominant canopy species included western red cedar *Thuja plicata,* Scots pine *Pinus sylvestris*, Douglas fir *Pseudotsuga menziesii*, larch and spruce. Typically, the field layer within the central part of the conifer plantations was very sparse or absent, with a thick layer of needles covering the ground and dense shade cast by the closely-spaced trees. Around the margins of the plantations there was a ground flora present where light could penetrate. Species present included red campion, primrose, male fern, cleavers and wood avens.

DENSE/CONTINUOUS SCRUB A2.1

4.2.18. Dense/continuous scrub occurred as small patches throughout the Phase 1 Survey Area. It occurred along roadside verges adjacent to the A1, as blocks within improved grassland and arable fields, and at the edge of woodlands.

4.2.19. Most of the scrub habitat within the NVC Survey Area was dominated by hawthorn *Crataegus monogyna* or blackthorn *Prunus spinosa* and can be attributed to the W21 *Crataegus monogyna-Hedera helix* scrub or the W22 *Prunus spinosa-Rubus fruticosus* scrub NVC communities. At the location of the proposed Lionheart Enterprise Park construction compound (eastern and western sites), south-east of Alnwick, there were also patches of dense scrub, adjacent to woodland surrounding Cawledge Burn. These patches, however, were dominated by gorse *Ulex europaeus* and are referable to the W23 *Ulex europaeus-Rubus fruticosus* community.

SCATTERED SCRUB A2.2

4.2.20. Scrub also occurred within the Phase 1 Survey Area (although not within the Order Limits) as scattered individual bushes growing along watercourses, over poor semi-

improved grassland or along highway verges. The most frequent species comprising the scattered scrub were found to be hawthorn, blackthorn and gorse.

BROADLEAVED PARKLAND/SCATTERED TREES A3.1 AND MIXED PARKLAND/SCATTERED TREES A3.3

4.2.21. Parkland/scattered trees occurred at locations labelled as Target Notes 76 and 87. At location 76, a mixture of widely-spaced broad-leaved and coniferous trees occurred over grassland, with the trees having less than 30% coverage of the mapped area. At Target Note 87 a mixture of widely spaced broad-leaved and coniferous trees formed a broad band running along Denwick Burn.

IMPROVED GRASSLAND B4

4.2.22. Improved grassland was the second most extensive habitat within the Phase 1 Survey Area (comprising 34.71 ha within the Order Limits and 120.8 ha within the Order Limits and 50 m buffer). Most of the improved grassland was managed for cattle grazing. Consequently, it was very species-poor, with seed-mixes dominated by perennial rye-grass *Lolium perenne* and white clover *Trifolium repens.*

4.2.23. There were very few herbaceous species present within the improved grassland fields, with the most frequent species being creeping buttercup *Ranunculus repens*, broad-leaved dock *Rumex obtusifolius*, common nettle and common mouse-ear *Cerastium fontanum*.

MARSH/MARSHY GRASSLAND B5

4.2.24. Marshy grassland was recorded at Target Notes 14, 15, 43, 51 and 73. In several places the marshy grassland was associated with ponds, but this habitat type was also recorded within a woodland clearing and at wetter areas within surrounding improved grassland.

4.2.25. The most frequent species within the marshy grassland areas was soft rush *Juncus effusus,* whilst frequent grass species included tufted hair-grass *Deschampsia cespitosa,* Yorkshire-fog and reed canary-grass *Phalaris arundinacea.*

4.2.26. Representative examples of potential HPI grasslands, including marshy grassland, were subject to further botanical assessment during the NVC survey, to inform their nature conservation importance. It was found that marshy grassland within the NVC Survey Area included MG9 *Holcus lanatus – Deschampsia cespitosa* grassland and MG10 *Holcus lanatus – Juncus effusus* rush pasture communities.

4.2.27. Yorkshire-fog is constant within both of these damp, neutral grasslands. MG9 is a form of grassland found mainly on permanently moist and periodically inundated circumneutral soils across large areas of the British lowlands. This grassland is localised within grazing fields, where Yorkshire-fog becomes dominant with tufted hair-grass and few other associates. MG10 is a form of rush-pasture found on predominantly moist soils across most of the British lowlands. Similar to MG9, this community often occurs in wetter parts of grazing fields and differs from MG9 in that tussocks of soft rush often become prominent amongst Yorkshire fog. Both communities within the NVC Survey Area were species-poor.

4.2.28. The NVC survey also identified areas of species-poor M23 *Juncus effusus/acutiflorus – Galium palustre* rush-pasture within marshy grassland habitats. This rush-pasture occurs over a variety of moist, moderately acid to neutral soils in the cool and rainy lowlands of Britain. The vegetation is characterised by the abundance of either soft rush or sharp-flowered rush *Juncus acutiflorus*, sometimes both, in moist agricultural grassland. Within the NVC Survey Area, soft rush was dominant, with marsh bedstraw *Galium palustre*, being the only other notable associate.

4.2.29. Being species-poor, the different types of marshy grassland within the Phase 1 Survey Area are unlikely to be of comparable composition to the HPI habitat Purple Moor-grass *Molinia caerulea* and Rush Pasture.

POOR SEMI-IMPROVED GRASSLAND B6

4.2.30. Poor semi-improved grassland occurred in small localised patches including at Target Notes 10, 49, 56, 93 and 98. This habitat type was also present along most open sections of highway verge, along the A1. Throughout the Phase 1 Survey Area the dominant grass species included red fescue *Festuca rubra,* cock's-foot and false oat-grass *Arrhenathereum elatius.* Herbaceous species were scarce within the sward, with the most frequent species including creeping thistle *Cirsium arvense*, broad-leaved dock, cow parsley *Anthriscus sylvestris* and common nettle.

4.2.31. There appeared to be two types of poor semi-improved grassland present. One type was dominated by red fescue, with very few tussocky grasses (including cock's-foot and false oat-grass) present. This type of grassland occurred most frequently within farmland. The other type was dominated by cock's-foot and/or false oat-grass and, although examples occurred within farmland, it was more frequent along the A1 road verges.

4.2.32. The red fescue dominated swards are closest to the MG6 *Lolium perenne-Cynosurus cristatus* grassland NVC community, whilst the more tussocky swards are closer to the M1 *Arrhenatherum elatius* grassland community. Most grazing pasture would be classified as MG6 grassland or MG7 *Lolium perenne* leys and related grasslands. The short, tight sward is maintained by regular grazing. If, however, grazing ceases, then this allows more tussocky grass species to develop and eventually come to dominate the sward, thereby moving from MG6 towards MG1 through succession.

4.2.33. Poor semi-improved grassland is also shown on mapping as occurring around field margins, although this is not strictly true. Some of these areas are actually poor semi-improved grassland, similar to MG1 and MG6 but there are also patches within the mapped areas which conform more closely to unmanaged tall ruderal vegetation, ephemeral/short perennial or other Open Vegetation (OV) communities in NVC, which are associated with arable land. Potential OV communities of arable land in Northumberland are listed in **Table 4-12**.

TALL RUDERAL C3.1

4.2.34. Tall ruderal vegetation includes stands of tall perennial or biennial herbaceous vegetation, usually more than 25 cm high, including species such as common nettle,

rosebay willowherb *Chamaenerion angustifolium* and Japanese knotweed *Reynoutria japonica*. Within the Phase 1 Survey Area, large patches of tall ruderal were recorded at Target Notes 6 (rosebay willowherb) and 30 (common nettle).

4.2.35. Patches of tall ruderal vegetation were also present within arable field margins but were too small to map separately, including OV24 *Urtica dioica-Galium aparine* community, OV25 *Urtica dioica-Cirsium arvense* community, OV26 *Epilobium hirsutum* community and OV27*Chamaenerion angustifolium* community.

STANDING WATER G1

4.2.36. Standing water including ponds at Target Notes 14, 18, 51 and 99 were recorded within the Phase 1 Survey Area, although only two ponds (Target Notes 18 and 99) are within the current Order Limits. Ponds may potentially qualify as HPI as Ponds, Lakes and Reservoirs are listed within the Northumberland Biodiversity Action Plan (BAP).

