A358 Taunton to Southfields Dualling Scheme

Preliminary Environmental Information Report - Chapter 8 Biodiversity

HE551508-ARP-EBD-ZZ-RP-LE-000003

28/09/21

Table of contents

Table of Tables

8 Biodiversity

8.1 Introduction

8.1.1 This chapter provides a preliminary assessment of the potential impacts and effects on biodiversity from the construction and operation of the A358 Taunton to Southfields Dualling Scheme (the proposed scheme), following the methodology set out in Design Manual for Roads and Bridges (DMRB) *LA 108 Biodiversity (LA 108)* [1].

8.1.2 This chapter details the methodology followed for the assessment, summarises the regulatory and policy framework related to biodiversity and describes the existing environment in the area surrounding the proposed scheme. Following this, the design, mitigation and residual effects of the proposed scheme are reported, along with the limitations of the assessment.

8.1.3 A high-level quantification of the level of biodiversity that will be lost to the proposed scheme, and the biodiversity resource provided by the habitat creation/enhancement included within the proposed scheme, will be undertaken using the Department for Environment, Food and Rural Affairs (Defra) metric version 2.0 [2]. The Environment Bill is currently progressing through parliament; it is anticipated this will require developments, including nationally significant infrastructure projects, to achieve a 10% net gain in biodiversity. Should the Environment Bill be enacted during the assessment period of the proposed scheme, the proposed scheme would be reviewed in light of any new requirements and the design revisited to make any necessary amendments. At present, it is understood that due to timing the proposed scheme will not fall under the requirements of the Environment Bill if it becomes law.

8.2 Legislative and policy framework

8.2.1 A framework of international, European, national and local legislation and planning policy guidance exists to protect and conserve wildlife and habitats.

Legislation

8.2.2 The following relevant legislation exists to protect habitats and species of nature conservation importance:

- The Conservation of Habitats and Species Regulations 2017 (the 'Habitat Regulations')
- The Ramsar Convention on Wetlands 1971
- Wildlife and Countryside Act 1981
- Natural Environment and Rural Communities Act 2006 (NERC Act 2006)
- The Countryside and Rights of Way Act 2000
- The Hedgerow Regulations 1997
- The Eels (England and Wales) Regulations 2009
- Salmon and Freshwater Fisheries Act 1975
- The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017
- Protection of Badgers Act 1992
- Invasive Alien Species (Enforcement and Permitting) Order 2019

8.2.3 These pieces of legislation include a number of offences relating to protected species and requirements for licences to allow construction works to proceed. In addition, the Habitats Regulations set out the requirement for the consideration of the potential effects of a project on European designated sites.

8.2.4 The legislation and policy relating to specific species are further detailed within the ecological baseline reports, provided within the PEI report Biodiversity appendices (Appendices 8.1 to 8.23).

National policy

8.2.5 As discussed in Chapter 1 Introduction, the primary basis for deciding whether or not to grant a Development Consent Order (DCO) is the *National Policy Statement for National Networks,* (NPSNN), [3], which, sets out policies to guide how DCO applications will be decided and how the effects of national networks infrastructure should be considered. Table 8-1 identifies the NPSNN policies relevant to biodiversity and then specifies where in the PEI report chapter information is provided to address the policy.

Table 8-1 Relevant NPSNN policies for biodiversity assessment

Relevant NPSNN paragraph reference	Requirement of the NPSNN	Where in this PEI report chapter is information provided to address this policy
4.22 and 4.25	The NPSNN describes the need under the Habitats Regulations to consider whether the proposed scheme could have a significant effect on the objectives of a European site and the procedure to be followed. Prior to granting a DCO, the Secretary of State must, under the Habitat Regulations considered whether it is possible that the project could have a significant effect on the objectives of a European site, or on any site to which the same protection is applied. Applicants are required to provide sufficient information to enable the Secretary of State to carry out an Appropriate Assessment if required, this should include details of any measures that are proposed to minimise or avoid any likely significant effects on the site. If it is not possible to rule out an adverse effect on the integrity of a European site, it is possible to apply for derogation from the Habitats Directive, subject to the proposal meeting three tests: • That there are no feasible, less-damaging alternatives. • That there are imperative reasons of overriding public interest (IROPI) for the proposal going ahead. • That adequate and timely compensation measures will be put in place to ensure the overall coherence of the network of protected sites is maintained.	A Habitats Regulations Assessment (HRA) is being undertaken, initially comprising a screening of likely significant effects on European sites, provided in Appendix 8.1 and discussed briefly in Section 8.10.

Relevant NPSNN paragraph reference	Requirement of the NPSNN	Where in this PEI report chapter is information provided to address this policy
	Where a development may negatively affect any priority habitat or species on a site for which they are a protected feature the IROPI case would need to be solely on the grounds of human health, public safety or beneficial consequences of primary importance to the environment.	
5.22 – 5.23	The NPSNN details that the applicant must ensure the environmental statement clearly sets out any likely significant effects on: • internationally, nationally or locally designated sites of ecological importance • protected species or other species identified as being of principal importance for the conservation of biodiversity • habitats of principal importance for the conservation of biodiversity And the statement considers the full range of potential impacts on ecosystems. The applicant should show how the project has taken advantage of opportunities to conserve and enhance biodiversity.	The assessment of effects on all biodiversity receptors is detailed in Section 8.10 Assessment of likely significant effects.
5.24 – 5.31	The NPSNN describes the general principle that development should avoid significant harm to biodiversity conservation interests, including through mitigation and consideration of reasonable alternatives. Where significant harm cannot be avoided or mitigate, as a last resort, appropriate compensation measures should be sought. The NPSNN describes that the Secretary of State should ensure, in taking decisions, that appropriate weight is attached to designated sites of international, national and local importance. As described above, paragraphs 4.22 to 4.25 detail the approach to be taken to the identification and assessment of significant effects upon internationally designated sites. Where a proposed development on land within or outside a Site of Special Scientific Interest (SSSI) is likely to have an adverse effect on an SSSI (either individually or in combination with other developments), development consent should not normally be granted. Where an adverse effect on the site's notified special interest features is likely, an exception should be made only where the benefits of the development at this site clearly outweigh both the impacts that it is likely to have on the features of the site that make it of special scientific interest, and any broader impacts on the national network of SSSIs.	The assessment of effects on designated sites is included in Section 8.10 Assessment of likely significant effects.

Relevant NPSNN paragraph reference	Requirement of the NPSNN	Where in this PEI report chapter is information provided to address this policy
	Sites of regional and local biodiversity interest have a fundamental role to play in meeting overall national biodiversity targets, as well as wider social benefits. The Secretary of State should give due consideration to such regional or local designations. However, these designations should not be used in themselves to refuse development consent.	
5.32 – 5.35	The NPSNN gives guidance on the principles that should be applied to the assessment of habitats and species. The NPSNN describes that the Secretary of State should not grant development consent for any development that would result in the loss or deterioration of irreplaceable habitats including ancient woodland and veteran trees, unless the national need for and benefits of the development, in that location, clearly outweigh the loss. Where irreplaceable habitats would be affected by development proposals, the applicant should set out proposals for their conservation or, where their loss is unavoidable, the reason for this. The NPSNN describes that the Secretary of State should ensure that applicants have taken measures to ensure protected habitats and species, and those of principal importance for the conservation of biodiversity, are protected from the adverse effects of development. The Secretary of State should refuse consent where harm to the habitats or species and their habitats would result, unless the benefits of the development clearly outweigh that harm. The NPSNN describes that the Secretary of State should consider whether the applicant has maximised opportunities for building in beneficial biodiversity features as part of good practice design.	The assessment of effects on habitats and species is included in Section 8.10 Assessment of likely significant effects.
5.36 – 5.38	The NPSNN gives guidance on the principles that should be applied in the EIA and design development, including avoiding adverse impacts on sites, species and habitats (outlined in 5.22); providing appropriate mitigation measures as an integral part of a development and taking advantage of opportunities to conserve and enhance biodiversity features in and around development. The NPSNN states that the Secretary of State should consider what appropriate requirements should be attached to any consent and/or in any planning obligations entered into in order to ensure that mitigation measures are delivered. The Secretary of	Section 8.9 Design, mitigation and enhancement measures outlines the design, mitigation and enhancement measures incorporated in the proposed scheme.

Relevant NPSNN paragraph reference	Requirement of the NPSNN	Where in this PEI report chapter is information provided to address this policy
	State will take account of what mitigation measures may have been agreed between the applicant and Natural England, and whether they have granted or refused, or intend to grant or refuse any relevant licences.	

8.2.6 Particular attention has been made to the planning policy and strategy documents listed below that are applicable to assessing the impacts of the proposed scheme on the identified ecological resources:

- NPSNN [3]
- *National Planning Policy Framework* [4]
- *UK-Post 2010 Biodiversity Framework* [5] (which replaced the UK Biodiversity Action Plan (BAP))
- *Biodiversity 2020: A strategy for England's wildlife and ecosystem services* [6]
- *A Green Future: Our 25 Year Plan to Improve the Environment* [7]
- *Towards a Wilder Britain* [8]

8.2.7 The Government's detailed policy on environmental mitigations for developments is set out in section 5, Biodiversity and ecological conservation of the NPSNN. It states:

> *"Paragraph 5.20: Biodiversity is the variety of life in all its forms and encompasses all species of plants and animals and the complex ecosystems of which they are a part. Government policy for the natural environment is set out in the Natural Environment White Paper (NEWP). The NEWP sets out a vision of moving progressively from net biodiversity loss to net gain, by supporting healthy, well-functioning ecosystems and establishing more coherent ecological networks that are more resilient to current and future pressures."*

8.2.8 Highways England recognises the national loss of biodiversity and that the road network includes a substantial area of land within the UK. Due to this, Highways England produced their *Delivery Plan 2020 – 2025* [9] which commits to the delivery of improved biodiversity, as set out in Highways England's Biodiversity Plan and reducing the net loss of biodiversity by end of Road Period 1 , on an ongoing annual basis. In addition, *Highways England Road Investment Strategy (RIS 2) 2020 – 2025* [10] further commits to delivering no net loss of biodiversity by 2025, and continuing progress towards the target of delivering a net gain in biodiversity by 2040.

8.2.9 Biodiversity policy within the UK has been revised through the publication of the *UK Post-2010 Biodiversity Framework* [5] which supersedes the *UK Biodiversity Action Plan ('BAP')* and covers the period from 2011 to 2020. A total of 65 Priority Habitats and 1,150 Species of Principal Importance (SPI) were identified as the most in need of protection. An update to the UK BAP is awaited.

8.2.10 However, the UK list of SPI remains an important reference source and has been used to draw up statutory lists of SPI in England as required under Section 41 (s41) of the NERC Act 2006. A total of 56 Habitats of Principal Importance (HPI) and 943 SPI found in England are included in the s41 list. These habitats and

species were identified as requiring action in the UK BAP and continue to be regarded as conservation policies in the subsequent UK post-2010 Biodiversity Framework.

Local policy and guidance

8.2.11 Consideration has been given to the following local policies and guidance relating to biodiversity:

- *Taunton Deane Local Plan* [11] with particular focus on Chapter 7, 'Environment and Conservation'
- *Taunton Deane Local Biodiversity Action Plan* [12]
- *Taunton Deane Borough Council Adopted Core Strategy 2011-2028* [13]
- *Somerset Highways Biodiversity Manual* [14]
- *Somerset County Council Pollinator Action Plan 2018-2028* [15]
- *Wild Somerset - The Somerset Biodiversity Strategy 2008-2018* [16]

Guidance and standards

8.2.12 A range of standards and guidance documents are available for biodiversity. The principal assessment sources, which have been taken into account, include:

- Highways England standards, namely DMRB *LA 108* [1], DMRB *LA 104 Environmental assessment and monitoring (LA 104)* [17], DMRB *LD 118 Biodiversity design (LD 118)* [18] and DMRB *LA 115 Habitats Regulations assessment (LA 115)* [19]
- The ecological assessment will be undertaken using the Chartered Institute of Ecology and Environmental Management (CIEEM) *Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine* [20]
- Natural England - *Ancient woodland, ancient trees and veteran trees: protecting them from development* [21]

8.2.13 Guidance for specific species, groups and other ecological features is discussed in individual relevant sections or is provided in the PEI report ecological baseline reports (Appendices 8.1 to 8.23).

8.3 Assessment methodology

Assessment of biodiversity value and significance criteria

8.3.1 This assessment methodology is based on that set out in DMRB *LA 104 Environmental assessment and monitoring LA 104)* [17] and DMRB *LA 108 Biodiversity (LA 108)* [1]. *LA 108* sets out a process for the establishment of the relative importance of the biodiversity resources including sites, habitats, species populations and assemblages of species, characterisation of predicted scheme impacts before and after mitigation and the subsequent assessment of significance of effects.

8.3.2 The assessment methodology for ecological resources is supplemented where appropriate with guidance from the CIEEM *Guidelines for Ecological Impact Assessment* [20].

8.3.3 The assessment process has also relied on professional judgement by qualified individuals with relevant expertise, recognising scheme-specific circumstances,

and decisions have been made through consultation with stakeholders including Natural England.

Valuation of resources

8.3.4 The importance of resources including sites, habitats, species populations and assemblages of species is assessed in accordance with guidance provided in DMRB *LA 108* [1], as summarised in Table 8-2.

8.3.5 The valuation of bat roosts has been informed by guidance on valuing bats in ecological impact assessment by Wray et al [22]. The valuation of roosts considers the distribution and relative rarity of the bat species based on its UK population size and the type of bat roost present. The guidance provides a framework for assigning roosts, commuting routes and foraging areas to geographic importance categories that are consistent with the values defined in DMRB *LA 108* [1] as summarised in Table 8-2.

Table 8-2 Biodiversity resource importance

Importance	Typical biodiversity resources
International or European importance	
Sites	Sites including: 1) European sites: • Sites of Community Importance • Special Protection Areas (SPAs) • Potential SPAs (pSPAs) • Special Areas of Conservation (SACs) • Candidate or possible SACs • Wetland of international importance (Ramsar site) 2) Biogenic Reserves, World Heritage Sites (where recognised specifically for their biodiversity value) and Biosphere reserves 3) Areas which meet the published selection criteria for those sites listed above but which are not themselves designated as such
Habitats	N/A
Species	Resident, or regularly occurring, populations of species which may be considered at an International or European level[1] where: • the loss of these populations would adversely affect the conservation status or distribution of the species at this geographic scale; or • the population forms a critical part of a wider population at this scale; or • the species is at a critical phase of its life cycle at an international or European scale Bat roosts as defined in Wray et al [22]: • SACs designated for Annex II bat species (greater horseshoe (*Rhinolophus ferrumequinum)* and lesser horseshoe (*Rhinolophus hipposideros*), barbastelle (*Barbastellus barbastella*) and Bechstein's (*Myotis bechsteinii*))
UK or National (England)	
Sites	Sites including: 1) Sites of Special Scientific Interest (SSSIs)

[1] Such species include those listed within Council Directive 79/409/EEC on the conservation of wild birds or animal/plant species listed within Council Directive 92/43/EEC.

Importance	Typical biodiversity resources
	2) National Nature Reserves (NNRs) 3) National Parks 4) Marine Protected Areas including Marine Conservation Zones 5) Areas which meet the criteria, but which are not themselves designated
Habitat	Habitats including: 1) Areas of UK BAP priority habitats 2) Habitats included in the relevant statutory list of Species of Principal Importance and habitats 3) Areas of irreplaceable habitats including: • ancient woodland • ancient or veteran trees 4) Areas which meet the published selection criteria for those sites listed above but which are not themselves designated as such
Species	Resident, or regularly occurring, populations of species which may be considered at an International, European, UK or National level where: • the loss of these populations would adversely affect the conservation status or distribution of the species at this scale • the population forms a critical part of a wider population at this scale • the species is at a critical phase of its life cycle at a UK or national scale Bat roosts as defined in Wray et al [22]. • Maternity sites for rarest species in England (greater horseshoe, Bechstein's, Alcathoe (*Myotis alcathoe*), greater mouse-eared (*Myotis myotis*), barbastelle, grey long-eared (*Plecotus austriacus*))
Regional (South-West England)	
Sites	Designated sites (non-statutory) including heritage coasts
Habitats	Areas of habitats identified (including for restoration) in regional plans or strategies (where applicable)
Species	Species including: • Resident, or regularly occurring, populations of species which may be considered at an International, European, UK or National level where: - the loss of these populations would adversely affect the conservation status or distribution of the species at a regional scale - the population forms a critical part of a wider regional population - the species is at a critical phase of its life cycle at a regional scale • Species identified in regional plans or strategies Bat roosts as defined in Wray et al [22]: • Mating sites for rarer species (lesser horseshoe, whiskered (*Myotis mystacinus*), Brandt's (*Myotis brandtii*), Daubenton's (*Myotis daubentonii*), Natterer's (*Myotis nattereri*), Leisler's (*Nyctalus leisleri*), noctule (*Nyctalus noctula*), Nathusius' pipistrelle (*Pipistrellus nathusii*), serotine (*Eptesicus serotinus*)) and rarest species (greater horseshoe, Bechstein's, Alcathoe, greater mouse-eared, barbastelle, grey long-eared) including well used swarming sites • Maternity sites (rarer species as above) • Hibernation sites (rarest species as above) • Significant hibernation sites for rarer/rarest species (as above) or all species assemblages
County (Somerset)	

Importance	Typical biodiversity resources
Sites	Wildlife/ nature conservation sites designated at a county level (or equivalent) level including: 1) Local Wildlife Sites (LWS) 2) Local Nature Conservation Sites (LNCS) 3) Local Nature Reserves (LNRs) 4) Sites of Importance for Nature Conservation (SINCs) 5) County Wildlife Sites (CWS)
Habitats	Areas of habitat identified in the county or equivalent authority plans or strategies (where applicable)
Species	Species including 1) Resident, or regularly occurring, populations of species which may be considered at an International, European, UK or National level where: • the loss of these populations would adversely affect the conservation status or distribution of the species across the County • the population forms a critical part of a wider population • the species is at a critical phase of its life cycle 2) Species identified in a county or equivalent authority area plans or strategies Bat roosts as defined in Wray et al [22]: • Maternity sites for common species (common pipistrelle (*Pipistrellus pipistrellus*), soprano pipistrelle (*Pipistrellus pygmaeus*), brown long-eared (*Plecotus auritus*)). • Small numbers of hibernating bats for common species (as above) and rarer species (lesser horseshoe, whiskered, Brandt's, Daubenton's, Natterer's, Leisler's, noctule, Nathusius' pipistrelle, serotine). • Feeding perches for rarer species (as above) and rarest species (greater horseshoe, Bechstein's, Alcathoe, greater mouse-eared, barbastelle, grey long-eared). • Individual bats for rarer/rarest species (as above). • Small numbers of non-breeding bats for rarer/rarest species (as above).
Local	
Sites	Wildlife/ nature conservation sites designated at a local level including sites including: 1) LWS 2) LNCS 3) LNRs 4) SINCs 5) Sites of Local Nature Conservation Importance (SLNCIs)
Habitats	Areas of habitat considered to appreciably enrich the habitat resource within, the local context including features of importance for migration, dispersal, or genetic exchange
Species	Populations/communities of species considered to appreciably enrich the habitat resource within the local context including features of importance for migration, dispersal or genetic exchange Bat roosts as defined in Wray et al [22]: • Feeding perches for common species (common pipistrelle, soprano pipistrelle, brown long-eared). • Individual bats for common species (as above). • Small numbers of non-breeding bats for common species (as above). • Mating sites for common species (as above).

Table taken from Table 3.9 of DMRB *LA 108* [1] 'Biodiversity Resource Importance'

8.3.6 In circumstances where there are other environmental factors influencing the value of the receptor which are not covered by the guidance in DMRB *LA 108* [1], professional judgement has been applied in accordance with the CIEEM *Guidelines for Ecological Impact Assessment* [20]. In such instances the justification for valuation is fully described.

8.3.7 Ecological receptors within the study area are described within Section 8.6. Baseline Conditions. Receptors valued below local importance are assessed as having limited ecological value. Therefore, only receptors valued as being of local importance or above will be taken forward for detailed assessment. However, the Department for Environment Food and Rural Affairs (Defra) biodiversity metric used will take account of all habitats lost, including those valued at less than local importance.

Characterisation of impacts

8.3.8 The potential impacts arising from the proposed scheme on receptors taken forward for detailed assessment are described and characterised in detail in accordance with Table 3.11 in DMRB *LA 108* [1], and as shown in Table 8-3.

Table 8-3 Characterisation of impacts

Level of impact		Typical description
Major	Adverse	1 Permanent/irreversible damage to a biodiversity resource 2 the extent, magnitude, frequency, and/or timing of an impact negatively affect the integrity or key characteristics of the resource
	Beneficial	1 Permanent addition of, improvement to, or restoration of a biodiversity resource 2 The extent, magnitude, frequency, and/or timing of an impact positively affects the integrity or key characteristics of the resource
Moderate	Adverse	1 Temporary/reversible damage to a biodiversity resource 2 the extent, magnitude, frequency, and/or timing of an impact negatively affects the integrity or key characteristics of the resource
	Beneficial	1 Temporary addition of, improvement to, or restoration of a biodiversity resource 2 The extent, magnitude, frequency, and/or timing of an impact positively affects the integrity or key characteristics of the resource
Minor	Adverse	1 Permanent/irreversible damage to a biodiversity resource 2 the extent, magnitude, frequency, and/or timing of an impact does not affect the integrity or key characteristics of the resource
	Beneficial	1 Permanent addition of, improvement to, or restoration of a biodiversity resource 2 the extent, magnitude, frequency, and/or timing of an impact does not affect the integrity or key characteristics of the resource
Negligible	Adverse	1 Temporary/reversible damage to a biodiversity resource 2 the extent, magnitude, frequency, and/or timing of an impact does not affect the integrity or key characteristics of the resource
	Beneficial	1 Temporary addition of, improvement to, or restoration of a biodiversity resource 2 the extent, magnitude, frequency, and/or timing of an impact does not affect the integrity or key characteristics of the resource
No change		No observable impact, either positive or negative

Table taken from DMRB *LA 108* [1] (Table 3.11 Level of impact and typical descriptions).

8.3.9 The level of impact on biodiversity will also be concluded in accordance with CIEEM's *Guidelines for Ecological Impact Assessment in the UK and Ireland* [20].

8.3.10 Air quality modelling assessment has been used to assess the impact of nitrogen (N) deposition on sensitive habitats. More details on air quality can be found in Chapter 5 Air Quality.

Zone of influence

8.3.11 The CIEEM *Guidelines for Ecological Impact Assessment* [20] have been used to guide the characterisation of impacts process. For example, in determining factors influencing character such as the complexity of the impact (whether it is direct or indirect), and the Zone of Influence[2] (ZoI) of that receptor . The ZoI is the area over which ecological features may be subject to significant effects. This area may differ for different receptors. The ZoI is explained in more detail within Section 8.6.

Assessment of significance of effects

8.3.12 In accordance with DMRB *LA 104* [17] and DMRB *LA 108* [1], and shown in Table 8-4, the significance of effects characterised as Neutral, Slight, Moderate, Large, Very Large and both adverse and beneficial, is determined by assessing the importance of resources/receptors against any residual impact.

8.3.13 In accordance with DMRB *LA 108* [1], a significant effect is considered to be any effect of moderate, large or very large categories once mitigation has been taken into account. Significant effects, or impacts which affect receptors protected under legislation, require consideration of avoidance, reduction or mitigation as defined within CIEEM Guidance [20].

Table 8-4 Impact Significance matrix

[2] The 'zone of influence' for a project is the area over which ecological features may be subject to significant effects as a result of the proposed project and associated activities. This is likely to extend beyond the project site, for example where there are ecological or hydrological links beyond the site boundaries. The zone of influence will vary for different ecological features depending on their sensitivity to an environmental change. It may be appropriate to identify different zones of influence for different features.

Resource importance	Level of Impact					
		No change	**Negligible**	**Minor**	**Moderate**	**Major**
	International or European importance	Neutral	Slight	Moderate or large	Large or very large	Very large
	UK or National importance	Neutral	Slight	Slight or moderate	Moderate or large	Large or very large
	Regional importance	Neutral	Neutral or slight	Slight	Moderate	Moderate or large
	County or equivalent authority importance	Neutral	Neutral or slight	Neutral or slight	Slight	Slight or moderate
	Local importance	Neutral	Neutral	Neutral or slight	Neutral or slight	Slight

Table taken from DMRB *LA 108* [1] (Table 3.13 Significance matrix)

8.3.14 The assessment of the significance of effects is also informed by professional judgement of ecologists experienced in the assessment of ecological impacts of major linear infrastructure schemes in the UK, and further guidance provided within CIEEM Guidelines [20].

Stakeholder engagement

8.3.15 Natural England have been engaged via the discretionary advice service, discussions to date have focussed on agreement over the scope of surveys to inform the assessment of the proposed scheme. Technical Working Groups (TWG) are being set up with key stakeholders including the local planning ecologists and representatives of Somerset Wildlife Trust. The intention is for TWG meetings to discuss a shared vision for the proposed scheme and more detailed design with regard to the infrastructure crossings/ecological networks and achieving biodiversity targets. Further details on the consultation relating to biodiversity would be provided in the Statements of Common Ground, which would be submitted with the DCO application.

8.4 Assessment assumptions and limitations

8.4.1 The preliminary assessment presented in this chapter is based on the ecological surveys completed to date and the data collected and assessed at the time of writing. Every effort has been made to ensure that the findings of the study present as accurate an interpretation as possible of the status of flora and fauna within the study area; however, surveys are ongoing which will provide additional data on the ecology of the area. Updated survey results and an updated assessment of biodiversity impacts will be reported in the ES.

8.4.2 Ecological surveys are limited by factors that affect the presence of plants and animals, such as the time of year, weather, migration patterns and behaviour. Surveys undertaken have been largely conducted during the optimal survey periods and using standard methodologies accepted by Natural England and other statutory bodies. Field survey limitations, assumptions of presence and deviations from optimal survey windows and standard methodologies are stated within the individual technical reports appended to this PEI Report chapter.

8.4.3 Ecological surveys have been undertaken across the proposed scheme since 2016. The validity of data collected prior to 2021 has been assessed in accordance with CIEEM guidance [20], and the 2021 survey scope designed to ensure an up-to-date ecological baseline to inform the assessment of the

proposed scheme in the ES. For example, given the agricultural nature of the majority of the land within the proposed scheme, the potential for rapid change in habitat types is recognised. Therefore, updated habitat and protected species scoping surveys are being undertaken for the whole of the proposed scheme to ensure the assessment captures any changes. Land access has been good across the proposed scheme, however there were areas where access was not permitted prior to 2021; for example the woodland belt to the south of Griffin Lane has not been surveyed to date. However, access has been agreed for 2021 surveys. Therefore land access is not considered to be a significant limitation to the assessment of the biodiversity effects arising from the proposed scheme for the ES. All biodiversity surveys carried out in 2021 will be amalgamated with existing data and reported in the ES issued to support the DCO application.

8.4.4 Where 'reasonable worst-case' valuations are necessary they have been made based on the information available at the time of writing. This has included consideration of any available field or desk study data (including aerial photography), a comparison with similar habitat areas occurring in the wider local area, and a qualitative consideration against any factors that indicate suitability for the particular habitat or species in question. The degree or precaution built into the assessment, and mitigation provided, is linked to the level of confidence in the existing data upon which the assessment is based. The findings of surveys undertaken in 2021 will be reviewed and, where appropriate, be used to inform updates to the environmental mitigation, which may include additional habitat creation measures, that will be detailed in the ES.

8.5 Study area

8.5.1 Initially the ecology of the proposed scheme and surrounding area was surveyed over five years between 2016 and 2020, in which time several route options were considered, with the preferred route (Pink Modified Option) being determined and announced in 2019 (see Chapter 3 Assessment of Alternatives). The survey data available and relevant to the proposed scheme has been incorporated into the baseline and will be supplemented by update survey data being collected during 2021/2022. The scope of surveys to be undertaken has been developed in consultation with Natural England to ensure refinement of the baseline previously established in order to inform the impact assessment of the proposed scheme.

8.5.2 The study area for each survey was based upon the options selection stage design and varied for different species and ecological survey methods to ensure compliance with specific guidance for species, groups and habitats.

8.5.3 The maximum extent of the study areas was determined by guidance, the predicted Zone of Influence (ZoI) of the proposed scheme and consultation with statutory bodies. For example, surveys for badger (*Meles meles*) extended 0.31 miles (500 metres) from the proposed scheme, as per DMRB *LD 118 Biodiversity design (LD 118)* [18]. Where there are any deviations from guidance, these are described and justified within the assessment and ecological baseline reports within PEI report Appendices 8.1 to 8.23.

8.5.4 Table 8-5 provides a summary of the desk study and field study area distances applied for each ecological receptor surveyed for the proposed scheme; specific guidance used is provided below for each biodiversity receptor considered. The 2021/2022 survey study area is detailed in Table 8-5 where it deviates from the study area of the surveys undertaken previously.

Table 8-5 Summary of the study area distances applied for each biodiversity receptor considered

Biodiversity resource or survey type	Study area
Desk study	
Internationally designated nature conservation sites, including SAC, SPA and Ramsar Sites	18.6 miles (30 kilometres) from the proposed scheme boundary for sites designated for bats. European sites within likely foraging range for birds species (where the ZoI could affect potentially functionally linked land). A 6.2 miles (20 kilometres) study area was applied to identify any internationally designated site with potential hydrological connectivity, sites beyond this were considered in consultation with water environment specialists to identify sites with hydrological connectivity and an impact pathway from the proposed scheme. Any internationally designated site with a component SSSI that has an Impact Risk Zone (IRZ) that extends into the proposed scheme boundary. The IRZ defines zones around each SSSI which reflect the particular sensitivities of the features for which the SSSI is notified and could potentially extend beyond the study areas defined for internationally designated sites. 0.12 miles (200 metres) from the Affected Road Network (ARN) for sites sensitive to N deposition (assessed for air quality impacts only).
Nationally and locally designated nature conservation sites, including NNR, SSSI, Local Nature Reserves (LNR), priority habitats, Local Wildlife Sites (LWS), ancient woodland, ancient and veteran trees and Royal Society for the Protection of BirdsReserves.	Any SSSI that has an Impact Risk Zone that extends into the proposed scheme boundary. 1.2 miles (2 kilometres) from the proposed scheme boundary for other sites. 0.12 miles (200 metres) from the ARN for sites sensitive to N deposition (assessed for air quality impacts only).
Records of protected species and notable species from Somerset Environmental Records Centre (SERC).	1.2 miles (2 kilometres) from the proposed scheme boundary.
Field survey	
Extended Phase 1 habitat survey	The Extended Phase 1 habitat survey was conducted up to 0.31 miles (500 metres) from the proposed scheme boundary (undertaken in 2016).
UK Habitats Classification (UKHab) survey	Surveys are being conducted in 2021 within up to 0.16 miles (250 metres) of the proposed scheme boundary.
River Habitat Survey (RHS) and River Corridor Survey (RCS)	Watercourses which were within the proposed scheme boundary or wider catchment likely to be impacted by the works were considered, and the RHS was ultimately undertaken along 0.31 mile (500 metres) lengths of the River Ding and the associated Back Stream. Further RCS will be undertaken in 2021 with the study area extended to include up to 0.31 miles (500 metres) upstream and downstream of all locations where the proposed scheme will

Biodiversity resource or survey type	Study area
	cross a watercourse, including crossing points of the existing A358 carriageway.
Modular river (MoRPh) surveys	MoRPh surveys will be undertaken in 2021 up to 0.16 miles (250 metres) upstream and downstream at all locations where the proposed scheme will cross a watercourse, including crossing points of the existing A358 carriageway.
Assessment of habitat suitable for migratory and resident populations of fish such as salmonid species, European eel (*Anguilla anguilla*), lamprey species and shad species.	Fish habitat assessments and electric fishing were undertaken on a 0.06 mile (100 metres) stretch of the River Ding where a channel diversion is part of the proposed scheme. Further surveys will be undertaken in 2021 with the study area extended to include up to 0.06 miles (100 metres) upstream and downstream of all locations where the proposed scheme crosses a watercourse, including crossing points of the existing A358 carriageway.
Hedgerow Survey	All hedgerows within 0.03 miles (50 metres) of the proposed scheme boundary.
Woodland Survey - National Vegetation Classification (NVC)	Woodland sites within 0.12 miles (200 metres) of the proposed scheme boundary were scoped in for NVC surveys if they had the potential to support protected or notable plant species, were designated for their botanical interest, and/or were listed on the Ancient Woodland Inventory. This distance was used to account for potential air quality impacts which have potential to have adverse impacts within 0.12 miles (200 metres) of the air pollution source in accordance with DMRB LA 105 Air quality [23]. Further surveys will be undertaken in 2021 at woodland sites within 0.06 miles (100 metres) of the proposed scheme where access issues or survey limitations were previously an issue.
Botanical Survey - NVC	Grassland and woodland sites of potential conservation importance selected based on the Phase 1 habitat Map within the proposed scheme boundary or hydrologically connected sites. The Phase 1 habitat Map is available in Appendix 8.2 Preliminary Ecological Appraisal (PEA). Further surveys will be undertaken in 2021 at grassland sites within 0.06 miles (100 metres) of the proposed scheme where access issues or survey limitations were previously an issue.
Bat surveys – ground level tree assessments	Trees within 0.06 miles (100 metres) of the proposed scheme options at the time of survey (which includes all those within the proposed scheme boundary) were surveyed from ground level.
Bat surveys – aerial tree climbing	Following the GLTA results, aerial tree climbing surveys were conducted on all trees with high bat roosting potential within 0.06 miles (100 metres) of the proposed scheme boundary, and all trees with moderate potential within 0.01 miles (20 metres) of the proposed scheme boundary.

Biodiversity resource or survey type	Study area
Bat surveys – internal building inspections	Internal inspections were conducted (where possible) on high potential buildings within 0.06 miles (100 metres) of the proposed scheme boundary, buildings with moderate or better potential to support roosting bats within 0.01 miles (20 metres) of the proposed scheme boundary, and buildings with low potential to support roosting bats which would be directly impacted by construction.
Bat surveys – dusk emergence and dawn re-entry surveys	Moderate and high potential buildings and trees, and low potential buildings within the proposed scheme boundary were included in emergence and re-entry surveys. Buildings and trees with moderate and high suitability within 0.01 miles (20 metres) and 0.06 miles (100 metres) of the proposed scheme boundary, respectively, were also subject to emergence and re-entry surveys (dawn and dusk).
Bat surveys – hibernation surveys	Any caves or other underground features which could provide suitable hibernation conditions within 0.06 miles (100 metres) of the proposed scheme boundary.
Bat surveys – activity transects and automated detector surveys	Fourteen transects designed to cover suitable bat foraging and commuting habitat within 0.16 miles (250 metres) of the proposed scheme boundary. Three static detectors were deployed for each transect route.
Bat surveys – crossing points	Fourteen bat crossing point locations along the proposed scheme alignment. Update and additional crossing point surveys will be undertaken in 2021 to include additional locations resulting from design changes to the proposed scheme.
Bat surveys – bat trapping and radio-tracking	In woodlands/tree-dominated habitats within or adjacent to the proposed scheme boundary.
Badgers – surveys to identify and classify badger setts including activity level, followed by badger bait marking of main setts.	Surveys were conducted within a 0.31 mile (500 metres) area of the proposed scheme boundary. Targeted update surveys will be undertaken in 2021 within 0.16 miles (250 metres) of the proposed scheme boundary.
Breeding bird survey transects	Fourteen pre-determined transect routes designed to cover all of the habitats suitable for breeding birds present within 0.16 miles (250 metres) of the preferred route of the proposed scheme boundary with particular focus upon those areas that were likely to be directly affected by the proposed scheme.
Wintering bird survey transects	Nine pre-determined routes designed to cover areas of open farmland and grassland suitable for wintering birds within 0.6 miles (1 kilometre) of the preferred route of the proposed scheme, with the scope reduced to 0.31 miles (500 metres) from the proposed scheme where areas lack extensive open fields or where a small realignment of the road occurs.
Barn owl (*Tyto alba)* surveys	Stage 1 (Desk-based scoping) and Stage 2 (Investigative Field Survey) were combined into one walkover undertaken within 0.9 miles (1.5 kilometres) of the proposed scheme boundary. Stage 3 (Nest Verification Surveys) was completed within 0.31 miles (500 metres) of the proposed scheme boundary.

Biodiversity resource or survey type	Study area
	Targeted update Stage 1, Stage 2 and Stage 3 surveys will be undertaken in 2021 within up to 0.31 miles (500 metres) of the proposed scheme boundary.
Dormouse (*Muscardinus avellanarius)*	Suitable habitat within 0.16 miles (250 metres) of the proposed scheme boundary. Targeted update surveys will be undertaken in 2021 within 0.06 miles (100 metres) of the proposed scheme boundary.
Great crested newt (*Triturus cristatus)* surveys, including Habitat Suitability Index (HSI) assessments, environmental DNA (eDNA) surveys and population size class estimate surveys.	All ponds and other potentially suitable waterbodies identified within 0.25 miles (400 metres) of the proposed scheme were assessed for their suitability to support great crested newts using the standardised HSI methodology [24]. Further eDNA surveys were undertaken of ponds within 0.25 miles (400 metres) of the proposed scheme boundary. Population size class estimate surveys were undertaken on ponds testing positively for great crested newt eDNA. Targeted update HSI surveys will be undertaken in 2021 on all waterbodies within 0.16miles (250 metres) of the online section and 0.31 miles (500 metres) of the offline section of the proposed scheme boundary. Update eDNA surveys will be undertaken on all waterbodies within 0.03 miles (50 metres) of the proposed scheme, and all of those within the described buffers (as detailed for HSI surveys) of the online and offline sections of the proposed scheme with an HSI score of 0.5 or above. Population estimate surveys will be undertaken on all ponds that return a positive or inconclusive eDNA survey result.
Reptiles	A habitat suitability assessment, presence/likely absence surveys and population assessment surveys were conducted within 0.06 miles (100 metres) of the proposed scheme boundary.
Otter (*Lutra lutra)*	Following the Extended Phase 1 habitat survey, 23 watercourses within 0.16 miles (250 metres) of the proposed scheme boundary were identified as having potential to support otters, of which 15 were subject to detailed survey. A minimum survey extent of 1.2 miles (2 kilometres) was covered for each watercourse. Update surveys will be undertaken in 2021; habitat suitability assessments will be undertaken on all watercourses that are located within the footprint of the proposed scheme and up to 0.16 miles (250 metres) from the construction boundary. Surveys for field signs of otter will be undertaken along watercourses within the construction boundary of the proposed scheme, extending up to 0.06 miles (100 metres) upstream and downstream of the construction boundary. Where the habitat suitability assessments indicate low suitability for otter within the 0.06 mile (100 metre) buffer, but high suitability for otter beyond 0.06 miles (100 metres), then the field signs surveys may be extended accordingly, up to 0.16 miles (250 metres) upstream and downstream of the construction boundary.
Water vole (*Arvicola amphibius)*	Watercourses wholly or partially within 0.16 miles (250 metres) of the proposed scheme boundary were surveyed for water vole, including habitat suitability and presence/absence.

