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9 ECOLOGY AND NATURE CONSERVATION

9.1 INTRODUCTION

9.1.1. This chapter reports the outcome of the assessment of likely significant effects arising from the Scheme upon Ecology and Nature Conservation.

9.1.2. The remainder of the chapter describes the assessment methodology and the baseline conditions relevant to the assessment, which have been used to reach these conclusions, as well as a summary of the likely significant effects leading to the secondary mitigation measures required to avoid, prevent, reduce or, if possible, offset any likely significant adverse effects, and the likely residual effects and any required monitoring after these measures have been employed.

9.1.3. This chapter (and its associated figures and appendices) is intended to be read as part of the wider ES, including introductory chapters (**Chapters 1 - 5**) and with particular reference to **Chapters 6 Air Quality, Chapter 10 Landscape and Visual, Chapter 14 – Cumulative Effects** as well as the Habitats Regulations Assessment (HRA) Stage 1 - Habitats Regulations Screening Assessment (HRSA) (**Appendix 9.9**), Biodiversity Net Gain assessment (**Appendix 9.10)** and Arboricultural Report (**Appendix 3.4**).

9.2 LEGISLATIVE FRAMEWORK, POLICY AND GUIDANCE

LEGISLATIVE FRAMEWORK

9.2.1. The applicable legislative framework is summarised in **Table 9-1** below.

Table 9-1 – Ecology: Summary of Legislation

Legislation	Summary
The Conservation of Habitats and Species Regulations 2017 (as amended) (Ref. 9.1).	The Conservation of Habitats and Species Regulations (Habitats Regulations) came into force on 30 November 2017 and extend to England and Wales (including the adjacent territorial sea). These Regulations provide for the designation and protection of 'European sites', the protection of 'European protected species', and the adaptation of planning and other controls for the protection of European Sites.
The Wildlife and Countryside Act 1981 (as amended) (WCA) (Ref. 9.2)	The Wildlife and Countryside Act 1981 is the primary legislation in Great Britain for the protection of flora, fauna and the countryside. It covers four key areas; ▪ Wildlife protection, including protection of wild birds, their eggs and nests. ▪ Protection of other animal and protection of plants. Nature Conservation, Countryside and National Parks, Public Rights of Way.
Countryside Rights of Way Act 2000 (Ref. 9.3)	The Countryside and Rights of Way Act 2000 places a duty on Government Departments to have regard for the conservation of biodiversity and maintain lists of species and habitats for which conservation steps should be taken or promoted, in accordance with the Convention on Biological Diversity.

Legislation	Summary
The Protection of Badgers Act 1992 (Ref. 9.4)	The Protection of Badgers Act 1992 applies to England and Wales making it an offence to kill, injure or take a badger, or to damage or interfere with a sett unless a license is obtained from a statutory authority allowing the badgers to be carefully excluded, making them move elsewhere in their territory. Badgers are protected and so are the setts (burrows) they live in.
The Natural Environment and Rural Communities (NERC) Act 2006 (England) (Ref. 9.5)	The Natural Environment and Rural Communities Act 2006 established Natural England by merging English Nature, the Rural Development Agency and the Countryside Agency. The Act makes provision in respect of biodiversity, pesticides harmful to wildlife and the protection of birds, and in respect of invasive non-native species. Section 40 of the Act imposes a biodiversity duty on public bodies to have regard to the purpose of conserving biodiversity. Under Section 41 of the Act the Secretary of State must publish a list of habitats and species of principal importance for the purpose of conserving biodiversity.
The Hedgerow Regulations 1997 (Ref. 9.6)	The Hedgerow Regulations 1997 protect important hedgerows in England and Wales. These Regulations cover hedgerows that have a continuous length of at least 20m, or if less than 20m, meets another hedgerow at each end. These Regulations also cover hedgerows that grow in, or adjacent to any common land, local nature reserve, Site of Special Scientific Interest, or land used for agriculture, forestry of the breeding or keeping of horses, ponies or donkeys. Anyone proposing to remove a hedgerow, or part of a hedgerow, covered by these regulations, must first notify the local planning authority by submitting a Hedgerow Removal Notice.

POLICY

9.2.2. The applicable policy framework is summarised in **Table 9-2** below.

Table 9-2 – Ecology: Summary of Policy

Policy	Summary
The National Planning Policy Framework (NPPF) 2019 (Ministry of Housing Communities & Local Government, February 2019) (Ref. 9.7)	The National Planning Policy Framework highlights that the planning system should contribute to and enhance the natural and local environment by minimising impacts on biodiversity and providing net gains in biodiversity, including by establishing coherent ecological networks that are more resilient to current and future pressures.
Adoption Arun Local Plan 2011-2031 (Ref. 9.8)	The Arun Local Plan covers the period of 2011-2031 for the area of Arun District (excluding the area covered by the South Downs National Park Authority) and was adopted on the 18th July 2018. Relevant Core Strategy policies include: ▪ Policy ENV SP1 Natural Environment. ▪ Policy ENV DM1 Designated Sites of biodiversity (or geological) importance.

Policy	Summary
	▪ Policy ENV DM3 Biodiversity Opportunity Areas. ▪ Policy ENV DM4 Protection of trees. ▪ Policy ENV DM5 Development and biodiversity.

GUIDANCE

9.2.3. This chapter has been prepared in accordance with guidance set out with the Chartered Institute of Ecology and Environmental Management (CIEEM) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal (Ref 9.9).

9.3 CONSULTATION, SCOPE, METHODOLOGY AND SIGNIFICANCE CRITERIA

CONSULTATION UNDERTAKEN TO DATE

9.3.1. **Table 9-3** provides a summary of the consultation activities undertaken in support of the preparation of this chapter.

Table 9-3 – Ecology and Biodiversity: Summary of Consultation Undertaken

Body / organisation	Individual / stat body / organisation	Meeting dates and other forms of consultation	Summary of outcome of discussions
Natural England	Nicky Britton-Williams	2nd March 2020, meeting at WSCC. Subsequent written advice provided on 11th March 2020	Advice was sought via Natural England's discretionary advice service (DAS) regarding the required badger mitigation for the Scheme. It was confirmed by Natural England that an artificial sett will be required as a replacement for the main badger sett to be lost. The location of the artificial badger sett was agreed.
WSCC	Graham Roberts, County Ecologist	18th April 2019, written response to EIA scoping report.	There is no ecological objection to the EIA progressing as proposed subject to consideration of potential impacts on harvest mice.

SCOPE OF THE ASSESSMENT

9.3.2. The scope of this chapter has been established through a scoping process. Further information can be found in **Chapter 5: Approach to EIA**.

9.3.3. This section provides an update to the scope of the assessment and re-iterates the evidence base for scoping out elements of the topic following further assessment.

9.3.4. The EIA scoping opinion received from West Sussex County Council supported the progression of the EIA, subject to consideration of potential impacts on harvest mice.

ELEMENTS SCOPED OUT OF THE ASSESSMENT

9.3.5. The elements shown in **Table 9-4** are not considered to give rise to likely significant effects as a result of the Scheme and have therefore not been considered within the ES.

Table 9-4 - Elements Scoped Out of the Assessment

Element scoped out	Justification
Internationally designed sites	
Pagham Harbour Ramsar	A Habitats Regulations Screening Assessment (HRSA) was undertaken to establish if the Scheme will have a likely significant effect (LSE) upon all five European or international sites (Appendix 9.9). The HRSA concluded that there will be no LSEs on the five designated sites. Additionally, as set out in **Chapter 6 – Air Quality,** air quality impacts at designated habitat sites (construction and operational) have been scoped out of the assessment.
Pagham Harbour Special Protection Area (SPA)	
Ducton to Bignor Escarpment Special Area of Conservation (SAC)	
Chichester to Langstone Harbours Ramsar	
Solent and Dorset Coast SPA	
European Designated Sites designated for bats: Singleton and Cocking Tunnels SAC, The Mens SAC and Ebernoe Common SAC.	All three SAC's are considered unlikely to be affected due to the lack of potential significant effect pathways.
UK statutory designated sites	The South Downs National Park lies 1.4km north-west of the Scheme, but is considered sufficiently distant to be adversely affected by the construction or operation phase.
UK non-statutory designated sites	Fontwell Park Racecourse LNR and Slindon Bottom LNR are located 0.4km and 1.3km north of the Scheme respectively. Neither site is likely to be adversely affected by the construction or operation phase of the Scheme as Slindon Bottom is sufficiently distant from the Scheme, beyond existing housing, and Fontwell Racecourse's habitats are enclosed within the race track and its surrounding buildings and access tracks.
Notable Road Verge (NRV)	Two NRV's are located within 2km of the Scheme; Barnham Road at Eastergate (0.4km south) and Brittens Lane (1.4km north east). Both these NRV's already tolerate high disturbance from their adjacent roads and therefore will not be

Element scoped out	Justification
	adversely affect during the construction or operational phase of the Scheme.
Ancient woodland	The closest parcel of ancient woodland is located 0.8km north of the Scheme. As parcels of ancient woodland are sufficiently distant from the Scheme they will not be adversely affected during the construction or operational phase of the Scheme.
Veteran trees	Four veteran, or potential veteran trees were identified during the arboricultural survey. During the detailed design stage, the road alignment was adjusted where necessary, to ensure these trees could be retained and protected as part of the Scheme, as detailed in the Arboricultural Report (Appendix 3-4).
Habitats (on-site) excluding HPI e.g hedgerows and traditional orchard	With the exception of HPI, the habitats within the Scheme are dominated by semi-improved neutral grassland, with scrub, amenity grassland, buildings and arable also present. Whilst these habitats will provide some ecological value to protected species, they are considered to be of less than local conservation value and will therefore be scoped out of the ES. Habitats present within the Scheme that are considered to qualify as HPI will remain scoped-in. It should be noted that a BNG Assessment (Appendix 9.10) has been undertaken which takes into account the loss and gain of all habitat types within the Scheme and has influenced the landscape design, in addition to the EIA mitigation requirements.
Hazel dormouse	Surveys confirmed the likely absence of this species and therefore will be scoped out of this assessment.
Great crested newt	Surveys confirmed the likely absence of this species and therefore will be scoped out of this assessment.

ELEMENTS SCOPED INTO THE ASSESSMENT

Construction Phase

9.3.6. The following elements are considered to have the potential to give rise to likely significant effects during construction of the Scheme and have therefore been considered within the ES:

- Permanent and temporary land-take within the footprint of the Scheme;
- Permanent manipulation of habitats such as landscaping;
- Temporary storage of construction materials within / adjacent to ecological resources with associated habitat contamination and compaction;
- Habitat loss and fragmentation disrupting connectivity, species movement and dispersal, causing expenditure of extra energy and genetic isolation;
- Direct injury/mortality during site clearance and construction;
- Disturbance from construction activities including visual, noise, vibration and lighting;

- Degradation through airborne pollution; and
- Pollution caused by use of hazardous materials and incidental release of dust, chemicals, fuels or waste materials.

Operation Phase

9.3.7. The following elements are considered to have the potential to give rise to likely significant effects during operation of the Scheme and have therefore been considered within the ES:

- Direct mortality during operational use;
- Displacement, species loss and isolation;
- Habitat fragmentation disrupting connectivity, species movement and dispersal, causing expenditure of extra energy and genetic isolation;
- Direct disturbance from operational use visual, noise, vibration and lighting; and
- Degradation through airborne and waterborne pollution.

EXTENT OF THE STUDY AREA

9.3.8. At the outset of the project, baseline survey coverage included the indicative Scheme alignment, with a 250m buffer. This has been refined as the design has progressed, with the extent of the study area varying depending upon the type of survey. In all instances, surveys have incorporated all areas within the red line boundary, which includes the footprint of the Scheme, lighting requirements and all landscaping.

9.3.9. Larger study areas were utilised to search for features such as designated sites and notable habitats during the desk study.

METHOD OF BASELINE DATA COLLATION

DESK STUDY

9.3.10. An ecological desk study was completed in 2018, and updated in 2020, for the purposes of this assessment. (**Appendix 9-1**) The desk study collated and reviewed existing information available in the public domain and information held by relevant third parties. The desk study focused primarily on obtaining records of legally protected species and habitats, species and habitats of conservation concern, and habitat designated for its nature conservation value.

9.3.11. **Table 9-5** sets out the following search radii from the Scheme that were used for desk study records.

Table 9-5 – Search Area and data sources for Potential Ecological Features

Potential Ecological Feature	Search Area from Scheme	Data source
Designated Sites and Habitats		
European Designated Sites (Special Area of Conservation (SAC) designated for bats	30km	Natural England corporate datasets, citations and data held by the Joint Nature Conservation Committee (JNCC).
European Designated Sites SAC, Special Protection Area (SPA) and Ramsar sites).	10km	Natural England corporate datasets, citations and data held by the Joint

Potential Ecological Feature	Search Area from Scheme	Data source
		Nature Conservation Committee (JNCC).
UK statutory Designated Sites (Sites of Special Scientific Interest (SSSI), National Nature Reserves (NNR) and Local Nature Reserves (LNR)).	2km	Natural England corporate datasets, citations and data held by the JNCC.
Non-statutory Designated Sites (Local Wildlife Sites (LWS)).	2km	Sussex Biological Records Centre.
Ancient Woodland	2km	Natural England corporate datasets.
Habitats of Principal Importance (HPI)	2km	Natural England corporate datasets.
Species		
Protected and notable species records	2km	Sussex Biological Records Centre.
Bat records	5km	Sussex Biological Records Centre.