RUNNING WATER G2

4.2.37. Running water within the Phase 1 Study Area consisted of un-named drainage ditches and named watercourses including Shipperton Burn, White House Burn and Denwick Burn which bisect the Order Limits to the north of Alnwick. These burns are mostly narrow (between 1-2 m wide) and are overgrown with scrub in places. There is also a wider watercourse (Cawledge Burn), with a rocky substrate which runs through woodland to the east of the Lionheart Enterprise Park Compound location.

4.2.38. Rivers (including a very wide range of types, encompassing all natural and near-natural running waters in the UK i.e. with features and processes that resemble those in ‘natural’ systems) are included as HPI. Ditches, however, are excluded from this priority habitat. Rivers and Streams are listed within the Northumberland BAP.

ACID/NEUTRAL INLAND CLIFF I1.1

4.2.39. There is an exposed rock face on the edge of a woodland area at Target Note 62. A small section encroaches within the Phase 1 Survey Area, although is found outside of the Order Limits. The cliff presented with abundant great wood-rush *Luzula sylvatica* along the top edge and within crevices on the rock face. The Inland Rock Outcrop and Scree HPI covers a wide range of rock types, varying from acidic to highly calcareous. Inland rock outcrop and scree habitats are widespread in upland areas of the UK, with more limited occurrence in the lowlands.

4.2.40. Although inland rock outcrops are common in more upland areas of Northumberland, this habitat type is rare within the local area, which is dominated by flat expanses of arable and improved grassland.

ARABLE J1.1

4.2.41. Arable habitat occurs throughout the Phase 1 Survey Area (comprising 35.82 ha within the Order Limits and 162.41 ha within the Order Limits and 50 m buffer). At the time of the survey most of the arable fields were bare, with only a small percentage containing the remains of the previous crop, including cereal stubble and legume

stalks. Although arable fields can provide valuable habitat for farmland birds, including skylark *Alauda arvensis* and corn bunting *Emberiza calandra*, the valuation within this assessment is based solely on the intrinsic importance of the habitat.

4.2.42. Arable fields also provide a valuable habitat for a diverse group of annual vascular plants, which have a short growing season and thrive on regular disturbance. Many of these species have undergone severe recent declines in frequency and distribution due to changes in farming practices. These species, however, are largely confined to a narrow uncultivated strip along the field edge and would correspond to OV NVC communities including OV1, 3, 4, 7, 9, 10, 12, 13, 18 and 19. Wide arable field margins are mapped separately within the Phase 1 mapping as poor semi-improved grassland.

4.2.43. Arable fields are also a potentially very valuable habitat for ephemeral bryophyte species (comprising mosses, liverworts and hornworts). Several rare or scarce species are now largely confined to arable habitats, but only occur if stubble fields are left unploughed over winter. This was the case in an arable field located at Target Note 32, which correspondingly possessed a rich bryophyte flora. The majority of arable fields, however, appeared to have been ploughed in autumn and either re-sown or left bare over winter, with all bryophyte propagules being buried too deep in the inverted, ploughed soil.

AMENITY GRASSLAND J1.2

4.2.44. Amenity grassland was recorded throughout the Phase 1 Survey Area, most frequently associated with residential properties, where this habitat type includes lawns and playing fields. Amenity grassland was also present along road verges which are subject to a regular mowing regime. A more unusual example of amenity grassland was present at Target Note 22, where it formed a runway for light aircraft.

EPHEMERAL/SHORT PERENNIAL J1.3

4.2.45. A single, large patch of this habitat type was present at the location of the Lionheart Enterprise Park Compound (eastern and western sites), at Target Note 100. It was an area of recently disturbed ground with frequent bare patches but colonised by short, scattered vegetation including annual meadow-grass *Poa annua*, thyme-leaved speedwell *Veronica serpyllifolia*, sticky groundsel *Senecio viscosus*, red dead-nettle *Lamium purpureum*, parsley-piert *Aphanes arvensis* and scarlet pimpernel *Lysimachia arvensis*.

HEDGES/HEDGE AND TREES J2.1.1, J2.1.2, J2.2.1, J2.2.2, J2.3.1, J2.3.2

4.2.46. Hedges and hedge/trees were widespread within the Phase 1 Survey Area, including intact and defunct hedges and species-rich and species-poor hedges. The criteria used in this assessment to determine whether a hedge is species-rich, or species-poor have previously been described in **Section 2**.

4.2.47. Approximately 0.19 km of native species-rich and 13.1 km of native species-poor intact hedges were found to be present within the Order Limits, with 0.44 km and 20.91 km respectively present within the Phase 1 Survey Area.

4.2.48. Approximately 0.15 km of native species-rich and 1.09 km of native species-poor defunct hedges were also present within the Order Limits, with 0.22 km of native species-rich and 2.20 km respectively present within the Phase 1 Survey Area.

4.2.49. An approximate total of 1.67 km of native species-rich and 4.50 km of native species-poor hedge and trees were found to be present within the Order Limits, with 2.34 km and 5.79 km respectively present within the Phase 1 Survey Area.

4.2.50. Hedges and hedge/tree lines predominantly occurred along field boundaries, either dividing up agricultural land into smaller land parcels or delineating a boundary with public footpaths or highways. Tree lines also occurred along watercourses and may be planted or naturally occurring. The most frequent species occurring within hedgerows was hawthorn which was present within nearly every hedgerow. The second and third most frequent hedgerow species were blackthorn and elder. The most frequent tree species growing within hedge/tree lines were ash, sycamore and pedunculate oak.

4.2.51. The HPI definition of a hedgerow is any boundary line of trees or shrubs over 20 m long and less than 5 m wide, and where any gaps between the trees or shrub species are less than 20 m wide. This means that nearly all hedgerows within the Phase 1 Survey Area conform to the HPI hedgerows habitat. Trees and Hedges are also listed within the Northumberland BAP.

4.2.52. None of the assessed hedges fell into the criteria for classification as an 'important hedgerow' under the ecological criteria in The Hedgerows Regulations (1997), lacking the characteristics and species required to satisfy the classification. Information regarding the potential for 'important hedgerows' under the cultural heritage criteria is discussed within **Chapter 8: Cultural Heritage, Volume 3** of this ES (**Application Document Reference: TR010041/APP/6.3**).

BOUNDARY FEATURES J2.4, J2.5, J2.8

4.2.53. Other boundary features present across the Phase 1 Survey Area include fences, walls and a single earth bank, the latter located to the east of a poor semi-improved grassland field to the south of Target Note 63.

BARE GROUND J4

4.2.54. An extensive patch of bare ground is present at the Lionheart Enterprise Park Compound location (Target Note 102). The ground appeared to have been recently disturbed, as part of ongoing construction works within the area, with no vegetation coverage at the time of the Phase 1 habitat survey.

SCHEDULE 9 PLANT SPECIES

4.2.55. Himalayan balsam *Impatiens glandulifera* was recorded in woodland along Shipperton Burn, near to where it crosses the A1 at West Lodge. It was not recorded during the March 2019 Phase 1 habitat survey, when the species would only just be germinating, but was detected during riparian mammal surveys in May and June 2019. It was mainly concentrated along the banks of the burn, but was also interspersed, at lower densities, through the woodlands. The locations, at Target

Notes 8 and 9 are shown on the Phase 1 habitat map, **Figure 9.3: Phase 1 Habitat Survey, Volume 6** of this ES (**Application Document Reference: TR010041/APP/6.6**). The stand at TN8 was centred on OS grid reference NU 16986 21976 and the stand at TN9 was centred on OS grid reference NU 17101 21950.

5. NATURE CONSERVATION EVALUATION

5.1. FEATURES SCOPED IN

5.1.1. The habitat features scoped into the impact assessment are presented in **Table 5-1**, together with the justification for this evaluation.