Biodiversity resource or survey type	Study area
	Updates surveys will be undertaken in 2021; habitat suitability assessments will be undertaken on all watercourses that are located within the footprint of the proposed scheme and up to 0.16 miles (250 metres) from the construction boundary. Surveys for field signs of water vole will be undertaken along watercourses within the construction boundary of the proposed scheme, extending up to 0.06 miles (100 metres) upstream and downstream of the construction boundary. Where the habitat suitability assessments indicate low suitability for water vole within the 0.06 mile (100 metre) buffer, but high suitability for water vole beyond 0.06 miles (100 metres), then the field signs surveys may be extended accordingly, up to 0.16 miles (250 metres) upstream and downstream of the proposed scheme construction boundary. In addition, field signs surveys will be further extended to up to 0.31 miles (500 metres) upstream and downstream of the construction boundary where potential river diversions are proposed.
White-clawed crayfish (*Austropotamobius pallipes)*	Within the proposed scheme boundary and where indirect effects could occur. Update surveys will be undertaken in 2021 including habitat assessment and, where required, presence/ likely absence surveys within 0.06 miles (100 metres) upstream and downstream on all watercourses crossed by the proposed scheme.
Terrestrial invertebrates	Suitable terrestrial invertebrate habitats, including broadleaved woodland, open grassland with veteran trees and calcareous grassland (as identified within the Extended Phase 1 habitat survey) within or adjacent to the proposed scheme boundary (within 0.31 miles (500 metres)). Targeted update surveys will be undertaken in 2021 within 0.06 miles (100 metres) of the proposed scheme.
Brown hairstreak	Suitable habitats within 0.03 miles (50 metres) of the proposed scheme boundary.
Aquatic invertebrate assessment through kick sampling and manual searching.	Within the proposed scheme boundary and where indirect effects could occur. Update surveys will be undertaken in 2021 with sampling points within 0.06 miles (100 metres) upstream and downstream on all watercourses crossed by the proposed scheme.

8.5.5 A desk study was carried out, followed by field studies. Definition of the desk and field study areas follows guidance given in DMRB *LD 118* [18] and other available sources of survey good practice guidance referenced below and in PEI report Appendices 8.1-8.23.

Desk Study

8.5.6 A desk study was undertaken in 2016 and updated in 2021 to collate and review records of statutory and non-statutory designated sites, protected and notable species and notable habitats within 1.2 miles (2 kilometres) of the options being considered at the time. This search area was extended to 18.6 miles (30

kilometres) for SACs where bats are a qualifying species. This desk study was updated in December 2019 and again in February 2021 to account for any additional protected and notable species and notable habitat records since the date of the first desk study search and to ensure that the age of the ecological data used to inform the assessment is no older than 12-18 months, in line with CIEEM guidance [20].

8.5.7 The following organisations and resources have been consulted to compile the desk study:

- Multi-Agency Geographic Information for the Countryside (MAGIC) (Defra).
- Somerset Environmental Records Centre (SERC).
- Woodland Trust, for records of veteran trees.
- The Ancient Woodland Inventory [25].
- Environment Agency (EA) monitoring data (Ecology and Fish Data Explorer) for aquatic ecological features (fish, white-clawed crayfish, macro-invertebrates and macrophytes) up and downstream of where watercourses are directly crossed by the proposed scheme.
- The EA were contacted in 2016 for records of otter road casualties within the vicinity of the A358.
- Aerial photography and Ordnance Survey maps from between 2016 and 2021 have been reviewed.

Field survey methodology

8.5.8 The field survey methods used are summarised within Table 8-6 and additional details provided in the following section.

Table 8-6 Summary of field survey methods used for each type of biodiversity resource relevant to the proposed scheme

Biodiversity Survey	Field survey methods	Dates of survey	Reference/ Appendix
Extended Phase 1 habitat survey	The broad habitat types within the study area have been identified and mapped in accordance with the Handbook for Phase 1 Habitat Survey [26]. Features of potential significance to protected species were identified and recorded as target notes which are included in Appendix 8.2 Preliminary Ecological Appraisal (PEA). Habitats have been classified according to Joint Nature Conservation Committee (JNCC) habitat types and are shown on the Phase 1 Habitat map within Appendix 8.2	March and April 2016	PEIR Appendix 8.2
UKHab survey	UKHab surveys are being undertaken in line with the relevant guidance [27] throughout 2021, the results of which will inform the Environmental Statement (ES). All habitats within the study area will be classified using the UKHab classification system. A description of each habitat, including botanical communities, key indicator species and	To be undertaken throughout 2021	To be reported in the ES

Biodiversity Survey	Field survey methods	Dates of survey	Reference/ Appendix
	indicative physical characteristics will be included.		
River Habitat Survey (RHS) and River Corridor Survey (RCS)	RHS and RCS were undertaken of the River Ding in accordance with relevant guidance [28] [29]. Further RCS will be undertaken within the study area in 2021, to include all watercourses crossed by the proposed scheme.	August 2020 To be undertaken throughout 2021	PEIR Appendix 8.3 To be reported in the ES
Modular river (MoRPh) surveys	MoRPh surveys will be undertaken within the study area in 2021 according to the relevant best practice guidelines [30] [31] [32].	To be undertaken throughout 2021	To be reported in the ES
Hedgerow surveys	Hedgerows within the study area were surveyed in accordance with the methodology within the Hedgerow Survey Handbook [33]. Additional surveys to be undertaken in 2021 to include those hedgerows within the study area not previously surveyed due to previous access issues and design changes.	Within the optimal survey period between 2017 and 2020 Additional surveys: throughout the optimal survey period in 2021	PEIR Appendix 8.4 To be reported in the ES
National vegetation classification (NVC) surveys	NVC surveys were undertaken for woodland and grassland, following best practice guidance and standard methodology [34] [35]. The nomenclature for the vascular plants in this report follows Stace [36] and Atherton et al. [37] for both scientific and English names. Additional NVC surveys will be undertaken within the study area where access issues or survey limitations were previously an issue.	April – June 2017 (woodland) and May – August 2017 (grassland) Additional surveys: to be undertaken throughout 2021	PEIR Appendix 8.5 To be reported in the ES
Bat roost surveys	<u>Ground-level tree assessments</u> Trees in the study area were subject to a ground-level assessment to obtain an initial judgement on potential roost features (PRF) and likely roosting potential, as per good practice guidelines [38]. Trees were classified according to their potential to support roosting bats, whilst any evidence of bats was also recorded. Targeted ground-level assessments will be undertaken within the study area focussing on areas where access was previously unavailable, as well as areas that are now within the study area due to design changes. In addition, where the requirement for emergence/re-entry surveys is identified for a tree, (see below) an update ground-level inspection will be undertaken prior to the survey to make an assessment of current roosting potential.	2017 – 2020 Additional and update surveys to be undertaken in 2021	PEIR Appendix 8.6 To be reported in the ES

Biodiversity Survey	Field survey methods	Dates of survey	Reference/ Appendix
	Aerial tree-climbing surveys Trees with high or moderate roosting potential within the study area were subject to aerial tree-climbing surveys as per good practice guidelines [38]. Surveys were undertaken by two suitably qualified tree climbers, at least one of whom held a Natural England Level 2 bat licence. Features were inspected using an endoscope as appropriate. As a result of these surveys, trees were re-classified according to roost potential and were further assessed as to the potential to support hibernating bats. Trees that were deemed unsafe to climb were not included but were subject to alternative survey methods such as emergence/re-entry, or otherwise indicated as requiring further survey. Targeted aerial tree-climbing surveys to be undertaken within the study area focussing on areas where access was previously unavailable, as well as areas that are now within the study area due to design changes.	2017 – 2019 Additional surveys to be undertaken in 2021	PEIR Appendix 8.6 To be reported in the ES
	External building and structure inspections Buildings and structures (such as bridges and culverts) within the study area were surveyed externally according to good practice guidelines [38], and classified according to their potential to support roosting bats. Targeted external inspections to be undertaken within the study area of the proposed scheme, focussing on areas where access was previously unavailable, as well as areas that are now within the study area due to design changes, or where updated emergence/re-entry surveys are required.	2017 – 2020 Additional surveys to be undertaken in 2021	PEIR Appendix 8.6 To be reported in the ES
	Internal building inspections Buildings with the potential to be directly impacted by the proposed scheme and those supporting confirmed roosts within the study area were subject to internal inspections as per good practice guidelines [38]. Buildings were classified according to roost potential, including their potential for use as a hibernation site. Update internal building inspections are not generally being undertaken currently, due to ongoing access and Covid-19 restrictions. However, buildings within the study area where access was previously unavailable are to be subject to external inspections (see above) and	2019	PEIR Appendix 8.6

Biodiversity Survey	Field survey methods	Dates of survey	Reference/ Appendix
	emergence/re-entry surveys (see below) as appropriate.		
	<u>Dusk emergence and dawn re-entry surveys</u> Trees, buildings and structures identified to be of high, moderate or low (buildings only) roosting potential were subject to emergence/re-entry surveys to provide an assessment of the presence or likely absence of roosting bats. Survey effort and detailed methodology was as per good practice guidance [38].	May – October of 2017 – 2020	PEIR Appendix 8.6
	Targeted additional and update emergence/ re-entry surveys to be undertaken within the study area. These are focusing upon trees, buildings and structures within the study area where access was previously unavailable, or to account for land now within the study area due to design changes, as well as where the survey information is now considered to be out of date.	Additional and update surveys to be undertaken in 2021	To be reported in the ES
	<u>Hibernation surveys</u> Where suitable hibernation roost potential had previously been identified, buildings and features were proposed to be subject to hibernation surveys to identify the presence/ likely absence of hibernating bats. Due to Covid-19 restrictions, only one building was subject to such surveys. These surveys were undertaken in accordance with good practice guidelines [38], whilst static detectors (Wildlife Acoustic SM4BAT full spectrum bat detectors) were also deployed where appropriate.	January and February 2021	PEIR Appendix 8.7
	Hibernation surveys to be undertaken at buildings/structures identified as providing hibernation potential within the study area during winter of 2021/2022.	To be undertaken in winter 2021/ 2022	To be reported in the ES
Bat activity surveys	<u>Bat activity transect surveys</u> Bat activity transect routes were designed to provide adequate coverage (where access allowed) of all suitable bat foraging and commuting habitat within the study area. Surveys were planned and undertaken according to good practice guidelines [38]. Two full spectrum detector models were used (Anabat Walkabout and Batlogger M) to record sound files throughout the transect surveys.	April – October 2017 – 2020	PEIR Appendix 8.8
	It was agreed, in consultation with Natural England that update activity transect surveys were not required, with a focus on other methods such as advanced surveys and automated detector surveys instead. Transect	Additional surveys to be undertaken at transect 14 in 2021	To be reported in the ES

Biodiversity Survey	Field survey methods	Dates of survey	Reference/ Appendix
	14 was not surveyed in previous years due to access restrictions and is therefore currently subject to activity surveys.		
	Automated detector surveys Three static detectors (Wildlife Acoustic SM4BAT full spectrum bat detectors) were installed for each transect in line with good practice guidance [38]. Static detectors were set up to begin recording 30 minutes before sunset and stop recording 30 minutes after sunrise and were deployed across a range of suitable habitats within the study area.	April – October 2017 – 2020	PEIR Appendix 8.8
	Targeted static detector surveys to be undertaken, with detectors deployed for a minimum of 5 nights on a monthly basis in key locations within the study area, where access allows.	Additional surveys to be undertaken in 2021	To be reported in the ES
	Bat crossing point surveys Bat crossing point locations were chosen within the study area (where access allowed), to determine potential fragmentation of bat foraging and commuting habitat along with direct bat mortality. Surveys were conducted according to best practice guidance and methodologies [39]. The surveys consisted of visual observations of bats along linear habitat features to be crossed or severed by the proposed scheme over a 90-minute period.	May – September 2017 – 2020	PEIR Appendix 8.8
	Update and additional surveys are planned to be undertaken, with new locations resulting from design changes to the proposed scheme. As agreed, following consultation with Natural England, surveys are being undertaken once per month from May to August during the peak activity period (i.e. a total of four surveys at each crossing point) using multiple surveyors equipped with full spectrum detectors (Batlogger M) and infrared cameras.	Update and additional surveys to be undertaken in 2021	To be reported in the ES
Bat advanced surveys	*Bat trapping and radio tracking* Trapping of bats using mist nets and harp traps (including the use of acoustic lures) and the fixing of radio transmitters (tags) was used in order to understand the potential impacts of the proposed scheme upon the target species (barbastelle and Bechstein's). Trapping was carried out in accordance with the conditions of Natural England licence 2017-30599-SCI-SCI and in accordance with good practice guidelines [38].	Appropriate survey periods in 2017 – 2020	PEIR Appendix 8.9
	Tagged bats were simultaneously or subsequently followed by radio-tracking teams during the survey session to locate and identify		

Biodiversity Survey	Field survey methods	Dates of survey	Reference/ Appendix
	roost sites and to examine flying activity of the tagged bats. Where access was possible to roost sites, emergence counts were undertaken to determine the status/function of the roost. An increased advanced survey effort will be undertaken, which comprises at least three capture and radio tracking sessions at key identified locations within the study area. These surveys will cover all species, with a focus on Annex II bat species to identify key (maternity) roosts and crossing points along the proposed scheme.	Additional surveys to be undertaken in 2021	To be reported in the ES
Badger	Badger walkover surveys and badger bait marking surveys were conducted in accordance with best practice guidelines [40] [41], to assess the presence of badger setts, sett activity status and badger territory ranges. Update surveys will be undertaken within the study area to verify previous field data and to re-confirm the classification of known setts, as well as identify any additional setts and previously unrecorded field signs. Update survey findings will be used to inform future territory mapping (bait marking analysis).	Walkover: February 2017 – February 2020 Bait marking: February – March 2020 Update surveys to be undertaken in 2021/2022	PEIR Appendix 8.10 To be reported in the ES
Breeding birds	Breeding bird surveys were conducted in accordance with the Common Bird Census and Breeding Bird Surveys methods [42]. Update surveys were undertaken in 2020, although due to the Covid-19 pandemic, only one visit was made to each transect. Update surveys will be undertaken within the study area due to the time lapsed since the surveys in 2017 and due to the survey baseline was not able to be fully updated during the 2020 survey season. These surveys comprise 14 walked transects across suitable habitats.	April, May and June 2017 and June 2020 Update surveys to be undertaken in 2021	PEIR Appendix 8.11 To be reported in the ES
Wintering birds	Wintering bird surveys were conducted within the study area in accordance with best practice guidance [42] to assess the capacity of suitable habitats to support assemblages of wintering birds. These surveys comprised nine walked transects that covered the largest open farmland and grassland habitats within the survey area.	October 2020 – March 2021	PEIR Appendix 8.12
Barn owl	Habitat suitability assessments, followed by stage 1, stage 2 and stage 3 barn owl surveys were carried out where appropriate using best practice guidance [43] to identify Potential Nest Sites (PNS), Occupied Breeding Sites (OBS), Active Roost Sites (ARS) and / or Temporary Roost Sites (TRS).	Habitat assessments: 2017 Stage 1&2: June and July 2017 Stage 3: August – November	PEIR Appendix 8.13

Biodiversity Survey	Field survey methods	Dates of survey	Reference/ Appendix
	Update stage 1, stage 2 and stage 3 surveys will be undertaken within the study area.	2017 Update surveys to be undertaken in 2021	 To be reported in the ES
Hazel dormouse	Habitat suitability assessments were undertaken, followed by nest tube surveys within suitable habitat. Best practice guidelines [42] were followed to establish presence or likely absence of this species. Update hazel dormouse surveys will be undertaken within the study area in 2021. Nest tubes and nest boxes are being used to determine presence or likely absence and to allow for an assessment of likely population size.	Habitat assessments: May 2016 Presence/likely absence: February – November 2017 Update surveys to be undertaken in 2021	PEIR Appendix 8.14 To be reported in the ES
Great crested newt	<u>Habitat Suitability Index (HSI) assessments</u> Suitable waterbodies within the study area were subject to HSI assessments following standardised methodology [24]. Waterbodies recorded to be dry, be isolated by significant dispersal barriers or support flowing water were not subject to HSI assessment. Update HSI assessments will be undertaken in 2021 on all waterbodies within the study area.	2017 – 2020 Update surveys planned to be undertaken in 2021	PEIR Appendix 8.15 To be reported in the ES
	<u>eDNA surveys</u> eDNA surveys were undertaken by experienced ecologists each holding a Natural England great crested newt Class Licence (Level 1 CL08). Update eDNA surveys will be undertaken in 2021 on all waterbodies within the study area and all of those with an HSI score of 0.5 or above.	eDNA: June 2018, May 2019 and May 2020 Update surveys to be undertaken in 2021	PEIR Appendix 8.15 To be reported in the ES
	<u>Presence/likely absence and population estimate surveys</u> Prior to eDNA surveys being conducted, all suitable ponds within the study area were subject to presence/likely absence surveys in accordance with best practice guidance [44]. Where great crested newts were identified as present, these waterbodies were also subject to population estimate surveys.	Presence/likely absence and population estimate (where required): March – mid-June 2017	PEIR Appendix 8.15

Biodiversity Survey	Field survey methods	Dates of survey	Reference/ Appendix
	Update population estimate surveys will be undertaken on all ponds that return a positive or inconclusive eDNA survey result.	Update surveys to be undertaken in 2021	To be reported in the ES
Reptiles	Habitat suitability assessments were completed for the study area, with subsequent survey visits to determine presence/likely absence, population size and importance (where required), in accordance with best practice guidance [45]. Update surveys will be undertaken in 2021 within the study area due to the time elapsed since the previous surveys. In addition, a number of additional locations have been scoped into the study area following design changes.	Habitat assessments: 2017 Presence/likely absence: April – October 2017 Update surveys will be undertaken in 2021	PEIR Appendix 8.16 To be reported in the ES
Otter	Habitat suitability assessments were completed for the study area. Suitable watercourses were subject to presence/ likely absence surveys following standard methodology [46] and DMRB guidelines [47]. DMRB guidelines were subsequently withdrawn but after the surveys were undertaken, so were pertinent when used. Update surveys will be undertaken within the study area due to the time elapsed since the previous surveys. Surveys will be undertaken following the current standard methodology [46].	Habitat assessments and presence/likely absence: 2017 - 2020 Update surveys will be undertaken in 2021	PEIR Appendix 8.17 To be reported in the ES
Water vole	Habitat suitability assessments were completed for the study area. Presence/ likely absence surveys were completed, where required, following best practice guidance [48]. Update surveys will be undertaken within the study area due to the time elapsed since the previous surveys.	Habitat suitability assessments: mid-April – June 2017. Presence/likely absence: June 2017 – August 2020 Update surveys will be undertaken in 2021	PEIR Appendix 8.18 To be reported in the ES
White-clawed crayfish	Habitat suitability assessments were undertaken for the study area. Presence/ likely absence surveys were completed (where required) following best practice guidance [49] [50]. Given the length of time that has lapsed since the previous surveys in 2017, update habitat assessment and, where required, presence/ likely absence surveys will be undertaken within the study area including all watercourses crossed by the proposed scheme.	Habitat suitability assessments and presence/likely absence surveys: October 2017 Update surveys to be undertaken in 2021	PEIR Appendix 8.19 To be reported in the ES

Biodiversity Survey	Field survey methods	Dates of survey	Reference/ Appendix
Terrestrial invertebrates	Suitable habitats for notable invertebrate species were identified during Phase 1 surveys. Targeted surveys were undertaken at the identified locations. Methods used at all sites involved visual searching of nectaring sites and basking areas, the use of a hand net or pooter to capture individual species, sweeping of vegetation, beating of foliage and grubbing. Pitfall traps, pan-traps and a light trap were used at certain sites where the habitats present allowed. Species requiring further identification were collected and identified under microscope. Given the length of time that has lapsed since the previous surveys, update terrestrial invertebrate surveys will be undertaken across suitable habitats within 0.06 miles (100 metres) of the proposed scheme.	Phase 1 surveys: 2016 Targeted surveys: late season 2017 and early season 2019 Update surveys to be undertaken in 2021	PEIR Appendix 8.20 To be reported in the ES
Brown hairstreak	Suitable hedgerow habitats were identified within the study area, with egg search surveys being undertaken at each suitable location according to the UK Butterfly Monitoring Scheme survey guidance [51].	December 2020 – March 2021	PEIR Appendix 8.21
Aquatic invertebrates	Aquatic kick sampling surveys were undertaken at 16 representative sampling locations within the study area, in watercourses to be crossed by the proposed scheme. Under laboratory conditions, macroinvertebrate samples were analysed to Taxon Level 5. For each given sample, the taxa present, and their abundance was recorded to inform the metrics. A series of biological indices were then calculated to analyse the invertebrate community data. Due to the length of time lapsed since the previous surveys in 2017, update surveys will be undertaken within the study area including all watercourses crossed by the proposed scheme.	May – September 2017 Update surveys will be undertaken in 2021	PEIR Appendix 8.22 To be reported in the ES
Fish	A single, fully quantitative, three-run, electric fish survey was undertaken along the River Ding. Further surveys will be undertaken within the study area in 2021, to include all watercourses crossed by the proposed scheme.	October 2020 Update surveys will be undertaken in 2021	PEIR Appendix 8.23 To be reported in the ES
Other section 41 Species of Principal Importance	Species-specific surveys were not undertaken for the remaining SPIs. However, desk study records, incidental sightings and knowledge of the presence of suitable habitat gathered during other habitat surveys has informed professional judgement as to the likelihood of other SPI species occurring throughout the proposed	N/A	To be reported in the ES

Biodiversity Survey	Field survey methods	Dates of survey	Reference/ Appendix
	scheme. Given the presence of suitable habitats, a range of Species of Principal Importance are anticipated to be present along the proposed scheme.		

Extended Phase 1 habitat survey

8.5.9 The Extended Phase 1 habitat survey was carried out during March and April 2016. The broad habitat types within 0.31 miles (500 metres) of the proposed scheme options at the time of the surveys have been identified and mapped in accordance with the *Handbook for Phase 1 Habitat Survey* [26].

8.5.10 During the Extended Phase 1 survey, features of potential significance to protected species were identified and recorded as target notes which are included in Appendix 8.2 *Preliminary Ecological Appraisal (PEA)*. These included habitats of potential significance or evidence of, or potential for, any protected or notable species.

8.5.11 Habitats within the study area have been classified according to JNCC habitat types and are shown on the Phase 1 Habitat map given within Appendix 8.2 *Preliminary Ecological Appraisal (PEA)*. Where possible, plant species have been identified to species level. The species lists have been compiled and incorporated into the PEA. Further details on the methodology and limitations can be found in Appendix 8.2 of the PEA.

UKHab survey

8.5.12 UKHab surveys are being undertaken in line with the relevant guidance [27] throughout 2021, the results of which will inform the baseline information within the ES.

8.5.13 Surveys are being conducted within up to 0.16 miles (250 metres) of the proposed scheme, whereby all habitats will be classified using the UKHab classification system. A description of each habitat, including botanical communities, key indicator species and indicative physical characteristics will be included.

River habitat and river corridor survey

8.5.14 RHS and RCS were undertaken along the River Ding, as a section of this watercourse would require diversion as part of the proposed scheme. The surveys were undertaken in accordance with the methodology outlined within *River Habitat Survey in Britain and Ireland; Field Survey Guidance Manual* [28] and the *River Corridor Survey – Conservation and Technical Manual* [29] by an accredited RHS surveyor.

8.5.15 Both surveys were undertaken in August 2020 over the same 0.31 mile (500 metre) reach of the river; from ST 33453 15486 to ST 33704 15683. The downstream extent of the survey reach was approximately 0.04 miles (60 metres) upstream of where the existing A358 crosses the River Ding, near Horton Cross.

8.5.16 In broad terms, RHS is a method designed to characterise and assess the physical structure of freshwater streams and rivers. Using the application of a set of rules to RHS data, artificial modification to the physical structure of the river channel (e.g. channel realignment, weirs, culverts, sluices, bridges) can be

expressed as a Habitat Modification Score. This score is used to assign a Habitat Modification Class (HMC) (ranging on a five-point scale from 'pristine/semi-natural' to 'severely modified') for each 0.31 mile (500 metre) survey.

8.5.17 A Habitat Quality Assessment (HQA) score can also be derived, which describes the habitat diversity of the site. A greater HQA score indicates a more varied habitat with a greater number of natural physical (riparian and in-channel) features (e.g. riffles, pools, sediment bars and vegetation structure).

8.5.18 RCS comprises mapping and characterising the habitats, flow types, vegetation communities/species and physical features of a watercourse. Like RHS, the survey covers a 0.31 mile (500 metre) section of river. It supplements the RHS data as the exact location of features is recorded/mapped and plant species (as opposed to plant morphotypes) within the channel and riparian zone are recorded.

8.5.19 The RHS and RCS methodologies are detailed in Appendix 8.3: *A358 River Habitat/Corridor Technical Report*.

8.5.20 RCS are being undertaken in the 2021 survey season, with the scope expanded to include up to 0.31 miles (500 metres) upstream and 0.31 miles (500 metres) downstream of all 21 locations where the proposed scheme will cross a watercourse, including crossing points of the existing A358 carriageway. The results of which will inform the ES.

Modular river (MoRPh) surveys

8.5.21 MoRPh surveys are being undertaken during the 2021 survey season following relevant best practice guidance [30] [31] [32]. These surveys will be carried out at all 21 locations where the proposed scheme will cross a watercourse, including crossing points of the existing A358 carriageway. The results of which will inform the BNG calculations utilising the Defra Metric and will be reported in the ES.

8.5.22 Each MoRPh survey comprises a desk-based and field-based element. The desk-based element will identify hydrogeomorphological river type, whilst the field-based element, known as a MoRPh Sub-reach Field Survey, will capture information within the study area on each sub-reach of each watercourse. Additionally, at each survey location, influencing factors such as pollution sources and recent management practices are to be recorded.

Hedgerow surveys

8.5.23 All hedgerows within the area of the proposed scheme options at the time of the surveys and within a 0.03 mile (50 metre) buffer were assessed within the optimal period between 2017 and 2020. Survey methodology followed that detailed in the *Hedgerow Survey Handbook* [33], and the Hedgerows Regulations 1997, and the hedgerow importance was assessed following the criteria provided in Part II of Schedule 1 of the Hedgerows Regulations 1997. These criteria include, but are not limited to, features such as the presence and/or abundance of woody species, connections with other ecological features, rare tree species, and woodland ground flora species. The aims of the hedgerow assessment were to:

- identify hedgerows that are classified as 'important' under the Wildlife and Landscape criteria of the Hedgerows Regulations 1997; and
- identify hedgerows that, although not deemed 'important' under the ecological criteria of the Hedgerows Regulations 1997, have ecological value in terms of species diversity or as potential wildlife corridors.

8.5.24 Further details on the methodology and limitations can be found in Appendix 8.4 *Hedgerow Technical Report*.

8.5.25 Additional hedgerow surveys are being undertaken within the optimal survey period in 2021. All hedgerows within up to 0.03 miles (50 metres) of the proposed scheme that have not previously been subject to survey are to be included. The results of which will inform the ES.

National vegetation classification (NVC) surveys

8.5.26 NVC surveys were undertaken for woodland in April to June 2017 and for grassland in May to August 2017, following best practice guidelines and standard methodology [34] [35].

8.5.27 Woodland sites within 0.12 miles (200 metres) of the proposed scheme options at the time of the surveys were scoped in for NVC surveys if they had the potential to support protected or notable plant species, were designated for their botanical interest, and/or were listed on the Ancient Woodland Inventory. This distance was used to account for potential air quality impacts which have potential to have adverse impacts within 0.12 miles (200 metres) of the air pollution source.

8.5.28 Grassland sites scoped in for NVC surveys were based on the Phase 1 Habitat Survey carried out in 2016, which indicated the potential presence of grassland of conservation importance in these areas and targeted for more detailed botanical investigation. The areas surveyed are shown in Appendix 8.5 *A358 National Vegetation Classification Technical Report*.

8.5.29 Grasslands within a total of 13 sites, and woodlands within a total of 15 sites within the ZoI were initially considered for detailed NVC surveys and prioritised for further survey. Of these, eight grasslands and 11 woodlands fall within 0.06 miles (100 metres) of the proposed scheme. Detailed NVC surveys were undertaken on all but one of the grassland parcels, with a partial survey of a second site. Various access restrictions prevented survey of seven woodland sites within the ZoI, with a further two deemed unsuitable for detailed NVC survey.

8.5.30 The nomenclature for the vascular plants in this report follows Stace [36] and Atherton et al. [37] for both scientific and English names.

8.5.31 Further details on the methodology and limitations, including figures, can be found in Appendix 8.5 *A358 National Vegetation Classification Technical Report*.

8.5.32 NVC surveys are being undertaken in 2021 following the above methodology. Seven sites have currently been identified as previously being subject to access issues or survey limitations and will, therefore, be surveyed during the 2021 survey season. Additional sites may be subject to NVC surveys following the completion of the UKHab surveys detailed above. The results of which will inform the ES.

Bat surveys

8.5.33 A suite of bat surveys was carried out between 2017 and 2020 in accordance with available land access. The surveys included bat roost surveys and activity surveys, all of which were carried out broadly in accordance with the Bat Conservation Trust (BCT) good practice guidelines [38], and following consultation with Natural England in 2017 to agree the survey methodology. Where update surveys are proposed for the 2021/2022 survey seasons, these have been scoped through consultation with Natural England consultation in 2021.

Bat roost surveys

Habitat assessment

8.5.34 As part of the Extended Phase 1 habitat survey undertaken in 2016, potentially suitable habitats for roosting bats were identified within 0.06 miles (100 metres) of the proposed scheme options at the time of the surveys. Habitats were initially assessed using aerial photography as part of a desk-study exercise followed by ground truthing during the Extended Phase 1 habitat survey in May 2016. Further details can be found in Appendix *8.2 Preliminary Ecological Appraisal (PEA)*. Following the Extended Phase 1 habitat survey, more detailed preliminary roost assessments were undertaken as outlined below.

Ground-level tree assessments

8.5.35 Trees within 0.06 miles (100 metres) of the proposed scheme footprint at the time of the surveys were assessed from ground level between 2017 and 2020, to obtain an initial judgement on PRF and likely roosting potential as per good practice guidelines [38].

8.5.36 The trees were classified according to their potential to support roosting bats; as negligible, low, moderate, high or confirmed as a roost, taking into account connectivity to the wider environment and position in the context of the landscape. Any evidence of bats such as presence, droppings or staining was also recorded.

8.5.37 It was not possible during the course of these surveys to access all land parcels or individual trees to complete the 2020 survey, as such these land parcels and individual trees will be surveyed in 2021.

8.5.38 Targeted updated ground-level tree assessments are being undertaken in the 2021 survey season. These surveys will focus upon areas within 0.06 miles (100 metres) of the proposed scheme where access was previously unavailable or to account for land now within the study area due to design changes. Where the requirement for emergence/re-entry surveys is identified (see below) a ground-level inspection will be undertaken prior to the survey to make an assessment of the current roosting potential of trees. The results of these surveys will inform the requirement for further survey effort and will be reported in the ES.

Aerial tree-climbing surveys

8.5.39 To provide further assessment of trees with potential to be affected by the proposed scheme, aerial inspection surveys were undertaken in 2017 and 2019. The surveys were undertaken by two suitably qualified tree climbers (CS38 certified in tree-climbing and aerial rescue), at least one of whom held a Natural England Level 2 bat licence. Where larger features were accessible, they were assessed with use of an endoscope.

8.5.40 The surveys included all high roosting potential trees within 0.06 miles (100 metres) and moderate roosting potential trees within 0.01 miles (20 metres) of the proposed scheme footprint. Trees that were identified as having low roosting potential were not included in this scope or in any further surveys with the exception of those considered likely to be directly impacted by the proposed scheme at the time of survey.

8.5.41 As a result of these surveys, trees were re-classified (upgraded, downgraded, confirmation of classification of PRF and/or confirmation of the presence of bats

or evidence) according to roost potential and further assessed as to the potential to support hibernating bats.

8.5.42 Trees that were deemed unsafe to climb were not included but were subject to alternative survey methods such as emergence/re-entry or otherwise indicated as requiring further survey in 2021.

8.5.43 Targeted update aerial tree-climbing surveys are being undertaken in 2021. These surveys will focus upon areas within 0.06 miles (100 metres) of the proposed scheme where access was previously unavailable or to account for land now within the study area due to design changes. The results of these surveys will be reported in the ES.

External building and structure inspections

8.5.44 Buildings and structures (such as bridges and culverts) within 0.06 miles (100 metres) of the proposed scheme footprint at the time of the surveys were surveyed externally between 2017 and 2020, to obtain an initial judgement of PRF. Each building or structure was methodically surveyed in order to identify any potential access or egress points.

8.5.45 The buildings and structures were classified according to their potential to support roosting bats; as either negligible, low, moderate, high or confirmed roost, taking into account connectivity to the wider environment and position in the context of the landscape. Any evidence of bats (such as presence, droppings or staining) and the evidence of features with the potential to support hibernating bats were also recorded.

8.5.46 Targeted updated external building inspections are being undertaken in the 2021 survey season. These surveys will focus upon areas within 0.06 miles (100 metres) of the proposed scheme where access was previously unavailable or to account for land now within the study area due to design changes. Where an updated emergence/re-entry survey is anticipated to be required (see below) an external inspection will be undertaken prior to this to ascertain the current roosting potential. The results of these surveys will inform the requirement for further survey effort and will be reported in the ES.

Internal building inspections

8.5.47 Internal building inspections were undertaken in 2019. Buildings were selected based upon those with the potential to be directly impacted by the proposed scheme, confirmed roosts and within 0.06 miles (100 metres) of the proposed scheme footprint at the time of surveys. Surveyors accessed all areas (where possible to do so) and torches (with red filters), binoculars and endoscopes were used as appropriate, as per good practice guidance [38].

8.5.48 Where bat droppings were found that were characteristic of a species, and a positive identification could be made by an experienced and licenced bat worker, droppings were not sent for analysis. Otherwise, a small sample was collected and sent off for DNA analysis at the University of Warwick.

8.5.49 As a result of these surveys, buildings were subsequently re-classified according to roost potential and additional information on the type/significance of roost the building could support was gathered in addition to further assessment as to the potential to support hibernating bats.

8.5.50 Update internal building inspections will not generally be undertaken in 2021 due to ongoing access and Covid-19 restrictions. However, buildings within 0.06 miles (100 metres) of the proposed scheme where access was previously unavailable are subject to external inspections and emergence/re-entry surveys (see below) as appropriate.

Dusk emergence and dawn re-entry surveys

8.5.51 Trees, buildings and structures previously identified as of high (within 0.06 miles (100 metres) of the proposed scheme footprint) or moderate (within 0.01 miles (20 metres) roosting potential were subject to emergence/re-entry surveys between 2017 and 2020, to provide an assessment of the presence or likely absence of roosting bats by surveyors experienced in this survey type. In accordance with best practice guidelines and standard methodology [38], trees with low roost potential were not subject to further survey. Those with negligible or no roost potential were excluded from the surveys.

8.5.52 Survey effort was determined by roosting potential, outlined within best practice guidelines [38] , three surveys for high potential, two for moderate and one for low (where applicable). Surveyor numbers were sufficient for each survey, ensuring all PRFs and identified access/ egress points were known and were visible by at least one surveyor throughout the duration of the survey. There was a minimum gap of two weeks between each survey repeat.

8.5.53 Evening emergence surveys commenced at least 30 minutes before sunset and ended between 90 and 120 minutes after. Dawn re-entry surveys commenced 90 minutes before sunset and extended to up to 15 minutes after. Surveys were carried out in suitable weather conditions between May and October with two surveys occurring within the core period (May to August) for high potential and one for moderate potential.

8.5.54 Full spectrum bat detectors (Anabat Walkabout or Elekon Batlogger) were used to record bat calls during the survey. Species were identified during the surveys and subsequently sound files were analysed using either Anabat Insight or BatExplorer software to confirm species (where possible, otherwise identified to genus level).

8.5.55 Further details on the methodology and limitations of all bat roost surveys (excluding hibernation surveys, below), including figures showing survey locations and classifications, can be found in Appendix 8.6 *Bat Roost Technical Report*.

8.5.56 Targeted update emergence/re-entry surveys are being undertaken in the 2021 survey season. These will focus upon trees, buildings and structures within 0.06 miles (100 metres) of the proposed scheme where access was previously unavailable, or to account for land now within the study area due to design changes, and where the survey information is now considered to be out of date. Previously confirmed roosts will be included within 0.06 miles (100 metres) of the proposed scheme. High and moderate trees, buildings and structures and low buildings and structures within the proposed scheme construction boundary will be included, as agreed in consultation with Natural England 2021. The results of these surveys will be reported in the ES.

Hibernation surveys

8.5.57 Based on the preliminary roost assessments undertaken between 2017 and 2020, several buildings and features were determined to have suitable hibernation

roosting potential. Features of high hibernation potential included buildings likely to have cellars or other structures likely to have stable cool and humid conditions.

8.5.58 Where suitable hibernation potential was identified, further surveys were proposed to be undertaken in January and February 2021, over a two-week period in each month. Surveys were led by a suitably qualified Natural England bat licenced ecologist. Static bat detectors (Wildlife Acoustic SM4 detectors) were also deployed where appropriate within structures classified with a moderate or high potential for roosting bats. Due to Covid-19 restrictions only one building was subject to surveys, therefore further surveys are proposed for the winter of 2021/2022.

8.5.59 Further details on the methodology and limitations of the hibernation surveys, including figures showing survey locations and classifications, can be found in Appendix 8.7 *Bat Hibernation Technical Report*.

8.5.60 Update hibernation surveys will be undertaken in the 2021/2022 winter survey season. The surveys will focus upon any trees, buildings and structures with features suitable for hibernating bats, within 0.06 miles (100 metres) of the proposed scheme. The results of these surveys will be reported in the ES.

Bat activity surveys

Bat activity transect surveys

8.5.61 Eleven transect routes were designed to provide adequate coverage (where access allowed) of all suitable bat foraging and commuting habitat within and nearby the proposed scheme as per good practice guidelines [38]. Each transect route was surveyed a total of seven times over the active periods of 2017 to 2020, with a transect undertaken for each of the active months (April to October), with the exception of transects 12 and 13 where access prevented the April survey and transect 14 where access was denied for the entirety of the survey period.