PROTECTED SPECIES SURVEYS

9.3.12. A summary of the ecological surveys and associated study areas undertaken to inform this assessment is provided below, with further detail provided in **Appendix 9.1**. Detailed information including survey conditions, surveyors, methodologies and limitations is included in the dedicated reports (**Appendices 9.1 - 9.8**).

Table 9-6 – Search Area and data sources for Potential Ecological Features

Survey type	Survey Area	Date of survey	Relevant guidance / methodology	Relevant Appendix / Reference
Extended Phase 1 habitat survey	250m buffer of the Site	July 2018	CIEEM, (2017a and 2017b) (Ref 9.10 – 9.11) JNCC, (2010) (Ref 9.12) British Standards Institute, (2013) (Ref 9.13)	Appendix 9-1
Bat	Survey dependent. Up to 30m buffer from the Site.	April-October 2019	Collins (ed.), (2016) (Ref 9.14)	Appendix 9-2
Badger	Bespoke survey area, covering large areas of land connected to the Site (where	April 2019 September/October 2019	Harris et al. (1989) (Ref 9.15) Roper, (2010) (Ref 9.16)	Appendix 9-3 (Restricted)

Survey type	Survey Area	Date of survey	Relevant guidance / methodology	Relevant Appendix / Reference
	access is possible).		Delahay et al. (2000) (Ref 9.17)	
Hazel dormouse	Up to a 50m buffer from the Site	April-September 2019	English Nature, (2006) (Ref 9.18)	Appendix 9-4
Breeding bird	Up to 250m buffer from the Site	March – June 2019	Bibby et al. (2000) (Ref 9.19)	Appendix 9-5
Wintering bird	Up to 250m buffer from the Site	November 2018-Februsry 2019	Bibby et al. (2000) (Ref 9.20)	Appendix 9-6
Reptile	Site	April-July 2019	Gent, A and Gibson, S. (1998). (Ref 9.21) Froglife (1999) (Ref 9.22)	Appendix 9-7
Great crested newt	500m buffer of the Site	April 2019	ARG UK (2010) (Ref 9.23) Oldham et al. (2000) (Ref 9.24) Freshwater Habitats Trust. (2015) (Ref 9.24) Biggs et al. (2014) (Ref 9.25)	Appendix 9-8
Invertebrate	Site	May-August 2019	Drake et al. (2007) (Ref 9.26)	Hopkins Ecology, 2019

OTHER STUDIES

9.3.13. In addition to the above surveys, a Biodiversity Net Gain (BNG) assessment was undertaken of the Scheme to inform and quantify the change in biodiversity value of the Scheme before and after development. This assessment has captured scoped-out habitats present within the Scheme, and the landscaping plan is the result of the EIA mitigation requirements and the BNG requirements which aims for a 10% gain in both area based and linear based habitats. The final BNG assessment reported a significant net gain in area based habitats (+44%), and as a result of updates to the landscape plan a +10% BNG for linear habitat has now been achieved through the inclusion of an extra 52m of hedgerow planting. ~~but only resulted in no net loss of linear habitat (+3%) and as such the Scheme itself does not achieve overall BNG. It has been recommended however that a further 50m of hedgerow planting would achieve a 10% BNG in linear habitats and therefore, if this can be incorporated into the detailed landscape design, the Scheme overall would achieve BNG providing the habitats are appropriately managed.~~ The BNG calculation was based on the Phase 1 habitat survey data collected, the final landscape proposals (see **Appendix 3.3**) and uses the Natural England 2.0 Biodiversity Net Gain metric for calculations (Ref 9.27 and 9.28). Further details on the methodology are included at **Appendix 9.10**.

ASSESSMENT METHODOLOGY

9.3.14. The assessment of significant effects has been undertaken in line with CIEEM Ecological Impact Assessment (EcIA) guidelines (Ref 9.9).

9.3.15. In order to assess the potential significance of effects resulting from the Scheme, the value of important ecological features is first determined with reference to a defined geographical scale (recommended in good practice (Ref. 9.9), and extended to include the Scheme**:**

- International (i.e. Europe);
- National (i.e. the UK);
- Regional (i.e. South-East England);
- County (i.e. West Sussex);
- District (i.e. Arun District);
- Local (i.e. Chichester); and
- Site (i.e. within the Scheme Boundary).

9.3.16. In addition, to distinguish between habitats and species that are of value and/or relevance at the Site scale and those that have negligible value at any scale (i.e. of conservation value at a scale below Site), the latter have been assigned to be of negligible value.

9.3.17. A number of characteristics are considered to contribute to the importance of ecological features, including for example (but not exclusively) the rarity of a species or habitat, habitat diversity, whether the species population size is notable in a wider context, rich assemblages of plants and animals and species on the edge of their range, particularly where their distribution is changing as a result of global trends and climate change.

SIGNIFICANCE CRITERIA

9.3.18. The significance level attributed to each effect has been assessed based on the sensitivity/value of the affected receptor(s) and the magnitude of change arising from the Scheme, as well as a number of other factors that are outlined in more detail in **Chapter 5: Approach to EIA**. The sensitivity of the affected receptor is assessed on a scale of very high, high, medium, low and negligible, and the magnitude of change is assessed on a scale of major, moderate, minor, negligible and no change, as set out in **Chapter 5: Approach to EIA**. Magnitude refers to the 'size' or 'amount' of an effect determined on a quantitative basis e.g. total or partial.

9.3.19. For the purposes of this assessment, the assigned sensitivity of each receptor was determined in accordance with the assigned value at the geographic scale as described in 9.3.15. In particular, the following criteria were used when determining sensitivity:

- Receptors of International or National value were considered to be of High sensitivity;
- Receptors of Regional or County value were considered to be of Medium sensitivity;
- Receptors of District or Local value were considered to be of Low sensitivity; and
- Receptors of Site or less-than-Site value were considered to be of Negligible sensitivity.

EFFECT SIGNIFICANCE

9.3.20. The following terms have been used to define the significance of the effects identified and apply to both beneficial and adverse effects and are based on good practice guidelines (Ref 9.9) and professional judgement:

- **Major effect**: where the Scheme could be expected to have a substantial improvement or deterioration on receptors;
- **Moderate effect**: where the Scheme could be expected to have a noticeable improvement or deterioration on receptors;
- **Minor effect**: where the Scheme could be expected to result in a perceptible improvement or deterioration on receptors; and
- **Negligible**: where no discernible improvement or deterioration is expected as a result of the Scheme on receptors, including instances where no change is confirmed.

9.3.21. Effects that are classified as **minor or above** are considered to be **significant**. Effects classified as below minor are considered to be **not significant**.

9.4 BASELINE CONDITIONS

9.4.1. A summary of the baseline conditions identified during the desk study and Phase 1 habitat survey is outlined below. Full details are provided within the PEA report in **Appendix 9.1**.

Site Description

The Scheme is located within a semi-rural location. The northern areas contain a mixture of woody habitats including traditional orchard, woodland and scrub, with a small residential plot, whilst the centre and south feature predominantly semi-improved grassland and industrial buildings associated with a plant nursery.

Notable habitats

9.4.2. As shown on **Figure 6** in **Appendix 9.1**, the following HPI are present within 2km of the Site:

- Coastal and floodplain grazing marsh – two parcels;
- Lowland meadows – two parcels;
- Lowland fens – one parcel;
- Deciduous woodland – 79 parcels; and
- Traditional orchard – 12 parcels, some of which fall within the Scheme itself[1].

9.4.3. Within the Site itself, there are a number of habitats that qualify as HPI, including:

- Three species-poor hedgerows, which from an ecological perspective are considered unlikely to meet the criteria for important hedgerows[2]; and
- One parcel of plantation broadleaved woodland that is likely to qualify as traditional orchard HPI.

9.4.4. Given the widespread nature of hedgerow HPI within the local area, it is considered to be of value at up to Local conservation value. Within the local area, traditional orchard occurs less frequently, with

[1] although the desk study shows several parcels of traditional orchard HPI falling within the Scheme, the Phase 1 habitat survey confirmed only one parcel present within the Scheme itself.

[2] Chapter 13 – Archaeology and Heritage confirms via consultation with the County Archaeologist that none of the hedgerows on the Site were considered to be historic hedgerows.

areas previously identified as traditional orchard HPI becoming scrubbed over such that they no longer meet the criteria for HPI. As such, traditional orchard is considered to be of up to District conservation value.

Protected and Notable Species

9.4.1. The following information set out in **Table 9-7** regarding protected and notable species is summarised from the protected species surveys that were undertaken (**Appendices 9-1 – 9-8**), unless stated otherwise.

Table 9-7 – Protected and Notable Species identified within the Site.

Ecological feature	Baseline summary	Valuation
Bats – roosting	The PBRA identified a number of buildings / trees with the potential to support roosting bats: ■ Three buildings with bat roosting potential, including one with low potential (B2) and two with moderate (B5 and B7). ■ Forty-four trees with bat roosting potential, including eight with low potential (T5, T7, T11-12, T14, T29, T31 and T43), 26 with moderate potential (T1, T4, T6, T8-10, T13, T15-16, T18, T21, T23-24, T27-28, T20, T32-33, T35-40, T42, T44), nine with high potential (T2, T17, T19, T20, T22, T25-26, T34, T41) and one confirmed bat roost (T3) (via the presence of droppings). For the buildings, subsequent dusk emergence and dawn re-entry surveys were undertaken. During which, B5 was confirmed as a roost for soprano pipistrelle *Pipistrellus pygmaeus* and serotine *Eptesicus serotinus.* The likely absence of roosting bats was confirmed at buildings B2 and B7. For trees with moderate or high potential, at-height inspections were conducted, during which five trees were assessed as negligible (T3[3], T15, T16, T33 and T41), eight trees with low potential (T1, T6, T9, T13, T27, T32, T36 and T42), 18 trees with moderate potential (T2, T4, T8, T10, T18-19, T21-26, T30, T35, T37-38 and T40) and one confirmed roost (T20) (via the presence of droppings). One tree, T44 could not be climbed due to health and safety reasons. Instead, this tree was subject to a dusk emergence and dawn re-entry survey. The likely absence of roosting bats was confirmed during this survey. Overall, the Site is regarded to be conservation importance at up to a Local level for roosting bats.	Up to Local

[3] T3 was confirmed as a roost during the PBRA survey but was subsequently downgraded to negligible during the at-height surveys. This is due to branch damage that was sustained between the PBRA and at-height survey, exposing the features where the droppings had previously been recorded, and no longer provided the same protection and shelter for bats.

Ecological feature	Baseline summary	Valuation
Bats – foraging and commuting	Habitats within the Site include orchard, semi-improved neutral grassland, scrub and hedgerows. Bat activity surveys focussed on linear features within the Site, such as hedgerows, with four static detectors deployed monthly between April and October. At least eight species of bat were recorded, however common and soprano pipistrelle *Pipistrellus pipistrellus and Pipistrellus pygmaeus* which are widespread and common bat species[4][5] accounted for over 75% of all bat activity recorded. Ecobat analysis revealed these were the only two species that recorded high activity levels. The remaining recordings were made by a range of species, including the rarer greater horseshoe bat *Rhinolophus ferrumequinum,* Barbastelle bat *Barbastella barbastellus* and Leisler's bat *Nyctalus leisleri.* Other species recorded included noctule *Nyctalus noctule,* serotine *Eptesicus serotinus* and Nathusius' pipistrelle *Pipistrellus nathusii.* other genus, that could not be identified to species level included *Plecotus* sp. and *Myotis* sp. Location 3 alongside a row of hornbeam trees recorded the highest activity levels, with Location 2, alongside the footpath that bisects the Site considered to be important for Barbastelle bats. Overall, the Site is regarded to be of conservation importance at up to a District level for its assemblage of bats.	Up to District
Badger *Meles meles*	A badger survey, undertaken in April 2019, identified a number of setts within the Site and surrounding area, including a main sett located within the alignment of the Scheme. A second potential main sett was subsequently identified though an extension of the survey area. A badger bait marking survey was undertaken in September / October 2019 to identify whether multiple clans were present within the area. The results of the surveys identified one badger clan residing within the Badger Bait Marking Survey Area. At the time of the survey, this clan had three very active setts (Sett 1-3) likely comprising a main, annex and subsidiary. Several outlier setts were also identified within the Site. Badgers are widespread within Sussex and southern England and are afforded legal protection for reasons of animal cruelty, not rarity. However, given the presence of a main, annex, subsidiary and outlier setts, the Site and surrounding area is considered to be of Local importance for badgers.	Local

[4] Bat Conservation Trust (2017a). National Bat Monitoring Programme Population Trends | The state of the UK's bats 2017.
[5] Bat Conservation Trust (2017b). National Bat Monitoring | Annual report 2017.