Table 5-1 - Receptor Valuation and Rationale

Receptor	Valuation	Rationale for Valuation
Broad-leaved semi-natural woodland A1.1.1 (including HPI deciduous woodland)	Local	HPI deciduous woodland parcels were surveyed during the Phase 1 habitat and NVC surveys. In terms of the NVC classification it was found that the woodland most closely matched the W8 and W10 NVC communities. Woodland within the Lowland Mixed Deciduous Woodland HPI is described as mostly falling into these categories, with lesser amounts of W16. Although areas of broad-leaved semi-natural habitat within the NVC Survey Area are mostly HPI, the W8 and W10 communities are widespread throughout lowland Britain. None of the woodland parcels within the NVC Survey Area are listed as AWI. Therefore, they are not valued as being any higher than of Local importance.
Standing water G1 (Ponds)	Local	Further assessment of the ponds would be necessary to establish whether they would meet the criteria for HPI classification. Reference should be made to the aquatics chapter of this EcIA report for further information. Ponds are widespread throughout the UK, but high-quality examples are now highly localised, especially in the lowlands. Therefore, they are not valued as being any higher than Local importance.
Running water G2	Local	Natural watercourses within the Phase 1 Survey Area may potentially be included within the Rivers HPI, but large parts of the small watercourses within the Phase 1 Survey Area are overgrown with bramble scrub or have dry sections. Therefore, they are not valued as being any higher than of Local importance.
Acid/neutral inland cliff I1.1	Local	This feature may qualify as Inland Rock Outcrop and Scree HPI. It is valued as being Locally important as there are very few other

Receptor	Valuation	Rationale for Valuation
		similar features within the surrounding lowland landscape.
Hedges/hedge and trees J2.1.1, J2.1.2, J2.2.1, J2.2.2, J2.3.1, J2.3.2	Local	The HPI definition of a hedgerow is any boundary line of trees or shrubs over 20 m long and less than 5 m wide, and where any gaps between the trees or shrub species are less than 20 m wide. This means that nearly all hedgerows within the Phase 1 Survey Area conform to the HPI hedgerows habitat. Despite matching HPI criteria, hedgerows are common and widespread within the landscape and are therefore valued no higher than of Local importance.

5.2. FEATURES SCOPED OUT

5.2.1. The CIEEM Guidelines for EcIA (**Ref. 1**) state that the assessment process does not require consideration of effects on ecological receptors deemed to be below a predefined nature conservation importance threshold. Receptors that are considered to have nature conservation importance of less than local are not considered important ecological receptors in the context of this assessment and any impact on such receptors is considered unlikely to have a significant effect on their conservation status on a scale beyond less than local. This has included consideration of the zone of influence for each ecological receptor as determined by professional judgement. The zone of influence is defined by the pathways available for an impact from Part B, either directly or indirectly, to result in a potential effect upon the habitat and/or species.

5.2.2. Receptors scoped out of this assessment have been are identified and justified in **Table 5-2.**

Table 5-2 - Nature Conservation Importance of Ecological Receptors Scoped Out

Receptor	Justification for Scoping Out
Hulne Park LWS	Receptor of County importance; however not within Order Limits or zone of influence of Part B.
Littlemill Quarries LWS	Receptor of County importance; however not within Order Limits or zone of influence of Part B.
Ratcheugh Crag-Pepper Moor LWS	Receptor of County importance; however not within Order Limits or zone of influence of Part B.

Receptor	Justification for Scoping Out
Cawledge Burn LWS	Receptor of County importance; however not within Order Limits or zone of influence of Part B.
Coquet River-Felton Park LWS	Receptor of County importance; however not within Order Limits or zone of influence of Part B.
Longhoughton Quarry SSSI	Receptor of National importance; however not within the Order Limits or zone of influence of Part B.
River Coquet and Coquet Valley Woodlands SSSI	Receptor of National importance; however not within the Order Limits or zone of influence of Part B.
Newham Fen SAC	Receptor of International importance; however not within the Order Limits or zone of influence of Part B.
Berwickshire and North Northumberland Coast SAC	Receptor of International importance; however not within the Order Limits or zone of influence of Part B.
Northumbria Coast Ramsar	Receptor of International importance; however not within the Order Limits or zone of influence of Part B.
Northumbria Coast SPA	Receptor of International importance; however not within the Order Limits or zone of influence of Part B.
North Northumberland Dunes SAC	Receptor of International importance; however not within the Order Limits or zone of influence of Part B.
Northumberland Marine SPA	Receptor of International importance; however not within the Order Limits or zone of influence of Part B.
River Tweed SAC	Receptor of International importance; however not within the Order Limits or zone of influence of Part B.
Swineclose Wood AWI	Receptor of County importance; however not within the Order Limits or zone of influence of Part B.
Traditional orchard HPI	Receptor of County importance; however not within the Order Limits or zone of influence of Part B.
Broad-leaved plantation woodland A1.1.2 and mixed plantation woodland A1.3.2	Habitat common across wider landscape; receptor of Less than Local importance only.
Coniferous plantation woodland A1.2.2	Habitat common across wider landscape; receptor of Less than Local importance only.

Receptor	Justification for Scoping Out
Dense/continuous scrub A2.1	Habitat common across wider landscape; receptor of Less than Local importance only.
Scattered scrub A2.2	Habitat common across wider landscape; receptor of Less than Local importance only (includes habitat at Main Compound).
Broadleaved parkland/scattered trees A3.1 and mixed parkland/scattered trees a3.3	Habitat common across wider landscape; receptor of Less than Local importance only.
Improved grassland B4	Habitat common across wider landscape; receptor of Less than Local importance only (includes habitat at shared construction compound).
Marsh/marshy grassland B5	Habitat common across wider landscape; receptor of Less than Local importance only.
Poor semi-improved grassland B6	Habitat common across wider landscape; receptor of Less than Local importance only.
Tall ruderal C3.1	Habitat common across wider landscape; receptor of Less than Local importance only.
Acid/neutral inland cliff I1.1	Habitat outside the Order Limits and a zone of influence of Part B.
Arable J1.1	Habitat common across wider landscape; receptor of Less than Local importance only (includes habitat at shared construction compound).
Amenity grassland J1.2	Habitat common across wider landscape; receptor of Less than Local importance only.
Ephemeral/short perennial J1.3	Habitat common across wider landscape; receptor of Less than Local importance only.
Boundary features J2.4, J2.5, J2.8	Habitat common across wider landscape; receptor of Less than Local importance only (includes habitat at shared construction compound).
Bare ground J4	Habitat common across wider landscape; receptor of Less than Local importance only.

6. POTENTIAL IMPACTS

6.1. CONSTRUCTION

6.1.1. During construction, potential impacts are limited to:

a. Habitat degradation and/or loss; and
b. Habitat fragmentation.

6.1.2. The pathways by which such impacts could occur are:

a. Direct damage/loss within the Order Limits;
b. Pollution and sedimentation; and
c. Disruption to underlying hydrological processes.

6.1.3. The temporal magnitude of each impact will vary from temporary to permanent.

6.1.4. The following table details potential impacts on ecological receptors listed in **Table 6-1**:

Table 6-1 – Potential Impacts on to Ecological Receptors

Receptor	Potential Impacts
Broad-leaved semi-natural woodland A1.1.1	There are 3.13 ha of broad-leaved semi-natural woodland within the Phase 1 Survey Area with 1.55 ha lying within the Order Limits, including woodland at Target Notes 9, 47 and 59. Construction impacts potentially include: - Direct loss of woodland within Order Limits; - Fragmentation of woodland within Order Limits; and - Damage to woodland within the Phase 1 Survey Area due to changes in hydrological conditions.
Standing Water G1 (Ponds)	There are only two areas of standing water (Target Notes 18 and 99) within the Order Limits. The waterbody at Target Note 18 is a large, shallow waterbody spreading over an improved grassland field. It is more akin to a flooded field than a pond. It still has terrestrial plant species growing within, with only a very small patch of aquatic plants (floating sweet-grass *Glyceria fluitans*). It was only 20-30 cm maximum depth and would be anticipated to dry regularly in the summer and would not qualify as Pond HPI. This area may be lost during construction, but this waterbody is of less than Local importance. The waterbody at Target Note 99 consists of a recently constructed artificial drainage pond within land adjacent to Lionheart Enterprise Park. This land has been identified as the location of a construction compound for Part B. It is unlikely that the loss of this waterbody would occur as it is assumed that the construction compound would retain this feature.