8.5.62 Dusk transects began at sunset and lasted for between two and three hours to account for late-emerging bat species; notably the horseshoe bat (*Rhinolophus* spp.). Three hours was the intention (as agreed with Natural England in 2017) however some were cut short due to differing constraints such as at the landowners' request or due to changes in weather conditions. Each of the July transects were subject to a single follow-up dawn survey, which was undertaken within the same 24-hour period as the dusk survey. Each transect was up to 3.1 miles (5 kilometres) in length and featured ten stopping points of five minutes, associated with habitat identified as being of potential importance for foraging or commuting. The direction of passage was alternated each survey to ensure that different areas of each transect were surveyed at different times before/after sunset.

8.5.63 Two full spectrum detector models were used (Anabat Walkabout and Elekon Batlogger M) to record sound files throughout the transect surveys. These were then analysed using their respective software (Anabat Insight and BatExplorer). Analysis of the bat passes was used to create heat maps of bat activity using ArcGIS and the Kernel density tool.

8.5.64 Further details on the methodology and limitations, including figures showing the transect routes and species heat maps, can be found in Appendix 8.8 *Bat Activity Surveys Technical Report*.

8.5.65 There have been no significant changes to the habitats within the study area since the previous activity transect surveys were undertaken, therefore in consultation with Natural England, it was proposed that instead of repeating all of the previous activity transect surveys a greater emphasis will be placed upon other survey methods. This includes an increased crossing point, static monitoring and advanced survey effort which is considered to comprise a more robust methodology and in keeping with the stage of development.

8.5.66 Transect 14 was not surveyed in previous years due to access restrictions and will therefore be subject to activity surveys in 2021. The activity surveys on this transect are being carried out on a monthly basis from June to October (due to the timing of land access being granted) over a period of approximately three hours (to identify late emerging species) using a full-spectrum detector (Elecon Batlogger M). The results of all of the 2021 activity transect surveys will be reported in the ES.

Automated detector surveys

8.5.67 Three static detectors were installed for each transect, in line with best practice guidance [38], resulting in a total deployment of 30 detectors. The static deployment did not follow the transect routes in all instances (for example transect ten and transect 11) due to changes in the availability of land access during the survey period. Each detector was deployed for one week per month between April and October within the bat active periods spread across different survey seasons between 2017 to 2020 due to access restrictions, to collect data over five consecutive nights per month.

8.5.68 Static detectors were set up to begin recording 30 minutes before sunset and stop recording 30 minutes after sunrise and were deployed within a range of suitable habitats considered to be directly or indirectly affected by the proposed scheme. Standardised equipment was used (Wildlife Acoustics SM4 full spectrum bat detectors) across the transects and analysis of recordings was analysed using Wildlife Acoustics Kaleidoscope Pro software. Comparison and analysis of data collected during static surveys was undertaken using Microsoft Excel spreadsheets and pivot tables. Additionally, the data was analysed using the Ecobat tool [52].

8.5.69 Further details on the methodology and limitations, including figures showing the location of static detectors, can be found in Appendix 8.8 *Bat Activity Surveys Technical Report*.

8.5.70 Targeted automated detector surveys are being undertaken in the 2021 survey season. These will comprise monthly (April to October inclusive) deployment of static detectors (Wildlife Acoustics SM4 full spectrum bat detectors) in key locations across the proposed scheme set to record for a minimum of five nights in each period with 24 locations proposed, in accordance with available land access. The results of these surveys will be reported in the ES.

Bat crossing point surveys

8.5.71 Fourteen bat crossing point locations were chosen along the proposed scheme alignment to determine potential fragmentation of bat foraging and commuting habitat, and direct mortality (in accordance with available land access).

8.5.72 Six surveys were carried out in 2017, 2019 and 2020 (spread between years due to access restrictions) in accordance with best practice guidelines and

methodology [39], adapted for pre-construction surveys. The surveys were undertaken in suitable weather conditions (where weather resulted in a cancelled survey a repeat was carried out), between May and September and with repeat surveys generally at monthly intervals throughout the survey period

8.5.73 The surveys consisted of visual observations of bats along linear habitat features to be crossed or severed by the proposed scheme over a 90-minute period (extended from the standard 60 minutes [53] due to the presence of barbastelle bats (*Barbastella barbastellus*) and other later emerging species such as horseshoe bat species).

8.5.74 Further details on the selection process for each location, methodology and limitations can be found in Appendix 8.8 *Bat Activity Surveys Technical Report*.

8.5.75 Update crossing point surveys are being undertaken in the 2021 survey season, which also includes additional crossing point locations identified to reflect design changes to the proposed scheme. Twenty-three crossing point locations are being surveyed, which include existing severances along the online section of the A358 where widening has the potential for impacts to bat passage, in addition to known crossing points (such as Griffin Lane underbridge) and proposed severances of potential bat habitat in the offline section to the north. As agreed, following consultation with Natural England, surveys are being undertaken once per month May to August during the peak activity period (i.e. a total of four surveys at each crossing point) using multiple surveyors equipped with full spectrum detectors (Batlogger M) and infrared cameras. This is reduced from the standard six surveys as the radiotracking surveys have also been designed to capture crossing point data of all species. The results of these surveys will be reported in the ES.

Bat trapping and radio-tracking surveys (advanced surveys)

8.5.76 In 2017 mist-netting surveys were undertaken in Huish Woods which under some route options would have been directly impacted. These surveys identified barbastelle and Bechstein's (*Myotis bechsteinii*) bat species. Further bat trapping and radio-tracking surveys were undertaken in 2018 in order to inform design route selection. In 2019 the proposed route option was selected, avoiding Huish Woods. However, the data gathered in 2018 (and in 2017) indicated the potential for impacts as a result of the proposed scheme upon local bat populations including barbastelle and Bechstein's bat species and as such further trapping and radio-tracking surveys were undertaken in 2020.

8.5.77 Trapping of bats using mist nets and harp traps (including the use of acoustic lures) and the fixing of radio transmitters (tags) was used in order to present a robust data set of the use of the site and surrounding areas by the target bat species (barbastelle and Bechstein's). The surveys were undertaken in July and August 2018 and June 2020. Trapping was carried out in accordance with the conditions of Natural England licence 2017-30599-SCI-SCI and in accordance with good practice guidelines [38].

8.5.78 Tagged bats were simultaneously or subsequently followed by radio-tracking teams during the survey session to locate and identify roost sites and to examine nocturnal flying activity of the tagged bats, with a focus on collecting activity data for bats within the proposed scheme's ZoI and other key areas considered potentially important to Annex II bat population(s). Where access was possible to

roost sites, emergence counts were undertaken at identified roosts to determine the status/function of the roost.

8.5.79 An increased advanced survey effort is being undertaken in 2021. This comprises three capture and radio-tracking sessions spread across the season (May, July/August and August/September) at key identified locations (including Bickenhall Wood, Hatch Park Wood, Line Wood, Hurford's Plantation, Robert's Wood, Knowl Wood, Stoke Wood, Ashill Wood & Every's Copse, Huish Wood and unnamed woods near Griffin Lane). The results of these surveys will be reported in the ES.

8.5.80 Further details on the methods, trapping locations and radio-tracking analysis can be found in Appendix 8.9 *Bat Trapping and Radio Tracking Technical Report*.

Badger surveys

8.5.81 Habitats within 0.31 miles (500 metres) of the proposed scheme options for offline areas and within 0.16 miles (250 metres) of the proposed scheme for online areas were assessed for their capacity to support badger between 2017 and 2020. Areas of broadleaved woodland, scrub, hedgerow networks, and semi-improved and unimproved grassland provide excellent badger habitat for sett construction and foraging, with good connectivity to the wider landscape.

8.5.82 Initial walkover surveys between February 2017 and February 2020 were carried out to identify badger setts and other signs of habitat use. Incidental badger signs were also recorded throughout the 2017, 2018, 2019 and 2020 survey seasons. Evidence of setts, latrines, scratching, snuffle (foraging) holes, hairs, paths, runs, bedding material and footprints were searched for. The level of badger activity was also assessed and classified as well used, partially used, or disused. All connected and accessible land within 0.16 (250 metres) of the online section of the proposed scheme footprint, and within 0.31 miles (500 metres) of the offline section of the proposed scheme, was thoroughly searched for badger field signs, in line with best practice guidelines from DMRB [40] and Cresswell et al [41].

8.5.83 Following the identification of badger habitats and field signs, more detailed territory mapping was considered necessary to confirm activity within the proposed scheme footprint. Badger bait marking surveys of a number of main setts were undertaken in February and March 2020 to establish the territories of each badger clan and provide information on whether the new road would cause fragmentation to these territories.

8.5.84 Further details on the methodology and limitations, including figures, can be found in Appendix 8.10: *Badger Technical Report 2020 CONFIDENTIAL*.

8.5.85 Update badger surveys are being undertaken in the 2021/2022 survey season. Habitats within up to 0.16 miles (250 metres) of the proposed scheme will be surveyed to verify previously recorded field signs, re-confirming the classification of known setts, whilst new setts or other previously unrecorded field signs will also be noted. The findings of the update surveys will be used to inform a territory mapping (bait marking) analysis in spring 2022, the results of which will be reported in the ES.

Bird surveys

Breeding bird surveys

8.5.86 Habitats within 0.16 miles (250 metres) of the proposed scheme options at the time of the surveys in 2017 and 2020 were assessed for their capacity to support breeding bird assemblages. The majority of habitat within the survey boundary is typical of lowland farmland in southern England, dominated by arable, pasture and woodland.

8.5.87 Field surveys were undertaken along the length of the proposed scheme (where access allowed) in 2017. These comprised monthly visits in April, May and June. Field surveys, following guidance used for common bird census and breeding bird surveys [42], comprised 14 walked transects that covered all suitable habitats within 0.16 miles (250 metres) of the proposed scheme. Birds were identified by sight and sound, and evidence of breeding was determined by recording specific behavioural cues.

8.5.88 Due to the time elapsed, update surveys were undertaken in 2020 following the same methodology as above. However, due to the Covid-19 pandemic, only one visit to each transect was undertaken in June 2020.

8.5.89 Further details of the methodology and limitations, including figures can be found in Appendix 8.11 *Breeding bird Technical report*.

8.5.90 Updated breeding bird surveys are being undertaken during the 2021 survey season, with the scope and methodology of the surveys as described above, the results of which will be reported in the ES.

Wintering bird surveys

8.5.91 Suitable habitats, primarily open farmland and grassland, within 0.6 miles (1 kilometre) of the proposed scheme were assessed for their capacity to support overwintering bird assemblages. The surveys were conducted between October 2020 and March 2021.

8.5.92 Field surveys, following guidance described by Bibby et al (2000) [42], comprised nine walked transects that covered the largest open farmland and grassland habitats within the survey area. Transects were walked at a constant pace, recording all notable or protected species observed within and utilising the survey area. Surveyors stopped periodically to scan open fields and listen to calls. Prominent hills were used as vantage points to increase survey coverage, with scans of 15 minutes at each suitable location.

8.5.93 Further details of the methodology and limitations, including figures, can be found in Appendix 8.12: *Wintering Birds Survey Technical Report*.

Barn owl surveys

8.5.94 Habitats within 0.9 miles (1.5 kilometres) of the proposed scheme were assessed in 2017 for their capacity to support barn owl in. The surveys followed the best practice guidelines set out by Shawyer [43] .

8.5.95 Stage 1 surveys, referred to as potential foraging habitat surveys, were undertaken in June and July 2017 to assess the suitability of foraging habitat within the survey area. Type 1 habitat is considered optimum habitat to support field vole (*Microtus agrestis*) and is usually permanent, unimproved or semi-improved grassland. Type 2 habitat is considered sub-optimal for field voles and

is usually semi-improved or improved grassland with a more homogenous, even-height sward. Type 3 habitat is considered very poor habitat for field vole, with a homogeneous sward and a high level of management.

8.5.96 Stage 2 surveys, referred to as potential nesting surveys, were undertaken in June and July 2017 to identify locations which could offer PNS. Trees located within hedgerows, open fields or on woodland edges, and possessing sufficient diameter, were considered suitable for nesting or roosting barn owls. Buildings were noted as PNS if there were entrance holes of at least 80 millimetres diameter and an internal nesting chamber of 250 millimetres x 250 millimetres.

8.5.97 Following the completion of stage 1 and 2 surveys, stage 3, referred to as nest verification surveys, were undertaken between August and November 2017. The identified PNS were subjected to inspections by an ornithologist with a Schedule 1 barn owl licence, who would inspect the sites for evidence of occupation including adult birds, chicks, moulted feathers, pellets or eggs. The sites were classified as OBS, ARS or TRS.

8.5.98 Further details on the methodology and limitations, including figures, can be found in Appendix 8.13: *Barn Owl Survey Technical Report*.

8.5.99 Update barn owl surveys are being undertaken in the 2021 survey season. Land within up to 0.31 miles (500 metres) of the proposed scheme will be subject to stage 1, stage 2 and stage 3 surveys as detailed above to supplement the existing survey data. The results of these surveys will be reported in the ES.

Dormouse surveys

8.5.100 Suitable hazel dormouse habitat was identified within 0.16 miles (250 metres) of the proposed scheme following a Phase 1 habitat survey in May 2016 and a desk study in 2017. Further details can be found in Appendix 8.2 *Preliminary Ecological Appraisal (PEA)*. Following habitat suitability assessment, 24 sites of potential dormouse habitat were identified, of which 18 sites were within 0.16 miles (250 metres) of the proposed scheme.

8.5.101 Due to access restrictions, presence/absence surveys were carried out at 11 of the 18 sites, with set-ups taking place between February and mid-May 2017 inclusive and return visits taking place between April and November 2017 inclusive, following good practice guidance [54]. A minimum of 50 nest tubes were deployed in suitable and connected habitat at each site and checked monthly during the active season until the presence of adult or juvenile dormice was confirmed, or until the required 20 survey points was reached.

8.5.102 Further details on the methodology and limitations, including figures, can be found in Appendix 8.14: *Hazel Dormouse Technical Report*.

8.5.103 Update dormouse surveys are being undertaken within the 2021 survey season throughout suitable habitat within up to 0.06 miles (100 metres) of the proposed scheme. Nest tubes and nest boxes are to be used to determine presence or likely absence and allow an assessment of likely population size, following good practice guidance [54]. The results of these update surveys will be reported in the ES.

Great crested newt surveys

8.5.104 Ponds and potentially suitable waterbodies within 0.31 miles (500 metres) of the proposed scheme were identified using MAGIC as part of a desk study exercise in 2017. All waterbodies identified during this desk study were put forward to be

assessed for their potential to support great crested newts using the standardised HSI methodology [24]. In April 2019, a meeting was held with Natural England which resulted in the survey buffer being reduced to 0.25 miles (400 metres). In June 2019 the preferred route option was announced and therefore the surveys from June 2019 onwards focussed on ponds within 0.25 miles (400 metres) of the preferred route for the proposed scheme.

8.5.105 In total, 180 waterbodies were identified during the desk study that were located within 0.25 miles (400 metres) of the proposed scheme. Of these, 82 were subject to HSI surveys, with the remainder assessed as being unsuitable for breeding great crested newt due to either being dry, isolated by significant dispersal barriers or supporting flowing water.

8.5.106 Great crested newt eDNA surveys were undertaken in June 2018, May 2019 and May 2020 on 40 waterbodies. All eDNA surveys were undertaken by experienced ecologists holding a Natural England great crested newt Class Licence (Level 1 CL08).

8.5.107 Twenty-two ponds identified as potentially suitable in 2017 (prior to eDNA surveys being undertaken) were subject to initial presence/absence surveys (four visits) and then population estimate surveys (additional two visits) if required. The surveys were undertaken in accordance with best practice guidelines [44]. At least three survey methods were utilised for each visit, with methods including bottle trapping, torching, egg searching and netting. Surveys were undertaken by a Natural England great crested newt Class Licence holder and an assistant, between March and mid-June 2017.

8.5.108 Further details on the methodology and limitations, including figures, can be found in Appendix 8.15: *A358 Great Crested Newt Technical Report*.

8.5.109 Update great crested newt surveys are being undertaken within the 2021 survey season. HSI surveys of all waterbodies within 0.16 miles (250 metres) of the online section and 0.31 miles (500 metres) of the offline section of the proposed scheme are being carried out. eDNA surveys are then being undertaken on all waterbodies within 0.03 miles (50 metres) of the proposed scheme and all of those within the described buffers of the online and offline sections of the proposed scheme with an HSI score of 0.5 or above. Population estimate surveys are being undertaken on all ponds that return a positive or inconclusive eDNA survey result. The results of these update surveys will be reported in the ES.

Reptile surveys

8.5.110 An assessment of the habitat suitability for reptiles were completed which identified all suitable reptile habitat within 0.06 miles (100 metres) of the proposed scheme options at the time of the surveys. 0.06 miles (100 metres) is the likely distance the proposed scheme impacts are considered to extend for reptiles. From this initial assessment in 2017, 27 sites within the study area were identified which required further investigation.

8.5.111 During the initial site visits in early 2017, 19 of the 27 sites were identified as offering suitable habitat to support common reptile populations. Of the 19 sites, 14 were located within 0.06 miles (100 metres) of the preferred route.

8.5.112 Of these 14 sites, 11 were subject to further presence/absence surveys carried out between April and October 2017. Three sites were not surveyed due to access restrictions.

8.5.113 Roofing felt tiles measuring 0.5m by 0.5m were deployed at each of the 11 accessible sites with potential to support reptiles, in areas of suitable habitat. Sites were subject to 20 visits in suitable weather conditions to provide an accurate estimation of the population size of reptile species where present. Population size and importance was assessed according to categories described under *Froglife Advice Sheet 10: Reptile Survey* [45].

8.5.114 Further details on the methodology and limitations, including figures, can be found in Appendix 8.16: *Reptile Technical Report*.

8.5.115 Update reptile surveys are being undertaken during the 2021 survey season. As previously, suitable habitat within up to 0.06 miles (100 metres) of the proposed scheme will be subject to survey. The majority of sites to be surveyed during 2021 were also surveyed in 2017. However, there are a small number of additional locations that have since been scoped in. The results of these surveys will be reported in the ES.

Otter surveys

8.5.116 Initial habitat suitability assessments were undertaken along all rivers and joining tributaries, including streams and ditches, within 1.2 miles (2 kilometres) of the proposed scheme options at the time of the surveys. Suitable watercourses were identified within 0.16 miles (250 metres) of the proposed scheme options, which were assessed for their potential to support otter.

8.5.117 The habitat suitability surveys assessed the quality of the watercourses and riparian habitat for supporting otters, based on physical properties (type of watercourse, depth, flow, channel width), presence of suitable terrestrial habitat, food supply, adjoining land use, disturbance, pollution, dispersal barriers and overall connectivity to the wider landscape. Watercourses identified within 0.16 miles (250 metres) of the proposed scheme were not scoped out of field sign surveys unless the entirety of a watercourse within the 1.2 miles (2 kilometres) study area was deemed unsuitable for otter. In total, 61 watercourses were identified within 1.2 miles (2 kilometres) of the proposed scheme. Of these watercourses, 38 were scoped out for being unsuitable for otter and two could not be accessed for habitat suitability assessments.

8.5.118 Each identified watercourse within 0.16 miles (250 metres) of the proposed scheme were surveyed along a 1.2 mile (2 kilometre) length, 0.6 miles (1 kilometre) upstream and 0.6 miles (1 kilometre) downstream of the proposed scheme. The survey followed standard methodology [46] and DMRB guidelines [47] (these were subsequently withdrawn in November 2019 after the surveys were undertaken, so were pertinent when used). This involved assessing the watercourses for signs of otter which included natural holts, couches, spraints, anal jelly, tracks, slides and feeding remains. All field signs were photographed and mapped with a GPS device.

8.5.119 Further details on the methodology and limitations, including figures, can be found in Appendix 8.17: *Otter Surveys Technical Report*.

8.5.120 Update otter surveys are being undertaken in 2021, with a reduced scope having been agreed with Natural England. Habitat suitability assessments are being undertaken on all watercourses that are located within the footprint of the proposed scheme and up to 0.16 miles (250 metres) from the construction boundary. Surveys for field signs of otter are being undertaken along watercourses within the construction boundary of the proposed scheme,

extending up to 0.06 miles (100 metres) upstream and downstream of the construction boundary. Where the habitat suitability assessments indicate low suitability for otter within the 0.06 mile (100 metre) buffer, but high suitability for otter beyond 0.06 miles (100 metres), then the field signs surveys may be extended accordingly, up to 0.16 miles (250 metres) upstream and downstream of the construction boundary. The results of these surveys will be reported in the ES.

Water vole surveys

8.5.121 Initial habitat suitability assessments were undertaken along all watercourses within 0.16 miles (250 metres) of the proposed scheme options at the time of the surveys during mid-April to June 2017. Suitable watercourses were identified based on this initial assessment. These watercourses were then assessed for their potential to support water voles.

8.5.122 The initial habitat suitability surveys assessed the quality of the watercourses and riparian habitat for supporting water voles based on physical properties (type of watercourse, depth, flow, channel width), presence of suitable terrestrial habitat, food supply, adjoining land use, disturbance, pollution, dispersal barriers and overall connectivity to the wider landscape. Watercourses were not scoped out of field sign surveys unless the entirety of a watercourse was deemed unsuitable for water voles.

8.5.123 Seventy-four watercourses were identified within 0.16 miles (250 metres) of the proposed scheme options at the time of the surveys. However, this was reduced to 42 watercourses within 0.16 miles (250 metres) of the proposed scheme. Of these 42 watercourses, 15 were subject to field sign surveys. Twenty-six watercourses were deemed unsuitable for water vole, whilst one watercourse could not be accessed for a habitat assessment.

8.5.124 Each watercourse identified as having potential to support water vole was surveyed along all accessible areas within a 0.16 mile (250 metre) survey area. Two presence surveys were undertaken; one during the early season (mid-April – June) and one during the late season (July – September). The survey followed standard methodology set out by the Water Vole Conservation Handbook 3rd Edition [48]. This involved assessing the watercourses for signs of water voles which included latrines, burrows, cropped vegetation, nests above ground, feeding remains, footprints, pathways, sightings and the distinctive sound of water voles entering water. All field signs were photographed and mapped with a GPS device.

8.5.125 Further details on the methodology and limitations, including figures, can be found in Appendix 8.18: *Water Vole Technical Report*.

8.5.126 Update water vole surveys are being undertaken in 2021, to a scope agreed with Natural England. Habitat suitability assessments will be undertaken on all watercourses that are located within the footprint of the proposed scheme and up to 0.16 miles (250 metres) from the construction boundary. Surveys for field signs of water vole are being undertaken along watercourses within the construction boundary of the proposed scheme, extending up to 0.06 miles (100 metres) upstream and downstream of the construction boundary. Where the habitat suitability assessments indicate low suitability for water vole within the 0.06 mile (100 metre) buffer, but high suitability for water vole beyond 0.06 miles (100 metres), then the field signs surveys may be extended accordingly, up to 0.16 miles (250 metres) upstream and downstream of the construction boundary. In addition, field signs surveys will be further extended to up to 0.31 miles (500

metres) upstream and downstream of the construction boundary where potential river diversions are proposed. The results of these surveys will be reported in the ES.

White-clawed crayfish surveys

8.5.127 Initial habitat suitability assessments were undertaken along all rivers and joining tributaries within 0.16 miles (250 metres) of the proposed scheme options at the time of the surveys in October 2017. Suitable watercourses were identified based on this initial assessment. These watercourses were then assessed for their potential to support white-clawed crayfish.

8.5.128 The initial habitat suitability surveys assessed the quality of the watercourses and riparian habitat for supporting white-clawed crayfish based on physical properties (type of watercourse, depth, flow, channel width), refuges in the channel or bank, substrate composition, pollution, erosion and presence of invasive crayfish or bullhead (*Cottus gobio*). Watercourses were not scoped out of field sign surveys unless the entirety of the watercourse within the study area was deemed unsuitable for white-clawed crayfish. Habitat assessments were conducted across a 0.06 mile (100 metre) length of each watercourse, centred on the point at which the proposed scheme was anticipated to cross. If no suitable, white-clawed crayfish habitat was found within 0.06 miles (100 metres), the survey area was extended up to 0.31 miles (500 metres) from the proposed scheme, or until a length of at least 0.06 miles (100 metres) was identified.

8.5.129 Ten watercourses were identified within 0.16 miles (250 metres) of the proposed scheme. Of these, nine were assessed for their suitability to support white-clawed crayfish, whilst access was refused for one. Manual search surveys were undertaken at the same time if the watercourse was deemed suitable to support crayfish. Each watercourse was divided into five patches of habitat that appeared favourable for white-clawed crayfish, where a search of ten potential refuges was undertaken in each patch. The survey methodology is outlined in the JNCC guidance [49] (Protocol 2), based on Peay (2003) [50]. A hand net was used during manual searches to catch any smaller crayfish during searches in shallow water.

8.5.130 Further details on the methodology and limitations, including figures, can be found in Appendix 8.19: *White-clawed Crayfish Technical Report*.

8.5.131 Update white-clawed crayfish surveys are being undertaken in 2021, with the scope and methodology of the surveys as described above. The results of which will be reported in the ES.

Terrestrial invertebrate surveys

8.5.132 A total of 13 grassland sites were identified during the Phase 1 Habitat surveys in 2016 as habitats with potential to support notable invertebrate species. Further details can be found in Appendix 8.2 *Preliminary Ecological Appraisal (PEA)*. Targeted terrestrial invertebrate surveys were undertaken between July 2017 and June 2019 at these habitat locations within 0.06 miles (100 metres) of the proposed scheme at the time of the surveys. Of the 13 sites, eight are located within 0.06 miles (100 metres) of the proposed scheme.

8.5.133 Each site was visited in the late part of the season in 2017 and in the early part of the season in 2019, with each suitable site being visited twice during the main invertebrate survey period, where access was possible. Survey methods used at all sites involved visual searching of nectaring sites and basking areas, the use of

a hand net or pooter to capture individual species, sweeping vegetation, beating foliage and grubbing.

8.5.134 Additionally, the use of pitfall traps was employed at Site 9 as this site provided the optimum habitat type for this technique. This site supported short and diverse grassland likely to provide habitat for scarcer species, whilst other sites consisted largely of taller rank grassland of poor quality.

8.5.135 The use of pan-traps was employed at Site 2. Site 2 was selected, as this was a tall woodland site with very few low-level flowering plants and therefore visual searching was ineffective. Other sites had a sufficient diversity of flowering plants to make visual survey methods effective.

8.5.136 At Site 1, a battery-powered 20-watt moth light trap was deployed on 10 August to sample for the rare tortrix moth (*Celypha woodiana*) which is associated with mistletoe (*Viscum album*). No other sites were selected for deployment of light traps as there were no others likely to support scarce species or were sufficiently botanically diverse and therefore likely to support a high diversity of moth species.

8.5.137 This range of techniques allowed the sampling of a range of species. Species requiring further identification were collected and identified under microscope.

8.5.138 Further details on the methodology and limitations, including figures, can be found in Appendix 8.20 *Terrestrial Invertebrate Technical Report*.

8.5.139 Update terrestrial invertebrate surveys are being undertaken in the 2021 survey season, with surveys being carried out across suitable habitat within 0.06 miles (100 metres) of the proposed scheme. The results of which will be reported in the ES.

Brown hairstreak surveys

8.5.140 Hedgerow habitats within the proposed scheme area were identified as being potentially suitable for brown hairstreak (*Thecla betulae*), a declining butterfly listed under Section 41 of the NERC Act 2006 as a SPI in England.

8.5.141 A field survey was undertaken between December 2020 and March 2021 to search for the eggs of this species. The field survey followed the standard technique for brown hairstreak egg searches following The UK Butterfly Monitoring Scheme (UKBMS) surveying guidelines [51].

8.5.142 All accessible hedgerows within a 0.03 mile (50 metre) buffer either side of the proposed scheme were surveyed. For each hedgerow, presence/absence of brown hairstreak eggs was recorded, and each was given a score based on blackthorn percentage (the larval foodplant) and hedgerow condition.

8.5.143 Further details on the methodology and limitations, including figures, can be found in Appendix 8.21: *Brown Hairstreak Technical Report*.

Aquatic invertebrate surveys

8.5.144 Aquatic invertebrate kick sampling surveys were undertaken in May and September 2017 at 16 representative sampling locations in watercourses crossed by the proposed scheme. Two survey sites were sampled on each of the watercourses, one approximately 0.06 miles (100 metres) upstream and a second 0.06 miles (100 metres) downstream of the point at which the proposed scheme options at the time of the surveys crossed each watercourse.

8.5.145 Under laboratory conditions, macroinvertebrate samples were analysed to River Level 5 (TL5). For each given sample, the taxa present, and their abundance was recorded to inform the metrics.

8.5.146 The following biological indices were calculated to analyse the invertebrate community data; Whalley Hawkes Paisley Trigg (WHPT), Average Score Per Taxon (ASPT), Number of Scoring Taxa (NTAXA), Lotic-invertebrate Index for Flow Evaluation (LIFE), Proportion of Sediment-sensitive Invertebrates (PSI) and Community Conservation Index (CCI).

8.5.147 Further details on the survey, including methodology and limitations, can be found in Appendix 8.22: *Macroinvertebrates Technical Report*.

8.5.148 Update aquatic invertebrate surveys are being undertaken in 2021 with the scope and methodology described above. The results of which will be reported in the ES.

Fish surveys

8.5.149 A single fish survey was undertaken along the River Ding, as a section of this watercourse will require diversion as part of the proposed scheme. A fully quantitative three-run electric fishing survey was carried out along a 0.06 mile 100 metre length of the river, demarcated by stop nets.

8.5.150 A battery powered E-Fish 500W backpack electric fishing system was used to attract and stun fish, which allow operators to remove them from the water to identify the species and measure the fish.

8.5.151 Further details on the survey, including methodology and limitations, can be found in Appendix 8.23: *Fish Technical Report*.

8.5.152 Fish surveys are being undertaken within the 2021 survey season, with the scope expanded to include up to 0.06 miles (100 metres) upstream and downstream of all locations where the proposed scheme crosses a watercourse, including crossing points of the existing A358 carriageway. The results of these surveys will be reported in the ES.

Other section 41 Species of Principal Importance (SPI)

8.5.153 Species specific surveys were not undertaken for the remaining SPIs. However, desk study records, incidental sightings and knowledge of the presence of suitable habitat gathered during other habitat surveys has informed professional judgement and confirmed the likely presence of a range of SPI species occurring throughout the proposed scheme, which will be reported in the ES.

8.6 Baseline conditions

8.6.1 Desk study data for each habitat and protected species has been summarised here within each relevant sub-heading, which is followed by the field survey results.

8.6.2 Within this section, the receptors within the study area determined through the baseline conditions are valued in accordance with DMRB *LA 108 Biodiversity* [1] which assigns a geographical value.

Designated sites

Statutory designated sites

8.6.3 Statutory designated sites within the study area are summarised in Table 8-6. Figure 8-1A and Figure 8-1B show the location of these sites in relation to the proposed scheme.

8.6.4 Internationally important statutory designated sites include Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and Ramsar Sites. Nationally important statutory designations include Sites of Special Scientific Interest (SSSIs) and National Nature Reserves (NNRs), and locally important statutory designations are termed Local Nature Reserves (LNRs).

8.6.5 There are five internationally designated sites within the study area of the proposed scheme. These are the Somerset Levels and Moors SPA and Ramsar Site, which is hydrologically connected to the proposed scheme; Hestercombe House, Exmoor and Quantock Oakwoods SAC, Beer and Quarry Caves SAC and Bracket's Coppice SAC, which are all designated for their bat populations and located within 18.6 miles (30 kilometres) of the proposed scheme. These sites are of international importance. There are no potential SPAs or candidate SAC within the study area of the proposed scheme.

8.6.6 The Severn Estuary SAC and Ramsar site is located beyond the 1.2 mile (2 kilometre) study area; however is approximately 15.5 miles (25 kilometres) downstream of the proposed scheme along the River Tone and River Parrett, and is for the purposes of this assessment, therefore, considered hydrologically linked to the proposed scheme.

8.6.7 There are three nationally designated sites of national importance within the 1.2 miles (2 kilometres) study area. These are Thurlbear Woods and Quarrylands SSSI, Barrington Hill Meadows SSSI and Barrington Hill NNR.

8.6.8 A further 13 nationally designated sites of national importance are located over 1.2 miles (2 kilometres) from the proposed scheme but fall within 0.12 miles (200 metres) of the ARN, as shown on Figure 8-1A. These are:

- Ruttersleigh SSSI
- North Moor SSSI
- Langport Railway Cutting SSSI
- Maiden Down SSSI
- Deadman SSSI
- Long Lye SSSI
- Long Lye Meadow SSSI
- Wet Moor SSSI
- Prior's Park and Adcombe Wood SSSI
- Millwater SSSI
- Killerton SSSI
- Southlake Moor SSSI
- Huntspill River NNR

8.6.9 There are four statutory designated sites of county importance within the 1.2 mile (2 kilometre) study area. These are Bickenhall Orchard LNR, South Taunton Streams LNR, Children's Wood/Riverside Park LNR and Herne Hill LNR.

8.6.10 A further two LNR's are located over 1.2 miles (2 kilometres) from the proposed scheme but fall within 0.12 miles (200 metres) of the ARN, as shown on Figure 8-1A. These are:

- Grand Western Canal Country Park and LNR
- Screech Owl LNR

8.6.11 All measurements of distances to designated sites, habitats and protected species have been calculated from the proposed scheme boundary.