Ecological feature	Baseline summary	Valuation
Birds – wintering	A total of 40 species were recorded during the wintering bird surveys, of these 16[6] receive additional legal protection, including: ■ three Wildlife and Countryside Act Schedule 1 species; ■ eight Species of Principal Importance (SPI) listed under the Natural Environment and Rural Communities (NERC) Act 2006; ■ eight Birds of Conservation Concern (BoCC) red list species; and ■ seven BoCC amber species. No SPA qualifying species / assemblages (gulls) were recorded foraging in significant numbers, as such the wintering bird assemblage is considered to be of Local conservation importance.	Local
Birds – breeding	A total of 44 species were recorded during the breeding bird surveys, of these, 15[7] receive additional legal protection including: ■ three Wildlife and Countryside Act Schedule 1 species; ■ eight Species of Principal Importance (SPI) listed under the Natural Environment and Rural Communities (NERC) Act 2006; ■ six Birds of Conservation Concern (BoCC) red list species; and ■ seven BoCC amber species. No specific barn owl surveys have been undertaken; however, a barn owl was recorded incidentally during a bat survey foraging within the Site and therefore may have a breeding site locally. Given the species records and the habitats present, the breeding bird community within the Site is considered to be of District conservation importance.	District
Reptiles	The reptile survey confirmed the presence of two reptile species within the Site; slow worm *Anguis fragilis* and common lizard *Zootoca vivipara,* with low populations of both species present. Additionally, records of grass snake *Natrix helvetica* were returned in the desk study as present within 150m of the Site. Due to the close proximity of these records and also the suitability of the habitats on Site, it is considered that a low population of grass snake may also be present. Overall, the population of reptiles within the Survey Area is considered to be of importance at a Local level. This is because of widespread habitat within the local area and the low population size recorded of a relatively widespread species within West Sussex.	Local
Invertebrates	Due to the presence of orchard habitat within the Site, invertebrate surveys were undertaken, with a particular focus on noble chafer	Up to Local

[6] It should be noted that these categories are not exclusive, and a species can be listed in more than one conservation category (for example listed as both a SPI and BoCC red list species).

[7] It should be noted that these categories are not exclusive, and a species can be listed in more than one conservation category (for example listed as both a SPI and BoCC red list species).

Ecological feature	Baseline summary	Valuation
	Gnorimus nobilis found in traditional orchards. During the surveys, noble chafer was not identified so their likely absence from the Site is assumed. The surveys recorded six species of conservation concern including: ■ three nationally scarce species (an ant *Lasius brunneus,* longhorn beetle *Prionus coriarius* and flower beetle *Mordellistena humeralis*); ■ three SPI (small heath butterfly *Coenonympha pamphilus*, ghost moth *Hepialus humuli* and cinnabar moth *Tyria jacobaea*). Additionally, stag beetle *Lucanus cervus,* a SPI which are of high conservation concern, and also protected under the Wildlife and Countryside Act (1981, as amended) were recorded incidentally on Site, with suitable habitat present, and are considered of importance at up to a Local level.	
Other Species of Principal Importance (SPI)	As detailed in the PEA (Appendix 9.1), records of other SPI were returned in the desk study, including hedgehog *Erinaceus europaeus* and polecat *Mustela putorius*, with suitable habitat for these species present within the Scheme. Further, although not identified within desk study records, the open grassland habitat has the potential to support brown hare *Lepus europaeus* and areas of hedgerow and unmanaged grassland have the potential to support harvest mice *Micromys minutus.* SPI are considered of importance at up to a Local level.	Up to Local

FUTURE BASELINE

9.4.2. No change in land use or management is anticipated prior to clearance for construction of the Scheme. As such, the future baseline is considered likely to be closely similar to that of the current baseline. Habitats immediately adjacent to the Site (offsite habitats) will likely be subject to change, given that the land immediately to the south of the Scheme is within the Arun Local Plan 2011-2031 and has been allocated for residential development (Phase 2).

9.5 SENSITIVE RECEPTORS

9.5.1. **Table 9-8** below lists the sensitive ecological receptors identified during the baseline assessment.

Table 9-8 – Sensitive receptors and potential pathways of effect

Sensitive Receptor	Nature Conservation Value	Potential pathways of Effect
On-site HPI (Hedgerows)	Local	**Construction Phase** ■ Permanent and temporary land-take within the Scheme footprint. ■ Permanent manipulation of habitats, such as landscaping and 'tidying-up' of areas not within the footprint, felling of trees for Health and Safety reasons. ■ Temporary storage of construction materials within / adjacent to ecological resources with associated habitat contamination and compaction. ■ Degradation through airborne pollution.

Sensitive Receptor	Nature Conservation Value	Potential pathways of Effect
		▪ Pollution caused by use of hazardous materials and incidental release of dust, chemicals, fuels or waste materials. **Operation Phase** ▪ Degradation through airborne pollution.
On-site HPI (Traditional Orchard)	District	**Construction Phase** ▪ Permanent and temporary land-take within the Scheme footprint. ▪ Permanent manipulation of habitats, such as landscaping and 'tidying-up' of areas not within the footprint, felling of trees for Health and Safety reasons. ▪ Temporary storage of construction materials within / adjacent to ecological resources with associated habitat contamination and compaction. ▪ Degradation through airborne pollution. ▪ Pollution caused by use of hazardous materials and incidental release of dust, chemicals, fuels or waste materials. **Operation Phase** ▪ Degradation through airborne pollution.
Bats – roosting	Local	**Construction Phase** ▪ Habitat loss and fragmentation. ▪ Direct mortality during site clearance and construction. ▪ Disturbance from construction activities including visual, noise, vibration and lighting. **Operation Phase** ▪ Direct injury/mortality during operation. ▪ Direct disturbance from operational use, visual, noise, vibration and lighting.
Bats – foraging and commuting	District	**Construction Phase** ▪ Habitat loss and fragmentation. ▪ Disturbance from construction activities including visual, noise, vibration and lighting. **Operation Phase** ▪ Direct disturbance from operational use, visual, noise, vibration and lighting.
Badger *Meles meles*	Local	**Construction Phase** ▪ Habitat loss and fragmentation. ▪ Direct mortality during site clearance and construction. ▪ Disturbance from construction activities including visual, noise, vibration and lighting.

Sensitive Receptor	Nature Conservation Value	Potential pathways of Effect
		Operation Phase ▪ Direct injury/mortality during operation. ▪ Direct disturbance from operational use visual, noise, vibration and lighting.
Birds – wintering	Local	**Construction Phase** ▪ Habitat loss and fragmentation. ▪ Disturbance from construction activities including visual, noise, vibration and lighting. **Operation Phase** ▪ Direct injury/mortality during operation. ▪ Direct disturbance from operational use, visual, noise, vibration and lighting.
Birds – breeding	District	**Construction Phase** ▪ Habitat loss and fragmentation. ▪ Direct mortality during site clearance and construction. ▪ Disturbance from construction activities including visual, noise, vibration and lighting. **Operation Phase** ▪ Direct injury/mortality during operation. ▪ Direct disturbance from operational use, visual, noise, vibration and lighting.
Reptiles	Local	**Construction Phase** ▪ Habitat loss and fragmentation. ▪ Direct mortality during site clearance and construction. ▪ Disturbance from construction activities including visual, noise, vibration and lighting. **Operation Phase** ▪ Direct disturbance from operational use, visual, noise, vibration and lighting.
Invertebrates	Local	**Construction Phase** ▪ Habitat loss and fragmentation. ▪ Direct mortality during site clearance and construction. ▪ Disturbance from construction activities including visual, noise, vibration and lighting. **Operation Phase** ▪ Direct disturbance from operational use, visual, noise, vibration and lighting.
Other SPI	Local	**Construction Phase**

Sensitive Receptor	Nature Conservation Value	Potential pathways of Effect
		▪ Habitat loss and fragmentation. ▪ Direct mortality during site clearance and construction. ▪ Disturbance from construction activities including visual, noise, vibration and lighting. **Operation Phase** ▪ Direct disturbance from operational use, visual, noise, vibration and lighting.

9.6 ASSESSMENT OF EFFECTS, MITIGATION AND RESIDUAL EFFECTS

CONSTRUCTION PHASE

9.6.1. Construction of the Scheme is anticipated to commence in February 2021 and continue for a period of nine months until November 2021.

9.6.2. It is understood that construction activity will be mainly confined to daylight hours, during weekdays only (Monday to Thursday 07:30-17:30 and Friday 07:30-15:30). Final details on construction methods are not yet available, however it is considered that noise-generating methods including piling, compressing and breaking will be required. There is currently no lighting strategy in place for the construction phase, however the principles set out in Section 9.6.6 with regards to operational lighting will be adhered to.

Habitat Creation

9.6.1. An area predominately to the north of the Scheme has been allocated to landscaped habitat creation. The layout of these areas has been informed by iterative Biodiversity Net Gain assessment (see **Appendix 9.10**) in collaboration with the design team. Further details are included in **Chapter 10: Landscape and Visual Impact.**

9.6.2. The layout of habitats is shown in the landscape general arrangement plans (**Appendix 3.3**). The planting schedules (**Appendix 10.3**) have been designed to include locally native species, and those with a benefit to wildlife, e.g. berry- bearing shrubs providing a value food source. The following habitat creation forms part of the proposed landscaping and have been designed in a way to retain and enhance connectivity across the Site:

- Species-rich hedgerow (828m);
- Specimen trees (16 trees);
- Amenity grassland (14,170m^2);
- Wildflower meadow (18,956m^2) of which 13,700m^2 comprises orchard habitat;
- Wetland grassland (7,992m^2);
- Scrub (4,734m^2); and
- Woodland edge habitat (9,240m^2)

9.6.3. As the habitats created will take time to establish, their effect has been accounted for in the operational phase effects. Specific detail of habitat management (e.g. grassland mowing regime etc.) is also provided in the Landscape Maintenance and Management Plan (LMMP) (**Appendix 10.4**).

9.6.4. The assessment of effects during the construction phase is provided in **Table 9-9** to **Table 9-19** below.

Table 9-9 – Assessment of construction effects for offsite HPI

Assessment Component	Commentary
Offsite HPI	Hedgerows, deciduous woodland and traditional orchard habitat are located immediately outside of the Site and could be affected indirectly by dust, airborne pollution and degradation through temporary storage of construction materials during the construction phase. All habitats are sensitive to changes in soil pH or toxicity from deposition of chemicals, to light blocking from dust in the air or on leaves, and to changes in drainage regime which may increase or decrease available water and its quality. Pollution may occur at chronic levels from day-to-day construction activities, or at acute levels from a pollution event such as a fire or chemical spill. A pollution event could therefore cause loss of habitat. The sensitivity of offsite HPI is considered to be Low, and the magnitude of change prior to mitigation, is considered to be Small (chronic pollution event) or Medium (acute pollution event). Therefore, there is likely to be an indirect, temporary, short-term or permanent long-term **Minor adverse** effect on offsite HPI (**significant**) prior to the implementation of mitigation measures.
Secondary Mitigation	A CEMP will be produced for the Scheme in advance of the construction phase. The CEMP will include best practice construction measures minimise the effects of noise pollution, dust and air pollution and visual intrusion during construction. Measures to avoid temporary storage of construction materials adjacent to offsite HPI will also be included within the CEMP. Fencing will be installed around all construction works to protect the surrounding retained habitats.
Residual Effects and Monitoring	The sensitivity of offsite HPI is Low, and the magnitude of change, following mitigation, is Negligible Therefore, there will be a **negligible adverse** residual effect on offsite HPI (**not significant**) following the implementation of mitigation measures.