Receptor	Potential Impacts
	Although there would be no direct loss of waterbodies outside the Order Limits due to Part B, construction impacts to ponds within the 50 m buffer may include potential pollution due to run-off from construction operations.
Running Water G2	There is 4.37 km of running water within the Phase 1 Survey Area with 1.06 km lying within the Order Limits, including Shipperton Burn, White House Burn and Denwick Burn which bisect the Order Limits to the north of Alnwick. Construction impacts potentially include: - Potential pollution due to run-off from construction operations; and - Severance of watercourses within the Order Limits.
Acid/neutral inland cliff I1.1	There is only 41 m of acid/neutral inland cliff within the Phase 1 Survey Area, to the south of Target Note 62. This section of cliff is contained entirely within the 50 m buffer and is not within the Order Limits. Therefore, there are no potential impacts predicted for this receptor.
Hedges/hedge and Trees J2.1.1, J2.1.2, J2.2.1, J2.2.2, J2.3.1, J2.3.2	There is approximately 31,916 m of hedge/hedge with trees within the Phase 1 Survey Area, with an approximate total of 20,682 m within the Order Limits. Potential impacts are predicted in the form of direct losses of hedges and trees/hedges within the Order Limits. The approximate maximum amount of loss that may occur for each type of hedge/hedge and tree line, within the Order Limits is as follows: - 0.2 km of species-rich intact hedges; - 10.0 km of species-poor intact hedges; - 0.2 km of species-rich defunct hedges; - 1.0 km of species-poor defunct hedges; - 1.7 km of species-rich hedge and trees; and - 4.3 km of species-poor hedge and trees. The figures shown above comprise the total length of each type of hedge/tree line within the Order Limits, but it is assumed that large sections of these hedges/tree lines would be retained. In addition to direct losses, hedges may also be impacted through severance of retained sections of hedgerow, thereby diminishing their function as corridors for commuting animals.

6.2. OPERATION

6.2.1. Habitat loss within the Order Limits would be permanent, it would be realised during construction and thus is addressed in full in **Section 7** and **Section 8**. Operational

impacts may arise due to increased NOx concentrations and N deposition caused by a potential increase of vehicular traffic along the widened section of A1 carriageway.

6.2.2. The Annual Average Daily Traffic (AADT) flows have been calculated, which are forecast to increase in future due to usual background growth and developments. The traffic flows are also forecast to increase above the predicted background growth as a result of Part B being implemented but this increase is not predicted to be greater than 1,000-2,000 cars each way (north and south-bound) over the course of a day.

6.2.3. This relatively modest increase in traffic flows should result in only small increases in NOx concentrations and N deposition, adjacent to the widened section of the A1 carriageway.

7. MITIGATION

7.1.1. The below mitigation items feed into a larger list of prescribed measures to be adhered to through construction of Part B. A full list is provided in **Chapter 9: Biodiversity, Volume 3** of this ES (**Application Document Reference: TR010041/APP/6.3**); those measures of relevance to valuable habitats have been extracted and are detailed in **Table 7-1** below alongside the Scheme-wide mitigation measures. Mitigation measures are illustrated in **Figure 7.10: Landscape Mitigation Plan, Volume 6** of this ES (**Application Document Reference: TR010041/APP/6.6**).

7.1.2. Part B incorporates mitigation measures into the design, whereby direct losses of habitats and species are mitigated through landscaping plans which seek to replace areas of valuable habitat with larger areas or lengths of the same habitat type or through the creation of replacement habitats which contain a more diverse range of native species, than were present prior to construction.

7.1.3. Part B aspires to achieve no net loss of biodiversity, striving for net gains, whereby the development would leave biodiversity in a better state than before construction. An easily achievable example of this is that of new hedgerow planting which would either exceed the length of hedgerows present before the development and/or plant hedgerows containing a greater number of native woody species as listed within the 1997 Hedgerow Regulations.

Table 7-1 - Part B Mitigation Commitment

Measure Type	Measure Reference	Approximate Location	Timing of Measure	Description	Mitigation Purpose or Objective	Specific Consultation or Approval Required
Delivery Mechanisms and Preliminary Activities						
Delivery Mechanism and Preliminary Activity	EC01	Throughout Part B	Pre-Construction	All permits and assents would be requested and granted prior to the commencement of works. This may include for example, but not limited to, an Environment Agency Permit for works in and around watercourses.	To protect sites, habitats and fauna.	Natural England/Environment Agency
Delivery Mechanism and Preliminary Activity	EC02	Throughout Part B	Pre-Construction	Pre-construction surveys would be undertaken to verify and, where required, update the baseline ecological conditions set out in this ES. The scope of the pre-construction surveys would be discussed with Natural England prior to being undertaken and would be specific to each ecological receptor under consideration.	To update the baseline ecological conditions set out in this ES.	Natural England
Delivery Mechanism and Preliminary Activity	EC03	Throughout Part B	Pre-Construction	Prior to construction a suitably qualified (or team of suitably qualified) Ecological Clerk of Works (ECoW) and a named bat licensed ecologist would be appointed and would be responsible for implementation of the Ecological Management Plan (EMP) and measures within the **Outline CEMP** (**Application Document Reference: TR010041/APP/7.3**) and subsequent Outline CEMP prepared by the main contractor. The ECoW would: - Provide ecological advice over the entire construction programme, at all times as required; - Undertake or oversee pre-construction surveys for protected species in the areas affected by Part B; - Monitor ecological conditions during the construction stage to identify additional constraints that may arise as a result of natural changes to the ecological baseline over time. - Provide an ecological toolbox talk to site personnel to make them aware of ecological constraints and information, identify appropriate mitigation developed do minimise impacts and make site personnel aware of their responsibility with	To ensure the implementation of the EMP.	None required

Measure Type	Measure Reference	Approximate Location	Timing of Measure	Description	Mitigation Purpose or Objective	Specific Consultation or Approval Required
				regards to wildlife. The toolbox talk would include, as required, all ecological receptors considered within this ES; - Monitor the implementation of mitigation measures during the construction stage to ensure compliance with protected species legislation and commitments within this ES. - The ECoW would have previous experience in similar ECoW roles, be approved by the Applicant, and be appropriately qualified for the role. The ECoW would be appointed in advance of the main construction programme commencing to ensure pre-construction surveys are undertaken and any advance mitigation measures required are implemented.		
Delivery Mechanism and Preliminary Activity	EC04	Throughout Part B	Pre-Construction	The main contractor would obtain and comply with the requirements of any protected species derogation licences in respect of works that have the potential to breach applicable conservation legislation necessary to construct Part B. Licensing may be for UK and/or European protected species.	To comply with conservation legislation.	Natural England
Delivery Mechanism and Preliminary Activity	EC05	Throughout Part B	Pre-Construction & Construction	Any tree felling would be carried out by experienced main contractors to reduce direct mortality of protected species according to agreed felling methods between main contractors and the ECoW.	To protect fauna during removal of habitat.	None required
Delivery Mechanism and Preliminary Activity	EC06	Throughout Part B	Pre-Construction	A pre-commencement inspection by the ECoW would be undertaken within woodland prior to any felling to confirm the absence of dreys between February to September. Where deemed necessary, felling would be supervised by the ECoW.	To protect red squirrel.	None required
Delivery Mechanism and Preliminary Activity	EC07	Throughout Part B	Pre-Construction and Construction	Implementation of and adherence to the measures contained within the **Outline CEMP** (**Application Document Reference: TR010041/APP/7.3**) that details efforts taken to avoid, minimise and reduce impacts as a result of the Part B construction. This is considered particularly important for works in and around watercourses. This includes	To protect flora and fauna.	None required

Measure Type	Measure Reference	Approximate Location	Timing of Measure	Description	Mitigation Purpose or Objective	Specific Consultation or Approval Required
				measures to avoid disturbance of sensitive species and habitats by noise, dust and air pollution. A pre-commencement walkover survey would be undertaken to confirm the absence of invasive non-native species. Should invasive species be recorded within the construction area, this would be addressed through implementation of the Biosecurity Method Statement (EC08), to be developed at detailed design. These measures have been included within the Outline CEMP.		
Delivery Mechanism and Preliminary Activity	EC08	Throughout Part B	Construction	Given the presence of Schedule 9 invasive non-native species, a Biosecurity Method Statement would be developed and implemented throughout construction. The Method Statement would detail the location and extent of any invasive species or other biosecurity concerns, appropriate measures to control or eradicate the species from an area (if applicable), measures to prevent the spread of the species and good site hygiene practices (such as 'Check, Clean, Dry').	To prevent the spread of invasive species.	None required
General Mitigation						
General	EC09	Throughout Part B	Pre-Construction & Construction	Site/ vegetation clearance and tree felling would be kept to a minimum and only where essential to facilitate construction, to reduce the impacts of habitat loss and fragmentation. Areas of clearance, particularly those within temporary works, shall be identified within a method statement and agreed with the ECoW. Site clearance of dense vegetation would be undertaken carefully (use of hand tools) and by experienced main 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.	None required
General	EC10	Throughout Part B	Pre-Construction, Construction &	Plant and personnel would be constrained to a prescribed working corridor through the use of, where practicable, temporary barriers to minimise damage to habitats and potential	To protect habitats and fauna.	None required