Table 8-6 Statutory designated sites within the study area

Site	Reasons for designation	Distance and directions from proposed scheme
Statutory sites of international importance		
Somerset Levels and Moors SPA and Ramsar	This site is designated for being the largest area of lowland wet grassland and associated wetland habitats remaining in Britain, formed by the floodplains of the rivers Axe, Brue, Parret, Tone and their respective tributaries. The SPA encompasses a total of 12 SSSIs. Flooding affects extensive areas during the winter, which provides conditions for overwintering waterfowl that form the primary designation features under both SPA and Ramsar criteria as described below. SPA qualifying features: • Nationally important numbers of Annex 1 Bewick's swan (*Cygnus columbianus bewickii*) and golden plover (*Pluvialis apricaria*). • Regularly supporting over 20,000 wintering waterfowl. • Supports internationally important numbers of migratory Eurasian teal (*Anas crecca*) and northern lapwing (*Vanellus vanellus*). Ramsar qualifying criteria: • Supports 17 species of British Red Data Book invertebrates. • Assemblages of wintering birds of international importance. • Species/populations of birds occurring at levels of international importance, with qualifying species including: o Bewick's swan o Eurasian teal o Northern lapwing In addition to these qualifying features, the site is also notable for nationally important wintering numbers of gadwall (*Anas strepera*), widgeon (*Anas Penelope*) and shoveler (*Anas clypeata*), with further Annex 1 species marsh harrier (*Circus aeruginosus*), bittern (*Botaurus stellaris*), merlin (*Falco columbarius*), peregrine falcon (*Falco peregrinus*), hen harrier (*Circus cyaneus*) and short-eared owl (*Asio flammeus*) present in breeding or wintering capacity.	2.1 miles (3.5 kilometres) east ARN is 0.04 miles (60 metres) east of SPA and Ramsar boundary at closest point
Hestercombe House SAC	The primary reason for designation is the presence of lesser horseshoe bats. Hestercombe house supports a large maternity colony of lesser horseshoe bats within former stable blocks and domestic outbuildings. A small hibernation roost is also present.	2.4 miles (3.8 kilometres) north-west
Exmoor and Quantock	The primary reasons for designation are the presence of 'Old sessile oak woods with *Ilex* and *Blechnum* in conjunction with heath' and its maternity colonies of barbastelle bat. The qualifying features include	9.9 miles (16.0

Site	Reasons for designation	Distance and directions from proposed scheme
Oakwoods SAC	Alluvial forests with alder (*Alnus glutinosa*) and ash (*Fraxinus excelsior*) and the presence of Bechstein's bats and otters.	kilometres) north-west
Bracket's Coppice SAC	The primary reason for designation is the presence of a maternity colony of Bechstein's bat. The qualifying features include habitats such as *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils.	11.4 miles (18.3 kilometres) south-east
Severn Estuary SAC and Ramsar	The site is characterised by the presence of tidal rivers, estuaries, mud flats, sand flats, lagoons, salt marshes, salt pasture and salt steppes. The primary designation features under both SAC and Ramsar criteria as described below. SAC qualifying features: • The presence of estuaries, mudflats and sandflats not covered by seawater at low tide, sandbanks which are slightly covered by seawater all the time, reefs and Atlantic salt meadows. • The site supports sea lamprey (*Petromyzon marinus*), river lamprey (*Lampetra fluviatilis*) and twaite shad (*Alosa fallax*). Ramsar qualifying criteria: • Unusual estuarine communities with reduced diversity and high productivity. • Assemblage of migratory first species including sea lamprey, river lamprey, twaite shad, allis shad (*Alosa alosa*), salmon (*Salmo salar*), sea trout (*Salmo trutta*) and eel. • Supports an important feeding and nursery ground for fish species such as allis shad and twaite shad. • Internationally important assemblage of waterfowl including Bewick's swan, European white-fronted goose (*Anser albifrons*), dunlin (*Calidris alpine*), redshank (*Tringa tetanus*), shelduck (*Tadorna tadorna*) and gadwall. In addition to the primary reason for designation, the site also supports sandbanks which are slightly covered by sea water all the time and reefs, which are qualifying features of the SAC.	15.5 miles (25 kilometres) downstream along the River Tone and River Parrett
Beer Quarry and Caves SAC	The primary reason for designation is the presence of a hibernation roost for Bechstein's bats. The site comprises a complex of mines, with greater horseshoe bat (*Rhinolophus ferrumequinum*) and lesser horseshoe bat present as qualifying features but are not a primary reason for site selection.	17.6 miles (28.4 kilometres) south
Statutory sites of national importance		
Thurlbear Woods and Quarrylands SSSI	This site is of special interest due to species-rich woodland, formerly managed in a traditional coppice-with-standards system and situated on soils derived from Rhaetic shales and limestones. The recorded history of the site is of Medieval origin - embankments and the presence of several plants normally confined to primary woods, which all suggest that Thurlbear Wood is of considerable antiquity.	0.8 miles (1.3 kilometres) west
Barrington Hill Meadows SSSI and Barrington Hill NNR	The site is an outstanding example of traditionally managed unimproved neutral grassland supporting a diverse range of botanical species including the extremely rare French oat-grass (*Gaudinia fragilis*).	1.1 miles (1.0 kilometres) south west

Site	Reasons for designation	Distance and directions from proposed scheme
Ruttersleigh SSSI	The site comprises a mosaic of broadleaved, mixed and yew woodland, scrub, bracken, mires and unimproved grassland which provides the habitat for several species of butterfly which are now scarce in Britain. Many of the habitats have restricted distribution both nationally and in the South West. The site is also important for its lichens.	2.1 miles (3.4 kilometres) west. ARN is adjacent in parts to SSSI boundary
Deadman SSSI	The site contains a rich mosaic of wet heath, bog pools and birch/willow carr grading into acid, marshy grassland. Lowland neutral grassland is also present. These habitats support several species of plant which are rare in the county.	3.8 miles (6.0 kilometres) west. ARN is adjacent in parts to SSSI boundary
Prior's Park and Adcombe Wood SSSI	The site supports lowland, broadleaved, semi-natural woodland habitat, including ancient woodland, as well as area of unimproved marshy grassland.	4 miles (6.5) kilometres west. ARN is 0.06 miles (90 metres) south of SSSI boundary
North Moor SSSI	The site is a nationally important grazing marsh and ditch system on the Somerset Levels and Moors. A range of neutral grassland types supporting common and scarce plants has developed, mainly due to variations in soils and management practices. Aquatic plant communities are exceptionally diverse, with good populations of nationally scarce species. The site supports otter and an important assemblage of birds.	4.2 miles (6.8 kilometres) north east. ARN is adjacent in parts to SSSI boundary
Long Lye SSSI	The site supports a traditionally-managed, herb-rich, neutral grassland, with wet flush communities and mature broadleaved woodland.	4.7 miles (7.6 kilometres) south west. ARN is adjacent in parts to SSSI boundary
Long Lye Meadow SSSI	The site supports a lowland hay meadow; the neutral grassland varies in character and is herb-rich. The site is nationally important for supporting a crested dog's tail (*Cynosurus cristatus*) – common knapweed (*Centaurea nigra*) community.	5 miles (8.0 kilometres) south west. ARN is adjacent in parts to SSSI boundary
Southlake Moor SSSI	This site is part of the grazing marsh grassland and ditch system of the Somerset Levels and Moors SPA and Ramsar Site. Southlake Moor SSSI supports a variety of grassland habitats, including lowland neutral grassland as well as standing open water. Important assemblages of aquatic invertebrates and wildfowl have been recorded at the site, with regular field signs of otter also present.	6.4 miles (10.3 kilometres) north east. ARN is 0.08 miles (130 metres) west of SSSI boundary
Millwater SSSI	The site supports a complex mosaic of habitats, including pasture, wet grassland, tall-herb fen, standing and running water and alder and	6.7 miles (10.8

Site	Reasons for designation	Distance and directions from proposed scheme
	willow carr. There is an important assemblage of invertebrates, including many nationally scarce species as well as a nationally scarce species of sedge.	kilometres) south east. ARN is 0.06 miles (100 metres) west of SSSI boundary
Wet Moor SSSI	This site is part of the grazing marsh grassland and ditch system of the Somerset Levels and Moors SPA and Ramsar Site. Wet Moor SSSI supports neutral grassland habitat, with extensive winter flooding providing habitat for an important assemblage of wildfowl and birds. Common frog (*Rana temporaria*) are present throughout.	7.7 miles (12.4 kilometres) north east. ARN is 0.06 miles 60 metres east of SSSI boundary
Langport Railway Cutting SSSI	The site is designated for its geological interest as it is one of the few permanently exposed localities for cold-stage Pleistocene gravels in south Somerset.	8.8 miles (14.1 kilometres) east. ARN crosses SSSI
Maiden Down SSSI	The site is of interest for its lowland heath plant and animal communities. The site supports a rich invertebrate fauna which includes several nationally scarce species of insect.	11.3 miles (18.2 kilometres) west. ARN is adjacent in parts to SSSI boundary
Huntspill River NNR	This artificial river (created in 1940) holds a large stock of coarse fish, is home to otters and is a breeding area for barn owls. The main habitat types are woodland, open water and lowland grassland.	12.6 miles (20 kilometres) north east. ARN crosses LNR
Killerton SSSI	The site is designated for its geological interest as it contains Permain basalt-like rocks, known as lamprophyres.	22.6 miles (36.4 kilometres) south west. ARN is 0.07 miles (120 metres) east of SSSI boundary
Statutory sites of local importance		
Children's Wood/ Riverside Park LNR	The reserve is an important habitat and movement corridor for a host of animals with otter and a number of bats being recorded. A large number of bird species occur including kingfisher, dipper (*Cinclus cinclus*), grey wagtail (*Motacilla cinerea*), mute swan (*Cygnus olor*), grey heron (*Ardea cinerea*) and reed warbler (*Acrocephalus scirpaceus*). Butterflies include small skipper (*Thymelicus sylvestris*) and large skipper (*Ochlodes sylvanus*), marbled white (*Melanargia galathea*), small heath	0.1 miles (210 metres) north. ARN is adjacent in parts to LNR

Site	Reasons for designation	Distance and directions from proposed scheme
	(*Coenonympha pamphilus*) and small copper (*Lycaena phlaeas*). Also good for dragonflies and damselflies.	
South Taunton Streams LNR	This reserve supports a wide range flora and fauna including water vole, otters, kingfisher (*Alcedo atthis*), sand martin (*Riparia riparia*) and bats including pipistrelle species, lesser horseshoe and noctule.	0.2 miles 260 metres west. ARN is adjacent in parts to LNR
Bickenhall Orchard LNR	A traditional orchard supporting a rich bryophyte community and herb rich grasslands supporting a diverse invertebrate population, badgers and slow worm.	0.3 miles (440 metres) south west
Herne Hill LNR	This reserve supports woodland, grassland and scrub habitats. A large number of invertebrate species occur, including two nationally rare species. The reserve is also recorded to support a large population of badgers, as well as bats and birds.	0.8 miles (1.3 kilometres) south east
Screech Owl LNR	The reserve comprises a mosaic of ponds, reed beds, scrub and grassland. The site supports notable assemblages of wetland birds as well as water voles, otter, bats and grass snake.	7.1 miles (11.4 kilometres) ARN is 0.1 miles (160 metres) west of LNR boundary
Grand Western Canal Country Park LNR	Wholly manmade canal winding through a rural landscape within Mid-Devon, forming and important wildlife corridor. Species present include otter and the scarce chaser dragonfly (*libellula fulva*).	11.5 miles (18.6 kilometres) south west

Non-statutory designated sites

8.6.12 There are 46 non-statutory sites within a 1.2 mile (2 kilometre) study area, all of which are Local Wildlife Sites (LWS).

8.6.13 These non-statutory sites have been designated by the local planning authorities and are protected through local planning policies as they support locally important habitats and/or species of nature conservation value within the county. As such, all of the non-statutory sites designated within the study area are considered to be of county importance, with the exception of those that are component parts of SSSIs, in which case these are of national importance.

8.6.14 The LWSs within the study area are summarised in Table 8-7. Figure 8.2 shows the location of these sites in relation to the proposed scheme.

8.6.15 A further 110 non-statutory LWS (in Somerset) and County Wildlife Sites (in Devon) are located over 1.2 miles (2 kilometres) from the proposed scheme but fall within 0.12 miles (200 metres) of the ARN. The potential for air quality effects upon these sites will be assessed and reported in the ES.

Table 8-7 Non-statutory designated sites within the study area

Site	Reasons for designation	Distance and direction from proposed scheme boundary
Road Verges West of Hatch Beauchamp LWS	Supports important assemblage of vascular plants including notable species within the county.	Within the footprint of the proposed scheme
Bickenhall Wood LWS	Supports woodland (including ancient woodland) habitats and an important assemblage of vascular plants.	Within the footprint of the proposed scheme
Saltfield Copse LWS	Supports woodland (including ancient woodland).	Within the footprint of the proposed scheme
River Rag LWS	Supports freshwater habitats.	Within the footprint of the proposed scheme
Jordans Park LWS	Supports parkland with an important assemblage of veteran trees.	Within the footprint of the proposed scheme
Every's Copse LWS	Supports predominantly broadleaved semi-natural woodland (including ancient woodland).	Adjacent to proposed scheme boundary
Ashill Wood LWS	Supports predominantly broadleaved semi-natural woodland (including ancient woodland).	Adjacent to proposed scheme boundary
Huish Woods LWS	Supports broadleaved semi-natural woodland (including ancient woodland).	Adjacent to proposed scheme boundary
River Isle LWS	Supports freshwater habitats and an important assemblage of vascular plants.	0.04 miles (80 metres) south
River Tone and Tributaries LWS	Supports freshwater habitats and otter.	0.06 miles (100 metres) west
Huish Copse East LWS	Supports broadleaved semi-natural woodland (including ancient woodland).	0.07 miles (120 metres) south
Hatch Green Fields LWS	Supports unimproved calcareous and neutral grassland with an important assemblage of vascular plants.	0.1 miles (160 metres) north
Thorn Clump LWS	Supports semi-improved grassland and an important assemblage of vascular plants, including notable species within the county.	0.2 miles (260 metres) north east
Scutty Benches Copse LWS	Supports woodland (including ancient woodland).	0.2 miles (400 metres) north
Stoke Wood LWS	Supports mixed broadleaved woodland (including ancient woodland) and an important assemblage of vascular plants.	0.2 miles (400 metres) south
Bens Copse LWS	Supports woodland (including ancient woodland).	0.3 miles (430 metres) west
Forest Orchard LWS	Supports unimproved grassland habitat and orchard trees.	0.3 miles (440 metres) south

Site	Reasons for designation	Distance and direction from proposed scheme boundary
Oldway Bridge Field and Spring LWS	Supports unimproved neutral grassland with an important assemblage of invertebrates.	0.3 miles (450 metres) south
Abbey Hill Farm Meadow LWS	Supports an important grassland community.	0.3 miles (450 metres) south west
Curry Mallet Drove LWS	A green lane supporting grassland habitat and an important assemblage of vascular plants.	0.3 miles (470 metres) south west
Knowl Wood LWS	Supports woodland (including ancient woodland).	0.3 miles (500 metres) south west
Hatch Court Park LWS	Supports parkland habitat within an important assemblage of veteran trees.	0.3 miles (530 metres) east
Southtown Farm LWS	Supports neutral, wet unimproved grassland with an important assemblage of vascular plants including notable species within the county.	0.3 miles (560 metres) west
Merryfield Airfield LWS	Supports semi-natural mesotrophic/calcareous/ calcifugous grassland with at least five vascular plant species that are notable within the county.	0.4 miles (680 metres) north-east
Close Park LWS	Supports parkland habitat within an important assemblage of veteran trees.	0.4 miles (700 metres) north east
Donyatt Railway Cutting LWS	Supports a mosaic of habitats and a good bird population.	0.4 miles (720 metres) south east
Boon's Copse LWS	Designated for the presence of ancient woodland.	0.4 miles (720 metres) west
Near Myrtle Farm LWS	A green lane which supports a mosaic of habitats, including species-rich rough grassland, scrub and secondary woodland. Supports an important assemblage of vascular plants including notable species within the county.	0.5 miles (760 metres) south west
Blackbrook Pavilion LWS	Designated for the presence of hedgerows which support a dormouse population.	0.5 miles (790 metres) south west
Bridgwater and Taunton Canal LWS	Supports standing water with a higher-than-average number of submerged floating and emergent plant species and at least five vascular plant species that are notable in the county.	0.5 miles (880 metres) north-east
Line Wood LWS	Supports broadleaved semi-natural woodland (including ancient woodland).	0.6 miles (900 metres) north east
Ten Acre Copse LWS	Designated for the presence of ancient woodland.	0.6 miles (1.0 kilometres) west
Meadows at West Hatch LWS	Supports an important assemblage of vascular plants, including two or more species that are notable within the county and which make up a semi-natural mesotrophic/	0.6 miles (1.0 kilometres) west

Site	Reasons for designation	Distance and direction from proposed scheme boundary
	calcareous/calcifugous grassland community. Supports an important assemblage of amphibians,	
Wright's Copse LWS	Designated for the presence of ancient woodland.	0.7 miles (1.1 kilometres) west
Newlands Plantation and Extensions LWS	Supports semi-natural mesotrophic/calcareous/ calcifugous grassland with at least five vascular plant species that are notable within the county.	0.7 miles (1.2 kilometres) north-east
Herne Hill LWS	Supports at least eight species of flora and fauna that are notable within the county, across at least two species groups and supports broadleaved woodland on ancient woodland sites.	0.8 miles (1.3 kilometres) south
Forest Farm Drove LWS	Supports semi-natural mesotrophic/calcareous/ calcifugous grassland.	0.9 miles (1.4 kilometres) west
Quarrylands North LWS	Supports a mosaic of at least two semi-natural habitats	1.0 miles (1.6 kilometres) west
Crimson Hill Tunnel LWS	Supports a winter roost of at least five horseshoe *Rhinolophus sp.* bats.	1.0 miles (1.6 kilometres) east
Crimson Hill Farm Fields LWS	Supports semi-natural mesotrophic/calcareous/ calcifugous grassland.	1.0 miles (1.6 kilometres) east
Wrantage Covert LWS	Designated for the presence of ancient woodland.	1.1 miles (1.7 kilometres) east
Dillington Park LWS	Supports broadleaved woodland on ancient woodland sites, with veteran trees present.	1.1 miles (1.7 kilometres) east
Fieldgate Lane Fields LWS	Supports at least one Red Data Book vascular plant.	1.1 miles (1.8 kilometres) east
Drakes Meadow and Weir LWS	Supports semi-natural mesotrophic/calcareous/ calcifugous grassland, a mosaic of at least two semi-natural habitats and at least two species of vascular plant that are notable within the county.	1.2 miles (1.9 kilometres) west
Staple Farm Area LWS	Supports the breeding sites of avian species notable within the county.	1.2 miles (1.9 kilometres) west
Three Ponds, Dunpole LWS	Supports an important assemblage of amphibian species, including a 'good' population of great crested newt.	1.2 miles (1.9 kilometres) south

Ancient woodland and veteran trees

8.6.16 Ancient woodland is considered to be any area that has been continuously wooded since 1600 AD [55]. Ancient woodlands are considered to be irreplaceable habitat and are of national importance, irrespective of whether they are listed on Natural England's Ancient Woodland Inventory.

8.6.17 There are ten Ancient Woodland sites listed on Natural England's Ancient Woodland Inventory within 1.2 miles (2 kilometres) of the proposed scheme as shown in Table 8-8. The majority of these are also LWSs as shown in Table 8-7 above. Figure 8.3 shows the location of these woodlands in relation to the proposed scheme.

8.6.18 Saltfield Copse LWS is not listed on Natural England's Ancient Woodland Inventory, however the LWS citation states that it is ancient woodland. For the purposes of this assessment Saltfield Copse LWS is considered to be ancient woodland. Further assessment of the status of this woodland will be undertaken and reported in the ES.

8.6.19 A further ten Ancient Woodland sites listed on the Ancient Woodland Inventory and located over 1.2 miles (2 kilometres) from the proposed scheme but fall within 0.12 miles (200 metres) of the ARN. These are:

- Unnamed ancient woodland 1/2/3/4 (north of the A30 at Coombe, West Crewkerne)
- Unnamed ancient woodland 5 (north of the A30 at Lower Coombe, West Crewkerne)
- Unnamed ancient woodland 6 (north of A303 at Boxstone Hill, Whitelackington)
- Helliars Copse
- Higher Ash/Long Woods
- Knights Wood
- Parsonage Wood
- Parsons Steeple
- Staple Park Wood
- Warren Hill Wood

Table 8-8 Ancient woodland within the study area

Site	Distance and direction from proposed scheme
Bickenhall Wood	Adjacent to proposed scheme, and 0.01 miles (10 metres) west of the ARN
Ashill Wood/Everys Copse	Adjacent to proposed scheme
Huish Coppice	0.01 miles (20 metres) west, and 0.13 miles (200 metres) west of the ARN
Stoke Wood	0.2 miles (400 metres) south
Line Wood	0.3 miles (470 metres) east 0.07 miles (110 metres) north of the ARN
An unnamed site listed as 'ancient replanted woodland'	0.3 miles (550 metres) north
Knowl Wood	0.4 miles (600 metres) south
Boons Copse	0.5 miles (880 metres) west
Ten-Acre Coppices	0.6 miles (1.0 kilometres) west
Thurlbear Wood	1.0 miles (1.6 kilometres) west

8.6.20 As defined in the Natural England and Forestry Commission Standing advice, ancient and veteran trees[3] can be individual trees or groups of trees within habitat such as wood pasture. Ancient trees are exceptionally valuable and include attributes such as great age, size, conditions and biodiversity value as a result of significant wood decay and ageing. All ancient trees are veteran but not all veteran trees are ancient. A veteran tree may not be very old but has decay

[3] For the purpose of this report, a veteran tree is defined as: "a tree that is of interest biologically, culturally or aesthetically because of its age, size or condition" (refer to the following link for further details: http://publications.naturalengland.org.uk/file/113006)

features such as branch death and hollowing that contribute to its biodiversity value. Ancient and veteran trees are both irreplaceable habitat features that are each of national importance and afforded the same level of policy protection.

8.6.21 Veteran trees are located within and adjacent to the proposed scheme, including those at Jordans Park LWS. An arboricultural survey has been undertaken in accordance with available land access, and confirmed the presence of five veteran trees within the proposed scheme:

- A black poplar (T142) alongside Venner's Water.
- A pedunculate oak (T265) adjacent to access track at Jordans Park LWS.
- A pedunculate oak (T306) adjacent to the Back Stream at Jordans Park LWS.
- Two pedunculate oaks (T315, T316) within a hedgerow dividing fields immediately to the south of Jordans Park LWS.

Notable plant and fungi species

8.6.22 Notable plant species records were returned from data searches with Somerset Environmental Records Centre (SERC). The updated 2021 data search returned numerous records of notable plant species within the study area of the proposed scheme. Key areas of notable records include:

- Red listed autumn lady's-tresses (*Spiranthes spiralis*) and green-winged orchid (*Anacamptis morio*) at Barrington Hill Meadows SSSI and Barrington Hill NNR.
- Red listed dwarf spurge (*Euphorbia exigua*), greater butterfly-orchid (*Platanthera chlorantha*), box (*Buxus sempervirens*) within woodland to the west of the proposed scheme.
- Red listed dwarf spurge, dodder (*Cuscuta epithymum*), greater butterfly-orchid, bird's-nest orchid (*Neottia nidus-avis*), as well as basil thyme (*Clinopodium acinos*) and lesser butterfly-orchid (*Platanthera bifolia*) which are additionally SPIs, from the area within and surrounding Thurlbear woods and quarrylands SSSI.

8.6.23 Numerous other records of locally notable plant and fungi species (Local Biodiversity Action Plan and/or County notable) were also returned from various locations within the ZoI.

8.6.24 Field surveys have confirmed the presence of large numbers of pyramidal orchids (*Anacamptis pyramidalis*) and common spotted orchid (*Dactylorhiza fuchsia*) and occasional greater butterfly orchid within a woodland edge and grassland field margins either side of the A358 near Griffin Lane. Greater butterfly-orchid is a red listed species classified as being Near Threatened; however, along with pyramidal and common spotted orchids, remains widespread within southern counties of England. Given the large numbers present within the study area the orchid assemblage is classified as of local importance.

Invasive non-native species

8.6.25 No records of Invasive Non-Native Species (INNS) listed on Schedule 9 of the Wildlife and Countryside Act 1981 or the Invasive Alien Species (Enforcement and Permitting) Order 2019, were returned from the updated data search or identified during the 2016 Extended Phase 1 habitats survey.

8.6.26 However, the National Vegetation Classification (NVC) survey identified invasive giant hogweed (*Heracleum mantegazzianum*) within an area of grassland in the western section of the proposed scheme, and the River Habitat Survey (RHS)

identified Himalayan balsam (*Impatiens glandulifera*) within the River Ding riparian corridor. Additionally, while not listed as a Schedule 9 species, invasive winter heliotrope (*Petasites fragrans*) was also identified within the study area on road verges surrounding Ashill and on an earth bank near Thickthorn Cross.

Habitats

8.6.27 The desk study identified seven HPI within the study area. These are lowland mixed deciduous woodland, coastal and floodplain grazing marsh, hedgerows, traditional orchards, ponds, rivers and streams, wood-pasture and parkland.

8.6.28 A total of 27 different habitats were recorded in the study area of the proposed scheme during the Phase 1 Habitat Survey in 2016. Of these, the proposed scheme passes predominantly though arable land, improved grassland and poor semi-improved grassland, which are associated with agricultural practices. The proposed scheme also passes through significant blocks of semi-natural broadleaved woodland, as well as scattered trees associated with riparian corridors where the proposed scheme crosses numerous small watercourses. Further habitats of more limited extent within the study area include mixed semi-natural woodland, broadleaved plantation, scrub (dense and scattered), semi-improved neutral grassland, marshy grassland, standing and running water, and numerous hedgerows ranging in character.

8.6.29 All habitats surveyed are described below using information from the Phase 1 Habitat Survey as indicated on the Phase 1 Habitat Map which can be found in Appendix 8.2 *Preliminary Ecological Appraisal (PEA)*. Further hedgerow surveys were undertaken during 2017, 2019 and 2020 to identify important hedgerows in accordance with the Hedgerow Regulations 1997, and NVC botanical surveys were conducted on 12 areas of grassland initially identified during the Phase 1 survey as semi-improved neutral grassland that would be directly impacted by the proposed scheme. Woodland NVCs were also undertaken on 15 areas of woodland to be impacted by the proposed scheme. Information from these surveys informs the habitat valuation and classifications discussed below.

8.6.30 Full results of the hedgerow survey can be found in Appendix 8.4 *Hedgerow Technical Report*.

8.6.31 Full results of NVC surveys, can be found in Appendix 8.5: *National Vegetation Classification Technical Report*.

Semi-natural broadleaved woodland

8.6.32 There are a number of areas of semi-natural broadleaved woodland within the study area, including woodlands listed on the ancient woodland inventory. Generally, these are small scattered copses within the agricultural landscape, particularly centred on small waterbodies. Several riparian corridors within the study area are also wooded to varying degrees. Additionally, several extensive areas of continuous woodland are present within the study area, particularly along the central and eastern sections of the proposed scheme. These large areas are generally named sites also classified as ancient woodland, including Huish Woods, Ashill Wood and Every's Copse.

8.6.33 The majority of the woodlands are dominated by canopy trees, varying in the density and complexity of the understorey and ground layer. Dominant canopy species present in the majority of broadleaved woodlands include ash and pedunculate oak (*Quercus robur*), with primary understorey species including hazel (*Corylus avellana*), elder (*Sambucus nigra*), hawthorn (*Crataegus*

monogyna), field maple (*Acer campestre*), wild privet (*Ligustrum vulgare*), holly (*Ilex aquifolium*) and occasional willow (*Salix spp.*). Ground flora composition and richness is also variable between each woodland, with some woodlands displaying a relatively sparce ground flora and others a relatively diverse community, though frequently still with some signs of enrichment such as common nettle (*Urtica dioica*) and cleavers (*Galium aparine L*). The ground flora of several larger woodlands, such as Every's Copse and sections of Bickenhall Wood, indicate dampness.

8.6.34 NVC surveys to identify woodland plant communities assigned three separate plant communities to the eight woodland sites surveyed, however the majority of these fell into several subcommunities of the W8 *Fraxinus excelsior – Acer campestre – Mercurialis perennis* grouping.

8.6.35 Semi-natural broadleaved woodland is lowland mixed deciduous woodland HPI and the areas of this habitat within the study area are therefore of national importance.

Plantation woodland – broadleaved

8.6.36 Broadleaved plantation woodland is present within a number of areas throughout the study area, with significant blocks present at the western extent of the proposed scheme, including a block adjacent to Knowl Wood, which comprises planted and coppiced hazel. Further areas of broadleaved plantation woodland are also present at various other locations across the proposed scheme, including a number that are managed by Forestry England.

8.6.37 Broadleaved plantation woodland within the study area is of county importance.

Mixed semi-natural woodland

8.6.38 Areas of mixed semi-natural woodland are primarily located at the central section of the proposed scheme, with named examples including Bickenhall Wood and Saltfield Copse. The canopy of these woodlands is primarily deciduous and dominated by ash, though with frequent Douglas fir (*Pseudotsuga menziesii*) and silver birch (*Betula pendula*). Both of these woodlands are contiguous with the belts of woodland and scrub that form the highway planting along the A358.

8.6.39 Both woodlands have been subject to NVC survey to classify the woodland communities and identified each as subcommunities of *Fraxinus excelsior - Acer campestre - Mercurialis perennis*. Both were found to have developed understories including species such as wild privet, field maple, hawthorn, hazel and service-tree (*Sorbus domestica*). The ground flora in each area of mixed semi-natural woodland was found to be sparse but relatively diverse, with evidence of regeneration and standing deadwood.

8.6.40 A number of these woodland parcels would be directly impacted by the proposed scheme, resulting in habitat loss and/or fragmentation.

8.6.41 Mixed semi-natural woodland within the study area is of county importance.

Scattered broadleaved trees

8.6.42 Scattered broadleaved trees are present at several locations throughout the study area, primarily associated with riparian corridors, although a number are also associated with hedgerows, in fields and in gardens. Frequent species identified include ash, pedunculate oak and sycamore. A number of scattered trees

identified throughout the study area are highly mature, with five veterans identified as described in 8.6.21

8.6.43 Scattered trees within the study area are of local importance.

Scrub

8.6.44 Small areas of dense and scattered scrub are widespread, both forming their own habitat and in mosaic with other habitats which are frequently too small to be mapped. Key areas of scrub include within the existing highways verge and surrounding Broughton Brook at Junction 25 of the M5 and surrounding Taunton Gateway Park & Ride facility. Such areas are generally being colonised by dense bramble (*Rubus fruticosus agg.*) and dog rose (*Rosa canina*), although with some areas forming more complex mixed habitats, occasionally with buddleia (*Buddleja davidii*).

8.6.45 Scrub habitat comprising common species such as hawthorn and blackthorn within the study area is of less than local importance.

Acid grassland

8.6.46 One area of semi-improved acid grassland was noted at Thornhill which was rabbit-grazed with anthills, gorse (*Ulex europaeus*) stands are present. Ground flora comprises of frequent lesser celandine (*Ranunculus ficaria*), clover species, ribwort plantain (*Plantago lanceolata*), occasional creeping thistle (*Cirsium arvense*), red dead-nettle (*Lamium purpureum*), lords and ladies (*Arum maculatum*) and dock (*Rumex spp.*).

8.6.47 Lowland dry acid grassland is a HPI within the study area and is, therefore, of national importance.

Semi-improved neutral grassland

8.6.48 Semi-improved neutral grassland is only present in small, isolated areas of the study area adjacent to the eastern section of the proposed scheme and north of the A358 at Ashill. Four of these fields were connected, whilst two were isolated south of West View Farm between a species poor semi-improved grassland field, an arable field and the A358. Species identified include dominant false oat grass (*Arrhenatherum elatius*), meadow fescue (*Festuca pratensis*), tall fescue (*Festuca arundinacea*) and cock's-foot *(Dactylis glomerata*) with occasional perennial rye grass (*Lolium perenne*), dock, nettle and creeping buttercup (*Ranunculus repens*) and rare herb-Robert (*Geranium robertianum*), spear thistle (*Cirsium vulgare*) and dove's-foot crane's-bill (*Geranium mole*).

8.6.49 These fields were subject to additional NVC survey which identified them as being grasslands of MG7 *Lolium perenne* dominated subcommunities, with influences of seasonal flooding from Venners Water and active cattle grazing contributing to a more improved sward. Each is characterised by a species-poor sward with a low abundance and richness of forbs.

8.6.50 Neutral grassland may qualify as lowland meadow, a priority habitat, and is therefore of national importance, however no areas qualifying as priority habitat have been identified to date.

8.6.51 Other areas of neutral semi-improved grassland within the study area are of local importance.

Semi-improved species-poor grassland

8.6.52 Areas of semi-improved, species-poor grassland are frequent throughout the study area. The majority of fields are intensively grazed by livestock including horses, sheep and chickens. Species identified comprised dominant cock's-foot, Yorkshire fog (*Holcus lanatus*) and fescues, with occasional white clover (*Trifolium repens*), dandelion (*Taraxacum spp.*), dock, red clover (*Trifolium pratense*), perennial rye grass, yarrow (*Achillea millefolium*) and teasel (*Dipsacus fullonum*).

8.6.53 Whilst these areas of grassland are generally of low diversity, small areas are locally herb-rich.

8.6.54 Semi-improved species-poor grassland within the study area is of local importance.

Improved grassland

8.6.55 A number of large fields of agriculturally improved grassland are present across the study area, particularly the central section of the route around West Hatch. These grasslands were observed to have a lush bright green and even sward and were dominated by perennial rye grass and white clover, likely resulting from intensive sheep grazing.

8.6.56 Improved grassland within the study area is of less than local importance.

Marshy grassland

8.6.57 Marshy grassland is present throughout the study area, though with a patchy distribution. In the western and central sections of the proposed scheme, this habitat is generally limited to smaller, isolated fields associated with watercourses and wet ditches. Marshy grasslands become more prevalent in the eastern section of the proposed scheme, particularly east of the A303, where four marshy grassland areas are associated with the River Isle, west of Winterhay Green.

8.6.58 Marshy grassland areas throughout the proposed scheme are characterised by a prevalence of soft rush (*Juncus effusus*) and hard rush (*Juncus inflexus*), with occasional stands of great willowherb (*Epilobium hirsutum*).

8.6.59 One area of marshy grassland located west of Henlade within the footprint of the proposed scheme was subject to further NVC assessment. NVC assessment found this grassland area to be of the MG1a *Arrhenatherum elatius* grassland - *Festuca rubra* sub-community, resulting from livestock grazing in recent years followed by a period without management. The sward is dominated by grasses such as Yorkshire fog and cock's-foot, with additional species including smooth meadow-grass (*Poa pratensis*), false oat-grass and red fescue. The abundance and richness of forbs within the grassland was also found to be poor, including small patches of invasive giant hogweed.

8.6.60 Areas of marshy grassland within the study area are considered to be of local importance.

Arable

8.6.61 Extensive areas of land within the study area are occupied by large arable fields, comprising a large proportion of land within the proposed scheme. The majority of these fields are sewn with winter wheat crop (*Triticum sp*.). However, some cultivated daffodil (*Narcissus sp*.) fields, located near Taunton Racecourse were

also present. Whilst variable, a number of these large arable fields contained wide field margins or areas of set aside grassland.

8.6.62 Arable land provides suitable foraging ground for a number of species and species groups such as birds and badgers and also provides breeding habitat for ground nesting bird species.

8.6.63 Arable land within the study area is considered to be of less than local importance.

Hedgerows

8.6.64 Reflecting the large proportion of land within the study area given over to agricultural production, an extensive network of hedgerows is present, acting as boundary features throughout each section. This includes a variety of intact and defunct hedgerows, both native species-rich and native species-poor hedgerows, many of which are associated with ecologically important features such as mature standard trees and banks or ditches.

8.6.65 Many of the hedgerows within the study area are managed through hedge laying, creating thick, species diverse corridors. Hedgerows providing important habitat linkages to watercourses and woodland are numerous throughout the study area and likely to contribute to landscape connectivity for wildlife movement and dispersal.

8.6.66 Frequently encountered species across all hedgerows included blackthorn and hawthorn, with elder, field maple and ash among other species present. More species rich examples additionally include species such as pedunculate oak, hazel, wild privet and horse chestnut (*Aesculus hippocastanum*).

8.6.67 Detailed hedgerow surveys were also undertaken on all hedgerows up to 0.03 miles (50 metres) from the proposed scheme, over half of which were identified as species rich. Further high proportions of the hedgerows not qualifying as important through species richness, qualified through other hedgerow features, such as having an adjacent ‘by-way open to all traffic’. Forty-eight hedgerows qualified as important through records of species protected under 1, 5 or 8 of the Wildlife and Countryside Act 1981, primarily through supporting hazel dormice.

8.6.68 Intact hedgerows conforming with the priority habitat description [56], i.e. over 20 metres long, less than 5 metres wide and where gaps are less than 20 metres wide, are of national importance as are all hedgerows assessed as important hedgerows covered by the Hedgerows Regulations 1997 and qualifying as priority habitats.

8.6.69 All other hedgerows within the study area are of local importance.

8.6.70 Further details on the methodology, limitations and results can be found in Appendix 8.4 *Hedgerow Technical Report*.

Tall ruderal

8.6.71 Tall ruderal habitat is prevalent throughout the proposed scheme, but most often as a mosaic in association with other broad habitat types, frequently in small patches too limited to map. However, significant stands of tall ruderal vegetation are present as the dominant habitat in several locations within the study area. This includes patches adjacent to the M5 Junction 25 at the western extent, by the disused railway track in the central section and within three isolated fields north and south of the A303 at the eastern extent.

8.6.72 All tall ruderal areas are characterised by the presence of species such as nettles and dock, with occasional rosebay willowherb (*Chamerion angustifolium*).

8.6.73 Ruderal habitat within the study area is considered to be of less than local importance.

Standing water

8.6.74 Numerous standing waterbodies are present throughout the study area, though few were accessible during the Extended Phase 1 survey in 2016. The majority of these waterbodies appear to be small ponds, generally associated with woodlands or arable set-aside land and are unlikely to qualify as priority habitats. Further surveys are being undertaken of waterbodies during 2021 and will inform the assessment of these habitats in the ES.

8.6.75 The majority of the freshwater ponds within the study area do not meet the criteria for priority habitat on the basis of flora/habitat type. Due to the relative rarity of ponds within the area, freshwater ponds are considered of local importance.

8.6.76 Any fauna of conservation importance that ponds support, such as great crested newts, are valued separately in the subsequent sections.

Running water

8.6.77 Small watercourses are present throughout the study area of the proposed scheme, many of which are intersected by the current path of the A358. The surface watercourses located in the study area are described in Table 13-6 of Chapter 13 Road Drainage and the Water Environment and are shown on Figure 13.1.

8.6.78 A summary of the key watercourses identified during the Extended Phase 1 survey is presented below:

- Broughton Brook is a fast-flowing stream with a silt and pebble substrate, running over a weir in Orchard Portman. The stream has a variety of features including small waterfalls, debris dams and side bars.
- Black Brook, flows into Broughton Brook, is a moderate flowing stream with steep sided banks, located to the west of Henlade and north-east of Haydon.
- Thornwater Stream, east of Henlade is a tributary of the River Tone. The watercourse is lined with mature scattered trees and patches of scrub; access was not granted at the time of survey so a detailed description of the watercourse was not able to be obtained.
- Meare Stream, south of Meare Green, is a tributary of the West Sedgemoor Main Drain. South of the A358 the watercourse is lined with mature trees; however, access was not granted at the time of survey so a detailed description of the watercourse was not able to be obtained.
- Fivehead River runs through the central section of the study area from Bickenhall past Hatch Beauchamp. It is noted as an important riparian habitat corridor. The river has been managed at Brandy Bridge by reinforced brick sides and a weir. Its flow was observed to be smooth with debris dams, pools, and side bars present along its length. The rivers channel appears to have been historically altered, with a dry ditch present where it once flowed south of Hatch Beauchamp.
- Venner's Water, north of Ashill, is noted as an important riparian habitat corridor with scattered mature trees and broadleaved woodland bordering its edges. The stream's flow is smooth and its banks are steep with exposed

earth and roots in areas. South of Ashill Wood, a wet ditch was observed running along the southern boundary at Park Barn lane.
- Back Stream runs south of Cad Green. This stream is noted as generally fast flowing and clear.
- Cad Brook is a medium flowing stream with gravel substrate and vertical earth banks in areas.
- The River Isle displays a variety of features including side bars, reinforced banks and an effluent outflow.

8.6.79 RHS and River Corridor Surveys (RCS) were undertaken along the River Ding as this was, at the time of the survey, the only river known to require diversionary works as part of the proposed scheme. Further surveys are being undertaken during 2021 of all 21 locations where the proposed scheme will cross a watercourse, the results of which will inform the ES. Due to dense vegetation growth, it was not possible to undertake the surveys in the direct vicinity of the bridge on the existing A358. Instead, the surveys were undertaken upstream of the bridge, over a 0.31 mile (500 metre) reach which ended 0.04 miles (60 metres) upstream of the bridge.

8.6.80 The surveyed reach of the River Ding has already been historically realigned and over-deepened. Two 'major' weirs were identified, causing some impoundment of flow and potentially impeding fish passage. Alongside several bridges, these modifications generated an RHS Habitat Modification Score of 3,745, which equates to the highest modification class of 'severely modified'.

8.6.81 Despite the River Dings' modified nature, considerable recovery has taken place, resulting in a range of semi-natural bank profiles. The surveyed reach contained an abundance of habitat features related, in part, to several fallen trees which added morphological complexity. Features noted included channel features such as riffles, pools, mid-channel bars and side bars.

8.6.82 The banks are colonised by a mixture of tall herbs, scrub and trees, offering abundant shade, and a range of related habitat features such as woody debris, tree roots, and overhanging boughs. Aquatic plants were generally sparse, as expected for a river of this type and level of shading. Taxa observed included fool's watercress, water starwort (*Callitriche sp.*), branched bur-reed (*Sparganium erectum*), duckweed (*Lemna sp.*), and brooklime (*Veronica beccabunga*), all of which were only observed in isolated patches.

8.6.83 No protected or otherwise notable species were recorded, with the exception of the invasive non-native plant species Himalayan balsam, which was present (sparsely colonised) on both the bank face and top.

8.6.84 Based on the results of the RHS and RCS along the River Ding and aquatic macroinvertebrate surveys of all watercourses crossed by the proposed scheme, running water is considered to be of local importance.

Bats

Desk study

8.6.85 There are four European SAC designations for bats located within 18.6 miles (30 kilometres) of the proposed scheme, these include Hestercombe House SAC, Exmoor and Quantock Oakwoods SAC, Bracket's Coppice SAC and Beers Quarry and Caves SAC (see Table 8-6 above for further details).

8.6.86 Several other local and national statutory designated sites within 1.2 miles 2 kilometres of the proposed scheme also contain habitats that could support bats. These include Thurlbear Wood and Quarrylands SSSI, Herne Hill LNR, Bickenhall Orchard LNR, Children's Wood/Riverside LNR, and South Taunton Streams LNR.

8.6.87 Data provided by SERC in 2021 identified records of at least 16 species of bat within 6.2 miles (10 kilometres) of the proposed scheme, four of which are listed under Annex ll of the Habitats Directive. These comprise barbastelle, Bechstein's, lesser horseshoe and greater horseshoe bats.

8.6.88 Geospatial analysis of the SERC data indicates the importance of the area for rarer species, including lesser horseshoe, which was the second most frequently recorded species (after common pipistrelle) within 6.2 miles (10 kilometres) of the proposed scheme. A breakdown of bats accurately identified to species level and their overall percentage frequency within the SERC data set has been provided in Table 8-9.