Table 9-10 – Assessment of construction effects for onsite HPI (Hedgerow)

Assessment Component	Commentary
Onsite HPI (Hedgerow)	The construction phase of the Scheme will result in the removal of 410m of hedgerow, likely to meet the criteria of HPI, and a further 410m loss of line of trees, 50m of which is from a line of trees that is considered to be ecological valuable. Whilst hedgerows / line of trees within the Scheme are considered to be of Local level importance, the loss of up to 820m is not likely to significantly affect the distribution of hedgerows at the Local level. Sections of retained hedgerow within the Scheme could be affected indirectly by dust, airborne pollution and degradation through temporary storage of construction materials during the construction phase. As set out above for offsite HPI, pollution may occur at chronic or acute levels. The sensitivity of onsite hedgerow HPI is considered to be Low, and the magnitude of change prior to mitigation, is considered to be Medium. Therefore, there is likely to be

Assessment Component	Commentary
	both direct and indirect, permanent and temporary, long and short-term **Minor adverse** effects on hedgerow HPI (**significant**) prior to the implementation of mitigation measures.
Secondary Mitigation	All retained hedgerows will be protected in accordance with British Standard BS5837:2012 Trees in Relation to Construction, including the erection of robust protective fencing encompassing root protection areas. A CEMP will be produced for the Scheme in advance of the construction phase. The CEMP will include best practice construction measures minimise the effects of noise pollution, dust and air pollution and visual intrusion during construction. Measures to avoid temporary storage of construction materials adjacent to retained hedgerows will also be included within the CEMP. Where it is not feasible to retain all or part of hedgerows, they will be replaced with higher quality species-rich hedgerow. In the current landscaping plans, a total of 828m of hedgerow planting has been included, however this won't be available until the operational phase and therefore is not considered further here.
Residual Effects and Monitoring	Implementation of the above mitigation measures will significantly reduce the likelihood of habitat degradation associated with construction phase pollution. Due to the unavoidable loss of small areas of valuable habitats, and the delay for compensation areas to establish, the sensitivity of hedgerow HPI is Low, and the magnitude of change, following mitigation, is Small. Therefore, there is likely to be a temporary, direct, short-term **Minor adverse** residual effect on hedgerow HPI (**significant**) following the implementation of mitigation measures.

Table 9-11 – Assessment of construction effects for onsite HPI (Traditional Orchard)

Assessment Component	Commentary
Onsite HPI (Traditional Orchard)	The construction phase of the Scheme will result in the loss of traditional orchard HPI, totalling an area of approximately 4,200m^2. The sensitivity of traditional orchard HPI is considered to be of District level importance, and the loss of up to 4,200m^2 will affect the distribution of traditional orchard HPI at the District level. Parcels of retained orchard habitat within the Scheme and immediately outside of the Scheme could be affected indirectly by dust, airborne pollution and degradation through temporary storage of construction materials during the construction phase, and as set out for offsite HPI and hedgerow HPI, pollution may occur at chronic or acute levels. The sensitivity of onsite traditional orchard HPI is considered to be Low, and the magnitude of change prior to mitigation, is considered to be Large. Therefore, there is likely to be a both direct and indirect, permanent and temporary, long and short-term **Minor-Moderate adverse** effects on hedgerow HPI (**significant**) prior to the implementation of mitigation measures.
Secondary Mitigation	All retained trees within the orchard will be protected in accordance with British Standard BS5837:2012 Trees in Relation to Construction, including the erection of robust protective fencing encompassing root protection areas. A CEMP will be produced for the Scheme in advance of the construction phase. The CEMP will include best practice construction measures minimise the effects of noise

Assessment Component	Commentary
	pollution, dust and air pollution and visual intrusion during construction. Measures to avoid temporary storage of construction materials adjacent to retained trees will also be included within the CEMP. In the current landscape plans, 13,700m^2 of orchard planting is included, however as this won't be available until the operational phase, it is not considered further here.
Residual Effects and Monitoring	Due to the unavoidable loss of areas of valuable habitat, and the delay for compensation areas to establish, the sensitivity of hedgerow HPI is Low, and the magnitude of change, following mitigation, is Small. Therefore, there will be a direct, temporary, short-term **Minor adverse** residual effect on orchard HPI (**significant**) following the implementation of mitigation measures.

Table 9-12 – Assessment of construction effects for Bats – roosting

Assessment Component	Commentary
Bats (Roosting)	Habitat removal required to facilitate construction will result in the loss of six trees assessed to have moderate or high potential to support roosting bats, including: ▪ T34-35, T37-38 and T40 with moderate potential ▪ T39 with high potential Although the trees listed above have been subject to at-height tree climbing surveys (during which no evidence of bats was identified), bats may use Potential Roost Features (PRFs) on a transient basis, and as such, it is not possible to rule out the presence of bats roosting within these trees. If bats are present at the time of works, there is a risk of direct loss of individuals through injury/mortality. Even if bats are not using the trees for roosting purposes, the removal of trees will result in a loss of roosting resource within the Site. Additionally, although the Scheme will not result in the removal of Building B5, which supports a transitional roost for soprano pipistrelle and Serotine, the construction works themselves will be within close proximity (less than 5m) and noisy construction activities (e.g. piling/ compressing, drilling) may deter bats from using this building as a roost. During the construction phase, in addition to the tree removals, there will also be habitat degradation over a wider area both in terms of disturbance to retained trees and habitat fragmentation. There will be limited after dark lighting during the construction phase, however there will be noise and vibration that may affect roosting opportunities in retained trees and buildings with potential to support roosting bats. The sensitivity of roosting bats is considered to be Low, and the magnitude of change prior to mitigation, is considered to be Medium. Therefore, there is likely to be a direct and indirect, temporary and permanent and short and long-term **Minor adverse** effect on roosting bats (**significant**) prior to the implementation of mitigation measures.
Secondary Mitigation	All retained trees will be protected in accordance with British Standard BS5837:2012 Trees in Relation to Construction, including the erection of robust protective fencing encompassing root protection areas. To avoid disturbance to retained trees and buildings with suitability to support roosting bats, a CEMP will be produced for the Scheme in advance of the construction phase. The CEMP will include best practice construction measures to minimise the effects of

Assessment Component	Commentary
	noise pollution, dust and air pollution and visual intrusion during construction. Measures to avoid temporary storage of construction materials adjacent to retained trees will also be included within the CEMP. Prior to tree removal, as bats may use PRFs on a transient basis and there will be at least a 12-month time lapse between the most recent surveys (2019) and construction commencing, an updated ground-level inspection will be completed to confirm the level of suitability for bat roosts to be present. This is to ensure that mitigation is appropriate and based on information current at the time of works. The following approach will then be taken: ▪ Trees assessed as having low suitability to support bat roosts will be soft-felled by suitably qualified arborists, following an at-height inspection of any potential roost features to confirm the absence of roosting bats (and evidence of roosting bats). ▪ Trees assessed as having moderate or high suitability to support bat roosts will be subject to a climbing inspection to enable a thorough assessment of suitability and to search for evidence indicating the presence of roosting bats. If at this stage the suitability is downgraded to low, the trees will be soft felled by suitably qualified arborists as above. ▪ In the event that the presence of a bat roost is highlighted at this stage, the requirement for works affecting the roost would be reconsidered to identify whether adverse effects can be avoided. Where possible, in this scenario proposals would be updated to enable retention and protection of the bat roost. In the event that retention is not possible, a licence would be sought from Natural England to permit works to proceed, the licence application would be subject to a detailed method statement. Works in close proximity to Building B5 should be carried out under a precautionary method of works (PMoW) document to reduce disturbance effects. The method statement will include (but not limited to) the following: ▪ Timing of works for when bats are less likely to be present or during the least sensitive time period for bats. ▪ Avoidance of construction phase lighting within the vicinity of the building. ▪ Toolbox talk for onsite contractors. ▪ Details for use of machinery close to the bat roost. If it is not possible to avoid disturbance effects to Building B5 via careful timing of works, then it may be necessary to obtain a licence from Natural England to permit works to proceed, which would be subject to a detailed method statement. As Building B5 has been assessed as having negligible potential to support hibernating bats, avoidance of impacts would include timing the works to take place between November – February (weather dependent) when bats are likely absent from the roost. To mitigate for the loss of roosting opportunities across the Scheme, and to enable future monitoring, new roosting opportunities in the form of bat boxes will be installed on retained mature trees in suitable locations, either within the Site itself, or within nearby land under the ownership of WSCC, prior to any trees being felled. The number of bat boxes installed will at least replicate the number of PRFs lost from the six moderate/high suitability trees (12 PRFs in total), with another five additional PRFs provided as an enhancement measure. These boxes will be sited in appropriate locations, at least 4m high and close to foraging and commuting habitat (e.g. hedgerow) under the guidance of an ecologist.
Residual Effects and Monitoring	With the adoption of the mitigation measures, they will minimise the risk of increased injury and/or mortality of bats associated with construction activities and ensure that PRFs are maintained within the Scheme or at a suitable nearby location. However,

Assessment Component	Commentary
	there will remain unavoidable habitat degradation associated with roosting bats. As such, the sensitivity of roosting bats is Low, and the magnitude of change, following mitigation, is Small. Therefore, there will be a direct, temporary short-term **Minor adverse** residual effect on roosting bats (**significant**) following the implementation of mitigation measures.

Table 9-13 – Assessment of construction effects for Bats – foraging and commuting

Assessment Component	Commentary
Bats (foraging and commuting)	The Scheme will result in the removal of habitat providing suitable commuting and foraging habitat for bats. The construction phase will result in the severance of several commuting routes, including the severance of hedgerows and tree lines. This will result habitat degradation through the loss of areas of foraging and commuting habitat for bats. A reduction in the available foraging resource could ultimately contribute to reduced populations of bats in the local area and negatively affect the conservation status of bats. Temporary lighting associated with the construction phase which spills onto retained ecological features (e.g. retained hedgerows) or noisy construction activities (e.g. piling, compressing and drilling) during any night-time works may also deter bats from using established commuting routes or foraging resources within the Scheme. The sensitivity of commuting and foraging bats within the Scheme is considered to be Low, and the magnitude of change in the absence of mitigation is considered to be Medium. Therefore, there is likely to be direct and indirect, temporary and permanent short and long-term **Minor adverse** effects on commuting and foraging bats within the Proposed Scheme **(significant)** prior to the implementation of mitigation measures.
Secondary Mitigation	Landscaping as part of the Scheme which aims to provide replacement habitat for that lost will not be functional during the construction phase, as the area will be in use for construction activities until the landscaping is installed on completion. Therefore, the effects of new landscaping are considered under the operational phase assessment. Lighting during the construction phase will be kept to a minimum to avoid light spillage on retained habitat that bats will use for foraging and commuting purposes. In addition, measures will be taken to conserve and protect retained trees and hedgerow habitat which provides a foraging/commuting resource for bats. This will include the installation of protective fencing in line with BS5837:2012.
Residual Effects and Monitoring	There remains an unavoidable loss of foraging and commuting habitat for bats during the construction phase and therefore following the implementation of the mitigation measures, the sensitivity of foraging and commuting bats is Low, and the magnitude of change, following mitigation, remains Medium. Therefore, there will be a direct, temporary, short-term **Minor adverse** residual effect on foraging and commuting bats (**significant**) following the implementation of mitigation measures.

Table 9-14 – Assessment of construction effects for Badgers

Assessment Component	Commentary
Badgers	The Scheme will result in the loss of one main sett, one subsidiary sett and a number of outlier setts. All setts identified at risk or potentially at risk are in use by the same badger clan, as evidenced during the badger bait marking surveys. The site preparation, earthworks and construction phase of the Scheme has the potential to bring about negative effects on badgers though sett loss, habitat loss / fragmentation and potential injury / harm to individuals both within their setts and commuting and foraging across the Site. The sensitivity of badgers within the Scheme is considered to be Low, and the magnitude of change in the absence of mitigation is considered to be Large. Therefore, there is likely to be direct and indirect, temporary, short-term **Minor-Moderate adverse** effects on badgers within the Scheme **(significant)** prior to the implementation of mitigation measures.
Secondary Mitigation	As the use of the Site by badgers changes over time, with some setts becoming inactive and new setts being created, a walkover survey will be undertaken prior to commencement of works, and the licence application being submitted, as detailed below. It will be necessary to close the setts under a licence from Natural England. These licences are typically only issued for activities affecting setts to occur between 1st July and 30th November inclusive, in order to avoid the badger breeding season. A suitable mitigation strategy will need to be in place to obtain the licence and is likely to include the installation of one-way badger gates, kept in place for a minimum of 21 days, monitoring of the setts for signs of badgers entering of leaving the sett and destruction of the sett once badgers are excluded to reduce the risk of badgers re-occupying the sett. The area will also be secured against re-entry by badgers by using heavy-gauge chain link fencing. As one of the setts to be lost is a main sett, it will be necessary to install an artificial sett, which will need to be proven to have been occupied by badgers, prior to the closure of their main sett. This artificial sett should be installed at least six months prior to sett closure. Badgers use the wider area for foraging and commuting purposes and therefore measures need to be put in place during the construction phase to minimise effects upon badger movement and foraging activity. These will be detailed within the CEMP and include measures such as fencing dangerous areas of the construction site (e.g. deep excavations) or providing a means of egress from shallow excavations, whilst ensuring other construction fencing is raised 180mm above ground level to enable badgers to pass beneath. Storage of plant and materials on areas of potential foraging habitat (e.g. retained grassland) will be avoided. In addition, appropriate good practice measures will be implemented to reduce noise during construction and there will be no night works unless specifically needed, to avoid disturbance by artificial lighting. Where the use of lighting is unavoidable, hoods, cowls or shields will be used to avoid light spill onto setts or badger paths. For setts that are located outside the Scheme extent, to ensure they are not affected by the works, a 30m buffer around each sett in which no construction activities can take place will be clearly marked.
Residual Effects and Monitoring	The creation of the artificial sett, will ensure that the local badger population will have an alternative main sett during the construction phase, but there remains an unavoidable loss of commuting and foraging habitat, and therefore following the

Assessment Component	Commentary
	implementation of the mitigation measures, the sensitivity of badgers is Low, and the magnitude of change, following mitigation, is Small. Therefore, there will be an indirect, temporary, short-term **Minor adverse** residual effect on badgers (**significant**) following the implementation of mitigation measures.