Measure Type	Measure Reference	Approximate Location	Timing of Measure	Description	Mitigation Purpose or Objective	Specific Consultation or Approval Required
			Post-Construction	direct mortality and disturbance to animals located within and adjacent to the Order Limits.		
General	EC11	Throughout Part B	Pre-Construction & Construction	Stand-off distances around watercourses and other sensitive habitats (such as woodland) would be implemented prior to commencement of works and clearly demarked on site through the use of physical barriers (fencing, tape or similar). The buffer around trees/ woodland/ hedgerows would be in accordance with good practice (**Ref. 12**) to take into account root protection zones.	To protect habitats and fauna.	None required
General	EC12	Throughout Part B	Construction	Works during the construction period would be undertaken during daylight hours (07:00 to 19:00), Monday to Friday to reduce the impact to nocturnal and crepuscular species; particularly bats, barn owl and badger. However, extended hours, including nighttime, would be required for some construction operations. Should night working be required, this would be discussed with the ECoW and appropriate mitigation put in place (particularly concerning lighting). Appropriate mitigation would be determined by the ECoW but is likely to include: – Avoidance of direct lighting on any buildings or trees that contain bat roosts or barn owl nest/ roost sites; – Avoidance of artificial lighting of watercourses, particularly during the hours of darkness to prevent impacts to fish behaviour or passage; – Avoidance of light spill using directional and or baffled lighting; – The use of movement triggers, thus lighting only turns on when people (large objects) move through the area (use within compound); – Reducing the height of lighting columns to reduce light spill onto adjacent habitats; – Variable lighting regimes (VLR) - switching off when human activity levels are low i.e. 21:00 to 05:30; and/or	To reduce disturbance impacts during construction.	None required

Measure Type	Measure Reference	Approximate Location	Timing of Measure	Description	Mitigation Purpose or Objective	Specific Consultation or Approval Required
				– Avoid use of blue-white short wavelength lights and high UV content. Work during hours of darkness would be avoided as far as practicable and where necessary directed lighting would be used to minimise light pollution/glare. – Temporary lighting used for construction would be switched-off when not in use and positioned so as not to spill on to adjacent land, sensitive receptors or retained vegetation within the area surrounding the works. – Directed lighting would be used to minimise light pollution/glare, including for construction compounds. – Lighting levels would be kept to the minimum necessary for security and safety.		
General	EC13	Throughout Part B	Construction	To prevent entrapment of wildlife, any trenches or voids would be excavated and infilled within the same working day. If this is not possible, the void would be securely covered overnight, or a suitable means of escape provided (such as a ramp at no greater than a 45o angle). Any void would then be visually inspected prior to re-starting works to confirm the absence of entrapped wildlife. All escape measures would be discussed and agreed with the ECoW to ensure they are suitable for the size of void and wildlife that may become trapped. If deemed appropriate, the ECoW may enforce additional measures, such as the installation of temporary amphibian/reptile fencing around the void to prevent entry.	To protect wildlife.	None required
General	EC14	Throughout Part B	Construction & Post-Construction	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	To improve the value of detention basins to support biodiversity.	None required

Measure Type	Measure Reference	Approximate Location	Timing of Measure	Description	Mitigation Purpose or Objective	Specific Consultation or Approval Required
				native and locally appropriate seed mix (**Ref. 13**).		
General	EC15	Throughout Part B	Operation	Implementation of an Ecological/Environmental Management Plan to detail the monitoring and maintenance of habitat and mitigation/compensation features following creation and installation. The Ecological/Environmental Management Plan would be developed at detailed design. The requirement for an Ecological/Environmental Management Plan is captured within the **Outline CEMP** (**Application Document Reference: TR010041/APP/7.3**).	To maintain the ecological value of retained and created habitats long-term.	None required
Ecological Receptor Specific Mitigation						
Terrestrial Habitats	HAB01	Locations of broad-leaved semi-natural woodland A1.1.1	Pre-Construction & Construction	The Part B design would seek to minimise the amount of broad-leaved semi-natural woodland which would be subject to direct loss. Prior to construction, this would include a reassessment of whether the removal of trees earmarked for felling is essential to facilitate construction.	To retain the largest amount possible of those woodlands of semi-natural origin and with associated ground flora containing typical woodland plant species. These types of woodlands are often irreplaceable in the short/medium term and loss would be avoided wherever possible.	None required
Terrestrial Habitats	HAB02	Throughout Part B	Pre-construction	Species-rich grassland creation would be designed to replace areas of poor semi-improved grassland which would be subject to direct loss. Seed mixes would comprise native species of local origin and context.	To compensate for losses with a greater amount of higher quality grassland creation	None required
Terrestrial Habitats	HAB03	Throughout Part B	Pre-construction	Overall connectivity of new and existing habitats within the Order Limits would be increased to link up with the wider landscape including woodland, hedgerows, watercourses and ponds, where possible.	To link up existing and newly created areas of valuable habitat to allow increased movement of species between habitat parcels.	None required.
Aquatics	AQ01	In or in close proximity to waterbodies/watercourses	Construction	Construction materials would be stored and maintained away from watercourses and waterbodies. Silt fences or similar would be placed around exposed ground and stockpiles, and early re-vegetation of the completed elements of Part B would be undertaken to reduce erosion.	To protect aquatic habitats and species from pollution.	None required

Measure Type	Measure Reference	Approximate Location	Timing of Measure	Description	Mitigation Purpose or Objective	Specific Consultation or Approval Required
Aquatics	AQ02	In or in close proximity to waterbodies/watercourses	Construction	Chemicals and fuels must be stored in secure containers located away from watercourses and waterbodies. No refuelling of plant and machinery would take place near watercourses.	To protect aquatic habitats and species from chemical and fuel pollution.	None required
Aquatics	AQ03	In or in close proximity to waterbodies/watercourses	Construction	Lighting used for construction would be switched-off when not in use and, where possible, positioned so as not to spill on to watercourses.	To protect aquatic habitats and species from light pollution.	None required
Aquatics	AQ04	In or in close proximity to waterbodies/watercourses	Construction	Any construction works (including enabling works) would be conducted from the bank and tracking within the channel would be avoided. Where work needs to be carried out within a watercourse, then tracking would be minimised and sediment trapping equipment (hessian mats or similar), would be deployed and appropriately maintained. Any displaced substrate would be returned to as close to its original condition as possible upon completion of the works.	To protect aquatic habitats and species from pollution through physical disruption of sediments.	None required
Aquatics	AQ05	In or in close proximity to waterbodies/watercourses	Construction	Water quality would be monitored throughout construction works where working with concrete in or within close proximity (within 10 m) to waterbodies or watercourses is required. Monitoring would be undertaken by suitably trained personnel, with the use of a multiparameter probe that can accurately detect changes in pH. Should a rise in pH be detected then work would stop until the cause has been identified and resolved. Appropriate arrangements would be made for the cleaning of equipment that comes into contact with concrete and suitable arrangements would be made for the disposal of cementitious waste. No cementitious materials would enter watercourses. Appropriate sediment management systems would be deployed and maintained throughout the works to prevent suspended sediment being transported downstream (potentially affecting spawning grounds or causing wider pollution).	To protect aquatic habitats and species from concrete pollution.	None required

Measure Type	Measure Reference	Approximate Location	Timing of Measure	Description	Mitigation Purpose or Objective	Specific Consultation or Approval Required
Aquatics	AQ10	Culverts	Operation	Periodic removal of debris from culverts would be undertaken.	To prevent blockage and ensure maintenance of hydraulic capacity and movement of animals, sediment and woody / large debris downstream.	None required
Aquatics	AQ11	Throughout Part B	Operation	A surface water drainage system would be installed with a robust treatment system using filter drains, grassed detention basins, swales and reed beds would achieve sufficient sediment and pollutant removal.	Prevent pollution of watercourse by hydrocarbons and sediments from carriageway.	None required

8. RESIDUAL IMPACTS

8.1.1. This impact assessment assumes the adoption of the mitigation measures detailed in **Table 7-1** and as such detailed assessment is only provided on residual impacts. Pre-mitigation impact characterisation is provided for clarity, whilst those features assessed as of 'less than local' importance have not been assessed further.