Table 8-9 Summary of bat records provided by SERC

Species	Number of records within SERC data set	% Occurrence within SERC data set	Notes on significant records
Bats (indeterminate)	-	-	Indeterminate roosts
Long-eared (indeterminate)	-	-	Maternity, day, feeding, indeterminate roost.
Pipistrellus	-	-	Maternity, day, indeterminate roost.
Unidentified species	-	-	Indeterminate roost
Whiskered/Brant's	-	-	-
Common pipistrelle	794	32.13%	Day, night, maternity, indeterminate roosts,
Lesser horseshoe	391	15.82%	Maternity, day, transitional, night and indeterminate roost
Soprano pipistrelle	339	13.72%	Day, night, indeterminate roost
Serotine	235	9.51%	Maternity, day, indeterminate roost
Brown long-eared	194	7.85%	Maternity, day, night, indeterminate roost.
Noctule	180	7.28%	-
Natterer's	82	3.32%	Maternity, day, indeterminate roost
Daubenton's	71	2.87%	Day roost
Greater horseshoe	60	2.43%	Day, indeterminate roost
Barbastelle	59	2.39%	Aural observation/ recording only.
Leisler's	24	0.97%	-
Nathusius' pipistrelle	17	0.69%	-

Species	Number of records within SERC data set	% Occurrence within SERC data set	Notes on significant records
Bats (indeterminate)	-	-	Indeterminate roosts
Long-eared (indeterminate)	-	-	Maternity, day, feeding, indeterminate roost.
Pipistrellus	-	-	Maternity, day, indeterminate roost.
Unidentified species	-	-	Indeterminate roost
Whiskered/Brant's	-	-	-
Whiskered	14	0.57%	Day, indeterminate roost
Bechstein's	7	0.28%	Aural observation/recording only.
Brant's	3	0.12%	-
Grey long-eared	1	0.04%	-
Total	2471	100%	

8.6.89 Of the four Annex ll species recorded, only lesser and greater horseshoe were confirmed to be roosting within 6.2 miles (10 kilometres) of the proposed scheme. Barbastelle and Bechstein's records pertained to aural observation/recording only.

8.6.90 Twenty-nine confirmed lesser horseshoe roosts were recorded within 6.2 miles (10 kilometres) of the proposed scheme. Roost types included; day, night, maternity, indeterminate (droppings only) and transitional roosts. The closest lesser horseshoe roosts were located 0.31 miles (500 metres) east of the proposed scheme at Thornfalcon, 0.19 miles (300 metres) south-east at Ilminster and 0.37 miles (600 metres) west at Bickenhall. All other roost records were located over 1.9 miles (3 kilometres) from the proposed scheme and were primarily located to the north and south of Taunton.

8.6.91 Greater horseshoe records are largely located to the north and south of the proposed scheme, with the majority located to the north of Taunton and to the west of the M5 motorway. Records of a greater horseshoe roost (recorded annually from 2016 – 2019) are located 3.7 miles (6 kilometres) north-east of the proposed scheme at Butcher's Hill, Fivehead (roost type unknown). Two further roosts are located approximately 2.5 miles (4 kilometres) and 6.2 miles (10 kilometres) to the north, respectively.

8.6.92 The majority of the barbastelle records were located to the north of Taunton and the M5 motorway. Smaller secondary clusters were recorded to the south of the proposed scheme adjacent to the roundabout which is part of the Nexus 25 development and several off-site woodland blocks. The second closest records were located at Bickenhall, 0.43 miles (700 metres) west of the proposed scheme.

8.6.93 Bechstein's records were primarily located in association with large woodland blocks to the south and west of the proposed scheme. The closest records pertained to two separate observations 1.2 miles (2 kilometres) south-west of the proposed scheme boundary.

8.6.94 Other common and more notable species, including common and soprano pipistrelle, serotine, brown long-eared, noctule, Natterer's, Daubenton's, and whiskered bat, were also recorded roosting within 6.2 miles (10 kilometres) of the proposed scheme.

Field surveys – roosts

Tree surveys

8.6.95 As a result of the ground-level assessments a total of 144 trees were identified within 0.06 miles (100 metres) of the proposed scheme footprint at the time of survey as having the potential to support roosting bats (high, moderate and low). Upon completion of the aerial tree-climbing surveys 34 trees were classified with high potential, 46 moderate, 45 low and 19 negligible.

8.6.96 As a result of the emergence/re-entry surveys, six trees were identified within 0.06 miles (100 metres) of the proposed scheme footprint as confirmed bat roosts, all with low numbers of common species, in addition to four possible/unconfirmed roosts. As all of the roosts identified comprise low numbers of common species the tree roosts are valued at local importance.

8.6.97 Full results can be found in Appendix 8.6 *Bat Roost Technical Report*.

Building surveys

8.6.98 A total of 193 buildings and six bridges/culverts were identified within 0.06 miles (100 metres) of the proposed scheme footprint at the time of the surveys. As a result of the external building assessments two confirmed roosts were identified, in addition to 39 buildings with high potential, 29 moderate, 34 low and 79 negligible potential. The roost potential of 16 buildings were unable to be determined due to access issues or buildings being found to no longer exist. Update surveys during 2021 will focus on areas within 0.06 miles (100 metres) of the proposed scheme where access was previously unavailable, as detailed in paragraph 8.5.46 above. Where access is not possible, appropriate assumptions will be made for mitigation design.

8.6.99 Internal inspections of buildings within 0.06 miles (100 metres) of the proposed scheme footprint at the time of the surveys were carried out in accordance with available land access. This comprised 22 buildings, of which evidence (droppings) was identified in 12. Following emergence/re-entry surveys 27 buildings were confirmed as bat roosts and a further seven with possible emergences that fall within 0.06 miles (100 metres) of the proposed scheme. The buildings with possible emergences comprised buildings 74, 119A and 175 (anecdotal reports of bats by landowners) and buildings 196, 205, 206 and 274 (possible emergences of common pipistrelle), as set out in Appendix 8.6 *Bat Roost Technical Report*.

8.6.100 Buildings 226 and 230 are considered likely to be maternity colonies of common pipistrelle and are therefore considered to be of county importance. Building 210/201SE is identified as a potential maternity roost for lesser horseshoe bats (on the basis of droppings identified during internal inspections, not verified as a result of emergence/re-entry surveys). On a precautionary basis, this building is assigned county importance. All other confirmed roosts are likely to comprise day roosts of low numbers of common species, which are valued at local importance.

8.6.101 Full results can be found in Appendix 8.6 *Bat Roost Technical Report*.

Hibernation surveys

8.6.102 The initial preliminary roost assessments undertaken in 2017 and 2019 identified several buildings and structures as being suitable for hibernation roosts within 0.06 miles (100 metres) of the proposed scheme. Further hibernation specific surveys included internal inspections where possible, and deployment of static detectors for a two-week period in December 2020.

8.6.103 A total of five buildings and two bridges were subject to external assessments. Four buildings were also inspected internally, one of which was later subject to static detector surveys.

8.6.104 No evidence of hibernating bats was found during the internal inspections and single static detector deployment in December 2020.

8.6.105 Full results can be found in Appendix 8.7 *Bat Hibernation Technical Report* and Appendix 8.6 *Bat Roost Technical Report*.

Field surveys – activity

Bat activity transects and automated detector surveys

8.6.106 Bat activity surveys have confirmed the presence of at least 11 species of bat within and around the footprint of the proposed scheme. These comprised common pipistrelle, soprano pipistrelle, Nathusius' pipistrelle (*Pipistrellus nathusii*), barbastelle, greater horseshoe, lesser horseshoe, noctule, serotine, Leisler's (*Nyctalus leisleri*), long-eared *Plecotus sp. and Myotis sp*.

8.6.107 The majority of bats recorded during the activity surveys were common pipistrelle (total calls = 4,045, ~ 61%), followed by soprano pipistrelle (total calls = 1,049, ~ 16%) for transects and *Pipistrellus* species (79%), (excluding Nathusius' pipistrelle) for the static surveys. The three Annex ll species noted above (barbastelle, greater horseshoe, lesser horseshoe) were encountered in low numbers during the transect surveys.

8.6.108 Key areas of high activity were identified during these surveys. Activity was concentrated along transect route two between Henlade and Taunton Gateway Park & Ride, transect six adjacent to Ashill, and transect nine adjacent to Bickenhall Wood. Each of these transects covered a mixture of arable, pasture, and woodland edge habitats with linear features including hedgerows and streams. Activity surveys have highlighted the importance of these linear features within the landscape for commuting and foraging bats, including Annex ll species.

8.6.109 Static detectors placed along transect route eight at Henlade recorded the highest levels of activity overall, followed by transect route two between Henlade and Taunton Gateway Park & Ride. Both locations displayed high *Pipistrelle sp.* activity. Activity levels for the three Annex ll species was also low during the static surveys, totalling <1% of the overall dataset. The highest numbers of barbastelle calls were recorded at transect route eight and both greater and lesser horseshoe bat calls were identified in low numbers along transect route ten near Capland and no other routes with relatively high (45 calls) of lesser horseshoe bats within Hatch Park Wood, adjacent to Griffin Lane.

8.6.110 Full results including bat activity maps can be found in Appendix 8.8 *Bat Activity Surveys Technical Report*.

Bat crossing point surveys

8.6.111 As a result of the crossing point surveys, two crossing points (22 and 23) at Griffin Lane were identified as being of high value due to usage of the associated features by Annex ll species including barbastelle and lesser horseshoe. Three further crossing points (16 at Hatch Green, 20 at Capland and 34b at Mattock's Tree Green) were identified as being of moderate value due to the quantity of bats (primarily common and soprano pipistrelle bats) crossing and the presence of greater horseshoe, an Annex ll species. All other crossing point locations were considered to be of low value with assemblages of common species in low numbers.

8.6.112 Full results including bat activity maps can be found in Appendix 8.8 *Bat Activity Surveys Technical Report*.

Bat trapping and radio-tracking surveys

8.6.113 Radio-tracking surveys were undertaken in 2018 at Huish Woods and Henlade Woods, and in 2020 at Bickenhall Woods under licence from Natural England (2018-34894-SCI-SCI and 2020-46855-SCI-SCI). A total of 73 bats were captured between 2018 and 2020, with at least nine species encountered overall. Species included Natterer's, whiskered/Brant's/alcathoe, serotine, Bechstein's, common pipistrelle, soprano pipistrelle, barbastelle, noctule and brown long-eared.

8.6.114 Breeding Bechtein's, barbastelle, Natterer's, common pipistrelle and brown long-eared were all confirmed as a result of the trapping surveys.

8.6.115 In 2018, the majority of captures during surveys were from Huish Wood, and were predominantly Bechstein's bats. The most frequently caught species during the 2020 surveys at Bickenhall Woods were Natterer's and brown long-eared, however, Bechstein's and barbastelle were also caught at this location in low numbers.

8.6.116 Radio-tracking surveys (no.= nine bats (seven Bechstein's, one Natterer's, one barbastelle)) confirmed the exact locations of five separate tree roosts. Of the five confirmed roosts, two were used by Bechstein's with a total of 21 and 19 bats recorded respectively in former woodpecker holes. Two roosts were used by barbastelle, with a total of 11 bats recorded behind a bark plate and within split wood. One roost was used by an individual Natterer's within a split limb.

8.6.117 An assessment of home ranges confirmed that the majority of radio-tagged bats had home ranges of 27-28ha and small core areas of <0.8ha. Most tracked bats stayed close to either within Huish Woods and Bickenhall Woods, however, several were recorded crossing the A358 to roost sites.

8.6.118 Huish Woods and the network of woodlands nearby (Bickenhall Wood and Hatch Beauchamp) were concluded to be of national significance for Bechstein's bat and of regional significance for barbastelle bats.

8.6.119 A Natural England research licence (2021-52521-SCI-SCI) was obtained to facilitate the 2021 advanced bat surveys. Initial findings from surveys undertaken in May and July indicate a higher level of activity, particularly by Annex II bats, than recorded during the previous radiotracking studies described above. Early indications are that there are three separate colonies of Bechstein's bat present in proximity to the proposed scheme and at least one colony of barbastelle bats.

Advanced bat surveys are ongoing, and the results of these surveys will be reported in the ES.

8.6.120 Full results of the surveys completed to date including bat activity maps can be found in Appendix 8.9 *Bat Trapping and Radio Tracking Technical Report*.

8.6.121 In conclusion, taking into account the presence of all four Annex II species, the early findings of the 2021 advanced surveys, it is considered that the assemblage of bats within the study area are of national importance.

Badger

Desk study

8.6.122 Data returned from SERC in 2021 identified 43 records attributable to badger within 1.2 miles (2 kilometres) of the proposed scheme. Thirty seven of these records are for deceased individuals. Fourteen records are located within 0.31 miles (500 metres) of the offline proposed scheme and 0.16 miles (250 metres) of the online proposed scheme, with four of these records being badger setts.

Field surveys

8.6.123 Targeted badger walkover surveys were undertaken (where access allowed) between February 2017 and February 2020 within 0.31 miles (500 metres) of the offline proposed scheme and within 0.16 miles (250 metres) of the online proposed scheme. During these surveys, 72 setts were recorded within the study area, including 14 setts classified as partially used or well used main setts.

8.6.124 Badger bait marking surveys of 11 of the 14 identified main setts were undertaken in February and March 2020 to identify territories associated with these setts. Fresh latrines were found for each bait-marked sett throughout the survey period. Based on the results from the bait marking surveys, the proposed scheme severs six of the eleven territories and impacts upon the boundaries of the known territory of a further two.

8.6.125 Three main setts were not included in the bait marking surveys. Access was refused for one of these setts. The two other setts are located north of the current A358; the first sett has connectivity to land to the south of the current A358 towards the proposed scheme, but this land is under construction and is currently considered unsuitable for badger activity. The second sett is located on a section likely impermeable to badger movement, and moreover is separated from the proposed scheme by an additional main sett (which is included in the bait marking surveys), and its associated territory.

8.6.126 Badgers are a common and widespread species and are afforded protection due to historical issues of persecution rather than because of their conservation status. However, due to their intrinsic appeal and role in an ecosystem badgers are considered to be of local importance within the context of the study area.

8.6.127 Further details on the results including maps showing the various territories can be found in Appendix 8.10: *Badger Technical Report CONFIDENTIAL*.

Birds

Desk study

Breeding and wintering birds

8.6.128 Data returned from SERC in 2021 identified 1250 records of avian species within 1.2 miles (2 kilometres) of the proposed scheme. Of these records 64 species were regarded as notable; i.e. listed in Schedule 1 of the Wildlife and Countryside Act 1981, Section 41 of the NERC Act 2006, the South Somerset or Taunton Deane Biodiversity Action Plans or the Amber/Red List of Birds of Conservation Concern (BoCC).

8.6.129 The Somerset Levels and Moors SPA and Ramsar Site is located approximately 2.2 miles (3.5 kilometres) north-east of the proposed scheme at its closest point. One of the primary reasons for the designation of the Somerset Levels and Moors SPA is the presence of nationally important numbers of golden plover, a highly mobile species of wader which, within the SPA, primarily uses wet grassland but will readily make use of open farmland.

8.6.130 Five statutory and non-statutory designated sites are located within 1.2 miles (2 kilometres) of the proposed scheme which mention birds in their reason for designation, comprising; Barrington Hill NNR, South Taunton Streams LNR, Children's Wood/Riverside Park LNR, Donyatt Railway Cutting LWS and Staple Farm Area LWS.

Barn owl

8.6.131 Forty-three records of barn owl were returned by the 2021 data search within the study area, with the most recent record dated 2016. The closest record is a 2002 record from adjacent to the A303 at the eastern end of the proposed scheme. Two records, dating to 1995 and 2000 pertained to confirmed breeding and possible breeding were located 0.9 miles (1.5 kilometres) and 0.09 miles (150 metres) away from the proposed scheme respectively.

Field surveys

Breeding birds

8.6.132 A total of 66 species were recorded within the survey area during the two years of survey effort. Twenty-six of the species recorded were notable species, including two Schedule 1 species; kingfisher and Cetti's warbler (*Cettia cetti*). Furthermore, twelve species recorded were listed on Section 41 of the NERC Act 2006, twelve species were on the Red list and eleven species were on the Amber list of the BoCC.

8.6.133 A single Cetti's warbler was recorded singing in June 2020 along the River Isle at Ilminster, approximately 0.12 miles (200 metres) south of the A303. A pair of kingfisher were recorded at Batten's Green, Bickenhall on a tributary of the Fivehead River in May 2017. Single birds were also recorded at the River Isle at Ilminster, the sewage works at Horton Cross and the Fivehead River tributary at Batten's Green.

8.6.134 The overall bird assemblage comprises common species for the habitats present and is considered to be of local importance within the context of the study area.

8.6.135 Further details on the results, including maps showing the various territories, can be found in Appendix 8.11 *Breeding Bird Technical report*.

Wintering birds

8.6.136 Twenty-nine notable species were recorded during survey counts between October 2020 and March 2021, including six Schedule 1 species; brambling (*Fringilla montifringilla*), fieldfare (*Turdus pilaris*), green sandpiper (*Tringa ochropus*), peregrine falcon (*Falco peregrinus*), red kite (*Milvus milvus*) and red wing (*Turdus iliacus*). Furthermore, 11 species recorded were listed on Section 41 of the NERC Act 2006, 12 species were on the Red list and 13 species were on the Amber list of the BoCC.

8.6.137 Regarding the Schedule 1 species recorded, fieldfare and redwing were observed regularly throughout the survey area, utilising agricultural margins, boundary features and orchids. A peregrine falcon was observed over the Fivehead River and surrounding grassland, approximately 0.47 miles (750 metres) south-east of the proposed scheme. A single red kite was recorded flying overhead between Horton Cross and the Southfields Roundabout at the eastern end of the proposed scheme. Single observations of brambling and green sandpiper were recorded 0.31 miles (500 metres) and 0.19 miles (300 metres) north-east of the proposed scheme respectively.

8.6.138 Golden plover, a qualifying species for the Somerset Levels and Moors SPA, was only recorded on one occasion during the survey period; a flock of 47 was observed feeding in an arable field between Horton Cross and Broadway, approximately 0.04 miles (70 metres) west of the proposed scheme. Counts of other species cited as part of the qualifying wintering bird assemblage, namely common snipe (*Gallinago gallinago*) and mute swan, equated to <1% of the populations cited in the Ramsar Information Sheet which can be found in Appendix 8.1: *Habitats Regulation Assessment*.

8.6.139 The wintering bird assemblage comprises common species for the habitats present and is considered to be of local importance within the context of the study area.

8.6.140 Further details on the results can be found in Appendix 8.12: *Wintering Birds Survey Technical Report*.

Barn Owl

8.6.141 Areas of Type 1 habitat are found across the proposed scheme but are generally restricted to field margins. There were no significant areas of extensive rough grassland as the majority of land is intensively managed.

8.6.142 Areas of Type 2 habitat were, more often, found as whole fields along the proposed scheme, in areas where grazing pressure is moderate and some thatch has formed. There are large areas of Type 2 habitat around Henlade, Haydon, Horton Cross and West Hatch to the west of the A358 and around Hatch Beauchamp and Stewley to the east.

8.6.143 Fifty sites identified as a Potential Nest Site (PNS) during the stage 2 investigative field surveys, of which four sites were identified as Occupied Breeding Site (OBS), five as an Active Roost Site (ARS) and one Temporary Roost Site (TRS). All four OBS were located in boxes on trees on the western side of the A358. Of the four OBS, juvenile birds were present in three of them.

8.6.144 Barn owl is a Schedule 1 species and susceptible to sharp population declines as a result of prolonged poor weather conditions, low prey availability and habitat loss. Given the presence of multiple occupied, active and potential nesting sites and areas of suitable foraging habitat, the barn owl population within the study area is considered to be of county importance.

8.6.145 Further details on the results can be found in Appendix 8.13 *Barn Owl Survey Technical Report*.

Dormouse

Desk study

8.6.146 Historical data from 2021 provided by SERC identified 78 records of dormouse within 1.2 miles (2 kilometres) of the proposed scheme. The most recent record is dated October 2018 and located on the north-western edge of Ilminster, approximately 0.25 miles (400 metres) south-east of the proposed scheme.

Field surveys

8.6.147 Suitable habitat is present within the study area of the proposed scheme, including hedgerows comprising native species and ancient semi-natural woodland. Hedgerows provide connectivity to additional suitable habitat in the wider landscape.

8.6.148 Habitats suitable for dormouse (identified following a Phase 1 survey and a desk study) were subject to presence/absence surveys using nest tubes in 2017. In total, 11 sites were surveyed, with a minimum of 50 tubes deployed at each site.

8.6.149 Hazel dormouse was confirmed to be present at ten of the eleven surveyed sites, through the presence of adults, juveniles and/or nests. An additional seven sites supporting suitable habitat, but where access was not provided for the presence/absence surveys, are connected to those sites with confirmed presence. As such, dormouse are assumed to be present in these seven additional locations.

8.6.150 Hazel dormouse is a European Protected Species. They are common across Somerset, however suffering significant declines nationally. Therefore, in the context of the range of suitable habitats within the proposed scheme, hazel dormouse are considered to be of county importance.

8.6.151 Further details on the results, including figures, can be found in Appendix 8.14: *Hazel Dormouse Technical Report*.

Great crested newt

Desk study

8.6.152 Historical data provided by SERC identified a total of 22 records for great crested newt within the 1.2 mile (2 kilometre) study area. The most recent records were dated March-June 2018 and were for surveys undertaken at a pond located in farmland outside of Ilminster, 0.53 miles (850 metres) south-west of the proposed scheme. The surveys produced a peak count of four male and ten female great crested newt.

8.6.153 One record for great crested newt included within the desk study is located on the proposed scheme boundary north of West Hatch, whilst a second record is located within the footprint of the proposed scheme north of Ash.

8.6.154 Records for other amphibian species were also returned by SERC. Nine records related to common toad (*Bufo bufo*), the most recent of which was dated August 2018, whilst there were also six records of palmate newt (*Lissotriton heleveticus*), the most recent of which was dated June 2018.

Field surveys

8.6.155 A total of 180 waterbodies were identified within 0.25 miles (400 meters) of the proposed scheme, of which 82 were subject to a Habitat Suitability Index (HSI) survey as they were considered suitable for supporting breeding great crested newt. The remaining 98 ponds were not subject to HSI due to either being dry, being isolated by significant dispersal barriers or supporting flowing water.

8.6.156 Presence/absence surveys were conducted on 22 ponds between March and mid-June 2017. Of these surveyed ponds, great crested newt were recorded to be present within two. Population size class surveys were subsequently undertaken at these ponds. One pond was recorded to support a medium population of great crested newt, whilst the other was recorded to support a small population.

8.6.157 Environmental DNA surveys were undertaken on 40 waterbodies, of which five returned positive results indicating presence of great crested newt. One of the ponds with a positive result is located within the footprint of the proposed scheme.

8.6.158 The presence of great crested newts has been confirmed within four distinct clusters of ponds within the study area considered likely to represent distinct populations, as detailed below:

- One pond was confirmed as supporting a small population south of Thornfalcon approximately 0.22 miles (350 metres) from the proposed scheme.
- Two ponds were confirmed as supporting a medium population of great crested newts south west of Meare Green, one of these ponds falls within the land required for the proposed scheme.
- A single pond was confirmed as positive for great crested newts but population size not yet confirmed, to the west of Capland approximately 0.25 miles (400 metres) from the proposed scheme.
- A cluster of four ponds confirmed as positive for great crested newts but population size not yet confirmed, spanning either side of the existing A358 to the west of Rapps.

8.6.159 Great crested newts are a European Protected Species, and at the edge of its range in south west England, however still relatively widespread across the east of Somerset. Therefore, in the context of the large areas of suitable terrestrial habitats and ponds confirmed as supporting breeding populations within the land required for the proposed scheme, great crested newts are considered to be of county importance.

8.6.160 Further details on the results, including figures, can be found in Appendix 8.15: *Great Crested Newt Technical Report*.

Reptiles

Desk study

8.6.161 Data returned from SERC in 2021 indicated the presence of slow worm (*Anguis fragilis*), grass snake (*Natrix helvetica*), adder (*Vipera berus*) and common lizard (*Zootoca vivipara*) within the 1.2 mile (2 kilometre) study area. The most recent record is for three adult slow worm, dated September 2018 and located to the east of the village of Broadway approximately 0.7 miles (1.1 kilometres) west of the proposed scheme. Three records are located within the footprint of the western end of the proposed scheme, in proximity to J25 of the M5 and are for slow worm and grass snake.

Field surveys

8.6.162 All habitats within 0.06 miles (100 metres) of the proposed scheme were assessed for their suitability to support reptiles. Twenty-seven sites were originally identified during the desk study in 2016 as requiring further assessment.

8.6.163 During Phase 1 habitat surveys in 2016, 19 of the 27 sites were identified as offering suitable habitat to support common reptile populations. Of these 19, 14 were located within 0.06 miles (100 metres) of the proposed scheme and ten were considered to be of high potential and four to be of moderate potential to support reptiles. All 14 sites were therefore put forward for population size surveys, although access was refused for three. Surveys were undertaken across 20 visits in suitable weather conditions, between April and October 2017.

8.6.164 Reptile species were recorded at nine of the 11 sites that were subject to population size surveys. Of the two sites where reptiles were not recorded, one was not visited on twenty occasions as access was withdrawn after the fourteenth visit, however seven survey visits in suitable conditions is considered sufficient to establish presence/likely absence.

8.6.165 Slow worm was recorded at all nine sites, whilst grass snake was recorded at three. Four sites were classified as supporting a ‘low’ population of slow worm, whilst the remainder were classified as supporting a ‘good’ population, with a peak count of 17 adults across all sites and visits. No adult grass snake were recorded during the surveys (two sites identified juveniles whist the third identified a single sub-adult) and therefore population size class classifications could not be carried out for this species.

8.6.166 Common and widespread reptile species have been recorded in suitable habitats throughout the study area, however in relatively low numbers. Given this context and the prevalence of suitable habitats in the form of field margins, highway verges and scrub mosaic within the wider landscape, the reptile populations within the study area are considered to be of local importance.

8.6.167 Further detail on the results, including figures, can be found in Appendix 8.16: *Reptile Technical Report*.

Otter

Desk study

8.6.168 Data provided by SERC in 2021 identified a total of 366 otter records within the 1.2 mile (2 kilometre) study area. The most recent record was from December

2017, located at Eames Mill Bridge, approximately 0.9 miles (1.5 kilometres) north-east of the proposed scheme.

Field surveys

8.6.169 A total of 61 watercourses were found to exist within 1.2 miles (2 kilometres) of the proposed scheme. Thirty-eight of these watercourses were scoped out for their unsuitability for otters due to being dry, isolated, lacking in food supply or being subject to high levels of disturbance. Additionally, a number of sites could not be accessed for an initial habitat assessment.

8.6.170 Field sign surveys were carried out on 21 watercourses and presence of otter was confirmed on 14 of these. Three potential holts/couches were identified within 0.02 miles (30 metres) of the proposed scheme.

8.6.171 Otter have large home ranges and are found in most counties throughout the country. However, the confirmed presence of otter on 14 watercourses, and three potential holt sites, within the study area would indicate that the loss of these habitats could be felt beyond the local area. Therefore, the otter population within the study area are considered to be of county importance.

8.6.172 Further details on the results, including maps, can be found in Appendix 8.17: *Otter Surveys Technical Report*.

Water vole

Desk study

8.6.173 Two designated sites are located within 1.2 miles (2 kilometre) of the proposed scheme that have water voles as a qualifying feature; South Taunton Streams LNR and Bridgewater and Taunton Canal LWS, see Table 8-6 and Table 8-7 for details.

8.6.174 Data provided by SERC in 2021 identified a total of 14 water vole records within the 1.2 mile (2 kilometre) study area. This included four sightings, as well as droppings, feeding signs and tracks. The most recent record was from 2015, located in the village of Ham, approximately 1 mile (1.7 kilometres) from the proposed scheme.

Field surveys

8.6.175 A total of 26 watercourses were scoped out based on their unsuitability for water vole due to lack of available food resources and/or lack of water. Additionally, one site could not be assessed due to a lack of access.

8.6.176 Field sign surveys were carried out on 15 watercourses. Presence of water vole was confirmed on three of the waterbodies due to either presence of latrines or a combination of field signs in close proximity to each other. Potential evidence of water vole was recorded on a further five watercourses but this could not be confirmed.

8.6.177 Water vole are a SPI and, and have suffered significant declines in recent year as a result of predation and habitat loss. The study area supports suitable habitat, confirmed to be supporting water vole, therefore the population within the study area is considered to be of county importance.

8.6.178 Further details on the results, including maps, can be found in Appendix 8.18: *Water Vole Technical Report*.

White-clawed crayfish

Desk study

8.6.179 Data provided by SERC in 2021 identified no records for white-clawed crayfish within the study area. Furthermore, no records of signal crayfish (*Pacifastacus leniusculus*) were returned from the search, making it difficult to rule out white-clawed crayfish presence with any confidence based on desk study data alone.

Field surveys

8.6.180 Habitat assessments were undertaken between the 10th and 12th October 2017 on nine watercourses. Of these nine watercourses, two were deemed unsuitable for white-clawed crayfish due to poor habitat quality.

8.6.181 Manual searches were carried out on the seven watercourses deemed suitable enough to support white-clawed crayfish. None of the manual searches identified evidence of crayfish species. It was determined that the methodology employed was sufficiently robust to determine likely absence without the need for further trapping surveys to assess the deeper sections of the watercourses.

8.6.182 Further details on the results, including maps, can be found in Appendix 8.19: *White-clawed Crayfish Technical Report*.

8.6.183 Further surveys will be undertaken between July and September 2021 to confirm presence/absence of this species. These will be reported in the ES which accompanies the DCO application. If white-clawed crayfish were to be confirmed to be present the population within the study area would be of national importance.

Terrestrial invertebrates

Desk study

8.6.184 Data returned from SERC in 2021 identified 949 records of invertebrate species between 2011 and present day. Records returned included nine SPI butterflies with butterflies comprising 672 of the records. Notable species include local colonies of Duke of Burgundy (*Hamearis lucina*), brown hairstreak, grizzled skipper (*Pyrgus malvae*) and dingy skipper (*Erynnis tages*).

8.6.185 Moth records numbered 229 and included 37 SPI, though many of these are widespread species included on the SPI lists for long-term trend research only. The majority of records for butterflies and moths are from Thurlbear Quarrylands and nearby gardens where light traps have been run.

8.6.186 The remainder of the invertebrate records returned included scattered records of widespread dragonflies and damselflies (Odonata), bees (Hymenoptera), beetles (Coleoptera) and true flies (Diptera). No further SPIs were included within these records.

Field surveys

8.6.187 The communities of invertebrates recorded during the field surveys were generally of low diversity and lacked significant numbers of particularly rare or

scarce species. Across the surveyed sites in 2017 and 2019, a limited total of rare, scarce and SPI invertebrates were recorded. In summary, one Red Data book species, six Nationally Scarce species and two SPI were recorded.

8.6.188 The single Red Data Book species recorded was a picture-winged fly (*Campiglossa malaris*) (RDB 1) recorded from a single site in July 2018. This species has rapidly expanded its range in Britain in recent years. The site this species was recorded at (Site 1) is no longer within 0.06 miles (100 metres) of the proposed scheme.

8.6.189 Nationally scarce species recorded included the mistletoe bug (*Anthocoris visci*), Jersey tiger moth (*Euplagia quadripunctaria*), a picture-winged fly (*Acanthiophilus helianthin*), the mining bees (*Lasioglossum malachurum*) and (*L. pauxilium*) and the provisionally nationally scarce brown-banded carder bee (*Bombus humilis*).

8.6.190 As for *Campiglossa malaris*, the status of three of the nationally scarce species identified, Jersey tiger moth and the two mining bees mentioned above, requires review as all are more widespread than previously considered.

8.6.191 The SPI invertebrates recorded included brown-banded carder bee and cinnabar moth (*Tyria jacobaeae*). The latter species was included on the previous UK biodiversity action plan for research purposes only and remains widespread and frequent throughout much of the British Isles.

8.6.192 Given the presence of relatively widespread species and lack of high valued habitats within the study area, the terrestrial invertebrate assemblage is of local importance.

8.6.193 Further details on the results, including figures and site locations, can be found in Appendix 8.20: *Terrestrial Invertebrate Technical Report*.

Brown hairstreak

8.6.194 Brown hairstreak eggs were recorded in 108 hedgerows, out of a total of 223 surveyed. Approximately 48% of hedgerows within the search area are confirmed to support brown hairstreak.

8.6.195 Of the brown hairstreak eggs identified during the surveys, 53% were located south of the proposed scheme, with 47% to the north. Approximately 30% of the hedgerows surveyed where brown hairstreak were confirmed present were of high-quality habitat, with over 20% blackthorn presence recorded. Unsuitable habitat, where less than 5% of blackthorn was present within the hedgerow, recorded the lowest rate of brown hairstreak presence, accounting for only 18 of the 108 confirmed hedgerows. Brown hairstreak were not generally present on any hedgerows that had been recently flailed. This is likely due to the fact that flailing removes the shoots and suckers where brown hairstreak will lay their eggs.

8.6.196 Brown hairstreak butterfly is a SPI, and Somerset and Devon are strongholds for this species. Given the prevalence of blackthorn containing hedgerows and scrub within the wider landscape around the proposed scheme, the population of brown hairstreak in the study area is considered to be of local importance.

8.6.197 Further details on the results, including figures and site locations, can be found in Appendix 8.21: *Brown Hairstreak Technical Report*.

Aquatic invertebrates

Desk study

8.6.198 Data provided by SERC in 2021 identified no records of protected and/or notable aquatic invertebrate species within the 1.2 mile (2 kilometre) study area.

8.6.199 A total of eight Environment Agency (EA) invertebrate survey sites were identified within 1.2 miles (2 kilometres) of the proposed scheme (1998-2017). Sites were identified on Fivehead River Main Channel 1 (Site 10221, Site 10236 and Site 77544), River Isle (Site 10311), River Tone (Site 10534), Broughton Brook (Site 10542), Venners Water (Site 71682) and Old River Tone (Site 160521).

8.6.200 Surveys conducted after 2014 (sites 10534 and 10542 and 160521), identified taxa to species level (TL5) and provided a Community Conservation Index (CCI) for the site. The older data at the other sites precluded the use of this metric.

8.6.201 Where available, the conservation values of the macroinvertebrate communities (based on desk study records) were typically of 'moderate' value (Broughton Brook and Allen's Brook), as defined by CCI scores. The River Tone was shown to have a 'fairly high' conservation value.

8.6.202 No legally protected species or SPIs were identified at any of the EA sites. However, where available the conservation values of the macroinvertebrate communities (based on desk study records) were typically of 'moderate' value (Broughton Brook and Allen's Brook), as defined by CCI scores.

Field (laboratory) surveys

8.6.203 Monitoring was undertaken in the Black Brook, Thornwater Stream, Meare Stream, Fivehead River Tributary 1, Fivehead River Main Channel 2, Venner's Water, the Cad Brook and the River Ding.

8.6.204 A total of six species of 'local' conservation value (conservation score of five on the CCI Index) were found across all sites: the caddisflies (*Athripsodes bilineatus*, *Beraeodes minutus* and *Silo nigricornis*), the demoiselle damselfly (*Calopteryx virgo*), the minnow mayfly (*Procloeon pennulatum*) and the birch-fly species (*Simulium reptans*).

8.6.205 Overall, conservation values of macroinvertebrate communities were typically of 'low' and 'moderate' value throughout the proposed scheme, as defined by CCI scores. Notable occurrences of 'fairly high' conservation value communities were calculated for Site F1 (Fivehead River Tributary 1) in spring 2017 and Site D2 (Thornwater Stream) in autumn 2017. Individual species of 'local' conservation value were not identified at either site, indicating that the higher CCI score at these sites reflects a high number of taxa.

8.6.206 Due to the overall limited diversity of notable macroinvertebrates recorded, the assemblages of aquatic invertebrates within the study area are considered to be of local importance.

8.6.207 Further details on the aquatic invertebrate survey results and analysis can be found in Appendix 8.22: *Macroinvertebrates Technical Report*.

Fish surveys

Desk study

8.6.208 The SERC biological records search in February 2021 returned records of two protected and/or notable fish species; European eel from the Meare Stream (near West Hatch, approximately 0.6 miles (1 kilometre) upstream of the proposed scheme) and brown/sea trout *Salmo trutta* from Boughton Brook (near Little Broughton, approximately 1.5 miles (2.5 kilometres) upstream of the proposed scheme).

8.6.209 A desk study was undertaken to collate any fish data held on the Environment Agency - Ecology and fish data explorer [57] for the River Ding. Fish survey records within 1.8 miles (3 kilometres) upstream and downstream of the proposed scheme were included.

8.6.210 A single EA fish survey was identified (Site 64363, located approximately 0.8 miles (1.4 kilometres) upstream of the proposed scheme). European eel, European bullhead, stone loach (*Barbatula barbatula*) and minnow (*Phoxinus phoxinus*) were recorded.

8.6.211 Two notable species were recorded in the desk study; European eel (Critically Endangered [58] and NERC SPI) which is a catadromous migrant and European bullhead (Habitats Directive Annex II), which is a resident species.

Field surveys

8.6.212 An electric fishing survey of the River Ding was undertaken in heterogeneous habitat characterised by riffle/run sequences and pools, with varied substrates and the presence of woody debris.

8.6.213 A total of five fish species were recorded during the electric fishing survey, European bullhead, brown trout, stone loach, minnow and 3-spined stickleback (*Gasterosteus aculeatus*). Further surveys are proposed on other watercourses along the proposed scheme in 2021.

8.6.214 The size distribution of the European bullhead population (individuals ranged from approximately 25 millimetres to approximately 75 millimetres) reflects the habitat types present (riffle/run) and demonstrates that the watercourse supports all life stages of this species.

8.6.215 The size distribution of the brown trout population (individuals ranged from approximately 35 millimetres to approximately 75 millimetres) indicates the presence of parr and not adult fish within the study area at the time of survey. However, it is considered likely that the site is used for spawning during winter flows (as well as rearing) and as such is of key importance for the brown trout population of the River Ding.

8.6.216 The fish populations within the study area are considered to be of local importance.

8.6.217 Further details on the fish survey results and analysis can be found in Appendix 8.23 *Fish Technical Report*.

Other section 41 Species of Principal Importance (SPI)

8.6.218 The 2016 and 2021 data searches undertaken as part of this assessment returned 53 records of hedgehog (*Erinaceus europaeus*) within 1.2 miles (2 kilometres) of the proposed scheme. The most recent record is dated July 2019

and is for two deceased individuals located immediately adjacent to the eastern extent of the proposed scheme. The data search returned records for a number of other SPIs within the past ten years, namely three for polecat (*Mustela putorius*), seven for brown hare (*Lepus europaeus*) and four for harvest mouse (*Micromys minutus*).