Table 9-15 – Assessment of construction effects for Wintering birds

Assessment Component	Commentary
Wintering birds	The construction phase of the Scheme will result in the loss of habitat suitable for supporting a wintering bird community of up to Local level value, and therefore result in a reduction in the habitat available. Temporary lighting associated with the construction phase which spills onto retained ecological features (e.g. retained hedgerows) or noisy construction activities (e.g. piling, compressing and drilling) may also have a negative effect on wintering birds. The sensitivity of wintering birds within the Scheme is considered to be Low, and the magnitude of change in the absence of mitigation is considered to be Small. Therefore, there is likely to be direct, temporary short-term **Minor adverse** effects on wintering bird within the Scheme **(significant)** prior to the implementation of mitigation measures.
Secondary Mitigation	A CEMP will be produced for the Scheme in advance of the construction phase. The CEMP will include best practice construction measures minimise the effects of noise pollution, dust and air pollution and visual intrusion during construction The current landscaping proposals include for a range of different habitats that will provide a foraging resource for wintering birds. This includes the creation of wet swales, woodland, orchard and scrub habitat. Plant species will include berry-bearing shrubs and trees to provide suitable foraging resource.
Residual Effects and Monitoring	The proposed mitigation will ensure that there is sufficient foraging resource and habitat for wintering birds, however there will be a delay for compensation areas to establish. Following the implementation of mitigation, the sensitivity of wintering birds is Low, and the magnitude of change, following mitigation, remains Small. Therefore, there will be a **Minor adverse** residual effect on wintering birds (**significant**) following the implementation of mitigation measures.

Table 9-16 – Assessment of construction effects for Breeding birds

Assessment Component	Commentary
Breeding birds	The Scheme will result in the loss of suitable habitat for breeding birds, including hedgerow, trees, broadleaved and plantation woodland and scrub. The construction phase of the Scheme will result in the loss of suitable habitat for breeding birds, including hedgerow, broadleaved and plantation woodland and scrub. This will result in habitat loss and degradation. A reduction in the available suitable nesting habitat could ultimately contribute to reduced populations of breeding birds in the local area and negatively affect the conservation status of an assemblage of species considered to be of up to District level value. The sensitivity of breeding birds will increase immediately before and during the breeding period (March – August inclusive for most species). If construction activity

Assessment Component	Commentary
	occurs during the primary bird nesting season (March to August inclusive) there is a risk that active birds' nests would be damaged or destroyed and probable young would be injured or killed during the removal of vegetation. Noisy construction works (e.g. compressing/ breaking) has the potential to cause a disturbance effect on breeding birds, which could result in nest abandonment. There will also be a loss of habitat suitable for foraging barn owl during the construction phase. The sensitivity of breeding birds within the Scheme is considered to be Low, and the magnitude of change in the absence of mitigation is considered to be Medium. Therefore, there is likely to be direct, temporary, short-term **Minor adverse** effects on breeding birds within the Scheme **(significant)** prior to the implementation of mitigation measures.
Secondary Mitigation	To avoid adverse effects on nesting birds during the construction phase, where practicable Site clearance works will be undertaken outside of the bird nesting season which generally runs from March to August inclusive. If this is not possible, site clearance will proceed under the supervision of a suitably qualified ecologist in accordance with a precautionary working method statement. Such methods can be successfully implemented for localised activity but are generally not suitable for large-scale site clearance. As noted above with respect to bats, measures will be taken to conserve and protect retained trees, shrub and hedgerow habitat which provide a nesting resource for birds. This will include the installation of protective fencing in line with BS5837:2012. Appropriate good practice measures will be set out in the CEMP and be implemented to reduce noise, dust and vibration during construction. To mitigate for the loss of nesting opportunities across the Scheme, at least six bird boxes will be installed in suitable locations within retained habitat. All the above mitigation will be set out within a PMoW document and appended to the CEMP. Landscaping as part of the Scheme which aims to provide replacement habitat for that lost will not be functional during the construction phase, as the area will be in use for construction activities until the landscaping is installed on completion.
Residual Effects and Monitoring	The proposed mitigation will reduce the risk of increased injury and/or mortality of nesting birds associated with construction activities, and levels of disturbance of adjacent retained habitat. There will still be an unavoidable reduction in suitable nesting habitat during the construction phase. Following the implementation of mitigation, the sensitivity of breeding birds is Low, and the magnitude of change, following mitigation, is Small. Therefore, there will be a direct, temporary, short-term **Minor adverse** residual effect on breeding birds (**significant**) following the implementation of mitigation measures.

Table 9-17 – Assessment of construction effects for Reptiles

Assessment Component	Commentary
Reptiles	Suitable reptile habitat exists within the Scheme, with slow worm and common lizard recorded during the surveys. The construction phase will result in the removal of suitable habitat and therefore it is possible that there will be direct loss of animals from the population as a result of mortality and/or injury during construction works to facilitate

Assessment Component	Commentary
	construction. In addition, habitat removal required during the construction phase will reduce the area of habitat available to support the reptile population present and fragment retained areas of suitable habitat; inhibiting population movement. The sensitivity of reptiles within the Scheme is considered to be Low, and the magnitude of change in the absence of mitigation is considered to be Small. Therefore, there is likely to be direct, temporary short-term **Minor adverse** effects on reptiles within the Scheme **(significant)** prior to the implementation of mitigation measures.
Secondary Mitigation	Where feasible, all suitable reptile habitat within or immediately adjacent to the Scheme will be retained. Where it is not feasible to retain habitat, the landscaping proposals will include for creation of habitats suitable for reptiles, including the installation of log piles to act as natural refugia and hibernation opportunities. A PMoW document, which will be appended to the CEMP will be produced for the Scheme in advance of the construction phase. The PMoW will set out (but not be limited to) the following principles: ■ ~~It is advised that all~~All areas of suitable habitat will be treated as potentially supporting reptiles. ■ In all areas of suitable habitat, mitigation will entail the clearance of vegetation outside of the sensitive hibernation season (indicatively November-February inclusive, but weather dependent). ■ Where tall herbaceous vegetation is cleared during the active season for reptiles, then it will be undertaken in two stages over at least two consecutive days and include an initial cut down to 150mm, with the second cut reducing vegetation as close as possible down to ground level in order to progressively render habitat unsuitable for reptiles. ■ Any refugia will be dismantled by hand with all works undertaken under the supervision of a suitably qualified ecologist to minimise the risk of killing or injury to reptiles.
Residual Effects and Monitoring	The proposed mitigation will reduce the risk of increased injury and/or mortality of reptiles, however, there still remains an unavoidable loss of habitat during the construction phase. As such, following the implementation of mitigation, the sensitivity of reptiles is Low, and the magnitude of change, following mitigation, remains Small. Therefore, there will be a direct, temporary, short-term **Minor adverse** residual effect on reptiles (**significant**) following the implementation of mitigation measures.

Table 9-18 – Assessment of construction effects for Invertebrates

Assessment Component	Commentary
Invertebrates	Suitable habitat in the form of standing and buried deadwood and hedgerows is present within the Site that could support notable or protected invertebrate species, particularly stag beetle. The construction phase could result in a direct loss of invertebrates, including stag beetle as a result of mortality and/or injury during enabling works to facilitate construction. In addition, habitat removal required during the construction phase will reduce the area of habitat available to support invertebrate species, including stag beetle. The sensitivity of invertebrates within the Scheme is considered to be Low, and the magnitude of change in the absence of mitigation is considered to be Small. Therefore,

Assessment Component	Commentary
	there is likely to be direct, temporary, short-term **Minor adverse** effects on invertebrates within the Scheme **(significant)** prior to the implementation of mitigation measures.
Secondary Mitigation	Mitigation will entail the careful clearance of suitable habitat. Where any deadwood habitat is removed, this will be retained and incorporated within the areas of proposed landscaping, Careful habitat removal will also include a check of the soil around the deadwood / hedgerows to check for stag beetle larvae. The landscaping proposals include areas of wildflower meadow, wet grassland, scrub, hedgerow and woodland providing suitable habitat for a range of invertebrate species, however this will not be functional during the construction phase, as the area will be in use for construction activities until the landscaping is installed on completion.
Residual Effects and Monitoring	The proposed mitigation will reduce the risk of increased injury and/or mortality of invertebrates, however, there still remains an unavoidable loss of habitat during the construction phase. Therefore, following the implementation of mitigation, the sensitivity of invertebrates is Low, and the magnitude of change, following mitigation, remains Small. Therefore, there will be a direct, temporary, short-term **Minor adverse** residual effect on invertebrates (**significant**) following the implementation of mitigation measures.

Table 9-19 – Assessment of construction effects for Other SPI

Assessment Component	Commentary
Other SPI	Suitable habitat within the Scheme is suitable for a number of SPI including harvest mouse, brown hare, polecat and hedgehog, with records of the latter two being returned in the desk study. The construction phase could result in a direct loss of SPI, as a result of mortality and/or injury during enabling works to facilitate construction. In addition, habitat removal required during the construction phase will reduce the area of habitat available to support invertebrate species. The sensitivity of SPI within the Scheme is considered to be Low, and the magnitude of change in the absence of mitigation is considered to be Small. Therefore, there is likely to be direct, temporary, short-term **Minor adverse** effects on invertebrates within the Scheme **(significant)** prior to the implementation of mitigation measures.
Secondary Mitigation	Mitigation will entail the careful clearance of suitable habitat. This will include the sensitive clearance of habitat, which will be carried out in a phase approach (as above for reptiles) and avoid the hibernation period. Where this is not possible, careful removal of log/brash piles that may support hedgehogs will be undertaken. The landscaping proposals include areas of wildflower meadow, scrub, hedgerow and woodland providing suitable habitat for SPI, however this will not be functional during the construction phase, as the area will be in use for construction activities until the landscaping is installed on completion.
Residual Effects and Monitoring	The proposed mitigation will reduce the risk of increased injury and/or mortality of SPI, however, there still remains an unavoidable loss of habitat during the construction phase. Therefore, following the implementation of mitigation, the sensitivity of invertebrates is Low, and the magnitude of change, following mitigation, remains Small.

Assessment Component	Commentary
	Therefore, there will be a **Negligible adverse** residual effect on SPI (**significant**) following the implementation of mitigation measures.

OPERATIONAL PHASE

9.6.5. The Scheme will see the construction of a new road and associated landscaping. A lighting strategy has been developed, in which the road itself will be lit at the approaches to roundabouts, and the pedestrian / cycle path will be lit along the entire length, with the exception of a dark corridor towards the middle of the route, when it has been identified as a key commuting corridor for bats, including Barbastelle.

9.6.6. The lighting design strategy has taken into account ecologically sensitive receptors and includes the following elements. The lighting assessment is detailed in **Appendix 10.2**.

- The minimal necessary lighting required will be used;
- Directional cowls and louvres will be used to prevent backwards, upwards or other light spill onto retained or created habitats;
- Where possible, low-level luminaires will be used to light the Scheme;
- Warm white LEDs will be used (2700-3000 Kelvin) in order to minimise impacts upon nocturnal wildlife; and
- Lighting control will be used to minimise when the lighting is on, only delivering target illumination levels at peak use times. In low use times lighting will be dimmed back further.

9.6.7. The assessment of effects during the operational phase is provided in **Table 9-20** to **Table 9-30** below.

Table 9-20 – Assessment of operational effects for offsite HPI

Assessment Component	Commentary
Offsite HPI	Increased traffic flows as a result of the new road may cause low-level pollution or nitrogen deposition upon retained adjacent HPI which may affect factors such as growth rates and soil diversity. Traffic related effects are likely to be confined to the area around the roundabouts where vehicles will accelerate away, generating the most pollutants. However, a recent study has shown that land management practice greatly outweighs the impacts of air quality on habitats in close proximity to a road (Ref 9.29) The sensitivity of offsite HPI is considered to be Low, and the magnitude of change prior to mitigation, is considered to be Negligible. Therefore, there is likely to be an indirect, permanent long-term **negligible adverse** effect on offsite HPI (**not significant**) prior to the implementation of mitigation measures.
Secondary Mitigation	No specific mitigation measures in respect to off-site habitats are proposed.
Residual effects and monitoring	The sensitivity of offsite HPI is considered to be Low, and the magnitude of change following mitigation, is considered to be Negligible. Therefore, there is likely to be a

Assessment Component	Commentary
	negligible adverse effect on offsite HPI (**not significant**) prior to the implementation of mitigation measures.