8.1.2. A summary of specific impacts, mitigation and residual impacts (if any) is provided within **Table 8-1**.

8.1. CONSTRUCTION

8.1.1. Direct negative impacts are anticipated to areas of broad-leaved semi-natural woodland, hedges/hedge and tree lines and watercourses within the Order Limits which may be subject to direct loss. Significance of effects are detailed in **Table 8-1** below.

8.2. OPERATION

8.2.1. Residual operational impacts are restricted to increased NOx concentrations and N deposition potentially caused by an increase of vehicular traffic along the widened section of A1 carriageway.

8.2.2. Air pollution has been identified as a direct threat to biodiversity in England. Many habitats of nature conservation importance in the UK are adapted to low nutrient conditions and/or are vulnerable to acidification. They are, therefore, sensitive to additional airborne NOx, sulphur dioxide (SO_2) and ammonia (NH_3), as well as to nitrogen deposition and acid deposition. Transportation is the single largest source of NOx emissions and is emitted by road traffic in much larger quantities than SO_2 and NH_3.

8.2.3. Increases in traffic flows are predicted and the increase in NOx caused by the extra traffic could result in local habitat degradation over the operational life of Part B. However, as the changes in traffic flows are relatively small, the changes in air quality are considered to have a **Neutral** effect (**not significant**).

Table 8-1 - Summary of Specific Impacts, Mitigation, and Residual Impacts (Construction)

Feature	Potential Impact	Characterisation of Impact (Pre-mitigation)	Mitigation	Residual Impact
Broad-leaved semi-natural woodland A1.1.1 at Target Notes 9, 47, 59 Importance: Local	Loss of broad-leaved semi-natural woodland within the Order Limits	Extent: Total broad-leaved semi-natural woodland within the Order Limits is 1.55 ha. Part B would result in the permanent loss of 0.45 ha of broad-leaved semi-natural woodland. Effect: Direct negative Duration: Permanent and temporary Frequency and timing: One-time event Reversibility: Reversible but only over the long-term. Likelihood: Some loss is certain but exact amount would depend upon detailed design and access/storage areas. Compensation: Part B includes the creation of 10.13 ha of broad-leaved semi-natural woodland.	EC01 EC02 EC05 EC07 EC08 EC09 EC010 HAB01 HAB03	Moderate beneficial
Hedges/hedge and Trees J2.1.1, J2.1.2, J2.2.1, J2.2.2, J2.3.1, J2.3.2 located within the Order Limits Importance: Local	Loss of hedges and hedge/tree lines within the Order Limits	Extent: Part B currently does not retain or reinstate hedges/hedge with trees. Therefore, Part B would result in the permanent loss of approximately 17,217 m. Effect: Direct negative Duration: Permanent Frequency and timing: One-time event Reversibility: Reversible but only over the medium/long-term. Likelihood: Some loss is certain but exact amount would depend upon detailed design and access/storage areas Compensation: Part B includes the creation of approximately 17,128 m of hedge/hedge with trees.	EC01 EC02 EC05 EC07 EC08 EC09 EC010 HAB03	Slight adverse (not significant)
Running water G2 located within the Order Limits Importance: Local	Loss of watercourse within the Order Limits	Extent: There is a total of 1,059 m of running water within the Order Limits. Part B would result in the permanent loss of approximately 976 m as a result of culvert extensions and watercourse realignment (Kittycarter Burn). Part B would result in the reinstatement of approximately 365 m of running water. Effect: Direct negative Duration: Permanent: Frequency and timing: One-time event Reversibility: Irreversible Likelihood: Loss is certain but exact amount would depend upon detailed design	EC01 EC02 EC03 EC04 EC07 EC08 EC10 EC11 HAB03 AQ01-05 AQ10 AQ11	Slight adverse (not significant)

REFERENCES

Ref. 1 CIEEM (2019). Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine. CIEEM, Winchester.

Ref. 2 Local Nature Reserve (LNR), National Nature Reserve (NNR), and Site of Special Scientific Interest (SSSI).

Ref. 3 MAGIC Maps Available: https://magic.defra.gov.uk/home.htm (Date accessed: June 2019)

Ref. 4 Northumberland BAP, Northumberland Biodiversity Partnership, latest version January 2018.

Ref. 5 Jacobs UK Ltd (2018). A1 Alnwick to Ellingham: Extended Phase 1 Habitat Survey Report

Ref. 6 JNCC (2010). Handbook for Phase 1 Habitat Survey. Joint Nature Conservation Committee.

Ref. 7 Hedgerow Regulations (1997): http://www.legislation.gov.uk/uksi/1997/1160/contents/made

Ref. 8 Chief Highway Engineer Memorandum 422/18 (2018) Supporting Transparency around our Biodiversity Performance.

Ref. 9 Rodwell, J. S. (2006). NVC Users' Handbook. ISBN 978 1 86107 574 1.

Ref. 10 Rodwell, J. S. (Ed), et al. (1991 – 2000). British Plant Communities (5 volumes). Cambridge University Press.

Ref. 11 Design Manual for Roads & Bridges (2010) Interim Advice Note (IAN) 130/10 - Ecology and Nature Conservation: Criteria for Impact Assessment

Ref. 12 GB Non-Native Species Secretariat Check, Clean, Dry campaign. http://www.nonnativespecies.org/checkcleandry/

Ref. 13 British Standards Institution (2012). *BS5837:2012 Trees in relation to design, demolition and construction. Recommendations*. April 2012

Appendix A

TARGET NOTES

Target Note	Description
1	Mixed plantation woodland surrounding garden, included spruce, Scots pine, ash and sycamore in the canopy.
2	Small fenced triangular area recorded as broad-leaved plantation, but only recently planted saplings were overgrown with tall grasses and herbaceous vegetation, with their health appearing to suffer.
3	Another smaller overgrown area of recently planted saplings, similar to TN2.
4	Small patch of broadleaved plantation woodland, with canopy species including ash, silver birch *Betula pendula*, elder, hawthorn, rose *Rosa* sp., guelder rose *Viburnum opulus*, pedunculate oak and Scots pine. Ground flora included moschatel, white dead-nettle *Lamium album*, cleavers, common nettle, herb-Robert, red campion, cow parsley, lesser celandine and wood avens.
5	Isolated line of hawthorn trees.
6	Wide roadside verge with small patches of poor semi-improved grassland with cock's-foot, common knapweed *Centaure nigra*, creeping thistle, broad-leaved dock, ribwort plantain *Plantago lanceolata*, yarrow *Achillea millefolium* and common vetch *Vicia sativa*, but mostly consisted of tall ruderal vegetation dominated by rosebay willowherb, with some smaller patches of common nettle.
7	Old, disused road, separated from A1 by metal crash barriers.
8	Mixed plantation woodland including Scots pine, silver birch, beech *Fagus sylvatica* and pedunculate oak. Ground flora species included primrose, red campion and dog's mercury. Extensive stands of Himalayan balsam were recorded along the banks of Shipperton Burn, which runs through the woodland, centred on OS grid reference NU 16986 21976.
9	Semi-natural broadleaved woodland with canopy including ash, sycamore, beech, horse chestnut *Castanea sativa*, alder *Alnus glutinosa* and silver birch with occasional Scots pine and larch. The understorey layer consisted of elm, elder and hawthorn. Ground flora was extensive in coverage and varied, including wood avens, dog's mercury, moschatel, herb-Robert, cleavers, common nettle, red campion, male fern *Dryopteris filix-mas*, broad buckler-fern, primrose, lesser celandine and bluebell. An old tarmac road, now mostly covered up with soil and mosses, ran directly along the eastern edge of the woodland. There were approximately 30-40 woodcrete bat boxes located on trees within the