8.6.219 Populations of Section 41 species are considered to be of local importance.

Summary

8.6.220 Table 8-10 below provides a summary of the importance of the ecological receptors detailed in Section 8.6.

Table 8-10 Summary of importance of ecological receptors

Ecological receptor	Importance value
SPA / SAC / Ramsar Site	International
SSSI / NNR	National
LNR	County
LWS (not associated with SSSI)	County
Ancient woodland	National
Orchid assemblage	Local
Semi-natural broadleaved woodland	National
Broadleaved plantation woodland	County
Mixed semi-natural woodland	County
Veteran trees	National
Scattered trees	Local
Scrub	Less than local
Lowland dry acid grassland	National
Neutral semi-improved grassland	Local
Semi-improved species-poor grassland	Local
Improved grassland	Less than local
Marshy grassland	Local
Arable	Less than local
Hedgerows (priority)	National
Hedgerows (all other)	Local
Tall ruderal	Less than local
Freshwater ponds	Local
Running water	Local
Bats (tree roosts)	Local
Bats (assemblage)	National
Badger	Local
Breeding birds	Local
Wintering birds	Local
Barn owl	County

Ecological receptor	Importance value
Hazel dormouse	County
Great crested newt	County
Reptiles	Local
Otter	County
Water vole	County
White-clawed crayfish	National
Terrestrial invertebrates	Local
Brown hairstreak	Local
Aquatic invertebrates	Local
Fish	Local
Section 41 species	Local

Future baseline

8.6.221 As set out in Chapter 4 Environmental Assessment Methodology, the 'Do Minimum' and 'Do Something' scenarios have been set out, with the 'Do Minimum' scenario representing the future baseline with minimal interventions and without new infrastructure.

8.6.222 The ecological baseline conditions described above represent those which currently exist in the absence of the proposed scheme and at the time of survey. As stated in section 3 of the CIEEM guidelines [20], potential changes in baseline conditions also need to be identified in order to assess impacts.

8.6.223 Based on the above information and current land use, the future baseline in the absence of the proposed scheme is unlikely to change significantly by 2040. Subtle changes are expected due to climate change, such as some movements of certain species and local population changes. However, the overall habitats and species composition in the study area are expected to be broadly similar to that of the existing baseline. Therefore, the future baseline would remain the same as set out in the existing baseline.

8.7 Potential impacts

8.7.1 A highway scheme can impact biodiversity in a number of ways during construction and operation. The potential impacts to habitats and species could be permanent or temporary, and direct or indirect.

8.7.2 The direct impacts are of habitat loss and severance, species mortality through vehicle collisions, disturbance due to noise and habitat degradation due to changes in air quality, dust deposition, surface run-off and pollution events.

8.7.3 Indirect effects could include displaced individuals or the occupancy of alternative habitat, including reduced foraging success, increased competition and predation, genetic isolation and inbreeding, which can lead to local extinctions. It is possible that there would be indirect impacts of the proposed scheme due to hydrological changes affecting other habitats and areas of vegetation.

Construction impacts

Habitat loss and fragmentation

8.7.4 The proposed scheme would require the temporary and permanent loss of terrestrial and aquatic habitats, including priority habitats and habitats likely to be used by, or to support, protected and notable species.

8.7.5 Habitat loss would be restricted to areas cleared to make way for highway construction, including borrow pits, temporary compounds or temporary access roads.

8.7.6 Temporary and/or permanent loss and fragmentation of watercourses would occur with the installation or modification of culverts and bridge crossings and diversion or realignments.

8.7.7 Further habitat fragmentation would potentially result from the severance of other linear habitat features such as hedgerows, lines of trees and woodland edge. This could potentially affect protected or notable species that rely upon such habitats for sheltering, foraging, commuting or dispersal.

8.7.8 Fragmentation of habitat can sever dispersal corridors and lead to isolation both within and between populations and from specific resources vital for survival. This can result in reduced gene flow, resulting in less genetic diversity within the isolated population, making it less able to adapt to disease or environmental change, and at its extreme reduces the chances of encountering a mate and successfully breeding. In the absence of mitigation habitat fragmentation can lead to the decline and ultimately the extinction of local populations.

8.7.9 The impact associated with severance of habitats would be greatest within the offline section of the proposed scheme; however, the online section would also be subject to severance as a result of the loss of the habitat belts that run alongside the existing A358.

Habitat damage or degradation

8.7.10 Air quality changes could occur through releases of dust and changes in local pollutant concentrations caused by emissions from construction plant and machinery, earthworks and delivery of materials, with resulting effects on sensitive habitats. Air quality modelling assessment is required to assess the impact of N deposition on sensitive habitats. More details on air quality can be found in Chapter 5 Air Quality.

8.7.11 Where the new alignment passes through cuttings, there is potential for hydrological change to cause effects during construction where works would directly or indirectly affect watercourses. Hydrological changes include changes to both groundwater quality and surface water quantity within nearby watercourses. Changes in hydrology, fluvial geomorphology and hydrogeology are important to terrestrial and freshwater ecology due to the following factors:

- Water quantity has an important role in structuring the floral and faunal communities in watercourses, ponds and wetlands.
- Sediment and other pollutant releases have the potential to adversely affect sensitive ecological receptors.
- Ecological receptors can be sensitive to alterations of runoff regimes changing the quality of surface and groundwater.

8.7.12 Any introduction or spread of Invasive Non-Native Species (INNS) would potentially cause significant adverse effects to sensitive habitats and may result in an offence under the Wildlife and Countryside Act 1981. This is because of the dominance that these species can have over native species. During construction works, topsoil and subsoil potentially containing floral INNS would be disturbed. Such soil or seed and 'propagules' could be spread during construction activities, including excavation and machinery movements. Works within water can also introduce and spread faunal INNS.

Disturbance

8.7.13 Disturbance to important receptors could result from changes in noise, light, vibration or visual stimuli. During construction, disturbance could arise from the following activities: vegetation clearance, site hoarding and fencing installation, establishment of site compounds including laydown areas and facilities, utility diversions, bulk earthworks including excavation of cuttings and creation of embankments, and drainage works.

8.7.14 Impacts from visual disturbance (including human activity and artificial lighting) and noise disturbance could have significant effects on sensitive species. This could lead to abandonment of territory or of young, increased predation risk and use of critical energy reserves. Disturbance resulting from lighting can also lead to significant effects on nocturnal species such as bats.

Species mortality and injury

8.7.15 The following activities could potentially result in mortality and injury of species receptors: vegetation clearance, site establishment, bulk earthworks, drainage works affecting watercourses and other temporary works that may result in entrapment in excavations for example.

8.7.16 Significant effects could arise if protected or notable species are present within the draft DCO boundary, especially if they are not able to avoid works, or are attracted to disturbed land to forage (e.g. badgers).

8.7.17 The physical interaction between species and elements of the proposed scheme, machinery or activities would be limited to areas within the draft DCO boundary and areas immediately outside the draft DCO boundary due to construction traffic approaching or leaving the site.

8.7.18 Initial vegetation clearance works associated with the construction phase, particularly for the offline section of the proposed scheme, have the potential to attract foraging birds including gull and corvid species. Birds often gather to forage during vegetation clearance and earthworks as insects are disturbed and exposed during the movement of vegetation and soil. There is the potential for larger flocks of birds to represent a bird strike risk to planes using the nearby Royal Navy Air Service (RNAS) Merryfield airbase. However, given the arable dominated landscape within and adjacent to the proposed scheme, this risk is considered to be low. A bird strike risk assessment will, however, be undertaken on a precautionary basis and reported as part of the ES.

Operational impacts

Habitat loss and severance

8.7.19 Impacts from operational road lighting are most likely to affect bat species along the proposed scheme (although it could also affect birds, invertebrates and

nocturnal mammals, such as dormice, badger, otter and hedgehog). The effects of road lighting are complex but include severance and loss of habitat due to light spill for light-shy species such as brown long-eared bat. Habitats where the impact of lighting can be particularly severe include along river corridors, woodland edges and hedgerows. Lighting of the proposed scheme will be restricted to the roundabouts at either end of the proposed scheme. Therefore the impact of lighting on adjacent habitats will be restricted.

8.7.20 The drainage design of the proposed scheme has the potential to form a barrier to dispersal of amphibian populations. Drainage ditches in times of flood may have a flow rate too fast for amphibians to swim against therefore representing a barrier.

8.7.21 Severance leads to isolation both within and between populations and from specific resources separated spatially and temporally. The effects of this include reduced foraging range and success, increased competition, genetic isolation and inbreeding, which can lead to local extinctions.

Habitat damage or degradation

8.7.22 The key receptors that may be sensitive to changes in vehicle emissions are the designated sites noted for their floristic importance, sensitive priority habitats and ancient woodland habitats, and any species that depend on these. Elevated N deposition is generally considered to be the main threat to vegetation from vehicle emissions.

8.7.23 Operational effects to watercourses are possible in relation to surface water road drainage and unexpected, accidental, pollution events. Impacts affecting watercourses may have a wide zone of influence, particularly on sensitive receptors downstream of the proposed scheme. The Water Framework Directive assessment undertaken as part of the ES would determine the effects of the proposed scheme on ecological quality, identifying any potential impacts that could cause deterioration in the assigned status of a water body or prevent a water body from meeting its WFD objectives.

8.7.24 Impacts from operational road lighting and vehicle headlights are most likely to affect bat species through a decline in airborne invertebrate prey available to light-shy species, as insects are attracted to lights.

Disturbance

8.7.25 Sources of disturbance in the operational phase also relate to road noise and lighting. Noise has the potential to impact upon local populations of breeding and wintering birds, potentially reducing the suitability of habitat close to the road and therefore reducing the availability of suitable habitat in the vicinity of the proposed scheme. Many mammal species are also susceptible to disturbance through the introduction of noise and vibration, particularly where this impacts upon their resting sites. Such noise and vibration disturbance may cause animals to abandon their resting sites.

8.7.26 The sensitivity of resting sites to disturbance may vary depending on the time of year e.g. bats occupying maternity roosts may have greater sensitivity to disturbance than those in summer day roosts.

8.7.27 Impacts from operational road lighting are most likely to affect bat species through roost disturbance and abandonment.

8.7.28 It is also acknowledged that there would be a greater impact to animals adjacent to the offline section of the proposed scheme, where they will not be as

habituated to vehicular related noise and vibration as those animals utilising habitats along the online section where there is an existing level of noise and vibration from vehicular movement.

Species mortality and injury

8.7.29 In the absence of mitigation the operation of a widened online section and new offline stretch of road could increase the risk of vehicle related mortality for a range of fauna species, such as bats, badger, otter, barn owl and other bird species. Animals would be required to cross a wider section of road along the online section of the proposed scheme, resulting in greater potential for collision with vehicles and injury or mortality. The offline section of the proposed scheme would introduce a new hazard source into a section of the landscape, with the introduction of a wide and high-speed road into a rural area, again increasing the potential for vehicle related injury or mortality. The risk of direct mortality through operation of the proposed scheme is permanent, unlike the vehicle collision risk posed by the construction phase.

8.7.30 Impacts from operational road lighting are most likely to affect bat species through increased traffic collisions for species such as pipistrelle that will actively forage on insects attracted to lighting.

8.7.31 The drainage system of the proposed scheme has the potential to increase the risk of amphibians being trapped by curb structures along the proposed scheme and falling into, or being washed into, gully pots positioned adjacent to curbs.

8.7.32 Highways balancing ponds, or ecological mitigation ponds, associated with the proposed scheme have the potential to attract waterfowl, which may represent a bird strike risk to planes using the nearby RNAS Merryfield airbase.

8.8 Design, mitigation and enhancement measures

8.8.1 The mitigation hierarchy is described in Chapter 4 Environmental Assessment Methodology Table 4-4 of the PEI report. The first stage of the mitigation hierarchy is to avoid or prevent adverse potential impacts through embedded mitigation. These would seek to avoid or eliminate the potential impacts identified in Section 8.7. Impacts can be avoided for instance, through changes to the horizontal or vertical alignment of the proposed scheme, junction strategy, structures or other aspects of the proposed scheme layout; or through changes in the timing, methods and/or materials to be used in construction. This is referred to as embedded mitigation. Where it is not possible to avoid an impact entirely, the design should seek to reduce the magnitude of the impact and provide essential mitigation.

8.8.2 The proposed scheme assessed within this PEI report includes a number of engineering design measures that have been incorporated to avoid significant adverse environmental effects arising, such as habitat loss, habitat fragmentation, habitat degradation and species disturbance and mortality, where practical.

8.8.3 These measures have been identified and are being further developed through the design process. These measures form part of the proposed scheme design and will be reported in the ES Chapter 2 The Project.

8.8.4 The proposed scheme also includes embedded mitigation within working practices during the construction phase which would avoid or reduce impacts such as habitat loss, habitat severance, habitat damage, disturbance and species mortality.

8.8.5 Where possible, enhancement measures have also been included, going above and beyond what is required to directly mitigate the adverse effects of the proposed scheme.

8.8.6 The following sections outline these measures and how they would reduce the impact of the proposed scheme on biodiversity. Details would be provided in the Environmental Mitigation Plan (Figure 7-8) and would be provided in a Landscape and Ecology Management Plan (LEMP) which would be provided as part of the Environmental Management Plan (EMP) submitted with the ES.

Embedded construction mitigation

8.8.7 Embedded mitigation during the construction phase would be identified in the Register of Environmental Actions and Commitments (REAC), contained within the EMP. This would be developed to avoid or reduce the potential construction impacts on habitats and species and would seek to employ best-practice methods for dealing with habitat loss, habitat severance, disturbance and species mortality.

8.8.8 The EMP presented with the ES to support the DCO application, would include specific construction phase method statements that would address potential impacts on habitats and species and would detail the timing of works, roles and responsibilities of the contractors, control measures, training and briefing procedures, risk assessments and monitoring systems to be employed during planning and construction for all relevant environmental factor areas. Prior to construction the EMP would be updated to include additional items identified in the DCO process, and additional input from the contractor.

8.8.9 The EMP would include site-specific methods, for example temporary use of silt busters or bales which would be used to prevent silt or contaminants from being released into watercourses during construction. Such precautions would be undertaken in accordance with relevant legislation and undertaken in compliance with the relevant Guidance for Pollution Prevention (GPPs) and industry best practice (GPP5, CIRIA).

Ancient woodland and veteran trees

8.8.10 Additional mitigation to protect ancient woodland habitat will be applied and will include a buffer zone of at least 0.01 miles (15 metres) between the works and the woodland edge in accordance with Natural England guidelines [55]. There are two locations where this buffer cannot be achieved due to the proximity of the ancient woodland to the existing A358; these are at Bickenhall Wood and Saltfield Copse. In these instances, further assessment of root protection areas and refinement of the proposed scheme design will be undertaken to reduce potential impacts to root protection areas.

8.8.11 The root protection areas and canopies of hedgerows, scattered trees, and woodland to be retained within the proposed scheme, will be protected during construction in accordance with BS5837: Trees in relation to design, demolition and construction [59]. Measures for protection would be included in the EMP and would refer to root protection areas as defined within the Arboricultural Impact Assessment (AIA) that will be presented with the ES. Consideration will be given to the retention and management of edge habitats, within the protected root protection areas, for the benefit of wildlife during construction. It is acknowledged that some overhanging branches from trees adjacent to construction areas may need to be subject to pruning in order to protect trees from accidental damage by construction machinery. Such works would be avoided through careful design of

construction logistics where possible, and where required would be carried out by suitably experienced arboriculturalists to maintain the health of the trees.

Protected and notable species

8.8.12 It is anticipated that the effects of disturbance or risk of mortality to species during construction would be mitigated through specific construction phase method statements detailing best practice that would address potential impacts on species and prevent committing offences in relation to the Wildlife and Countryside Act 1981. General best practice measures that address multiple ecological receptors are detailed below.

8.8.13 Construction activities could result in individual birds and/or their active nests being injured/killed and/or destroyed, respectively. For this reason, vegetation clearance would be planned to be undertaken between September and February outside of the core breeding bird season, which is considered as March-August, inclusive. If this is not possible and works are required within this period, vegetation clearance works would adopt a precautionary working method including nesting bird surveys to identify nesting birds within 24 hours of the commencement of clearance, and a watching brief by a suitably experienced ecologist during all vegetation clearance where visibility (for nest detection) is limited on the pre-works surveys. If nesting birds are encountered, a suitable working buffer distance from the nest would be devised, by a suitably experienced ecologist, and the nest left until all young have fledged.

8.8.14 Sensitive programming of construction works would be implemented to avoid or reduce potential impacts such as mortality or disturbance to species. Details would be incorporated in the EMP and could include:

- sensitive timing of works involving watercourse realignment to reduce impacts upon riparian mammals, aquatic macroinvertebrates and fish translocation
- sensitive timing and methodologies of vegetation clearance and manipulation regard to nesting birds, hazel dormouse and other species such as reptiles and amphibians to be overseen by a suitably experienced ecologist
- avoidance of ground works in key reptile and dormouse habitat between October and April to prevent harm to hibernating animals

8.8.15 Restrictions on working hours to avoid night working (taken as the period 30 minutes before sunset to 30 minutes after sunrise) would be implemented in key locations so that there is no light spill in the vicinity of watercourses and key bat flight lines or roosts and adjacent habitats. Any temporary task requiring lighting would use directional lighting and would be designed to ensure that there is no light spill over 0.5 Lux on any identified bat commuting and foraging areas, roosting habitat or water courses with regard to bats and otters. Detailed lighting restrictions would be detailed in the EMP. Lighting designed to be sensitive to bats and otters, would also benefit other nocturnal wildlife such as owls and badgers.

8.8.16 All excavations would be closed overnight, or ramps provided to reduce risk of trapping or injuring wildlife in them.

8.8.17 A pre-construction check for invasive plant species, both terrestrial and aquatic, would be undertaken at the appropriate time of year to inform and requirement to avoid or remove invasive species.

8.8.18 The implementation of biosecurity best practice described as ‘check, clean, dry’ would help to mitigate any potential mobilisation of invasive aquatic plant species

and also chytrid fungus which effects amphibians. Measures for dealing with invasive species and implementing biosecurity measures would be incorporated in the EMP.

Essential mitigation

8.8.19 Essential mitigation would be implemented in order to mitigate for the potential impacts as described in Section 8.7 that cannot be avoided through the embedded mitigation within design or construction working practices detailed above.

Veteran trees

8.8.20 Veteran trees are located within and adjacent to the proposed scheme, including at Jordans Park Local Wildlife Site. An arboricultural survey has been undertaken and this has confirmed the presence of five veteran trees within the land required for the proposed scheme.

8.8.21 Further design refinement will be undertaken to avoid or reduce the loss of veteran trees where possible. However, at this stage it is currently anticipated that veteran trees would be lost due to construction of the proposed scheme. Where veteran trees fall within land required temporarily for construction, or only within areas proposed for habitat creation, and it is possible to retain the trees alongside the proposed scheme they would require protection of their root and canopy extents. Trees that can be retained would be protected in accordance with the *British Standards BS 5837:2012* [59]. Measures for protection would be further detailed in the EMP and would include reference to root protection areas stated in the AIA report. Both documents would be provided with the ES supporting the submission of the DCO application.

8.8.22 Opportunities will be sought to implement sensitive management of veteran trees within the wider landscape, this may include measures such as thinning of young trees around veteran trees to reduce stresses upon the tree and their root zones. Opportunities will also be explored to undertake ‘veteranisation’ of mature trees retained within the proposed scheme and wider landscape, this involves wounding the tree to encourage rot features to form and replicate the beneficial features of naturally occurring veteran trees.

Woodland and scattered trees

8.8.23 Semi-natural broadleaved woodland accounts for the majority of woodland to be lost to the proposed scheme, this loss does not include any areas of ancient woodland. The majority of this is as a result of the expansion of the existing A358, between Henlade and Horton Cross, to the east and the associated loss of woodland within the verges and embankments. These losses include part of the belt of mature woodland that runs through the landscape and is bisected by the A358 between Griffin Lane and Bickenhall Lane. Smaller areas of semi-natural broadleaved woodland would also be lost to the construction of Village Road Overbridge (near Capland) and at Ashill junction, as well as associated with the River Ding and Black Brook Tributary realignments.

8.8.24 New broadleaved woodland species of local provenance characteristic of existing woodland would be planted along the A358 to provide new habitat, compliment retained areas of woodland and connect into the wider landscape via hedgerow and tree belt habitat creation along both the online and offline sections of the A358. Large areas of woodland planting are also proposed to the south of Griffin

Lane, connecting the woodland blocks that form the ridge line woodland belt which includes Bickenhall Wood. Large areas of woodland are also proposed adjacent to Every's Copse and Ashill Wood. These areas of planting would help to buffer the ancient woodlands at Bickenhall, Every's Copse and Ashill Wood.

8.8.25 Planting of new woodland either adjacent to existing high value habitat such as Bickenhall Wood, Every's Copse, Ashill Wood and Saltfield Copse or where woodland is lost or fragmented would provide valuable edge habitat to protect the core areas of woodland from variable environmental factors and stresses such as varied light conditions increased wind exposure and pollution. The diverse species mix proposed and structure of edge habitat provides a transition between two habitat types, usually woodland and grassland, and therefore supports a wider array of species. Planting of edge habitat would maximise biodiversity delivery and increase the resilience of existing woodland to climate change.

8.8.26 Species selection for new planting would include a diverse mix of native trees of local provenance and characteristic of the local area to ensure woodlands are resilient to climate change. Where appropriate, the use of non-native species would be considered to provide resilience against the effects of climate change. No ash would be replanted due to the spread of ash die-back disease; however, species would be selected that offer similar habitat for lichens and invertebrates, have similar pollen and nectar production or provide similar food resource. No one species can replace all the characteristics of ash but using aspen, alder, field maple, disease resistant elm, sycamore, oak, hazel and rowan in the landscape planting would provide many of the habitat niches provided by ash [60]. Woodland planting is shown on the Environmental Mitigation Plan (Figure 7-8).

8.8.27 The landscape in the study area is characterised by hedgerows with standard trees. New hedgerow planting (described below) along the proposed scheme would include the use of standard trees in keeping with the local landscape, namely oak and field maple.

8.8.28 Efforts would be made to retain scattered trees alongside the proposed scheme where they fall within or directly adjacent to the draft DCO Boundary. Measures for protection would be included in the EMP and include reference to root protection areas stated in the AIA report which will be provided with the ES supporting the submission of the DCO application.

8.8.29 Specimen trees would be included within the hedgerow planting along the length of the proposed scheme, the hedgerows would be managed to allow trees to mature as standards out of the hedgerow. Additional trees would be planted within areas of grassland creation and, as described above, mosaic areas of woodland and grassland planting with scattered trees would be provided, in particular around junction features where a more open habitat may be appropriate for visibility of road users.

8.8.30 Select sections of mature trees felled as part of the construction work would be retained for incorporation into habitat creation areas to provide a dead wood resource, and shelter opportunities for wildlife, while newly planted trees establish.

Grassland

8.8.31 The majority of grassland to be lost to the proposed scheme comprises improved grasslands and species poor semi-improved grassland characteristic of the agricultural landscape alongside the A358, and the verges of the A358 itself.

Smaller areas of neutral semi-improved grassland and marshy grassland will also be lost to the proposed scheme.

8.8.32 The proposed scheme would include the creation of areas of species rich grassland. These grasslands would be designed and managed to ensure their target condition exceeds that of the grassland habitat lost. The location of species rich grassland habitat creation has been designed to reconnect and compliment retained grasslands, or other valuable habitats, along the proposed scheme for example alongside the offline section of the proposed scheme around the Black Brook tributaries, around Mattock's Tree Green Junction, along the Stewley Link, with additional marshy grassland creation and restoration around the Village Road overbridge and along the Southfields Link.

8.8.33 Areas of grassland habitat creation have also been proposed in the landscape and ecology design at locations where they may be a requirement to provide receptor areas for protected species, such as great crested newts and reptiles, that would be displaced from the draft DCO boundary.

Hedgerows

8.8.34 Well-established and species-rich hedgerows will be lost to construction of the proposed scheme. New hedgerows with standard trees would be planted along the proposed scheme and would connect areas of retained woodland to areas of woodland and grassland habitat creation, while also connecting into the wider retained hedgerow network. Bolstering of hedgerows through gap filling, additional planting to increase species diversity and sensitive management is proposed on key hedgerows leading away from the proposed scheme to provide vital dispersal corridors for wildlife into the wider landscape. This planting would mitigate hedgerow loss and habitat fragmentation. Newly planted hedgerow would be species-rich comprising a mix of at least seven woody species of local provenance in keeping with the species recorded in the area. Planting would also include species such as hazel and honeysuckle to provide food and nesting resource for species such as hazel dormice which are present throughout the study area. Where land is not required for construction of the proposed scheme, hedgerow planting would occur in the first suitable season prior to commencement of works to allow some establishment in advance of habitat loss.

8.8.35 In locations where hedgerows of particular note for their age, and species diversity, have been recorded, or in key locations for protected faunal species such as hazel dormouse, opportunities to undertake hedgerow translocation would be explored. Translocated hedgerows can quickly provide structure, connectivity and foraging opportunities while newly created habitats establish, and continuity of habitat resource is required. The details of translocation methods would be included within the EMP as part of the ES supporting the submission of the DCO application.

Waterbodies

8.8.36 Ponds and ditches would be lost to construction of the proposed scheme. For every pond lost to construction of the proposed scheme at least one would be created. Ponds would be incorporated into larger areas of habitat creation so that associated terrestrial habitats, utilised by species within the pond, can be managed accordingly. Ponds would be designed for wildlife in line with best practice and incorporate aquatic species of local provenance and reflect those species found in the pond to be lost. New ponds would be established prior to

construction, where possible, to allow the translocation of flora and fauna from the lost pond where the risk of spreading INNS can be mitigated.

8.8.37 A new network of drainage ditches and channels would be established along the proposed scheme as part of the drainage strategy, where possible these would incorporate aquatic planting to maximise their benefit to wildlife.

8.8.38 The location of proposed ponds and ditches and requirements for their design would be detailed within the EMP as part of the ES supporting the submission of the DCO application.

Orchids

8.8.39 Orchids would be lost to construction of the proposed scheme. A translocation exercise is proposed to relocate orchids and their associated soils to pre-prepared grassland and woodland edge receptor sites. Orchids have an intricate relationship with their soil and the fungi they support, therefore the receptor sites would be established as close to their original location as possible to try to replicate these conditions, and the receptor sites would be carefully prepared to ensure the soil, geology, aspect and hydrological conditions replicate those lost to construction of the proposed scheme. The details of translocation methods would be included within the EMP as part of the ES supporting the submission of the DCO application.

Bats

8.8.40 The details of the essential mitigation would be agreed with Natural England through the licencing process, but a summary of the likely key measures is provided below:

- The loss of day roosts utilised by low numbers of bats, such as the five common pipistrelle day roosts currently identified within the draft DCO boundary, are considered of low value to the population. These roosts would be removed under a mitigation licence obtained from Natural England. Suitable alternative roosting habitat would be provided close to the existing foraging and commuting routes. The nature and location of roosts, timing of the exclusion (where appropriate) and timing of the tree felling or building demolition, in the case of building roosts, would all be in accordance with the licence method statement which would be developed in consultation with Natural England. Draft Protected Species Licences will be submitted separately from the DCO application and will be detailed in the Consents and Agreements Position Statement.
- The removal of roosts would take place at an appropriate time of year when the bats are least vulnerable.
- Given the update surveys to be undertaken in the 2021/2022 survey season and the known presence of Annex II species (barbastelle, Bechstein's, greater and lesser horseshoe bats) the potential exists for the loss of significant or important roosts. These will be reported in the ES and any mitigation measures required to be undertaken under licence from Natural England reported.
- Pre-construction surveys to be undertaken prior to any tree clearance and demolition of buildings, in particular if more than one year has passed since the last surveys, to ensure there are no new bat roost in trees and buildings to be cleared. If any new roosts are identified these would need to be included

within the proposed scheme bat mitigation licence and mitigation agreed with Natural England.

- Following pre-construction surveys, any trees where the potential for roosting bats cannot be ruled out after survey would be soft felled. This process will be detailed in the EMP.
- Provision of a mix of bat boxes on retained trees within the vicinity of roosts likely to be disturbed by construction activity to compensate for disturbance to these roosts.
- Existing tree roosting features would be salvaged where possible through careful section-felling and strapped onto nearby trees of the same species and at a similar height and orientation to that of the original tree roost, or erected as standing deadwood in a suitable, safe location. Such features would be retained within Highways England ownership and as close as possible to their original locations.
- Use of veteranisation techniques to create habitats in younger trees that are otherwise found on older more mature trees.

8.8.41 Any building or tree roosts within 0.03 miles (50 metres), depending on type of roost, environmental factors and type of construction activity within the area, could also require a disturbance mitigation licence from Natural England and associated method statements drawn up to reduce potential disturbance impacts, such as noise and lighting on these roosts during construction (to be detailed within the EMP).

8.8.42 Key commuting routes for bats would be retained for as long as possible in the works programme. Dead hedges would be used to allow bats to continue using commuting routes. It is likely that temporary screening would also be required to enable safe passage of bats across the works area along commuting and foraging routes. The location of such features would be detailed within the EMP as part of the ES.

8.8.43 If temporary construction lighting is required during the bat activity season, at compound areas for example, or for health and safety requirements, this would consist of directional lighting designed to ensure no light spill over 0.5 Lux on to any identified commuting and foraging areas, as well as roosting habitats. This will be detailed within the EMP and secured through the DCO.

Hazel dormouse

8.8.44 The details of the essential mitigation would be agreed through the licencing process, discussions are ongoing with Natural England about the most appropriate mitigation approach given the extent of the hazel dormouse habitat lost to construction of the proposed scheme, but a summary of the likely key measures has been provided below:

- Habitats within the draft DCO boundary utilised by dormouse would be removed under a mitigation licence obtained from Natural England.
- Habitat manipulation would be required to gradually displace dormice from these habitats into adjacent habitats where they have the carrying capacity to receive them. Where such habitats are not present, or larger areas of habitat removal are required, a translocation exercise to an offsite receptor area, agreed with NE and the local landowner, may be required.
- Displacement would comprise a two-stage clearance exercise, with vegetation reduces to stump level over winter while dormice are hibernating, followed by

stump removal in the following spring when dormice are active and will have moved to adjacent retained habitat in full leaf.

- Adjacent habitats or offsite receptor areas receiving displaced/translocated dormice would need to be subject to habitat creation in advance of any habitat clearance works to ensure they could support the displaced dormice and a long-term management strategy would be required to ensure maintenance of the favourable conservation status of the dormice population. The environmental mitigation for the proposed scheme has been designed to include areas outside of the land required for construction to ensure habitats are able to be established in advance of, and without disturbance by, construction activities.
- Areas of advanced planting may be supplemented with 'dead hedging' to establish habitat structure and maintain habitat connectivity while planting establishes.
- Deployment of nesting boxes may be required within retained adjacent habitats and habitat creation areas to ensure sufficient shelter opportunities for dormice while these habitats mature.
- Habitats have been designed to improve connectivity through the landscape for dormice, however additional measures such as dormouse bridges are likely to be required to mitigate habitat fragmentation and severance, particularly in the offline section of the proposed scheme.

8.8.45 The extent of time required to establish the planting within dormouse habitat creation areas in advance of clearance for construction will depend on the mitigation strategy to be adopted i.e. displacement is much more dependent on the establishment of substantial areas of habitat in advance. As a minimum, advanced planting should be provided at least one year in advance of construction works, and preferably two years to allow two full growing seasons. Where practical, established hedgerows and coppice stools, that would otherwise be lost to the proposed scheme, would be translocated into areas of dormouse and hedgerow habitat creation and 'dead hedging' used to provide shelter, connectivity and foraging resource while habitats establish, this will be particularly important in the early years of habitat establishment.

Breeding birds

8.8.46 Notable bird species have been recorded within the proposed scheme and adjacent land, this includes Schedule 1 species and those listed on the Red and Amber lists of birds of conservation concern.

8.8.47 Pre-construction surveys for Schedule 1 birds would be undertaken. If Schedule 1 birds are found breeding on site or within a distance from the construction work's and determined to be susceptible to disturbance, then advice should be sought from a suitably qualified ecologist and a method statement developed for works within proximity to Schedule 1 birds to mitigate any effect; this may include:

- restrictions on the timings of works
- restrictions on the types of work that can be undertaken
- installation of screening between construction works and adjacent habitats supporting Schedule 1 species to reduce visual disturbance

8.8.48 As described above, the sensitive timing of works including vegetation clearance during site preparation are crucial to avoid impacts upon breeding birds. Where ground-nesting species would lose habitat, e.g. skylark (*Alauda arvensis*), the

timing of vegetation removal or modification would also be considered, i.e. no cutting of grassland until birds have fledged.

8.8.49 Nesting bird boxes would be provided for a range of species. Notable species would have nest boxes installed for them, including marsh tit (*Poecile palustris*), spotted flycatcher (*Muscicapa striata*), kestrel (*Falco tinnunculus*) and stock dove (*Columba oenas*). Boxes would be installed prior to the bird nesting season to provide opportunities for displaced birds (from loss of breeding habitat) to relocate and nest where possible.

8.8.50 Details of all mitigation measures including the location of bird boxes would be included within the EMP supporting the submission of the DCO application.

Wintering birds

8.8.51 A number of notable wintering bird species were identified within the survey area, including the Schedule 1 species and those listed on the Red and Amber lists of birds of conservation concern.

8.8.52 The proposed scheme incorporates large areas of habitat creation to mitigate that lost to construction of the proposed scheme. These comprise a combination of woodland edge, grassland, hedgerows and pond habitat creation, which would complement the habitats within the wider agricultural landscape and provide foraging resources for overwintering birds. Details about the provision and management of habitats would be provided within the EMP supporting the submission of the DCO application.

Barn owl

8.8.53 The evidence from baseline surveys and incidental sightings of this species have confirmed the presence of suitable barn owl foraging habitats and roost sites along the length of the proposed scheme, with four occupied breeding sites identified to the west of the proposed scheme at West Hatch, near Kenny and at Capland.

8.8.54 In addition to the embedded construction mitigation the following mitigation would be implemented:

- A pre-construction survey for roosting or nesting barn owl would be undertaken in all suitable habitat within 0.06 miles (100 metres) of the proposed scheme.
- Habitat manipulation techniques would be employed to deter barn owls from entering construction areas, to include mowing long grass to reduce foraging potential.
- Strategic planting of woody species - dense structure planting (to include shrubs and five-year-old trees characteristic of the local area) should be introduced alongside the proposed road, especially along the offline section and adjacent to complex junctions such as Mattocks Tree Green and Ashill. Planting height should be at least 3 metres to encourage barn owls to fly over the road at a safe distance above traffic.
- Grass verge management - Where possible, and especially in high risk barn owl mortality areas the verges would be managed to support a species diverse but short grassland sward in order to reduce the potential for grass to support barn owl prey species and therefore decrease the foraging potential and collision risks to barn owls.

Great crested newt

8.8.55 Great crested newts have been identified in two distinct areas within 0.16 miles (250 metres) of the proposed scheme; to the west of Meare Green and either side of the A358 across ponds at Thornfalcon and Rapps. The construction of the proposed scheme would result in the loss of ponds and associated terrestrial habitats that are used by these populations of great crested newt, therefore a mitigation licence would be required from Natural England to permit the works. The details of the essential mitigation would be agreed through the licencing process, but a summary of the likely key measures are provided below:

- Two mitigation ponds would be provided for each pond lost to construction, these ponds would be at least equal size to the pond lost. The ponds would be designed in line with best practice guidance for great crested newts and include a size and profile to encourage the long-term use by great crested newts and support a range of other wildlife.
- Mitigation ponds would be provided within an area of suitable terrestrial habitat that would be subject to a management regime to optimise their value to great crested newts for foraging and shelter.
- A capture, exclusion and translocation exercise may be required, including the establishment of areas of habitat creation to use as receptor areas and deployment of exclusion fencing around construction areas providing suitable terrestrial habitats within 0.31 miles (500 metres) of a known great crested newt pond.
- Restrictions may apply on the timing of ground works to lower the risk of killing or injuring great crested newts, in particular avoiding the period when newts are hibernating taken as October to March inclusive.

Otter

8.8.56 Otters have been confirmed to be present on multiple watercourses crossed by the proposed scheme.

8.8.57 Where otter are present on the watercourse, mammal ledges would be incorporated into the design of new culvert structures, either as suitably high ledges within the structures or as separate adjacent mammal underpasses. This would reduce any habitat severance effect upon otter populations. These features would be at least 500 millimetres wide and installed above the flood level to ensure otter can continue to cross beneath the proposed scheme in times of high flow/ flood. These crossing features need to be used in conjunction with otter fencing within 0.06 miles (100 metres) of the structures to stop otters preferentially crossing the road and to funnel them towards the culvert or dry underpass.

8.8.58 Potential otter holt sites have been identified within the study area. Such resting sites are legally protected and any works which could disturb otter using these sites must be covered by a Natural England mitigation licence. Construction works for the proposed scheme have the potential to disturb otters utilising such resting sites. Given the transient nature of otter, a pre-construction survey of all wooded and scrub areas adjacent to watercourses within the proposed scheme would be undertaken to confirm the presence or absence of any otter holts within the construction area and to inform the requirement for any Natural England mitigation licence. If an otter holt were to be destroyed, or rendered unusable, as a result of the construction of the proposed scheme, an artificial holt may need to be provided as part of the mitigation strategy.

8.8.59 Working within 0.03 miles (50 metres) of a watercourse could cause disturbance to otters. Details of working time restrictions to reduce potential disturbance to dispersing and foraging otter would depend upon the pre-construction surveys and mitigation licence requirements (if required). Any required restriction would be detailed within the EMP to be provided with the ES supporting the submission of the DCO application.

Water vole

8.8.60 Water vole have been confirmed to be present on watercourses crossed by the proposed scheme, including on tributaries of the Black Brook which would be subject to realignment and culverting as part of the proposed scheme.

8.8.61 Construction works to watercourses, their channels and banks, or works adjacent to watercourses have the potential to directly destroy habitats used by water vole for foraging, shelter and dispersal. A detailed mitigation strategy would need to be developed and agreed with Natural England prior to commencement of works, and a conservation licence may be required from Natural England to permit the works. Where construction works are on a small scale and targeted to specific areas, vegetation manipulation could be used to displace any water voles present out of the construction area where they would be at risk of killing or injury. Where larger scale works are required a translocation exercise may be necessary. Any displacement or translocation exercise would require habitat creation, or enhancement of the existing habitats, into which the water voles are to be displaced or translocated.

8.8.62 As described above in relation to otters, mammal ledges would be incorporated into new culvert structures to ensure water vole can continue to pass beneath the proposed scheme and move between habitats on either side of the proposed scheme, even in times of high flow/flood.

Badger

8.8.63 Badger have been found to be active across the proposed scheme. In addition to embedded mitigation measures and best working practice the following mitigation for badgers would be undertaken;

- A pre-construction survey for badgers (activity and setts) would be carried out (this would be detailed within the EMP).
- No works or tracking of heavy machinery would occur within 0.02 miles (30 metres) of active badger setts.
- Any active setts to be lost or predicted to be affected as a result of the proposed scheme construction would be closed under a Natural England development licence between the months of July and November (inclusive) prior to commencement of construction. These setts would be determined following the pre-construction survey.
- Loss of main setts would be mitigated for with the provision of alternative artificial setts in suitable habitat within 0.6 miles (250 metres) of the main sett to be closed under licence from Natural England. This would be undertaken in advance of the main sett closure.