Table 9-21 – Assessment of operational effects for onsite HPI (Hedgerows)

Assessment Component	Commentary
Onsite HPI (Hedgerow)	The landscape proposals currently include for 880m ~~828m~~ of hedgerow planting comprising seven native species. Whilst this will only provide a small increase to what is being lost to facilitate construction, as it is a species rich hedgerow, it is of higher quality than that to be lost within the Scheme, which predominately comprises species poor hedgerow. The BNG assessment initially ~~has~~ resulted in a no net loss of hedgerows across the Scheme, and it was ~~. However, it has been~~ advised that a further 50m of species-rich hedgerow planting be incorporated within the detailed landscape plans. Updates to the landscape design has incorporated an additional 52m of hedgerow planting and as such, the Scheme now achieves a 10% BNG in linear units. ~~which would result in an overall net gain, providing appropriate long term landscape management is put in place~~ Whilst the Scheme will result in a permanent severance of hedgerows, therefore resulting in fragmentation and loss of connectivity, the landscaping design has aimed to achieve connectivity along the route, as set out in 9.6.2 ~~15~~. There will however be operational lighting from the Scheme that may have adverse effects upon bat species utilising this habitat for foraging and commuting. As set out above, land management practice outweighs the impact of vehicle emissions on roadside transects, as such negative effects on HPI are not anticipated as a result of an increase of traffic flows. The sensitivity of hedgerow HPI is considered to be Low, and the magnitude of change following mitigation, is considered to be Negligible. Therefore, there is likely to be an indirect, permanent long-term **negligible adverse** effect on hedgerow HPI (**not significant**') prior to the implementation of mitigation measures.
Secondary Mitigation	Whilst mitigation measures are not specifically required to mitigate against effects upon HPI, measures will be put in place to reduce negative effects that occur upon hedgerow HPI. A sensitive lighting strategy will be put in place during operation to reduce effects upon hedgerow habitat suitable to support foraging and commuting bats in line with best practice guidance (Ref 9.30). All newly created habitats to be managed in line with the LMMP which will effective in mitigating air quality impacts as a result of increased vehicle omissions on Hedgerow HPI as detailed in a recent study (Ref 9.29).
Residual effects and monitoring	As calculated by the BNG assessment (Appendix 9.10), the Scheme originally ~~whist the Scheme at present will~~ did not achieve a 10% net gain for biodiversity for linear units, with a further 50m of hedgerow planting ~~is required~~ recommended to achieve this, providing it is subject to an appropriate long term management regime. An additional 52m has now been incorporated into the landscape design and thus the Scheme overall achieves BNG. The sensitivity of hedgerow HPI is considered to be Low, and the magnitude of change following mitigation, is considered to be Negligible. Therefore, there is likely to be a direct, long-term permanent **Minor beneficial** ~~**Negligible adverse**~~ effect on hedgerow HPI (**not significant**) following the implementation of mitigation measures as a result of the Scheme achieving BNG. ~~If it is possible to incorporate an additional 50m of~~

Assessment Component	Commentary
	~~hedgerow in the landscaping to achieve 10% BNG on linear based habitats, there will be a long-term permanent **Minor beneficial** effect on hedgerow HPI.~~

Table 9-22 – Assessment of operational effects for onsite HPI (Traditional orchard)

Assessment Component	Commentary
Onsite HPI (Traditional Orchard)	~~Landscaping elements will focus on achieving 10% biodiversity net gain on area-based habitat creation.~~ The landscape proposals currently include for the creation of orchard habitat, totalling an area of approximately 13,700m^2, providing an addition of approximately 9,500m^2 of orchard habitat than what will be lost to facilitate construction and therefore an increase in what is currently present within the Scheme. Further, the orchard habitat is considered to be in a poor condition, due to the current lack of management which has allowed it to become encroached by scrub vegetation. Although there will be increased traffic flows as a result of the new road which may cause low-level pollution or nitrogen deposition upon retained and new orchard habitat, as set out above for off-site HPI and hedgerow HPI land management practice outweighs the impact of vehicle emissions. The sensitivity of traditional orchard HPI is considered to be Low, and the magnitude of change prior to mitigation, is considered to be Negligible. Therefore, there is likely to be an indirect, permanent long-term **negligible adverse** effect on traditional orchard HPI (**not significant**') prior to the implementation of mitigation measures.
Secondary Mitigation	Whilst mitigation measures are not specifically required to mitigate against effects upon HPI, management of these habitats, as detailed within the respective landscape plans, for the Scheme will result in the new and the retained habitats achieving higher quality (condition) than currently recorded. All newly created habitats to be managed in line with the LMMP which will effective in mitigating air quality impacts as a result of increased vehicle omissions on orchard HPI.
Residual effects and monitoring	As calculated by the BNG assessment (Appendix 9.10), the Scheme will achieve a significant net gain for area based ~~biodiversity~~ habitats ~~(area based units only),~~ including for orchard habitat, which will be subject to a management regime. The sensitivity of traditional orchard HPI is considered to be Low, and the magnitude of change following mitigation, is considered to be Small. Therefore, there is likely to be a **Minor beneficial** effect on traditional orchard HPI (**not significant**) following the implementation of mitigation measures.

Table 9-23 – Assessment of operational effects for bats – roosting

Assessment Component	Commentary
Bats (Roosting)	Light spill onto retained trees and buildings with roosting suitability / confirmed roosting status could result in direct negative effects upon certain species. In particular, barbastelle and bats of the *Myotis* genus are known to avoid illuminated habitat. Some other species of bat do readily forage in illuminated habitats (such as common/ soprano pipistrelles, frequently encountered during the surveys). However, lighting does have

Assessment Component	Commentary
	negative effects upon their invertebrate prey, which are drawn to illuminated habitats, potentially having long term negative effects on invertebrate populations. The number of bat boxes proposed will not only replace the number of PRFs lost as a result of the removal of six trees with moderate/high suitability but will also provide additional PRFs therefore increasing the number of roosting opportunities available to bats during the operational phase. The landscaping proposal include a range of habitats, including woodland, wildflower grassland, scrub and hedgerows that will providing supporting habitat for bat roosts. The sensitivity of roosting bats is considered to be Low, and the magnitude of change prior to mitigation, is considered to be Negligible. Therefore, there is likely to be an indirect, permanent long-term **negligible adverse** effect on roosting bats (**not significant**') prior to the implementation of mitigation measures.
Secondary Mitigation	Secondary mitigation will take the form of monitoring which will inform any further steps required. This will serve to protect the bat population in the long term. On at least one occasion in the first five years post-completion, an inspection of the bat boxes will be undertaken by a Natural England (NE) licensed ecologist to record evidence of use by bats and advise on any necessary repairs to be carried out. If a box has not been used for several years in succession, the installation of new alternative boxes (non-integral) shall be considered following the advice of a suitably qualified ecologist.
Residual effects and monitoring	Whilst there will be an increase in roosting opportunities, there will be increased permanent lighting. The sensitivity of roosting bats is considered to be Low, and the magnitude of change following mitigation, is considered to be Negligible. Therefore, there is likely to be a **negligible adverse** effect on roosting bats (**not significant**) following the implementation of mitigation measures.

Table 9-24 – Assessment of operational effects for bats – foraging and commuting

Assessment Component	Commentary
Bats **(Foraging and commuting)**	The new road will have a 30mph speed restriction, as such vehicle collision is not considered to be a significant risk to bats during the operational phase. During the operational phase, landscaping created during the construction phase will become established. The hedgerow breaches will result in a loss of connectivity north to south (or vice versa), however there is a significant amount of new hedgerow proposed (880m), which will provide connectivity in an east to west (or vice versa) direction, providing suitable foraging and commuting habitats for bats. The landscape proposals include a woodland edge mix, totalling an area of over 9,000m^2 which will provide suitable foraging and commuting habitat. There will be approximately 4,700m^2 of scrub planting with species mixes that will attract night-flying insects and are therefore of benefit to foraging bats (Ref 9.31). Additionally, the planting associated with the drainage ditches / attenuation basins (approximately 8,000m^2) to be sown with a wetland meadow mix is likely to attract an invertebrate assemblage and therefore in combination with the additional hedgerow, woodland and scrub planting will provide a higher quality foraging habitat upon establishment then what is currently present on the Site.

Assessment Component	Commentary
	A preliminary street lighting layout has been prepared, giving the location of the proposed lighting columns, as well as Lux contours, showing the level of light spill onto adjacent habitat (Drawing ref SSE281768-1300-002 to 006 ~~Revision B~~). This shows that whilst the majority of the route is to be lit, light spill is greatest at the roundabouts. To that end, as part of the detailed design process, the central roundabout was moved 100m west, to avoid significant light spill along the public right of way (PRoW), which has been assessed as an important bat corridor, particularly for Barbastelle. Additionally, designs have also been adapted to move a pedestrian crossing (which must be lit for safety purposes) by 21m to the east to avoid light spill onto the PRoW and therefore there will be a dark corridor, 15m either side of the PRoW, as detailed in the lighting strategy (Appendix 10-2). Whilst this corridor will be as dark as possible, it is noted in the lighting strategy that it is not always possible to completely remove levels of spill light onto nearby sensitive features near to artificial lighting installations as low levels of spill light can be present at significant distances from the installation. Further detail has been provided in an outline lighting management strategy (included in **Appendix 10.2 - Lighting Assessment Report**) which sets out the dimming regime of lighting across the Scheme, as well as the months in which lighting close to the PRoW will be switched off. In summary, lighting columns 17, 18, 21, 22 and 23 which are in close proximity to the PRoW will be switched off between the months of April – October (the active bat survey season). during the same time, lighting columns 19 and 20 which are on the new pedestrian crossing will be dimmed to 30% as some level of lighting is required for safety reasons. This is shown on inset drawing ref SSE281768-1300-004. Whilst lighting has been reduced from the most sensitive area for bats, it cannot be avoided across the whole extent of the Scheme due to safety considerations, as such, there will be light spill onto habitats that are in use by foraging and commuting bats. However, as set out in the outline lighting management scheme in Appendix 10.2, for all other lighting across the Scheme, it will be dimmed to 75% at 20:00, and further dimmed to 50% from 22:00 for the remainder of the night (until 06:00) therefore reducing the light spill across the Scheme. The sensitivity of foraging and roosting bats is considered to be Low, and the magnitude of change prior to mitigation, is considered to be Small. Therefore, there is likely to be an indirect, permanent long-term **Minor adverse** effect on commuting and foraging bats within the Scheme **(significant)** prior to the implementation of mitigation measures.
Secondary Mitigation	An appropriate lighting strategy will be created for the Scheme, informed by current best practice guidance with regards to bats and lighting (Ref. 9.13), and following guidance set out in 9.6.6. In particular, the lighting strategy will require that new permanent lighting is the minimum required and will avoid light spill directly onto retained and newly created ecological features (e.g. hedgerows and woodland) within the Scheme. Warm white LEDs will be used, and hoods and louvres will be used to prevent backwards, upwards or other light spill. The lighting strategy will also detail the careful timing of when the lighting will be operational to reduce the light spill further. This will be achieved through the use of Mayflower lighting in which it is possible to establish a site-specific switching regime, whereby each lighting unit fitted with a Mayflower external node can be controlled individually and set to dim at any time of day during operation. Furthermore, the dimming regime can be tweaked at any time and adjusted to suit seasons. By using this control, it will be possible to reduce the lighting at the times when bats are active.

Assessment Component	Commentary
	In line with the landscape strategy, retained, enhanced and newly created habitat will be maintained in line with the LMMP to ensure biodiversity continues to benefit during the lifetime of the Scheme.
Residual effects and monitoring	Whilst measures have been taken to reduce the lighting levels on the most sensitive areas for bats, there will be an overall increase in permanent lighting, as well as the severance of habitats currently used as commuting and foraging corridors. The sensitivity of roosting bats is considered to be Low, and the magnitude of change following mitigation, is considered to be Negligible. Therefore, there is likely to be a **Negligible adverse** effect on foraging and commuting bats (**not significant**) following the implementation of mitigation measures.