Target Note	Description
	wood, some trees with several boxes. Extensive stands of Himalayan balsam were recorded along the banks of Shipperton Burn, which runs through the woodland, centred on OS grid reference NU 17101 21950.
10	Poor semi-improved grassland field dominated by false oat-grass, with lesser amounts of cock's-foot and some patches of rosebay willowherb. Other herbaceous species present included common sorrell *Rumex acetosa*, creeping thistle, common ragwort *Jacobaea vulgaris*, hogweed *Heracleum sphondyllium*, creeping buttercup, cleavers, common nettle and spear thistle *Cirsium vulgare*. The grassland had no field boundary (hedge or fence) but there was a sharp demarcation between the grassland and the arable field immediately to the west.
11	Mature trees in the garden of a property, including sycamore, ash and holly.
12	Narrow band of trees above a hawthorn hedge, with trees mostly sycamore, with some scattered elder and gorse.
13	Coniferous plantation dominated by western red cedar *Thuja plicata*. There were also some Scots pine and a few ash trees around the edges of the wood. The plantation floor was bare near the centre of the woodland but around the edges there were some vegetated patches including primrose and red campion. There was a large rookery in the woodland.
14	Pond with small vegetated island in the centre. Aquatic plant species present included yellow flag iris *pseudacorus*, marsh marigold *Caltha palustris* and brooklime *Veronica beccabunga*. Surveyed for GCN in 2018. Marshy grassland surrounding a pond. Dominated by reed canary-grass and soft rush.
15	Marshy grassland with frequent soft rush and tufted hair-grass
16	Heavily shaded watercourse due to bramble and gorse growth along edges, fenced either side. There was also small trees along the edge including sycamore, ash and hawthorn.
17	Recently planted sapling hedgerow species between gaps in an existing defunct hedge. Fenced either side of this area with gorse and hawthorn scrub to the south of the newly re-planted hedgeline.
18	Large, shallow waterbody spreading over improved grassland field. More of a flooded field than a pond. It still had terrestrial plant species growing on bottom with only a very small patch of aquatic plants (floating sweet-grass). Only 20-30 cm maximum depth. Large numbers of gulls use the

Target Note	Description
	area along with several small groups of lapwing, oystercatcher and mute swans.
19	Hedge and tree line comprising sycamore, ash, gorse, elder, hawthorn, rose and field maple *Acer campestre*.
20	Poor semi-improved grassland strip to the south and east of an arable field with post and wire fence boundary. Grassland was dominated by cock's-foot and false oat-grass with herbaceous associates including creeping thistle, cleavers, hogweed, bramble, common nettle, common field speedwell *Veronica arvensis*, red dead-nettle, white dead-nettle, lesser celandine, common sorrell, ox-eye daisy *Leucanthemum vulgare*, crosswort *Cruciata laevipes* and several patches of raspberry *Rubus idaeus*. There was a small group of newly-planted trees around the sharp bend in the adjacent watercourse including alder and willow *Salix* sp.
21	Watercourse and associated culvert running beneath A1. The watercourse was approximately 1.5 m wide and 10-20 cm deep, with the channel enclosed within steep earth banks. Submerged/emergent vegetation included marsh marigold and water starwort *Callitriche* sp. Watercourse continued across land to the west of the A1.
22	Amenity grassland forming a runway for a light aircraft which was stored undercover within this area.
23	Narrow band of trees along roadside verge, predominantly larch but with occasional sycamore, hawthorn and holly *Ilex aquifolium*.
24	Predominantly coniferous plantation woodland, with dominant Scots pine. To the south-west and north east of this section the woodland was mixed with sycamore, beech and silver birch also present. Towards the south-west the woodland became more open, with large clearings and wood piles present. Sunlight penetrated into the wood here and it appeared to constitute good reptile habitat.
25	N/A. Outside Phase 1 Survey Area.
26	Wet ditch approximately 1.5 m wide with a sluggish flow. Ditch sides were covered in grasses and lesser celandine.
27	Mixed plantation woodland with a large proportion of Scots pine present and smaller amounts of spruce. Deciduous species included sycamore and beech, with the ground dominated by bramble, raspberry and flowering currant *Ribes sanguineum*.

Target Note	Description
28	Post and wire fence along one side of track with mature trees including sycamore and ash, some with bat Potential Roosting Features (PRF).
29	Along the verge in this section there was a line of semi-mature sycamores with a gorse and hazel *Corylus avellana* understorey. No hedgerow, just a wooden post and wire fence.
30	Ruined building with large piles of rubble around the remaining sections of the building. Extensive patches of common nettle. There were some bat PRF within the remaining structure and potential reptile habitat amongst the rubble and adjacent tracks and SI grassland, although the site was quite isolated, being surrounded on three sides by arable fields.
31	Mixed plantation woodland including ash, pedunculate oak, spruce, sycamore cherry laurel *Prunus laurocerasus*, silver birch, beech and elder to the north. Ground flora included broad buckler-fern, male fern, red campion, cleavers and herb-Robert. Further south the woodland comprised coniferous plantation dominated by spruce.
32	Wide field margin around arable field to the west of mixed plantation woodland. Frequent grass species included cock's-foot, red fescue, Yorkshire-fog and common bent *Agrostis capillaris*, with scattered patches of tufted hair-grass. Herbaceous species included abundant hogweed, bracken, ribwort plantain and creeping thistle, with frequent bugloss *Anchusa arvensis* and occasional parsley-piert along the boundary of the arable field and poor semi-improved field margins. Cereal stubble remained within the arable field, at the time of the survey, with extensive bryophyte coverage of the bare ground in between.
33	Watercourse fenced either side with trees along banks including ash, sycamore and hawthorn.
34	Group of three semi-mature sycamores and three semi-mature ash.
35	Hawthorn and grey willow *Salix cinerea* scrub-shaded wet ditch enclosed by post and wire fence on both sides with a line of mature and semi-mature trees including beech, sycamore, ash and Scots pine.
36	Group of eight semi-mature sycamores.
37	Large mature ash tree with PRF.
38	Mixed plantation woodland, dominated by spruce, with a narrow band of ash trees along the western and southern boundaries. Scattered self-sown silver birch trees and saplings were growing between the rows of spruce. Occasional larch was present. Ground flora was very sparse

Target Note	Description
	beneath the spruce but nearer the edges includes wood sorrel *Oxalis acetosella*, common nettle, foxglove *Digitalis purpurea*, wood avens, marsh thistle *Cirsium palustre*, cleavers, broad buckler-fern, herb-Robert and honeysuckle *Lonicera periclymenum*. A woodcock *Scolopax rusticola* was flushed from this section of woodland.
39	Woodland within central area was mostly native deciduous trees including ash and sycamore but with occasional scattered larch trees. Ground flora included tufted hair-grass, foxglove, broad buckler-fern, scaly male-fern *Dryopteris affinis* and ivy which carpeted the ground and covered the trunks of many of the trees. There were frequent ash seedlings and saplings in this section.
40	To the east of the access track the woodland was heavily managed, with lots of trees felled to thin-out the woodland. There were several large, mature beech which had been retained in the managed section, with spruce and Scots pine dominating towards the eastern end of the plantation. Conifers at the eastern end were more mature than those at the western end. A watercourse ran through this section of woodland and was culverted beneath the road before re-appearing in improved grassland fields to the south of the road.
41	Very open section of watercourse within improved grassland. Fenced on western side only. Approximately 1 m wide with marginal soft rush and submerged brooklime.
42	Coniferous plantation comprising a narrow band of Scots pine with sparse ground flora including honeysuckle.
43	Marshy grassland dominated by soft rush.
44	This section of the watercourse was approximately 50 cm wide and 5-10 cm deep, with brooklime growing in the channel. Trees along the bank included hawthorn, holly, goat willow *Salix caprea* and silver birch.
45	N/A. Outside Phase 1 Survey Area.
46	Two lines of trees including pedunculate oak, ash and hawthorn. Presumably formed part of hedgerow field boundaries in the past but now consists of two lines of widely spaced individual trees.
47	Small copse with mixed age deciduous trees including ash, hawthorn, elder, sycamore, silver birch and alder with some ivy coverage. Ramsons dominated ground flora, also included primrose, cleavers, broad buckler-fern, common nettle and bracken.