8.8.64 Where key badger movement corridors are identified that would be severed by the offline sections of the proposed scheme, badger tunnels will be incorporated to allow safe passage beneath the proposed scheme. As described for otter, mammal ledges or dry tunnels will be incorporated into selected culverts to maintain crossing points beneath the proposed scheme. Planting will be designed

in combination with badger fencing to 'funnel' mammals to safe crossing points beneath the proposed scheme.

Reptiles

8.8.65 Populations of slow worm and grass snake have been identified at locations along the proposed scheme, including within the grass verges of the existing A358. Construction activities could result in the individual reptiles being injured or killed in the absence of mitigation or suitable working practices.

8.8.66 The landscape design for the proposed scheme includes areas of habitat creation including grassland, woodland, hedgerow and ponds which would be managed for wildlife and offer foraging and shelter opportunities for reptiles. Log piles and artificial hibernacula would be provided at discrete locations within the habitat creation areas to provide shelter points for reptiles (and a range of other species). These measures would be further detailed in the EMP to be provided with the ES.

8.8.67 In areas that support large populations of reptiles a capture and exclusion exercise may be required, with the installation of reptile exclusion fencing around construction areas and individual reptiles translocated to a receptor area within retained existing habitats or to an offsite suitable receptor area. This translocation would need to occur in advance of any construction works which would impact upon habitats utilised by reptiles. This approach is likely to be required within the existing verges of the proposed scheme where populations of reptiles are impinged by the road on one side and agricultural land to the other, with no suitable habitats to displace reptiles into.

8.8.68 In areas where low numbers of reptiles were recorded habitat manipulation using phased and directional strimming to displace reptiles to retained habitat would be undertaken in suitable weather and within the reptile active season of April to October prior to construction. This habitat would then be maintained as short grassland to render it unsuitable for reptiles for the duration of the construction phase. Reptile exclusion fencing may be required around construction areas for the duration of the works. The exact requirements will be detailed in the EMP and take account of update surveys being completed in 2021.

Terrestrial invertebrates

8.8.69 The assemblage of invertebrates recorded along the proposed scheme includes notable and nationally scarce species including the brown hairstreak.

8.8.70 Construction of the proposed scheme would result in the loss of habitats utilised by invertebrates. The areas of habitat creation included within proposed scheme would be designed to replace those habitats lost and incorporate features beneficial to invertebrates. This would include species-rich grassland with species beneficial to insects including pollinators. Species mixes should seek to include plants that provide a food source for scarce species identified. Habitat creation would include south facing slopes, log piles, deadwood and sheltered areas for invertebrates.

8.8.71 Felled trees should be retained on-site where possible as habitat piles/log piles. Deadwood found in areas that are being cleared for the proposed scheme would be moved to suitable areas of retained habitat on site to ensure maintenance of some invertebrate habitat, in particular for wood-decay (saproxylic) invertebrates, e.g. beetles. These habitat piles/log piles will be supplemented with additional felled wood/deadwood removed during the operation of the proposed scheme e.g.

where decayed trees are felled for health and safety purposes to avoid risk of falling onto road users.

Brown hairstreak

8.8.72 Brown hairstreak butterfly are present within the land required for construction of the proposed scheme. A low intensity management regime would be implemented on newly created and retained hedgerows within the proposed scheme to mitigate the brown hairstreak habitats lost, this would include:

- Hedgerows being cut once every 3-5years on a rotational basis.
- Avoidance of chemical spraying up to the field edges, and ideally the provision of ruderal field margins between crops and hedgerows.
- Hedgerows to be cut as late as possible in the season and ideally during January and February.
- Landscape planting scheme to include a high proportion of blackthorn.

Fish

8.8.73 The proposed scheme design includes the realignment of watercourses including; the Back Stream which forms part of the River Ding, tributaries of the Black Brook, Thornwater Stream, Five Head River Main Channel 2 and Venner's Water. It is likely that most adverse effects would be mitigated by standard mitigation such as the provision of alternative aquatic habitat in the realigned length of channel and a fish translocation prior to dewatering and river diversion. A Section 27a exception permit is required from the Environment Agency to catch fish by means other than rod and line during the translocation.

8.8.74 Pre-construction fish surveys would be undertaken for all channels that require diversion. This would inform the strategy and methodology for the fish translocation and also the design of the realigned channel, which would be tailored to the specific species present. Surveys would include potential receptor sites where fish are to be translocated prior to construction.

8.8.75 Pollution prevention best practice would be employed during construction, as detailed in the EMP to be submitted with the ES, with specific measures at points where the proposed scheme is being constructed near or over watercourses to reduce the potential for impacts upon the fish assemblage.

Aquatic macroinvertebrates

8.8.76 The proposed scheme design includes the realignment of Back Stream, which forms part of the River Ding, and the realignment of tributaries of the Black Brook. It is likely that most adverse direct impacts relate to water quality during construction. These impacts would be mitigated through best practice pollution prevention during construction, as detailed in the EMP, with specific measures at points where the proposed scheme is being constructed near or over watercourses to reduce the potential for impacts upon the aquatic invertebrate assemblage.

Other section 41 species

8.8.77 Habitat clearance and habitat manipulation techniques would be designed to be sensitive to other SPIs and to deter species away from construction areas. Suitable alternative habitat would be identified and provided for any SPIs found during construction. SPIs would be moved to these areas by a suitably

experienced ecologist where possible. Habitat clearance and manipulation techniques, as well as the role of any Ecological watching brief would be detailed and method statements to be provided with within the EMP to avoid or reduce the risk of mortality.

Operational mitigation

8.8.78 An assessment of the potential air quality impacts of vehicular emissions upon sensitive statutory and non-statutory designated sites has been undertaken, as described in Chapter 5 Air Quality, and will inform the detailed mitigation proposals to be published within the EMP to be provided with the ES supporting the submission of the DCO application. Such proposals may include contributions to the management of sites at risk of air quality related habitat degradation, or habitat creation measures beyond the area impacted by emissions related air pollution. The Habitats Regulations Assessment will include an assessment of air quality impacts upon European sites and include mitigation measures as required.

8.8.79 The operational scheme has the potential to increase road related injury and mortality through an increase in traffic, and through operation of the new offline section of the proposed scheme through what is currently open countryside. In the absence of mitigation this would create a barrier to dispersal for many species, effectively fragmenting the habitat. The Environmental Masterplan (see Figure 7.8) has been designed to connect the habitats within the local area, and to mitigate the effects of habitat fragmentation. The landscape includes natural barriers in key locations to force bats and birds up over the carriageway to reduce the risk of collision with vehicles. Hedgerow and tree belt planting along the road has been designed in combination with the fencing strategy to channel species to culverts and underbridge crossing points.

8.8.80 In the absence of mature trees during early habitat establishment, it is likely that temporary screening would be required in some locations to force bats (particularly low flying species) up over the carriageway. The location of such features is dependent on the crossing point and advanced bat surveys being undertaken during 2021, which will be reported in the ES. Detailed proposals for temporary screening for bats will be published within the EMP to be provided with the ES.

8.8.81 Lighting along the proposed scheme has the potential to create disturbance to nocturnal species that are present within adjacent habitats or who would cross over/under the proposed scheme i.e. bats, dormice, birds, badger, otter, hedgehog and invertebrates. The lighting assessment has confirmed that lighting will only be required at the junctions with the roundabouts at the eastern and western ends of the proposed scheme, therefore restricting the level of potential disturbance. Further surveys are being undertaken in these locations to establish how sensitive species, such as bats, are using these areas and how they may be impacted by the light. The results of these surveys will be reported in the ES. Further restrictions may be required on the type of lighting used; this may include the use of directional to avoid unnecessary illumination of adjacent habitats. This can be achieved through the use of LED and incorporation of baffles, cowls or hoods.

8.8.82 As detailed in Chapter 13 Road Drainage and the Water Environment, a suitable drainage design would be completed for the proposed scheme in accordance with DMRB *CG 501 Design of highway drainage systems* [61] and DMRB *LA 113 Road drainage and the water environment* [62]. This would provide appropriate

measures to attenuate and treat (including pollution control devices where necessary) surface water runoff from the proposed scheme, thereby avoiding degradation of the water environment and resulting damage or degradation of water habitats and the species they support.

8.8.83 The landscape scheme and habitat management regime would be designed to be appropriate given the proximity of the airfield at RNAS Merryfield and the potential that certain types of habitat creation could attract flocks of birds and thereby represent a risk of aircraft bird strike. A bird strike risk assessment will be undertaken and reported as part of the ES, this will help to inform the design and management regime of the landscape scheme.

8.8.84 Towards the end of the construction period the EMP would be updated to reflect changes in baseline conditions and include essential environmental information required for future maintenance and monitoring requirements through the proposed scheme's operational life.

Enhancement

8.8.85 Enhancement is a measure that is over and above what is required to mitigate the adverse effects of a scheme.

8.8.86 The National Policy Statement for National Networks states that opportunities for building in biodiversity features should be maximised and the project should show how it has taken advantage of opportunities to conserve and enhance biodiversity. Through engagement with local stakeholders and landowners, further opportunities for biodiversity enhancements are being sought within the local landscape.

8.8.87 Opportunities have been taken to connect previously isolated woodlands with new woodland and hedgerow planting or management to create connectivity of habitats throughout the landscape. The landscaping design for the proposed scheme has been developed to incorporate species of benefit to local wildlife for example through the inclusion of species such as hazel and honeysuckle which are favoured by hazel dormice, and blackthorn which is the food plant of the brown hairstreak butterfly.

8.8.88 Opportunities to enhance local conditions, such as removing existing structures or heavily modified sections of channel, are being reviewed and sought as part of the design development process.

8.8.89 Enhancements will be detailed within the LEMP which will form part of the EMP submitted with the ES.

8.9 Assessment of likely significant effects

Construction effects

Designated sites

8.9.1 The construction of the proposed scheme has the potential to have the following effects on designated sites:

- Degradation of the qualifying feature
- Habitat degradation
- Habitat loss

Statutory designations

8.9.1 A Habitats Regulations Assessment (HRA) screening has been undertaken due to the presence of internationally designated sites, in accordance with DMRB LA 115 Habitats Regulations assessment (LA 115) [19]. The HRA screening report can be found in Appendix 8.1: Habitats Regulation Assessment.

8.9.2 The Somerset Levels and Moors SPA and Ramsar site is within 2.1 miles (3.5 kilometres) of, and hydrologically linked to, the proposed scheme. The SPA and Ramsar site are sensitive to any reduction in water quality and the potential impact of water pollution poses a potential threat to the bird and invertebrate assemblages for which the SPA and Ramsar site are designated. These internationally important sites may also be considered functionally linked to habitats within the proposed scheme that support bird species that form part of the designating features of the SPA and Ramsar, impacts to these habitats may pose a threat to these bird species through a loss of available functionally linked habitat and disturbance whist using habitats local to the proposed scheme. The Somerset Levels and Moors SPA and Ramsar site will be taken forward for appropriate assessment as part of the HRA process, as such a preliminary assessment of the impact of the proposed scheme is not provided at this stage.

8.9.3 The Severn Estuary Special Area of Conservation (SAC), SPA and Ramsar site is 15.5 miles (25 kilometres) downstream of, and hydrologically linked to, the proposed scheme. These sites are considered functionally linked to the habitats within the proposed scheme in relation to the migratory fish assemblage for which the SAC and Ramsar site are designated. Construction and operation of the proposed scheme has the potential to impact on migratory fish populations that are key species of the Severn Estuary SAC and Ramsar, through direct loss, fragmentation and/or disturbance to functionally linked habitats. The potential also exists for impacts to the migratory fish populations in relation to water quality while using habitats local to the proposed scheme. The preliminary assessment is that, due to the distance from the proposed scheme, there will be no observable impact upon, and therefore no change to, the bird populations that form the qualifying features of the SPA as a result of construction of the proposed scheme. As the SPA is of international importance this is preliminarily assessed as a neutral effect, which is not significant. The Severn Estuary SAC and Ramsar will be taken forward for appropriate assessment as part of the HRA process, as such a preliminary assessment of the impact of the proposed scheme on the SAC and Ramsar is not provided at this stage.

8.9.4 Hestercombe House SAC, Beer and Quarry Caves SAC, and Exmoor and Quantock Oakwoods SACs are designated for their notable bat populations and are located within the study area of 18.6 miles (30 kilometres) from the proposed scheme. Habitats within the proposed scheme have the potential to constitute functionally linked habitat for bats originating from the SACs. The construction of the proposed scheme has the potential to impact upon these bat populations through the loss of roosting sites and foraging habitat and the risk of injury or death. Hestercombe House SAC, Beer and Quarry Caves SAC, and Exmoor and Quantock Oakwoods SAC will be taken forward for appropriate assessment as part of the HRA process, as such a preliminary assessment of the impact of the proposed scheme on the SACs is not provided at this stage.

8.9.5 Bracket's Coppice SAC is designated for its population of Bechstein's bat. At a distance of 11.4 miles (18.3 kilometres) from the proposed scheme any habitat loss associated with the construction of the proposed scheme is beyond the core

sustenance zone of Bechstein's bat, therefore unlikely to constitute a reduction of functionally linked habitat to the SAC. The preliminary assessment is that there will be no observable impact upon, and therefore no change to, the qualifying feature of SAC as a result of construction of the proposed scheme. As the SAC is of international importance, this is preliminarily assessed as a neutral effect, which is not significant.

8.9.6 With the exception of Bracket's Coppice SAC and the Severn Estuary SPA, the internationally designated sites described above will be taken forward for appropriate assessment as part of the HRA process. In order to ensure that consideration of in-combination effects is fully assessed for each of the internationally designated sites, the screening decision for each site (including Bracket's Coppice SAC and the Severn Estuary SPA) will be updated as part of the HRA that will form part of the DCO application.

8.9.7 Thurlbear Wood and Quarrylands Site of Special Scientific Interest (SSSI), and Barrington Hill Meadows SSSI & National Nature Reserve (NNR) are designated for their terrestrial habitats. Given their distance from, and limited connectivity to, the proposed scheme, no impact pathways are anticipated between these sites and construction of the proposed scheme. The preliminary assessment is that there will be no observable impact upon, and therefore no change to, the integrity of these sites as a result of construction of the proposed scheme. As these sites are of national importance, this is preliminarily assessed as a neutral effect, which is not significant.

8.9.8 Herne Hill Local Nature Reserve (LNR) is designated for its semi-natural broadleaved woodland and associated assemblage of woodland species. The site is located on the far side of Ilminster and the River Isle approximately 0.75 miles (1.2 kilometres) from the proposed scheme, given this limited connectivity and the distance from the proposed scheme, no impact pathways are anticipated between the LNR and construction of the proposed scheme. The preliminary assessment is that there will be no observable impact upon, and therefore no change to, the integrity of Herne Hill LNR as a result of construction of the proposed scheme. As this site is of county importance, this is preliminarily assessed as a neutral effect, which is not significant.

8.9.9 Bickenhall Orchard LNR is designated for its traditional orchard and associated species, including a rich bryophyte community. The site is 0.28 miles (450 metres) west of the proposed scheme, given this proximity, the bryophyte communities may be sensitive to air quality changes associated with construction. Appropriate pollution prevention, such as construction dust suppression, would be detailed within the EMP submitted with the ES. With the implementation of such measures, the preliminary assessment is that there will be no observable impact upon, and therefore no change to, the integrity of Bickenhall Orchard Local Wildlife Site as a result of construction of the proposed scheme. As the site is of county importance, this is preliminarily assessed as a neutral effect, which is not significant.

8.9.10 South Taunton Stream LNR and Children's Wood/Riverside Park LNR are located downstream of the proposed scheme and, therefore, have the potential to be impacted by water pollution events during construction. With the embedded mitigation measures summarised in Section 8.8 and detailed within Chapter 13 Road Drainage and the Water Environment, this represents a negligible adverse impact on the integrity of the LNRs which are of county importance. This is preliminarily assessed as a slight adverse effect, which is not significant.

Non-statutory designations

8.9.11 Three non-statutory designated sites fall within the land required for construction of the proposed scheme and would be subject to habitat loss or degradation. These sites are: Road Verges West of Hatch Beauchamp LWS, which would be wholly lost to the widening of the A358 north of Griffin Lane, Jordans Park LWS which would lose approximately 4.9 hectares to the new carriageway and Southfields Link, and River Rag LWS which passes under the existing A358 and approximately 0.05 miles (80 metres) of its length falls within the land required for construction of the proposed scheme.

8.9.12 Road Verges West of Hatch Beauchamp LWS would be subject to the permanent and irreversible loss of all habitats that form the designating feature of the LWS. Areas of grassland habitat creation would be planted, to include a diverse mix of species of local provenance to compensate for the habitat lost. It is recognised that such habitat creation would take many years to establish to a level where it provides an equivalent biodiversity value to that lost. Therefore, the loss of habitats at Road Verges West of Hatch Beauchamp LWS will result in permanent / irreversible damage that negatively affects the integrity of the LWS. This represents a major adverse impact on this receptor of county importance and is therefore preliminarily assessed as a moderate adverse effect, which is significant.

8.9.13 Jordans Park LWS would be subject to the loss of approximately 16% of its area to construction of the proposed scheme; this would include the loss of parkland habitat (a HPI) and mature, potentially veteran trees, that form the designating feature of the LWS. Areas of species rich grassland, hedgerows, trees and woodland would be provided at Jordans Park LWS, and areas only temporarily required during construction would be reinstated post construction. It is recognised that such habitats would take many years to establish to a level where it provides and equivalent biodiversity value to that lost, and there would be a permanent reduction of the area within the LWS designation. The loss of habitats that form part of the designating features of Jordans Park LWS will result in permanent / irreversible damage that negatively affects the integrity of the LWS. This represents a major adverse impact on this receptor of county importance and is therefore preliminarily assessed as a moderate adverse effect which is significant.

8.9.14 River Rag LWS is crossed by the existing A358 to the west of Hatch Green. The existing bridge structure through which the river passes would be extended to accommodate the dualling of the A358. An approximately 0.05 mile (80 metre) length of the River Rag LWS and associated bank vegetation falls within the land required for construction of the proposed scheme and would be subject to direct impacts including loss of bank side vegetation and works within the channel itself. The LWS is designated for its high biological quality and bird population. Wider impacts to the LWS during construction would be controlled through appropriate pollution control measures as described within Section 8.8. Land on the banks only temporarily required either side of the bridge during construction would be replanted with tree and shrub species of wildlife benefit post construction, with approximately 0.02 miles (30 metres) of riverbank lost permanently to the widened A358. Given the size of the extended bridge structure it is not considered to represent a barrier to the river's function as a wildlife corridor. The localised loss of habitats either side of the existing bridge structure under the A358, and the shading effect of the extended structure upon the watercourse, is considered to represent permanent / irreversible damage, however given the relatively small

scale does not affect the integrity of the LWS. This represents a minor adverse impact on this receptor of county importance, which is preliminarily assessed as a slight adverse effect, which is not significant.

8.9.15 Ashill Wood LWS, Every's Copse LWS and Huish Copse LWS are located adjacent to the proposed scheme. River Isle LWS is located approximately 0.05 miles (80 metres) from the proposed scheme. No direct loss of habitats are anticipated at these LWS during construction. As such the preliminary assessment is that there will be no observable impact upon, and therefore no change to, the integrity of these LWSs as a result of construction of the proposed scheme. As the sites are of county importance, this is preliminarily assessed as a neutral effect, which is not significant.

8.9.16 Appropriate pollution prevention, such as construction dust suppression and water quality protection measures, would be detailed within the EMP submitted with the ES. With the implementation of these measures the preliminary assessment is that there will be no observable impact upon, and therefore no change to, the integrity of this LWS as a result of construction of the proposed scheme. As the site is of county importance, this is preliminarily assessed as a neutral effect, which is not significant.

8.9.17 Potential adverse impacts upon the ancient woodlands that form Saltfield Copse LWS, Bickenhall Woods LWS, Huish Woods LWS, Ashill Wood LWS and Every's Copse LWS are described below in the irreplaceable habitats section (paragraphs 8.9.23-8.9.28).

Habitats

8.9.18 In the absence of appropriate mitigation, the impacts associated with the construction phase of the proposed scheme on habitats are anticipated to be:

- Habitat loss
- Habitat severance
- Habitat degradation

8.9.19 The Environmental Master Plan (see Figure 7.8) is being developed which aims to replace any habitats permanently lost as a result of the proposed scheme and enhance retained habitats. This strategy includes the creation of habitat corridors along the length of the proposed scheme, providing links to off-site habitats including previously isolated woodland blocks, and compensatory measures for the loss of species rich grasslands. The strategy ensures that all priority habitats are replaced by at least a 1:1 ratio, and in most cases above this.

8.9.20 A LEMP would be developed in several stages as part of the EMP to ensure the establishment and success of habitat created to replace any habitats permanently lost as a result of the proposed scheme and to maintain habitat connectivity along the length of the proposed scheme. This will be submitted with the ES which will accompany the DCO application.

8.9.21 Habitats valued at local importance and above are assessed further below.

Woodland/trees

8.9.22 Approximately 23 hectares of woodland falls within the land required for construction of the proposed scheme; however, it should be noted that this figure includes areas, such as the western verge of the A358, that should be able to be at least partially retained through further refinement of design and implementation

of appropriate protection measures therefore this is a preliminary figure and would be refined and reported in the ES. The woodland within the proposed scheme is further subdivided as follows:

- Semi-natural broadleaved woodland (22.4 hectares)
- Broadleaved woodland plantation (0.7 hectares)
- Mixed semi-natural (0.3 hectares)

Irreplaceable habitats including ancient woodland and veteran trees

8.9.23 Bickenhall Wood ancient woodland is located directly adjacent to the west of the existing A358 and its associated verge woodland vegetation. The construction of the proposed scheme requires vegetation clearance up to the highway boundary, directly adjacent to the ancient woodland and ground works within 0.01 miles (15 metres) of the ancient woodland therefore there is the potential for direct impacts to the root protection area of some of the trees of the ancient woodland in this location. Further assessment is required of the root protection area of these trees and the potential impact of the proposed construction upon them, this assessment will be undertaken as part of the ES. Ancient woodlands are irreplaceable habitats; the value of which is derived from their longevity which allows stable conditions for a range of species to established. The direct loss of ancient woodland trees as a result of impacts to their roots from construction of the proposed scheme represents permanent and irreversible damage that negatively affects the integrity of the ancient woodland. The loss of trees within the ancient woodland therefore represents a major adverse impact upon this receptor of national importance and is therefore preliminarily assessed as a large adverse effect, which is significant.

8.9.24 Saltfield Copse LWS is designated for its ancient woodland, the boundary of the LWS extends into the existing highway boundary and up to the cutting of the existing A358. The construction of the proposed scheme requires vegetation clearance up to the highway boundary. Further assessment is required to confirm the age of Saltfield Copse and the extent of the ancient woodland component in order to fully assess the impact of construction of the proposed scheme upon the woodland; this assessment will be undertaken as part of the ES. Ancient woodlands are irreplaceable habitats; the value of which is derived from their longevity which allows stable conditions for a range of species to establish. The direct loss of ancient woodland as a result of construction of the proposed scheme represents permanent and irreversible damage that negatively affects the integrity of the ancient woodland. The loss of trees within the ancient woodland therefore represents a major adverse impact upon this receptor of national importance and is preliminarily assessed as a large adverse effect, which is significant.

8.9.25 Ashill Wood and Every's Copse ancient woodlands are located to the east of the existing A358 adjacent to Copse Lane and Park Barn Lane. The proposed scheme includes the creation of a new junction at Ashill and the Stewley Link road, which connects into the new junction to the west of Copse Lane. The new junction and Stewley Link have been designed to ensure the construction area required for the proposed scheme is beyond 0.01 miles (15 metres) of Ashill Wood and Every's Copse ancient woodland, allowing a buffer to be established between the construction works and the ancient woodland as recommended in Natural England guidance. Consequently, no direct loss of ancient woodland trees is anticipated at Ashill Wood and Every's Copse as a result of construction of the proposed scheme. The preliminary assessment is that there will be no

observable impact upon, and therefore no change to, the integrity of Ashill Wood and Every's Copse ancient woodland. As these sites are of county importance, this is preliminarily assessed as a neutral effect, which is not significant.

8.9.26 The ancient woodland component of Huish Woods LWS, which is known as Huish Copse, is located 0.01 miles (18 metres) from the proposed scheme, however this relates to an area of habitat creation only; the nearest construction for the proposed scheme is approximately 0.05 miles (75 metres) from the ancient woodland. As a 0.01 mile (15 metre) buffer is able to be maintained in line with Natural England guidance, no direct loss of ancient woodland trees at Huish Copse is anticipated as a result of construction of the proposed scheme. The preliminary assessment is that there will be no observable impact upon, and therefore no change to, the integrity of the ancient woodland at Huish Woods LWS as a result of construction of the proposed scheme. As this site is of county importance, this is preliminarily assessed as a neutral effect, which is not significant.

8.9.27 Given their proximity to the construction works these five ancient woodlands would be at risk of degradation associated with construction related dust deposition and/or changes in water quality or flow. Mitigation measures to further reduce the risk of impacts of habitat degradation on the woodland and ground flora vegetation would be implemented and are to be detailed in the EMP submitted with the ES. With the implementation of this mitigation, dust deposition and changes in water quality as a result of construction would result in temporary/reversible damage that would not affect the integrity or key characteristics of the ancient woodlands and therefore represents a negligible adverse impact upon this receptor of national importance and is therefore preliminarily assessed as a slight adverse effect, which is not significant.

8.9.28 Five veteran trees have been confirmed within the proposed scheme, two of which are pedunculate oaks that fall within proposed areas of habitat creation associated with Jordans Park LWS, these would be retained and protected during construction. A veteran black poplar is present alongside Venner's Water adjacent to an existing drainage basin that requires reconfiguring for the proposed scheme; opportunities will be sought to avoid the root protection area of this tree through further refinement of the design, the result of which will be reported in the ES. Two veteran pedunculate oaks at Jordans Park LWS would fall directly within the footprint of the eastern carriageway of the proposed scheme and would be lost to construction. The loss of veteran trees is a permanent/irreversible impact that negatively affects the integrity of the resource. The loss of veteran trees therefore represents a major adverse impact upon this receptor of national importance and is preliminarily assessed as a large adverse effect, which is significant.

Broadleaved woodland

8.9.29 The majority of woodland to be lost to construction of the proposed scheme is broadleaved semi-natural woodland along the verges and embankments of the existing A358 in particular the sections between Hatch Park and Capland, and between Jordans Park and Horton Cross. Small areas of broadleaved woodland would also be lost at Greenway Bridge, Three Oaks Cross and Thickthorne.

8.9.30 With the planting of 42.8 hectares of broadleaved semi-natural woodland and additional planting of approximately 10.3 hectares of a more open woodland and grassland mosaic habitat around junctions, there would be a net increase of up to

30.7 hectares of broadleaved woodland habitats and an increase in connectivity between previously isolated woodland blocks once this woodland has established.

8.9.31 Given the timescales required for woodland habitat creation to provide an equivalent biodiversity resource to that lost, the 22.4 hectare loss of broadleaved semi-natural woodland is considered permanent/irreversible, and the extent of loss would negatively affect the integrity of this habitat resource. The habitat loss represents a major adverse impact upon semi-natural broadleaved woodland, a priority habitat and receptor of national importance and is therefore preliminarily assessed as a large adverse effect, which is significant.

8.9.32 The 0.7 hectares loss of plantation broadleaved woodland is permanent/ irreversible; however, given the small extent of this loss would not negatively affect the integrity of this asset as a habitat resource. The habitat loss represents a minor adverse impact upon this receptor of county importance and is therefore preliminarily assessed as a slight adverse effect, which is not significant.

8.9.33 The 0.3 hectares loss of mixed semi-natural woodland is permanent/irreversible, however given the small extent of this loss would not negatively affect the integrity of this habitat resource. The habitat loss represents a minor adverse impact upon this receptor of county importance and is therefore preliminarily assessed as a slight adverse effect, which is not significant.

8.9.34 The creation of approximately 42.8 hectares of broadleaved semi-natural woodland, and 10.3 hectares of open woodland grassland mosaic habitat, would result in permanent addition to retained broadleaved woodland that would positively affect the integrity of this resource, once established. The habitat creation represents a major beneficial impact upon this biodiversity resource which is of national importance. This impact is therefore preliminarily assessed as a large beneficial effect, which is significant.

Scattered trees

8.9.35 The loss of scattered mature trees to construction of the proposed scheme is permanent/irreversible; however, the extent of this loss within the context of the local landscape would not negatively affect the integrity of this habitat resource. The habitat loss represents a minor adverse impact upon this receptor of local importance and is therefore preliminarily assessed as a slight adverse effect, which is not significant.

Hedgerows

8.9.36 Construction activities would have the following impacts on hedgerows during the construction phase, in the absence of mitigation or suitable working practices:

- Loss and fragmentation of hedgerow habitat
- Degradation of habitat

8.9.37 Approximately 16.9 miles (27.3 kilometres) of hedgerow falls within the land required for construction of the proposed scheme, however it should be noted that this figure includes hedgerows, such as those along the western verge of the A358, that should be retained through further refinement of design and implementation of appropriate protection measures therefore this is a preliminary figure and would be refined and reported in the ES submitted to support the DCO application.

8.9.38 The preliminary design includes the planting or enhancement of approximately 28.7 miles (46.2 kilometres) of native species-rich hedgerows and hedgerows with trees. This would result in up to 12.9 miles (20.8 kilometres) of additional species rich hedgerow resource across the proposed scheme, which offers improved connectivity to the existing hedgerow network, and other existing and proposed semi-natural habitats.

8.9.39 The loss of important and priority habitat hedgerows, and the associated fragmentation the hedgerow network, would result in the permanent/irreversible damage to this biodiversity resource, the extent of which would negatively affect the integrity of the resource. The habitat loss represents a major adverse impact upon this receptor of national importance and is therefore preliminarily assessed as a large adverse effect, which is significant.

8.9.40 The creation or enhancement of 28.7 miles (46.2 kilometres) of native species-rich hedgerows would result in permanent addition to the retained resource of hedgerow that would positively affect the integrity of this resource, once established. The habitat creation represents a major beneficial impact upon this biodiversity resource which is of national importance. This impact is therefore preliminarily assessed as a large beneficial effect, which is significant.

Grassland

8.9.41 The majority of grassland recorded within the study area comprises improved grassland (32.1 hectares) with areas of amenity grassland (0.4 hectares) associated with settlements. Improved grassland and amenity grassland are of less than local importance and so are not included in the assessment.

8.9.42 The proposed scheme would result in the following direct losses of grassland types valued as of local importance and above:

- Poor semi-improved grassland (24.4 hectares)
- Neutral grassland – semi-improved (6.6 hectares)
- Marshy grassland (1.2 hectares)

8.9.43 Most grassland has been categorised as poor semi-improved grassland but noted that there are localised areas of species richness. Areas of neutral semi-improved grassland were identified north of Ashill and Kenny either side of Venner's Water, and areas of marshy grassland identified at Capland and towards the north of the proposed scheme associated with Black Brook. These areas were subject to National Vegetation Classification surveys and found to be grazed by cattle which were contributing to a more improved sward and low abundance and richness of forbs. As such they are not considered to meet the criteria of lowland meadow or floodplain grazing marsh priority habitats.

8.9.44 New species rich grassland habitats would be created, and existing retained grassland enhanced, along the proposed scheme. Grassland creation and enhancement has been focussed on those areas where the more diverse grasslands are lost such as at Capland, adjacent to Venner's Water and Black Brook, in locations where there is a requirement for mitigation for fauna such as along Jordans Park, near to the River Ding and west of Meare Green, and also where there are opportunities to incorporate grassland creation alongside specific structures within the proposed scheme such as Ashill Junction and Mattock's Tree Green Junction.

8.9.45 The grassland species mix would include a diverse range of grasses and herbs of local provenance and characteristic of the local area and those which provide the

greatest opportunities for local wildlife e.g. by incorporating a high proportion of flowering plants for pollinators and seed producing species for birds. Grassland planting is shown on the Environmental Mitigation Plan (Figure 7.8).

8.9.46 With the planting of 43.9 hectares of species rich grassland and creation or enhancement of 10.3 hectares of marshy grassland, there would be a net increase of up to 22 hectares of species rich grassland habitats and an improved connectivity between adjacent semi-natural habitats, and provide foraging 'stepping stones' for pollinators, once the grasslands have established.

8.9.47 Given the timescales required for marshy grassland habitat creation to provide an equivalent biodiversity resource to that lost, the loss of 1.2 hectares of marshy grassland would result in permanent/irreversible damage that would negatively affect the integrity of the resource. The habitat loss represents a major adverse impact upon this biodiversity resource of local importance. This impact is therefore is preliminarily assessed as a slight adverse effect and not significant.

8.9.48 Given the timescales required for neutral semi-improved grassland habitat creation to provide an equivalent biodiversity resource to that lost, the loss of 6.6 hectares of neutral semi-improved grassland would result in permanent/irreversible damage that would negatively affect the integrity of the resource. The habitat loss represents a major adverse impact upon this biodiversity resource of local importance, This impact is therefore preliminarily assessed as a slight adverse effect, which is not significant.

8.9.49 Given the timescales required for grassland habitat creation to provide an equivalent biodiversity resource to that lost, the loss of 24.4 hectares of poor semi-improved grassland would result in permanent/irreversible damage that would negatively affect the integrity of the resource. The habitat loss represents a major adverse impact upon this biodiversity resource of local importance. This impact is therefore preliminarily assessed as a slight adverse effect, which is not significant.

8.9.50 The creation of approximately 54.2 hectares of species rich grassland would result in a permanent addition to the retained resource of semi-improved neutral and marshy grasslands that would positively affect the integrity of this resource, once established. The habitat creation represents a major beneficial impact upon this biodiversity resource of national importance. This impact is therefore preliminarily assessed as a large beneficial effect, which is significant.

Waterbodies

8.9.51 Nineteen ponds fall within or directly adjacent to the land required for construction of the proposed scheme. These are predominantly small ponds within woodlands and hedgerows at the edge of agricultural fields. Two of the waterbodies are larger flood attenuation basin type features directly adjacent to the A358, one to the south of West Hatch Lane and the other near Rapps, as shown on the Phase 1 Habitats Plan within Appendix 8.2.

8.9.52 A replacement wildlife pond would be created for each pond lost to construction of the proposed scheme. Where the pond supports a protected species, such as great crested newts, a minimum of two ponds would be created as compensation for the loss. Ponds would be created within the grassland habitat creation areas shown on the Environmental Mitigation Plan (Figure 7-8). The exact location and number of ponds would be reported in the ES following completion of the updated protected species and habitat surveys. Ponds would be designed to benefit a

range of wildlife and planted with native marginal and emergent aquatic plants of local provenance. Where ponds are at the edge of the land required for construction, these would be retained where possible and subject to appropriate protection measure against construction related dust and water pollution. Such protection measures would be detailed within the EMP submitted to support the DCO application.

8.9.53 The loss of 19 ponds would result in permanent and irreversible damage that would negatively affect the integrity of the resource. This habitat loss represents a major adverse impact upon this biodiversity resource of local importance. This impact is therefore preliminarily assessed as a slight adverse effect, which is not significant.

8.9.54 The creation of at least 19 ponds specifically designed for wildlife would result in a permanent addition to the retained resource of pond habitat that would positively affect the integrity of the resource, once established. The habitat creation represents a major beneficial impact upon this biodiversity resource of local importance. This impact is therefore preliminarily assessed as a slight beneficial effect, which is not significant, but will provide benefits for local biodiversity.

Watercourses

8.9.55 A large number of watercourses are present within the study area, many of which are crossed by the existing and proposed duelled A358 or would be crossed by the offline section of the proposed scheme. The channels, and associated riparian habitats, of these watercourses provide important foraging, shelter and dispersal opportunities for a range of species, and act as important ecological corridors through the wider landscape. The construction of the proposed scheme has the potential to impact upon these watercourses through direct loss, fragmentation and degradation of their habitats.

8.9.56 Where watercourses pass beneath the online section of the proposed scheme through existing culvert and bridge structures, these structures would either be extended or a new adjacent structure created adjacent to the existing structure to accommodate the dualling of the A358. Three watercourses; Black Brook Tributary 1, Black Brook Tributary 2 and the Thornwater Stream, would be crossed by the offline section of the proposed scheme and therefore pass through new culvert and under bridge structures.

8.9.57 As detailed within the embedded mitigation section and Chapter 13 Road Drainage and the Water Environment, specific measures would be implemented during construction to prevent the degradation of the water environment. Such measures would be detailed within the EMP and would include management of chemicals/fuels, dewatering protocols, piling risk assessments etc.

8.9.58 Watercourses that pass beneath the existing A358 as part of the online section of the proposed scheme would be subject to the loss of adjacent habitat to allow construction of the extended culverts or new adjacent underbridges. These habitat losses would be relatively small within the context of the watercourse and presence of existing structure. Efforts would be made to retain as much of the natural channel as possible. Where sections of the watercourse are only temporarily lost to permit construction, these areas would be re-vegetated post-construction with local species characteristic of the wider riparian corridor. A detailed assessment of the impact of this loss on each watercourse would be provided as part of the ES. On a preliminary basis, the localised loss of watercourse habitats either side of the existing culvert/bridge structures under the

A358 could cause permanent damage to a biodiversity resource. However, its extent does not affect the integrity of the watercourse and is, therefore, considered to represent a minor adverse impact on the biodiversity resource of each watercourse which are of local importance. This impact is therefore preliminarily assessed as a neutral adverse effect, which is not significant.

8.9.59 The Thornwater Stream would be crossed by the offline section of the proposed scheme via a new culvert, approximately 0.09 miles (150 metres) upstream of an existing culvert that passes under the existing A358 west of Thornfalcon. To accommodate the new culvert the Thornwater Stream will be subject to an approximate 0.05 mile (80 metre) long realignment. Approximately 0.07 miles (120 metres) of the Thornwater Stream falls within the land required for the construction of the proposed scheme and will result in the loss of riparian habitats along this corridor. The new culvert would be designed to allow it to continue to function as a biological corridor, and habitats would be established along the realigned stretch post construction. The loss and fragmentation of habitats on the Thornwater Stream would cause permanent loss of approximately 0.07 miles (120 metres) of existing river bed and bankside habitats, which would negatively affect the integrity of the watercourse, and represent a major adverse impact on this receptor of local importance which is therefore preliminarily assessed as a slight adverse effect, which is not significant.

8.9.60 As detailed within Chapter 13 Road Drainage and the Water Environment, where watercourses require channel diversions or realignments, these would be designed to match existing conditions (as a minimum) to maintain existing flood risk, water quality and geomorphological conditions. Opportunities would be sought to incorporate habitat and hydromorphological improvements through ‘re-naturalisation’ of the channel form.