Table 9-25 – Assessment of operational effects for Badgers

Assessment Component	Commentary
Badgers	During the operation of the Scheme, new habitats will become established and provide foraging and commuting habitat for badgers, as well as sett-creation opportunities. The planting schedule includes species such as crab apple, wild cherry, rowan, blackthorn, dog rose and apple species that will provide a good food source for badgers. It was confirmed, via badger bait marking surveys that badgers are using the wider area, given the location of setts recorded and other signs e.g. latrines. As such, during the operational phase, there is a risk of road traffic collisions as badger continue to attempt to forage on both sides of the new road, however, as the speed limit of the road is 30mph, the risk of vehicle collision is considered reduced The design of the artificial sett is as such that it allows for the natural extension of the sett over time, due to the inclusion of open-ended tunnels. Additionally, only the section of the main sett that will be impacted by the construction will be destroyed, with the part that falls outside of the construction zone only subject to temporary closure and therefore can be re-opened during the operation phase, allowing badgers to re-occupy. As set out for bats, a preliminary street lighting layout has been prepared, giving the location of the proposed lighting columns, as well as Lux contours, showing the level of light spill onto adjacent habitat which will be in use by badgers for foraging and commuting purposes. No lighting is proposed close to the artificial sett, and with the exception of roundabouts and the pedestrian crossing, there is minimal light spill where the artificial badger sett is located. The sensitivity of badgers is considered to be Low, and the magnitude of change prior to mitigation, is considered to be Small. Therefore, there is likely to be indirect, permanent long-term **Minor adverse** effects on badgers within the Scheme **(significant)** prior to the implementation of mitigation measures.
Secondary Mitigation	An appropriate lighting strategy will be created for the Scheme and will require that new permanent lighting is the minimum required and will avoid light spill directly onto retained and newly created ecological features (e.g. hedgerows and woodland) within the Scheme. The lighting strategy will also detail the careful timing of when the lighting will be operational to reduce the effect of lighting further, as set out above for bats, and therefore lighting will be reduced during the time in which badgers are active.

Assessment Component	Commentary
	In line with the landscape strategy, retained, enhanced and newly created habitat will be maintained in line with the LMMP to ensure biodiversity continues to benefit during the lifetime of the Scheme. Permanent badger fencing will be installed either side of the new road, with an underpass located to the west of the Scheme, to allow badgers to forage on either side of the road and therefore reducing the risk of vehicle collision.
Residual effects and monitoring	Whilst measures have been taken to reduce the lighting levels, there will be an overall increase in permanent lighting, as well as the severance of habitats currently used as foraging habitat. The sensitivity of badgers is considered to be Low, and the magnitude of change following mitigation, is considered to be Negligible. Therefore, there is likely to be a **Negligible adverse** effect on badgers (**not significant**) following the implementation of mitigation measures.

Table 9-26 – Assessment of operational effects for Wintering birds

Assessment Component	Commentary
Wintering birds	The Scheme, once operational, will result in increased noise levels compared to the current baseline, however as it will be a 30mph road, the effect of this noise is unlikely to extend far from the carriageway. Killing and/or injury to wintering birds is possible during the operation of Scheme, through collision with vehicles, however, as the speed limit of the road is 30mph, the risk of vehicle collision is considered reduced The landscaping will become established during the operational phase, which will include areas of wet swales, woodland, orchard and scrub habitat, providing suitable habitat and food source for wintering birds. The sensitivity of wintering birds is considered to be Low, and the magnitude of change prior to mitigation, is considered to be Negligible. Therefore, there is likely to be indirect, permanent, long-term **Negligible adverse** effects on wintering birds within the Scheme **(not significant)** prior to the implementation of mitigation measures.
Secondary Mitigation	In line with the landscape strategy, retained, enhanced and newly created habitat will be maintained in line with the LMMP to ensure biodiversity continues to benefit during the lifetime of the Scheme.
Residual effects and monitoring	The sensitivity of wintering birds is considered to be Low, and the magnitude of change following mitigation, is considered to be Negligible. Therefore, there is likely to be a **Negligible adverse** effect on wintering birds within the Scheme **(not significant)** following the implementation of mitigation measures.

Table 9-27 – Assessment of operational effects for Breeding birds

Assessment Component	Commentary
Breeding birds	The Scheme, once operational, will result in increased noise levels compared to the current baseline, however as it will be a 30mph road, the effect of this noise is unlikely to extend far from the carriageway. Killing and/or injury to breeding birds is possible during the operation of Scheme, either through collision with vehicles (particularly barn owl due to their hunting behaviour and poor peripheral vision) or through active landscape management. However, as the speed limit of the road is 30mph, the risk of vehicle collision is considered reduced. The landscaping will become established during the operational phase, which will include areas of hedgerows, woodland, orchard and scrub habitat, providing suitable nesting habitat for breeding birds, as well as foraging habitat for barn owl. The sensitivity of breeding birds is considered to be Low, and the magnitude of change prior to mitigation, is considered to be Negligible. Therefore, there is likely to be indirect, permanent, long-term **Negligible adverse** effects on breeding birds within the Scheme **(not significant)** prior to the implementation of mitigation measures.
Secondary Mitigation	In line with the landscape strategy, retained, enhanced and newly created habitat will be maintained in line with the LMMP to ensure biodiversity continues to benefit during the lifetime of the Scheme.
Residual effects and monitoring	The sensitivity of breeding birds is considered to be Low, and the magnitude of change following mitigation, is considered to be Negligible. Therefore, there is likely to be a **Negligible adverse** effect on breeding birds within the Scheme **(not significant)** following the implementation of mitigation measures.

Table 9-28 – Assessment of operational effects for Reptiles

Assessment Component	Commentary
Reptiles	The landscaping will become established during the operational phase, which will include areas of hedgerows, grassland, orchard and scrub habitat, providing suitable habitat for reptiles. Killing and/or injury to reptiles is possible during the operation of Scheme, either through collision with vehicles or through active landscape management. The sensitivity of reptiles is considered to be Low, and the magnitude of change prior to mitigation, is considered to be Negligible. Therefore, there is likely to a **Negligible adverse** effect on reptiles within the Scheme **(not significant)** prior to the implementation of mitigation measures.
Secondary Mitigation	In line with the landscape strategy, retained, enhanced and newly created habitat will be maintained in line with the LMMP to ensure biodiversity continues to benefit during the lifetime of the Scheme.
Residual effects and monitoring	The sensitivity of reptiles is considered to be Low, and the magnitude of change following mitigation, is considered to be Negligible. Therefore, there is likely to be a **Negligible adverse** effect on reptiles within the Scheme **(not significant)** following the implementation of mitigation measures.

Table 9-29 – Assessment of operational effects for Invertebrates

Assessment Component	Commentary
Invertebrates	As set out for bats, during the operational phase, permanent artificial lighting will be required alongside the pedestrian / cycle path (including crossings) and on the approaches to roundabouts for safety reasons. Lighting could attract insects from further afield, resulting in adjacent habitat supporting reduced numbers of insects, and disruptions to natural behaviours reducing survival rates. As part of the landscaping plans, areas of wildflower meadow, wetland grass mix, woodland, orchard and scrub habitat will become established providing suitable habitat for a range of invertebrates. Where trees are to be felled, log piles will be created within the proposed landscaping to provide suitable habitat for stag beetle. Once established these will provide a higher quality habitat for invertebrate species and are likely to lead to an increased invertebrate diversity utilising the local area. The sensitivity of invertebrates within the Scheme is considered to be Low, and the magnitude of change in the absence of mitigation is considered to be Negligible. Therefore, there is likely to be indirect, permanent, long-term **Negligible adverse** effects on invertebrates within the Scheme **(significant)** prior to the implementation of mitigation measures.
Secondary Mitigation	In line with the landscape strategy, retained, enhanced and newly created habitat will be maintained in line with the LMMP to ensure biodiversity continues to benefit during the lifetime of the Scheme.
Residual Effects and Monitoring	Following the implementation of mitigation, the sensitivity of invertebrates is Low, and the magnitude of change, following mitigation, is **Negligible**. Therefore, there will be a **Negligible adverse** residual effect on invertebrates (**not significant**) following the implementation of mitigation measures.

Table 9-30 – Assessment of operational effects for Other SPI

Assessment Component	Commentary
Other SPI	The landscaping will become established during the operational phase, which will include areas of hedgerows, grassland, orchard and scrub habitat, providing suitable habitat for SPI. Killing and/or injury to SPI is possible during the operation of Scheme, either through collision with vehicles (particularly hedgehog) or through active landscape management. The sensitivity of SPI is considered to be Low, and the magnitude of change prior to mitigation, is considered to be Negligible. Therefore, there is likely to a **Negligible adverse** effect on SPI within the Scheme **(not significant)** prior to the implementation of mitigation measures.
Secondary Mitigation	In line with the landscape strategy, retained, enhanced and newly created habitat will be maintained in line with the LMMP to ensure biodiversity continues to benefit during the lifetime of the Scheme. Measures set out within the CEMP.
Residual effects and monitoring	The sensitivity of SPI is considered to be Low, and the magnitude of change following mitigation, is considered to be Negligible. Therefore, there is likely to be a **Negligible**

Assessment Component	Commentary
	adverse effect on SPI within the Scheme **(not significant)** following the implementation of mitigation measures.

9.7 LIMITATIONS AND ASSUMPTIONS

9.7.1. This ES chapter has been prepared on the basis that where appropriate, the recommended ecological mitigation detailed will be designed into the Proposed Scheme during the detailed design stage. This may not be feasible for activities such as monitoring.

9.7.2. Any limitations applicable to individual technical surveys are documented within the relevant technical appendices. No limitations significant enough to influence the robustness of the results and analysis of these surveys were encountered, and all surveys undertaken to inform this Chapter are considered to be valid and a true representation of the current ecological conditions on the Site.

9.8 CUMULATIVE EFFECTS

9.8.1. As set out in **Chapter 14 - Cumulative Effects** in agreement with WSCC and Arun District Council, 19 committed developments are being considered for potential cumulative effects with the Proposed Scheme. Of particular note is the 'Barratts Development' "Adjacent Proposed Scheme" which is currently being progressed towards a planning application to be submitted later in 2021 or 2022.

CONSIDERATION OF STUDY AREA

9.8.2. As set out in Tables 9-5 and 9-6, the Study Area used varied depending upon the ecological feature(s) being surveyed and included up to a 250m buffer of the Site, of which there was significant overlap of the Barratts Development Site. The extent of the different Surveys Areas are shown in the relevant technical appendices[8]. By extending this study area beyond the extent of the Site boundary across multiple surveys, this allowed a thorough understanding of the ecology present within the Site as well as within the wider locale.

9.8.3. Throughout the progression of the detailed design stage, regular liaison with the lead ecologist for the Barratts Development was undertaken, in order to ensure there was a combined approach to mitigation where feasible. The principles of this combined approached is summarised below and has been detailed in an integration statement for the two developments, see Appendix 14.2 for further information.

- Maintaining green infrastructure / wildlife corridors;
- Complementary landscape strategy;
- Lighting principles;
- Maintenance and enhancement to key bat foraging / commuting corridors;

[8] Please note, whilst the Phase 1 habitat survey originally included all land within a 250m buffer of the Site, for the purpose of the planning application, the report was updated to only include land within the Site itself in order to align with the BNG assessment.

- Combined approach to badger mitigation including a wildlife underpass that will retain connectivity;
- BNG approach to be consistent with the Proposed Scheme e.g. extension of landscaping areas;
- Complimentary reptile mitigation strategy to avoid double handling; and
- Careful timings of works with regards to breeding birds / retention of breeding bird habitat where possible.

9.8.4. The construction phases of the Proposed Scheme and the Barratts Development could overlap given the timeframes for the respective planning applications. However, during the construction phase of the Proposed Scheme, there is not anticipated to be any additional loss of habitat from the adjacent land as a result of construction works for the Barratts Development. Given the careful consideration that has gone into designing the ecological mitigation for the Proposed Scheme with respect to the proposed Barratts Development, there are not anticipated to be any significant cumulative effects upon ecological features.

9.9 SUMMARY

9.9.1. The ecological baseline status has been established through desk studies and field surveys. A range of habitats and species were considered in the assessment including:

- On and off-site habitats of conservation importance;
- Bats;
- Badger;
- Birds;
- Reptiles;
- Invertebrates; and
- Other SPI

9.9.2. **Table 9-31** provides a summary of the findings of the assessment.