Target Note	Description
48	N/A. Outside Phase 1 Survey Area.
49	Poor semi-improved grassland dominated by cock's-foot with frequent timothy. Three semi-improved grassland indicator species present.
50	Coniferous plantation comprising 80% larch with some pedunculate oak around the edges.
51	Pond at Heckley Fence Farm.
52	N/A. Outside Phase 1 Survey Area.
53	Tree line comprising mostly hawthorn with some large mature ash trees and smaller trees including field maple and elder. Some PRF in ash trees. All trees were surrounded by double wooden post and wire fence (CA 122).
54	Broad-leaved plantation woodland including small, immature ash, pedunculate oak, beech, sycamore and hawthorn. There was an earth mound within the middle of the plantation comprising an area of poor semi-improved grassland with species including common knapweed, common vetch, cock's-foot, creeping thistle, perennial rye-grass, common couch *Elymus repens* and hedge bedstraw.
55	Coniferous plantation woodland, predominantly Scots pine, with some ash and hawthorn along the northern edge. Ground layer consisted of broad buckler-fern, common nettle, bramble and elder seedlings/saplings. PRF within the ash trees.
56	Poor semi-improved grassland was cock's-foot dominated also including broad-leaved dock, red campion, wood avens and hedge bedstraw.
57	Defunct hawthorn hedge overtopped by a line of mature trees including ash, sycamore, pedunculate oak, hawthorn and holly. Large trees had PRF.
58	Broad-leaved plantation woodland comprising mostly pedunculate oak and ash saplings but with two mature beech trees at the northern end.
59	Remains of semi-natural broad-leaved woodland to the south, with a felled area immediately to the north. Included ash, horse chestnut, sycamore and beech. Some PRF (including dead wood and cavities) present within mature trees, suitable for bats.
60	N/A. Outside Phase 1 Survey Area.

Target Note	Description
61	N/A. Outside Phase 1 Survey Area.
62	N/A. Outside Phase 1 Survey Area.
63	N/A. Outside Phase 1 Survey Area.
64	Shallow-sided watercourse with scarce scrub along the banks. Approximately 1-2 m wide with frequent floating sweet-grass, brooklime and marginal soft rush.
65	Coniferous plantation woodland with some mature sycamores along boundary of woodland but predominantly consisting of Scots pine. There was a large rookery in sycamores in the southern part of the woodland.
66	Plantation woodland, approximately 80% broad-leaved species including sycamore, beech and ash with approximately 20% Scots pine. This section of woodland started on land to the south of the house garden and was contiguous with the garden of the property. The section within the garden included a predominantly non-native understorey comprising rhododendron *ponticum* and cherry laurel.
67	Watercourse (Denwick Burn) at this point was approximately 0.5 - 1 m wide and approximately 10-20 cm deep with a moderate flow. No macrophytes were present in channel. Bankside vegetation consisted of scattered small trees/scrub including alder, ash, hawthorn, grey willow and gorse.
68	Coniferous plantation woodland dominated by spruce. Very sparse ground-layer vegetation with mostly bare ground near centre but with some vegetated areas along the plantation edge including common nettle, tufted hair-grass and elder seedlings/saplings.
69	Coniferous plantation woodland dominated by Scots pine, with a line of mature ash trees along the southern boundary.
70	Line of three mature common lime trees *Tilia* x *europaea*.
71	Treeline of mature ash with a defunct hawthorn hedge below. PRF in ash trees including rot holes and splits.
72	Scots pine plantation with an understorey of silver birch, sycamore, hawthorn, elder and pedunculate oak. Ground layer included common nettle, bramble, red campion, male fern, wood-avens and cleavers.
73	Marshy grassland with dominant soft rush (CA 74). Also present were broad-leaved dock, hogweed, common nettle, cow-parsley and some

Target Note	Description
	scattered gorse scrub. To the south of the area there was a large patch of great willowherb *Epilobium hirsutum*.
74	Watercourse approximately 20-30 cm deep and 1.5 m wide. No submerged macrophytes were present within channel. Both sides of the ditch were lined with small trees including hawthorn and sycamore.
75	Dense continuous scrub comprising small immature trees (under 5m tall) including pedunculate oak, grey willow and elder, with several mature ash trees within the scrub patch.
76	Large mature scattered trees over improved grassland consisting mostly of Scots pine with several ash trees present.
77	Recently created deciduous plantation woodland including pedunculate oak, beech, ash, hazel and rose. Ground layer included abundant patches of common nettle.
78	Previously marked as semi-improved grassland but remains of arable crop were present (brassica stalks).
79	Tree line including ash and sycamore. (CA 30).
80	N/A. Outside Phase 1 Survey Area.
81	N/A. Outside Phase 1 Survey Area.
82	N/A. Outside Phase 1 Survey Area.
83	N/A. Outside Phase 1 Survey Area.
84	Highway verge consisting of a mosaic of habitats including poor semi-improved grassland, scrub (gorse, bramble, broom *Cytisus scoparius* and hawthorn), trees (ash, beech and sycamore) and tall ruderal vegetation.
85	Narrow band of Scots pine along roadside verge.
86	More open section of Denwick Burn, without trees. Approximately 1-1.5 m wide and 10-20 cm deep. Steeply sloping banks with emergent vegetation dominated by great willowherb.
87	Denwick Burn with line of trees along watercourse including Scots pine, hawthorn, ash, sycamore, crack willow *Salix fragilis* and pedunculate oak. Some PRF (including dead wood and cavities) present within mature trees, suitable for bats.

Target Note	Description
88	N/A. Outside Phase 1 Survey Area.
89	N/A. Outside Phase 1 Survey Area.
90	N/A. Outside Phase 1 Survey Area.
91	Wet ditch emerging from culvert at the end of a hedgeline (CA 45), with mature trees along the northern bank, mostly pedunculate oak with some holly (CA 46). At the eastern end of the ditch there was a newly planted hedgerow along the northern bank, predominantly hawthorn with a small amount of blackthorn. The wet ditch around this point was not shaded by trees and scrub and contained brooklime within the channel.
92	N/A. Outside Phase 1 Survey Area.
93	Poor semi-improved grassland. Very disturbed in the middle, with abundant chickweed *Stellaria media*. Also present were perennial rye-grass, annual meadow-grass, common mouse-ear, spear thistle, daisy *Bellis perennis*, dandelion *Taraxacum officinale* agg., dove's-foot cranesbill *Geranium molle* and shepherd's purse *Capsella bursa-pastoris*.
94	Coniferous plantation woodland including spruce and Douglas fir. Ground layer was very sparse due to dense shading and needle coverage but around the edges, in more open areas, there were small amounts of male fern, broad buckler-fern, lesser celandine, red campion, elder, common nettle, wood anemone *nemorosa*, wood speedwell *Veronica montana*, opposite-leaved golden saxifrage *Chrysosplenium oppositifolium*, ramsons and primrose.
95	Small section of semi-natural broad-leaved woodland dominated by ash with lesser amounts of sycamore and beech. Ground flora was of a similar species composition to that listed for Target Note 94 but coverage was far more extensive throughout this section. Large areas were dominated by ramsons and the mosses *Thamnobryum alopecurum* and *Eurhynchium striatum* were frequent.
96	Cawledge Burn runs through the broad-leaved section of woodland. At this point it was approximately 3 m wide and up to 1 m deep. There were frequent boulders and cobbles within the channel and it appeared suitable for otter and white-clawed crayfish.
97	Extensive patches of gorse scrub, immediately to the west of the woodland. The gorse was also scattered over poor semi-improved

Target Note	Description
	grassland which sloped uphill from the woodland. Also, some bramble and hawthorn scattered over the grassland.
98	Poor semi-improved grassland covering slopes leading down to Cawledge Burn. Mostly false oat-grass, Yorkshire-fog and cock's-foot with frequent creeping thistle. Also, some common knapweed and tufted hairgrass. The habitat was adjacent to woodland along Cawledge Burn with very good connectivity along the woodland edge to other rough grassland so it did have potential for reptiles.
99	Recently excavated waterbody, with drains at either end. The sides were steep and grass-covered. The waterbody was surrounded by a border of amenity grassland which extended north-west along the boundary fence of a newly constructed development complex.
100	Large area of ephemeral/short perennial vegetation on recently disturbed ground, with frequent bare ground but scattered vegetation including annual meadow-grass, thyme-leaved speedwell *Veronica serpyllifolia*, sticky groundsel, red dead-nettle, parsley-piert and scarlet pimpernel.
101	New development comprising a fenced compound surrounding a concrete base with several steel framed, metal clad buildings.
102	Recently disturbed ground with no vegetation growth at the time of the survey.

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