Table 9-31 - Summary of Effects Table for Ecology

Description of Effects	Receptor	Significance and Nature of Effects Prior to Secondary Mitigation	Summary of Secondary Mitigation	Significance and Nature of Residual Effects
Construction Phase				
Disturbance from construction activities including visual, noise, vibration and lighting.	Bats - roosting	Minor - / T / I / ST	– CEMP to detail and guarantee measures	Negligible N/A
	Bats – foraging and commuting	Minor - / T / I / ST	– CEMP to detail and guarantee measures – Sensitive lighting regime – Site fencing/ hoarding to protect retained habitat.	Negligible N/A
	Badgers	Minor-Moderate - / T / I&D / ST	– CEMP to detail and guarantee measures – Protection of retained setts	Minor - / T / I / ST
	Birds – wintering	Minor - / T / I / ST	– CEMP to detail and guarantee measures	Negligible N/A
	Birds – breeding	Minor - / T / D / ST	– CEMP to detail and guarantee measures. – Avoidance of site clearance during the breeding bird season (March-August, inclusive).	Minor - / T / D / ST

Description of Effects	Receptor	Significance and Nature of Effects Prior to Secondary Mitigation	Summary of Secondary Mitigation	Significance and Nature of Residual Effects
	Reptiles	Minor - / T / D / ST	– CEMP to detail and guarantee measures. – Sensitive vegetation clearance	Negligible N/A
	Invertebrates	Minor - / T / D / ST	– CEMP to detail and guarantee measures. – Sensitive vegetation clearance	Negligible N/A
	Other SPI	Minor - / T / D / ST	– CEMP to detail and guarantee measures. – Sensitive vegetation clearance	Negligible N/A
Degradation through airborne pollution Pollution caused by use of hazardous materials and incidental release of dust, chemicals, fuels or waste materials.	Off-site HPI	Minor - / T&P / I / LT&ST	– CEMP to detail and guarantee measures – Pollution prevention measures – Site fencing/ hoarding to protect retained habitat.	Negligible N/A
	On-site HPI (Hedgerows)	Minor - / T&P / D&I / LT&ST	– CEMP to detail and guarantee measures – Pollution prevention measures – Site fencing/ hoarding to protect retained habitat.	Negligible N/A

Description of Effects	Receptor	Significance and Nature of Effects Prior to Secondary Mitigation	Summary of Secondary Mitigation	Significance and Nature of Residual Effects
	On-site HPI (Traditional Orchard)	Minor-Moderate - / T&P / D&I / LT&ST	– CEMP to detail and guarantee measures – Pollution prevention measures – Site fencing/ hoarding to protect retained habitat.	Negligible N/A
Permanent and temporary land-take with the Scheme footprint Permanent manipulation of habitats, such as landscaping and 'tidying-up' of areas not within the footprint, felling of trees for Health and Safety reasons	On-site HPI (Hedgerows)	Minor - / P / D / LT	– CEMP to detail and guarantee measures – Pollution prevention measures – Site fencing/ hoarding to protect retained habitat. – Habitat replacement	Minor - / T / D / ST
	On-site HPI (Traditional Orchard)	Minor-Moderate - / P / D / LT	– CEMP to detail and guarantee measures – Pollution prevention measures – Site fencing/ hoarding to protect retained habitat. – Habitat replacement	Minor - / T / D / ST
Temporary storage of construction materials within / adjacent to ecological resources with associated habitat contamination	Off-site HPI	Minor - / T / I / ST	– CEMP to detail and guarantee measures – Pollution prevention measures – Site fencing/ hoarding to protect retained habitat.	Negligible N/A

Description of Effects	Receptor	Significance and Nature of Effects Prior to Secondary Mitigation	Summary of Secondary Mitigation	Significance and Nature of Residual Effects
	On-site HPI (Hedgerows)	Minor - / T / I / ST	– CEMP to detail and guarantee measures – Pollution prevention measures – Site fencing/ hoarding to protect retained habitat.	Negligible N/A
	On-site HPI (Traditional Orchard)	Minor-Moderate - / T / I / ST	– CEMP to detail and guarantee measures – Pollution prevention measures – Site fencing/ hoarding to protect retained habitat.	Negligible N/A
Habitat loss and fragmentation disrupting species dispersal	Bats - roosting	Minor - / P / D / LT	– CEMP to detail and guarantee measures – Installation of bat boxes to replace lost PRFs prior to tree removal.	Minor - / T / D / ST
	Bats – foraging and commuting	Minor - / P / D / LT	– Site fencing/ hoarding to protect retained habitat.	Minor - / T / D / ST
	Badgers	Minor-Moderate - / T / I&D / ST	– Creation of artificial sett – CEMP to detail and guarantee measures – Protection of retained setts	Minor - / T / I / ST

Description of Effects	Receptor	Significance and Nature of Effects Prior to Secondary Mitigation	Summary of Secondary Mitigation	Significance and Nature of Residual Effects
	Birds – wintering	Minor - / T / D / ST	– CEMP to detail and guarantee measures	Minor - / T / D / ST
	Birds – breeding	Minor - / T / D / ST	– CEMP to detail and guarantee measures. – Avoidance of site clearance during the breeding bird season (March-August, inclusive). – Installation of bird boxes	Minor - / T / D / ST
	Reptiles	Minor - / T / D / ST	– CEMP to detail and guarantee measures. – Sensitive vegetation clearance	Minor - / T / D / ST
	Invertebrates	Minor - / T / D / ST	– CEMP to detail and guarantee measures. – Sensitive vegetation clearance	Minor - / T / D / ST
	Other SPI	Minor - / T / D / ST	– CEMP to detail and guarantee measures. – Sensitive vegetation clearance	Minor - / T / D / ST
Direct mortality during site clearance and construction	Bats - roosting	Minor - / P / D / LT	– CEMP to detail and guarantee measures	Negligible N/A

Description of Effects	Receptor	Significance and Nature of Effects Prior to Secondary Mitigation	Summary of Secondary Mitigation	Significance and Nature of Residual Effects
			– Updated surveys to establish any changes to baseline – Installation of bat boxes to replace lost PRFs	
	Badgers	Minor-Moderate - / T / I&D / ST	– CEMP to detail and guarantee measures – Creation of artificial sett and works completed under a Natural England licence – Protection of retained setts	Minor - / T / I / ST
	Birds – breeding	Minor - / T / D / ST	– CEMP to detail and guarantee measures. – Avoidance of site clearance during the breeding bird season (March-August, inclusive).	Minor - / T / D / ST
	Reptiles	Minor - / T / D / ST	– CEMP to detail and guarantee measures. – Sensitive vegetation clearance	Negligible N/A
	Invertebrates	Minor - / T / D / ST	– CEMP to detail and guarantee measures.	Negligible N/A

Description of Effects	Receptor	Significance and Nature of Effects Prior to Secondary Mitigation	Summary of Secondary Mitigation	Significance and Nature of Residual Effects
			– Sensitive vegetation clearance	
	Other SPI	Minor - / T / D / ST	– CEMP to detail and guarantee measures. – Sensitive vegetation clearance	Negligible N/A
Operational Phase				
Direct disturbance from operational use including visual, noise, vibration and lighting.	Bats – roosting	Negligible - / P / I / LT	– Monitoring of bat boxes – Sensitive lighting strategy	Negligible N/A
	Bats – foraging and commuting	Minor - / P / I / LT	– Sensitive lighting strategy, to include timing of operational lighting	Negligible N/A
	Badgers	Minor - / P / I / LT	– Sensitive lighting strategy, to include timing of operational lighting	Minor N/A
	Birds – wintering	Negligible - / P / I / LT	– Careful habitat management	Negligible N/A
	Birds – breeding	Negligible - / P / I / LT	– Careful habitat management	Negligible N/A

Description of Effects	Receptor	Significance and Nature of Effects Prior to Secondary Mitigation	Summary of Secondary Mitigation	Significance and Nature of Residual Effects
	Reptiles	Negligible - / P / I / LT	– Careful habitat management	Negligible N/A
	Invertebrates	Negligible - / P / I / LT	– Careful habitat management	Negligible - / P / D / LT
Degradation through airborne pollution	Off-site HPI	Negligible - / P / I / LT	– No specific mitigation	Negligible N/A
	On-site HPI (Hedgerows)	Negligible - / P / I / LT	– Establishment of new habitats	Negligible - / P / D / LT
	On-site HPI (Traditional Orchard)	Negligible - / P / I / LT	– Establishment of new habitats	Minor + / P / D / LT
Direct injury / mortality during operation	Bats – foraging and commuting	Minor - / P / I / LT	– Establishment of new habitats – Sensitive lighting strategy, to include timing of operational lighting	Negligible N/A
	Badgers	Minor - / P / I / LT	– Establishment of new habitats – Sensitive lighting strategy, to include timing of operational lighting	Minor N/A

Description of Effects	Receptor	Significance and Nature of Effects Prior to Secondary Mitigation	Summary of Secondary Mitigation	Significance and Nature of Residual Effects
			– Wildlife underpass	
	Birds – wintering	Negligible - / P / I / LT	– Establishment of new habitats – Careful habitat management	Negligible N/A
	Birds – breeding	Negligible - / P / I / LT	– Establishment of new habitats – Careful habitat management	Negligible N/A
	Other SPI	Negligible - / P / I / LT	– Establishment of new habitats – Careful habitat management	Negligible N/A

Key to table: + / - = Beneficial or Adverse P / T = Permanent or Temporary, D / I = Direct or Indirect, ST / MT / LT = Short Term, Medium Term or Long Term, N/A = Not Applicable

9.10 REFERENCES

- Reference 9.1. Her Majesty's Stationery Office (HMSO) (2017). The Conservation of Habitats and Species Regulations 2017 as amended (the Habitat Regulations), HMSO, Norwich.
- Reference 9.2. HMSO (1981). Wildlife and Countryside Act (as amended by the Countryside and Rights of Way Act 2000). HMSO, Norwich.
- Reference 9.3. HMSO (2000) The Countryside and Rights of Way Act. HMSO, Norwich.
- Reference 9.4. HMSO (1992) The Protection of Badgers Act (The Badgers Act), HMSO, London.
- Reference 9.5. HMSO (2006) Natural Environment and Rural Communities Act. HMSO, Norwich.
- Reference 9.6. HMSO (1997) The Hedgerows Regulations, SI 1997/1160. HMSO, London.
- Reference 9.7. Ministry of Housing, Communities and Local Government (2019). The National Planning Policy Framework.
- Reference 9.8. Arun District Council (2018) Adoption Arun Local Plan 2011-2031.
- Reference 9.9. CIEEM (2019) (Version 1.1) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine.
- Reference 9.10. CIEEM (2017a) Guidelines for Preliminary Ecological Appraisal. CIEEM, Winchester.
- Reference 9.11. CIEEM (2017b) Guidelines for Ecological Report Writing. CIEEM, Winchester.
- Reference 9.12. JNCC (2010) Handbook for Phase 1 habitat survey – a technique for environmental audit. JNCC, Peterborough.
- Reference 9.13. BSI (2013) Biodiversity code of practice for planning and development. BS42020. BSI, London
- Reference 9.14. Collins, J (ed.), (2016) Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd Edition) The Bat Conservation Trust, London.
- Reference 9.15. Harris, S., Cresswell, P. & Jefferies D. (1989) Surveying Badgers. Occasional Publication No. 9. The Mammal Society, London.
- Reference 9.16. Roper, T. J. (2010) Badger. Collins New Naturalist Library, Book 114 (First Edition).
- Reference 9.17. Delahay, R.J., Brown, J.A., Mallinson, P.J., Spyvee, P.D., Handoll, D., Rogers, L.M., and Cheeseman, C.L. (2000) The use of marked bait in studies of the territorial organisation of the European Badger (*Meles meles*). Mammal Review, 30 (2), pp 73-87.
- Reference 9.18. English Nature (2006) The Dormouse Conservation Handbook.
- Reference 9.19. Bibby C. J, Burgess N.D, Hill D.A, Mustoe S.H. (2000) Bird Census Techniques. Second Edition. Elsevier Ltd.
- Reference 9.20. Gent, A and Gibson, S. (1998). Herpetofauna Workers Manual, Joint Nature Conservation Committee, Peterborough.
- Reference 9.21. Froglife (1999) Reptile Survey: an introduction to planning, conducting and interpreting surveys for snake and lizard conservation. Froglife Advice Sheet 10. Froglife, Halesworth.
- Reference 9.22. ARG UK (2010) ARG UK Advice Note 5: Great Crested Newt Habitat Suitability Index. ARG UK.
- Reference 9.23. Oldham R.S., Keeble J., Swan M.J.S., and Jeffcote M. (2000) Evaluating the suitability of habitat for the great crested newt. Herpetological Journal 10: 143-155.
- Reference 9.24. Freshwater Habitats Trust (2015) Freshwater Habitats Trust (PondNet) How to collect an eDNA sample, [Online] Available at: https://freshwaterhabitats.org.uk/projects/edna/ [Accessed: 20/11/2019].

- Reference 9.25. Biggs J, Ewald N, Valentini A, Gaboriaud C, Griffiths RA, Foster J, Wilkinson J, Arnett A, Williams P and Dunn F, (2014) Analytical and methodological development for improved surveillance of the Great Crested Newt. Defra Project WC1067. Freshwater Habitats Trust, Oxford.
- Reference 9.26. Drake, C.M., Lott, D. A., Alexander, K. N. A., and Webb, J. (2007) Surveying terrestrial and freshwater invertebrates for conservation evaluation.
- Reference 9.27. CIEEM, CIRIA & IEMA. (2016). Biodiversity Net Gain: Good practice principles for development.
- Reference 9.28. Natural England (2019). The Biodiversity Metric 2.0. Available: http://publications.naturalengland.org.uk/publication/5850908674228224 [Accessed August 2020].
- Reference 9.29. Ecological Planning and Research Ltd. (2020). The Confounded and the Confounding: A Case Study into Air Quality and the Heathlands of Hampshire's New Forest.
- Reference 9.30. Institute of Lighting Professionals (2018) Guidance Note 08/18: Bats and artificial lighting in the UK. Bat Conservation Trust, London.
- Reference 9.31. Bat Conservation Trust (2015) Encouraging Bat – A Guide for Bat-friendly Gardening and Living. BCT, London.

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