8.9.61 Black Brook Tributaries 1-3 would be crossed by the offline section of the proposed scheme via three new underbridges, each approximately 0.02 miles (30 metres) in length. An approximately 0.31 miles (500 metre) realignment of Black Brook Tributary 3 is required to connect into Black Brook Tributary 2 and the new underbridge to allow this structure to be perpendicular to the proposed scheme ensuring the length of culverting is kept to a minimum. The realigned section would be designed following the principles detailed above to seek to provide habitats of wildlife benefit along its diverted length. The direct loss of riparian habitats, and fragmentation of the habitat corridors they provide, would cause permanent damage to the Black Brook Tributaries 1-3, which would negatively affect the integrity of the watercourse. This represents a major adverse impact on these receptors of local importance. Given the scale of the realignment the impact is preliminarily assessed as a slight adverse effect, which is not significant.

8.9.62 Five Head River Main Channel 2 passes beneath the A358 via an underbridge, the construction of the new eastbound carriageway would require an additional underbridge to be constructed directly to the north of the existing. To accommodate this new crossing, an approximately 0.02 mile (40 metre) long realignment of the watercourse is required. The realigned section would be designed following the principles detailed above to seek to provide habitats of wildlife benefit along its diverted length. Once established it is anticipated that the realigned stretch of watercourse would provide an equivalent or greater biodiversity value to that lost. Given the presence of the existing underbridge structure, the new underbridge structure is not considered to represent a significant barrier to the function of the watercourse as a biological corridor. The loss of riparian habitats, and fragmentation of the habitat corridors it provides,

would cause temporary, reversable damage to Five Head River Main Channel 2, that would negatively affect the integrity of the watercourse. This represents a moderate adverse impact on this receptor of local importance which is therefore preliminarily assessed as a slight adverse effect, which is not significant.

8.9.63 Venner's Water passes beneath the A358 via an underbridge; the construction of the new eastbound carriageway would require an additional underbridge to be constructed directly to the north of the existing, a new crossing point would also be required approximately 0.05 miles (80 metres) to the north to accommodate the Stewley Link Road. The Stewley Link Road crossing would also require realignment of approximately 0.02 miles (25 metres) of the watercourse either side of the crossing. The realigned section would be designed following the principles detailed above to seek to provide habitats of wildlife benefit along its diverted length. Once established it is anticipated that the realigned stretch of watercourse would provide an equivalent or greater biodiversity value to that lost. However, the new crossing point on the watercourse represents a further fragmentation of the habitat corridor it provides, which would cause permanent damage to Venner's Water, which would negatively affect the integrity of the watercourse. This represents a major adverse impact on these receptors of local importance. However, given the small scale of the realignment the impact is preliminarily assessed as a slight adverse effect, which is not significant.

8.9.64 The Back Stream connects to the River Ding and River Isle, and currently passes beneath the A358 via an underbridge; Ding Bridge. The construction of the new eastbound carriageway of the proposed scheme to the north of the existing A358 would require an additional underbridge to be constructed for the Back Stream. In order to keep the length of the underbridge to a minimum it has been designed perpendicular to the east bound carriageway of the proposed scheme and would therefore require realignment of the Back Stream channel between the two carriageways to connect into the new underbridge. The new underbridge would also need to accommodate an access track alongside the watercourse. The culverting and realignment of the Back Stream would result in the direct loss of channel habitats, bankside vegetation to the retained channel between the carriageways and within the construction area for the new carriageway. The construction of the proposed scheme would further fragment the Back Stream, creating an isolated stretch of channel approximately 0.09 miles (150 metres) in length between the two underbridge structures. The direct loss of riparian habitats, and fragmentation of the habitat corridor it provides, would cause permanent damage to the Back Stream, negatively affecting the integrity of the watercourse. This represents a major adverse impact on this receptor of local importance and is therefore preliminarily assessed as a slight adverse effect, which is not significant.

Protected species

Orchids

8.9.65 The orchid assemblage within the study area is considered to be of local importance.

8.9.66 The potential impacts on orchids during the construction phase are:

- habitat loss
- habitat degradation

8.9.67 **Habitat loss:** Construction of the proposed scheme would result in the direct loss of habitats supporting assemblages of orchid, in particular to the dualling of the proposed scheme and loss of the habitats along the east of the A358 at Hatch Park near Griffin Lane. New grassland, woodland edge and hedgerow habitat creation is proposed within close proximity to this loss but outside of the construction footprint to allow early establishment of the habitats. An orchid translocation exercise is proposed to relocate the orchids and their associated soils to these newly created habitat receptor sites. It is recognised that orchid translocation has a high failure rate due to the specific soil requirements and dependence on mycorrhiza, as such the translocation exercise would be carefully planned and the receptor habitats would be managed to encourage the natural colonisation of orchids to compliment the translocated plants and ensure the long-term viability of the local orchid population. Following a successful translocation and establishment of the receptor habitats the loss of the orchid assemblage to construction of the proposed scheme would result in temporary and reversable damage to the local orchid assemblage, that would not affect the integrity of the resource. The habitat loss represents a negligible adverse impact upon this biodiversity resource of local importance. This impact is therefore preliminarily assessed as a neutral effect, which is not significant.

8.9.68 **Habitat degradation:** Given their proximity to the construction works, orchids within retained habitats adjacent to the proposed scheme would be at risk of degradation associated with construction related dust deposition and or changes in water quality or flow. Mitigation measures to further reduce the risk of impacts of habitat degradation on orchids would be implemented and are to be detailed in the EMP submitted with the ES. With the implementation of this mitigation, dust deposition and changes in water quality as a result of construction would result in temporary/reversible damage that would not affect the integrity of the orchid assemblage and therefore represents a negligible adverse impact upon this receptor of local importance and is therefore preliminarily assessed as a neutral effect, which is not significant.

Bats

8.9.69 The overall assemblage of bats within this study area are considered to be of national importance. Within this assemblage common bat species using habitat features within the study area which are considered of low value to the population and are preliminarily assessed as of local importance.

8.9.70 The potential impact on bats during the construction phase are:

- loss of roosts
- loss of foraging habitats
- disturbance (from noise and vibration)
- severance of habitat and barrier to dispersal (habitat fragmentation)

8.9.71 **Loss of roosts**: Construction of the proposed scheme would result in the loss of likely day tree roosts utilised by low numbers of common bat species which are considered of low value to the population and preliminarily assessed as of local importance. Replacement roosts would be provided under a mitigation licence from Natural England.

8.9.72 Replacement roosts would be provided as mitigation. The exact locations and details of the replacement roosts will be detailed within the EMP to be provided with the ES. With this mitigation implemented, the loss of these roosts would

result in temporary/reversible damage to the bat populations that would not affect their integrity. The loss of the roost represents a negligible adverse impact upon the bat assemblage of local value, which is preliminarily assessed as being neutral and not significant.

8.9.73 All four Annex II species have been identified during activity surveys and Bechstein's and barbastelle are known to be roosting in woodlands near to the proposed scheme. Further detail will be provided upon completion of the update surveys to be undertaken in the 2021/2022 survey season and a full assessment will be reported in an addendum to the ES. Given the presence of these species, the potential exists for the loss of roosts of national importance, such as a maternity colony of an Annex II species. If present within the land required for construction of the proposed scheme, these roosts would be subject to replacement with the mitigation measures appropriate to the significance of the roosts to be lost. Replacement roosts would be provided under a mitigation licence from Natural England. On implementation of these measures the loss of Annex II roosts to construction of the proposed scheme would result in temporary/reversible damage to the bat populations, that would not negatively affect their integrity. The roost loss would represent a negligible adverse impact upon this nationally important receptor, which is preliminary assessed as a slight adverse effect, which is not significant.

8.9.74 **Loss of foraging habitats:** Construction of the proposed scheme would result in the loss of foraging habitat for the bat assemblage including the four Annex II species. The importance of the habitats adjacent to the existing A358, and within the proposed scheme, including woodland and grassland habitats near Huish Woods as well as the woodland complex between Bickenhall Wood and Hatch Beauchamp, have been identified as a result of the advanced surveys for Annex II species (Bechstein's and barbastelle) and the woodland habitats present throughout the length of the proposed scheme including those directly adjacent to the A358 in addition to hedgerows and watercourses/bodies are likely to be of high value for the bat assemblage associated with the site.

8.9.75 High value habitats would be retained where possible. The environmental design will include the creation of a linked mosaic of higher quality habitats of suitability for bats, which would increase the foraging habitat to the east and west of the proposed scheme in addition to the bolstering of existing vegetation, early/accelerated planting and/or translocation of habitats. The details of these habitats and their management will be described in detail within the EMP .

8.9.76 Following construction mitigation, the effects of habitat fragmentation may still require some bats to seek alternative foraging resources, travel greater distances and thus expend more energy during construction. The fragmentation of bat foraging and commuting habitat would result in temporary/reversible damage to bat populations that would not negatively affect their integrity. This fragmentation represents a moderate adverse impact upon this nationally important receptor, which is preliminarily assessed as a moderate adverse effect, which is significant.

8.9.77 **Disturbance:** Construction of the proposed scheme could result in increases in levels of noise, vibration or light which could lead to bats abandoning roosts. Roosts have been identified in trees and buildings within 0.01 miles (20 metres) of the proposed scheme that would be likely to be subject to disturbance effects as a result of the proposed scheme, in addition to further roosts between 0.01 miles (20 metres) and 0.06 miles (100 metres) (including maternity colonies of common pipistrelle between 0.03 miles (50 metres) and 0.06 miles (100 metres)).

8.9.78 Construction phase mitigation measures to reduce disturbance impacts would be drawn up in consultation with Natural England and will be detailed within the EMP. With this mitigation implemented, disturbance impacts to these roosts would result in temporary/reversible damage to the bat populations that would not affect their integrity. This disturbance represents a negligible adverse impact upon this nationally important receptor, which is preliminarily assessed as a slight adverse effect, which is not significant.

8.9.79 **Severance of habitat and barrier to dispersal**: Construction of the proposed scheme would result in the severance and fragmentation of foraging habitat and commuting habitat, notably at the high value crossing points identified during the activity surveys such as Griffin Lane underbridge and Meare Stream Culvert in addition to the woodland adjacent to the road including near Huish Woods and the woodland complex between Bickenhall Wood and Hatch Beauchamp, identified during the advanced surveys.

8.9.80 Habitat fragmentation is likely to affect all species in the identified assemblages including the four Annex II species with the possible exception of species more commonly associated with more open habitat types such as noctule, Leisler's and serotine.

8.9.81 Construction mitigation could include the retention and bolstering (with vegetation) of existing underpasses, creation of hop-overs in identified high value bat passage areas and habitat translocation (such as tree translocation) and/or early/accelerated planting may be carried out in areas where short-term habitat creation is required to minimise fragmentation effects. The EMP will include a description of the creation of a linked mosaic of higher quality habitats of suitability for bats, which would increase the foraging habitat to the east and west of the proposed scheme, in order to further reduce the fragmentation impacts.

8.9.82 The effects of habitat fragmentation may still require some bats to seek alternative foraging resources, travel greater distances and thus expend more energy during construction. The fragmentation of bat foraging and commuting habitat would result in temporary/reversible damage to bat populations that would not negatively affect their integrity. This fragmentation represents a moderate adverse impact upon this nationally important receptor, which is preliminarily assessed as a moderate adverse effect, which is significant.

White-clawed crayfish

8.9.83 The survey information gathered to date has concluded the likely absence of white-clawed crayfish within the study area of the proposed scheme. Surveys are being undertaken in 2021 to validate the findings of the previous surveys, however no change in status is expected given the national retreat in the range of this species. As such the preliminary assessment is that there will be no observable impact upon, and therefore no change to, white-clawed crayfish populations as a result of the construction of the proposed scheme. As this species is of national importance, this represents a neutral effect which is not significant.

Hazel Dormouse

8.9.84 The populations of Hazel dormouse within the study area are considered to be of county importance.

8.9.85 The potential impacts on Hazel dormouse during the construction phase are:

- habitat loss
- severance of habitat and barrier to dispersal
- injury/direct mortality and disturbance

8.9.86 **Habitat loss:** Construction of the proposed scheme would result in the loss of hedgerow, scrub and woodland habitats that have been found to support populations of hazel dormouse. In many locations dormice are found in habitats impinged between the existing A358 and an intensively managed agricultural landscape. This habitat loss would reduce foraging and nesting opportunities and ultimately the carrying capacity of the study area to support dormice, potentially leading to death or reproductive failure of individuals, threatening the long-term viability of the local dormouse population.

8.9.87 Large areas of hedgerow and woodland habitat creation, and habitat management, are proposed as part of the proposed scheme to compensate the habitats lost. This would form part of a mitigation strategy to be agreed with Natural England as part of the mitigation licence for the proposed works. Where possible the carrying capacity of adjacent habitats would be improved through introduction of a sensitive management regime which enhances the foraging resource i.e. rotational hazel coppicing, and hedgerow management. This would be supplemented by habitat creation which would provide foraging and shelter opportunities once established. In these instances, the intention would be to displace dormice from the land required for construction into the adjacent habitats. Where adjacent habitats are not suitable to support a displaced population of hazel dormice, a translocation exercise may be required to an offsite receptor area. The details of this strategy would be agreed with Natural England and submitted with the ES. The details of all habitat creation areas would be provided as part of the EMP with the ES.

8.9.88 With the implementation of the mitigation described above it is recognised that new habitats and management regimes would take time to provide an equivalent foraging and shelter resource to those lost. The loss of habitats therefore would result in temporary/reversible damage to the dormouse populations that would affect their integrity. The habitat loss represents a moderate adverse impact upon the local hazel dormouse population which is of county importance. This impact is therefore preliminarily assessed as a slight adverse effect, which is not significant. It is anticipated that within approximately five years, once the NE licenced mitigation strategy has been implemented and habitats have established to a level they provide an equivalent resource to that lost, that the impact of the habitat loss to construction of the proposed scheme would be reduced to a negligible adverse impact and therefore represent a neutral effect.

8.9.89 **Severance of habitat and barrier to dispersal:** The study area includes hedgerows and wooded belts that connect into a wider network of hedgerows through the landscape. These habitats offer dispersal opportunities and maintain gene flow between local populations of dormice ensuring their long-term viability. The construction of the proposed scheme would result in the loss of much of the hedgerow, scrub and woodland belt that runs along the verge of the existing A358, and the offline section would sever a network of hedgerows that currently pass through largely open countryside to the south of the A358. These habitats are used by dormice for foraging, shelter and dispersal. The fragmentation of these habitats would lead to the isolation of populations by removing or significantly reducing the movement of individual animals between areas.

8.9.90 The areas of hedgerow and woodland creation and management, described above, have been designed to provide connectivity between retained blocks of dormouse habitat and larger areas of habitat creation. Once established these habitats would contribute to the dispersal corridors into the wider landscape and maintain connectivity to the wider dormouse population. The proposed scheme would include the provision of dormouse bridges in key locations to allow movement of dormice across the proposed scheme, these would be designed to connect into retained vegetation and the wider habitat network. Dormouse bridges would be crucial through the offline section to maintain connectivity to the habitats, and dormouse population they support, between the existing A358 and proposed scheme. Dormouse bridges would also be installed at key locations on the online section of the proposed scheme to restore connectivity between habitats on either side of the existing A358, this would help to compensate reductions in connectivity elsewhere on the proposed scheme.

8.9.91 With the implementation of the mitigation described above it is recognised that new habitats and management regimes take time to mature and provide an equivalent level of connectivity and dispersal function to that lost. The severance of habitats and barrier to dispersal therefore would result in temporary/reversible damage to the dormouse populations that would affect their integrity. The habitat fragmentation represents a moderate adverse impact upon this receptor of county importance and is therefore preliminarily assessed as a slight adverse effect, which is not significant.

8.9.92 **Disturbance and injury/direct mortality:** Vegetation clearance works or construction activities within proximity to dormouse habitats have the potential to lead to disturbance, killing or injury of dormice. Dormice utilise habitats in different ways throughout the year and this has implications for their vulnerability to disturbance and their risk of injury from works associated with the construction of the proposed scheme. Dormice hibernate at the base of hedgerows, coppice stools, trees and within natural debris, during the autumn and winter (November-March). They are most vulnerable to being killed or injured by vegetation clearance and constructions works during this period. From April to October dormice are active and disperse through hedgerows and woodlands making nests and giving birth to young from June to September. Dormice are particularly vulnerable to disturbance during this period, as it can cause mothers to abandon their young.

8.9.93 The full details of the dormouse mitigation strategy would form the basis of the Natural England mitigation licence and would be included within the ES. Vegetation clearance associated with a dormouse displacement or part of a dormouse translocation strategy would take the form of a two-stage clearance exercise. All clearance works would be undertaken under supervision of a suitably experienced ecologist.

8.9.94 With the implementation of the mitigation described in Section 8.8, the risk of disturbance, injury/direct mortality would result in temporary/reversible damage to the dormouse populations that does not affect their integrity. The risk of disturbance, injury/direct mortality represents a negligible adverse impact upon this receptor of county importance and is therefore preliminarily assessed as a slight adverse effect, which is not significant.

Breeding and wintering bird assemblages

8.9.95 The breeding bird assemblage within the study area is considered to be of local importance. The wintering bird assemblage within the study area is also considered to be of local importance.

8.9.96 The potential impacts on the breeding and wintering bird assemblages during the construction phase are:

- injury/direct mortality from construction activities
- loss of breeding and roosting habitat
- loss and fragmentation of foraging habitat
- increased lighting and disturbance

8.9.97 **Injury/direct mortality:** With the implementation of mitigation measures, including timing of vegetation clearance and pre-construction nest checks (if works cannot be timed outside of the breeding bird season) injury/direct mortality and/or destruction of nests would be avoided. The preliminary assessment is that there would be no observable impact, and therefore no change to, the breeding or wintering bird assemblages resulting from injury or direct mortality during construction works. As these assemblages are of local importance, this is preliminarily assessed as a a neutral effect which is not significant.

8.9.98 **Loss of breeding habitat:** Construction activities would result in the loss of breeding bird habitat, notably grasslands, hedgerows, scrub and woodland. To mitigate for loss of breeding habitat, grassland, hedgerow and woodland habitat creation has been included within the proposed scheme. Habitat creation would begin before construction and nesting bird boxes would be provided on retained trees and structures for a range of species as detailed in the mitigation section. It is recognised that time is required for the habitats to provide an equivalent nesting resource to that lost therefore the loss of breeding habitat would result in temporary/reversible damage to the breeding bird assemblage that would negatively affect its integrity within the ZoI. This habitat loss represents a moderate adverse impact upon the breeding bird assemblage which is of local importance. This impact is therefore preliminarily assessed as a slight adverse effect, which is not significant.

8.9.99 **Loss and fragmentation of foraging habitat:** Loss of grassland, arable and other semi-natural habitats would reduce foraging opportunities during construction. To mitigate for the loss of connectivity and increased fragmentation, the proposed scheme incorporates habitat creation designed to provide additional foraging resources along the length of the proposed scheme, once established, and provided connectivity with retained semi-natural habitat blocks.

8.9.100 It is recognised that time is required for the habitats to provide an equivalent foraging resource, therefore the loss and fragmentation of foraging habitat would result in temporary/reversible damage to the breeding and wintering bird assemblages that would negatively affect their integrity. This habitat loss represents a moderate adverse impact upon breeding and wintering bird assemblages which are of local importance. This impact is therefore preliminarily assessed as a slight adverse effect, which is not significant.

8.9.101 **Disturbance, including sound and lighting:** Construction activities on site are likely to displace breeding and wintering birds both within the proposed scheme and potentially in adjacent habitat due to disturbance from increased noise levels and visual disturbance. Noise levels would increase overall, and some are likely

to be irregular in occurrence, meaning that birds are less likely to become habituated to them, although habituation is more likely where there is frequent of continuous noise or activity. Visual disturbance could also reduce the suitability of habitat for foraging. Lighting of construction areas and access routes could disturb owls causing them to avoid affected foraging areas and/or impact roosting.

8.9.102 The EMP to be provided with the ES will detail measures to mitigate the potential sources of disturbance, this will include provision of lighting design, schedule of works, planting and its management. Disturbance from construction activities would result in temporary/reversible disturbance to breeding and wintering bird assemblages that would not affect their integrity. This disturbance represents a negligible adverse impact upon the breeding and wintering bird assemblages which are of local importance. This impact is therefore preliminarily assessed as a neutral effect, which is not significant.

Barn owl

8.9.103 The population of barn own within the study area is considered to be of county importance.

8.9.104 The potential impacts on barn owl during the construction phase are:

- loss of breeding and roosting habitat
- loss and fragmentation of foraging habitat
- injury/direct mortality
- disturbance

8.9.105 **Loss of breeding and roosting habitat:** Of the 50 Potential Nest Sites (PNS) identified within the study area, four were confirmed as OBS, five as Active Roost Sites (ARS) and one Temporary Roost Site. It should be noted that the remaining PNS could become occupied in the future as barn owl populations undergo significant fluctuations depending on factors such as the availability of prey species and weather conditions. It is, therefore, possible that breeding barn owl could occur in locations where they have previously been recorded as absent, update surveys are being undertaken in 2021 to inform the ES.

8.9.106 The nearest OBS is located approximately 0.34 miles (550 metres) from the proposed scheme to the west of Capland. One ARS and twelve of the PNS are located within 0.31 miles (500 metres) of the proposed scheme and therefore if utilised by barn owl in the future may be subject to disturbance impacts during the construction phase. It is likely that barn owls would temporarily avoid areas undergoing disturbance from construction effects and would find alternative roost sites as there are suitable alternative sites in the vicinity.

8.9.107 Following implementation of the mitigation described in Section 8.8 the loss of breeding and roosting habitat would result in temporary/reversible damage to the barn owl population that would not affect its integrity. This habitat loss represents a negligible adverse impact upon the barn owl population which is of county importance. The impact is therefore preliminarily assessed as a slight adverse effect, which is not significant.

8.9.108 **Loss and fragmentation of foraging habitat:** Construction of the proposed scheme would result in the permanent loss and fragmentation of Type 1 and Type 2 barn owl foraging habitat. This includes the loss and fragmentation of high-quality habitats within the construction footprint of the offline section of the proposed scheme to the west of Henlade, and also along the online section at

Jordans Park LWS, around Ashill and Venner's Water and the farmland surrounding Bickenhall Wood. It is likely that barn owls would temporarily avoid disturbed areas of habitat and would forage in more distant and possibly less productive habitats. This has the potential to increase the risk of mortality through collision with vehicles and/or from reduced prey availability. It also has the potential to decrease breeding success for the same reasons.

8.9.109 The proposed scheme includes the provision of areas of species rich grassland, hedgerow and woodland edge habitats which have been designed to connect into the wider landscape and would be managed specifically for biodiversity. Once established these habitats would offer foraging opportunities for barn owl. On implementation of these mitigation measures, and recognising the time taken for habitats to mature and establish to an equivalent biodiversity resource to the lost, the loss and fragmentation of foraging habitat would result in temporary/reversible damage to the barn owl population that would not negatively affect its integrity. This habitat loss represents a negligible adverse impact upon the barn owl population which is of county importance. This impact is therefore preliminarily assessed as a slight adverse effect, which is not significant.

8.9.110 **Injury/direct mortality:** There is potential for injury and/or mortality of barn owls directly caused by construction activities. This could occur through disturbance causing abandonment of a nest (resulting in the death of dependent young birds), destruction of active nests, and/or collisions with construction vehicles. The EMP would include details of how these risks can be reduced including sensitive timing of the works and site speed limits. There would be no observable impact upon, and therefore no change to, the barn owl population resulting from injury or direct mortality during construction works. As the barn owl population is of county importance, this is preliminarily assessed as a neutral effect which is not significant.

8.9.111 **Disturbance:** Lighting of construction areas and access routes could cause owls to avoid affected foraging areas and/or have an impact on roosting. An increase in noise and physical disturbance during construction activities has the potential to cause abandonment of roosts and/or nests, particularly if disturbance occurs during the early breeding season when birds are egg-laying or incubating. The distance (from disturbance) at which barn owls would abandon a nest would vary depending on the level of disturbance, length of disturbance and the existing disturbance levels that the birds experience. Studies suggest disturbance from human activity can be caused up to 0.06 miles (100 metres) from the nest site, although the distance at which nesting barn owls become intolerant to the approach of humans and works activities can vary depending on levels of localised day to day activity. Forestry England (previously Forestry Commission) [63] sets a safe working distance from barn owls of between 0.06 miles (100 metres) to 0.16 miles (250 metres). Disturbance from construction activities would result in temporary/reversible damage to the barn owl population that would not affect its integrity. This disturbance represents a negligible adverse impact upon the barn owl population which is of county importance. This impact is therefore preliminarily assessed as a neutral effect, which is not significant.

Great crested newt

8.9.112 The populations of great crested newt within the study area are considered to be of county importance.

8.9.113 The presence of great crested newts has been confirmed within four distinct clusters of ponds within the study area considered likely to represent distinct populations.

8.9.114 The potential impacts on great crested during the construction phase are:

- habitat loss
- injury/direct mortality

8.9.115 **Habitat loss:** The construction of the proposed scheme would result in the loss of two ponds that are confirmed as supporting populations of great crested newt. The construction of the proposed scheme would also result in the loss of grassland, ditch, hedgerow, scrub and woodland habitats, within 0.16 miles (250 metres) of confirmed great crested newt ponds, that are likely to be used by great crested newts as terrestrial habitats for foraging, dispersal and shelter. The proposed scheme includes the provision of replacement ponds at a ratio for 2:1 for every confirmed great crested newt pond lost, and 1:1 replacement where great crested newts are absent. Following implementation of the mitigation, whilst recognising the time it takes for compensatory habitats to establish, the loss of aquatic and terrestrial habitats would result in a temporary/reversible damage to the great crested newt population that would affect the integrity of the population. This habitat loss represents a moderate adverse impact upon the great crested newt populations which are of county importance. The impact is therefore preliminarily assessed as a slight adverse effect, which is not significant. It is anticipated that within approximately two years, once the NE licenced mitigation strategy has been implemented, and replacement ponds and associated terrestrial habitats have established to a level they provide an equivalent resource to that lost, that the impact of the habitat loss to construction of the proposed scheme would be reduced to a negligible adverse impact and therefore represent a neutral effect.

8.9.116 **Injury/direct mortality:** The removal of great crested newt ponds and terrestrial habitats, within 0.31 miles (500 metres) of known great crested newt ponds, could result in individual newts being injured or killed. As described in Section 8.8, a mitigation strategy would need to be developed and agreed with Natural England as part of a mitigation licence application for the proposed works, this is likely to include a capture and exclusion exercise to avoid the risk of accidental injury or death of great crested newt during construction. On completion of the capture and exclusion exercise the risk of construction related injury would be reduced to a minimal level and the preliminary assessment is that there would be no observable impact, and therefore no change to, the great crested newt populations, arising from direct mortality during the construction works. As these populations are of county importance, this is preliminarily assessed as a neutral effect, which is not significant.

Otter

8.9.117 The population of otter within the study area considered to be of county importance.

8.9.118 The potential impacts on otter during the construction phase are:

- habitat loss
- severance and barrier to dispersal
- disturbance
- degradation of habitat

8.9.119 **Habitat loss:** Otter have been confirmed on 14 watercourses within the study area. Two potential otter holt sites have been identified within 0.03 miles (50 metres) of the proposed scheme, one on the Meare Stream and the other on the Fivehead River Main Channel. Works to construct extended culverts and underbridges along the online section, and new culverts and underbridges on the offline section of the proposed scheme would result in the direct loss of channel and bankside habitats of watercourses used by otter. This would result in reduced shelter and foraging opportunities, however given the long ranges of individual otters the loss of habitat to construction of the proposed scheme would result in a temporary and reversible damage to the foraging resource of the otter that does not affect the integrity of the otter population. This represents a minor adverse impact on the otter population which is of county importance. This impact is therefore preliminarily assessed as a neutral effect, which is not significant.

8.9.120 **Severance and barriers to dispersal:** The extension of existing culvert/underbridge structures under online section of the proposed scheme and creation of new culverts and underbridges on the offline section of the proposed scheme, have the potential to fragment dispersal corridors used by otter. Such structures may force otters out of the water channel where they may be at risk of injury or death. Furthermore, the fragmentation of otter dispersal corridors may cause fragmentation of populations, reducing the interaction and breeding between isolated populations. Following implementation of the measures described in Section 8.8, while recognising that construction of these crossing structures may act as a barrier to dispersal themselves, the severance effect and barrier to dispersal as a result of construction of the proposed scheme would result in a temporary and reversible damage that does not affect the integrity of the otter population. This represents a negligible adverse impact on the otter population which is of county importance. This impact is therefore preliminarily assessed as a slight adverse effect, which is not significant.

8.9.121 **Disturbance:** Otter are confirmed as using watercourses that fall within the draft DCO boundary. Two holt sites and one couch/resting site have been identified on watercourses at locations within 0.03 miles (50 metres) of the proposed scheme. In the absence of mitigation or suitable working practices, working within 0.03 miles (50 metres) of a watercourse could cause disturbance to otters. Disturbance within close proximity to resting sites or holts may cause otter to abandon these sites. Otter are highly mobile species, and their use of resting features along a watercourse will vary through the year. Pre-construction surveys would determine presence of otters and mitigation requirements, such as working distances, timing of works, lighting in the proximity of watercourses and requirements for artificial holts (if required) would be detailed within the EMP and a form the basis of a licence application to Natural England (if required). Disturbance from construction activities would result in temporary/reversible damage to the otter population that would not affect its integrity. This disturbance represents a negligible adverse impact upon the otter population which is of county importance. The impact is therefore preliminarily assessed as a neutral effect, which is not significant.

8.9.122 **Habitat degradation:** Pollution events in the absence of mitigation could cause short and long-term impacts upon aquatic habitat that otter depend upon for survival; however, pollution control measures would be included within the EMP. The preliminary assessment is that there would be no observable impact upon, and no change to, the otter population due to habitat degradation resulting from construction works. As this population is of county importance, this is preliminarily assessed as a neutral effect which is not significant.

Water vole

8.9.123 The population of water vole within the study area is considered to be of county importance.

8.9.124 The potential impacts on water vole during the construction phase are;

- habitat loss
- severance and barriers to dispersal
- degradation of habitat
- disturbance

8.9.125 **Habitat loss:** Water vole have been confirmed on three watercourses and based on partial survey information are considered likely to be present on an additional five watercourses. This includes the Black Brook, Black Brook Tributaries, Thornwater Stream, Meare Stream, Venner's Water and the River Ding Back Stream. Works to construct extended culverts and underbridges and associated minor realignments along the online section, and new culverts and underbridges on the offline section of the proposed scheme would result in the direct loss of channel and bankside habitats of watercourses used by water vole. This has the potential to result in the direct loss of existing water vole burrows as well as foraging resources, and cover for dispersal. The realignment works proposed on the Thornwater Stream, Black Brook Tributaries and River Ding Back Stream would result in more extensive losses of habitat, potentially comprising the entire home range of a water vole (0.03-0.09 miles (50-150 metres)).

8.9.126 Works impacting upon populations of water vole must be carried out under a conservation licence. This requires the applicant to demonstrate a conservation benefit for water voles. This can be achieved through a net gain in the amount of suitable habitat available to water vole. As described in Chapter 13 Road Drainage and the Water Environment, realigned watercourses would be designed to match existing conditions (as a minimum) to maintain existing flood risk, water quality and geomorphological conditions and opportunities would be sought to incorporate habitat and hydromorphological improvements through 're-naturalisation' of the bank profile and channel form. Appropriate planting would be introduced along realigned watercourses to provide cover and foraging resources for water vole. Opportunities would be sought to enhance retained sections of watercourse adjacent to the proposed scheme, through measures such as the implementation of sensitive management to encourage a diverse botanical composition, fencing to restrict poaching from livestock, and management of scrub encroachment.

8.9.127 Following implementation of the measures described above, the loss of habitat to construction of the proposed scheme would result in temporary and reversible damage to the habitat resource for water vole, however the extent of realignment works would negatively affect the integrity of the water vole population while the riparian habitats of the realigned watercourses establish. This represents a moderate adverse impact on this receptor of county importance and is therefore preliminarily assessed as a slight adverse effect, which is not significant. It is anticipated that within approximately two years, once the licenced mitigation strategy has been implemented and riparian habitats have established to a level they provide an equivalent resource to that lost, that the impact of the habitat loss to construction of the proposed scheme would be reduced to a negligible adverse impact and therefore represent a neutral effect

8.9.128 **Injury/direct mortality:** In the absence of mitigation or appropriate working practices, the construction of the proposed scheme has the potential to result in the direct injury or mortality of water vole, particularly through collapse of burrows with water vole resident. Buffer zones would be established to protect water voles. The exact extent of the buffer zones would be determined on the completion of detailed water vole surveys pre-construction to confirm the location and extent of any burrows present. However, burrows are likely to be at least 5 metres from the toe of the bank.

8.9.129 Where works cannot be restricted to outside of the buffers, it would be necessary to temporarily exclude and remove water vole from the construction areas as using displacement or translocation as described in Section 8.8. Displacement must be undertaken under supervision of a Natural England Class Licence holder. Translocation would require the development of a site-specific licence to permit the works. For both the displacement technique and translocation, the receptor area intended to receive relocated animals, must be created well in advance of the construction works to ensure it is sufficiently established to provide the foraging and shelter requirements of the relocated water vole. Following the implementation of these, the risk of injury and direct mortality as a result of construction of the proposed scheme would be reduced to a level at which there would be no observable impact upon, and therefore no change to, the water vole population, from the construction works. As the water vole population is of county importance, this is preliminarily assessed as a neutral effect which is not significant.

8.9.130 **Severance and barriers to dispersal:** The extension of existing culvert/underbridge structures under online sections of the proposed scheme and creation of new culverts and underbridges on the offline section of the proposed scheme, have the potential to create barriers to water vole dispersal. These barriers may fragment the territories of individual water voles, cause fragmentation of populations, reducing the interaction and breeding opportunities between isolated populations. As described in Section 8.8, the proposed scheme includes the provision of mammal ledges on new culvert or underbridge structures, or where vertical alignment does not allow, the provision of dry tunnels under the proposed scheme, adjacent to the watercourse. As described above water vole would be displaced from working areas prior to the commencement of construction, planting would be introduced at as early a stage post construction as possible to provide cover and foraging resources to encourage water vole to recolonise the areas and pass through new structures and channels.

8.9.131 Following implementation of these measures, while recognising that construction of the crossing structures and realigned channels would act as barrier to dispersal, the severance effect and barrier to dispersal as a result of construction of the proposed scheme would result in temporary and reversible damage that does not affect the integrity of the water vole population. This represents a negligible adverse impact on the water vole population which is of county importance. This impact is therefore preliminarily assessed as a slight adverse effect, which is not significant.

8.9.132 **Degradation of habitat:** Pollution events in the absence of mitigation could cause short and long-term impacts upon aquatic habitat that water vole depend upon for survival; however, pollution control measures would be included within the design and included in the EMP. The preliminary assessment is that there would be no observable impact upon, and therefore no change to, the water vole

population as a result of habitat degradation associated with construction works. As the water vole population is of county importance, this is preliminarily assessed as a neutral effect which is not significant.

8.9.133 **Disturbance:** Water vole are at greatest risk of being adversely affected by disturbance while they are in their burrows. The watercourses supporting water vole within the study area are already subject to a high level of noise, vibration and visual disturbance from the existing road network and agricultural activities. With the implementation of the measures discussed above, including buffer zones and displacement/translocation if required, the preliminary assessment is that there would be no observable impact upon, and therefore no change to, the water vole population as a result of habitat disturbance associated with construction works. As the water vole population is of county importance, this is preliminarily assessed as a neutral effect which is not significant.

Brown hairstreak

8.9.134 The population of brown hairstreak butterfly within the study area is considered to be of local importance.

8.9.135 The potential impacts on brown hairstreak during the construction phase are:

- habitat loss

8.9.136 **Habitat loss:** The construction of the proposed scheme would result in the loss of hedgerows, scrub and woodland edge habitats that have been confirmed as supporting a population of brown hairstreak. Blackthorn is particularly important for brown hairstreak, as females lay their eggs on young blackthorn stems. A reduction in the prevalence of blackthorn, particularly in hedgerows, as a result of clearance required for construction of the proposed scheme has the potential to interrupt the life cycle of the brown hairstreak and lead to decline of its local population.

8.9.137 As described within the embedded mitigation section, the proposed scheme includes the provision of areas of hedgerow and woodland habitat creation. These would be designed to include a high proportion of blackthorn within the planting mix. Hedgerows would be managed on a low intensity management regime to allow brown hairstreak to go through their full life cycle. Opportunities would be explored to translocate hedgerows into habitat creation areas to ensure continuity of mature habitats, while new habitats establish. Following implementation of these measures, but recognising the time taken for habitats to establish to a level at which they offer an equivalent resource to that lost, habitat loss associated with construction of the proposed scheme would result in temporary/reversible damage to the brown hairstreak population that would affect its integrity. This habitat loss represents a moderate adverse impact upon the brown hairstreak population which is of local importance. This impact is therefore preliminarily assessed as a slight adverse effect, which is not significant.

8.9.138 Once established, there would be a net increase in hedgerow habitats with a high proportion of blackthorn, sensitively managed to ensure they support the full life cycle of the brown hairstreak. This habitat creation would result in the permanent improvement of the habitat resource that would positively affect the integrity of the brown hairstreak population. This habitat creation represents a major beneficial impact upon the brown hairstreak population, which is of local importance. This is therefore preliminarily assessed as a slight beneficial effect, which is not

significant, however will provide long term benefits for the brown hairstreak population.

Badger

8.9.139 The population of badgers within the study area are considered to be of local importance.

8.9.140 The potential impacts on badgers during the construction phase are:

- habitat loss
- degradation of habitat
- severance of habitat and barrier to dispersal
- disturbance
- mortality, injury or trapping

8.9.141 **Habitat loss:** Based on survey results, the proposed scheme would result in the loss of badger foraging habitat and badger setts including outlier setts, subsidiary setts, annex setts and at least two main setts. All setts would require closure under a Natural England licence and closure of main setts would require the provision of artificial setts, which need to be in use by badgers, prior to closure of the existing main sett. The location of the proposed artificial sett would be determined on the basis of update survey information being gathered in 2021 & 2022. The location would be shown on the final Environmental Master Plan to be submitted with the ES. The loss of habitat including setts would result in temporary/reversible damage to the badger population that would negatively affect its integrity. This habitat loss represents a moderate adverse impact upon the badger population which is of local importance. The impact is therefore preliminarily assessed as a slight adverse effect, which is not significant.

8.9.142 **Habitat Degradation:** The construction of the proposed scheme has the potential to cause habitat degradation and a potential loss of foraging resource for badgers as a result of pollution events and run off from construction areas including compounds and spoil heaps. The EMP would include a description of proposed protection measures as stated above in the embedded construction mitigation section (para 8.9.64) of this chapter to reduce the likelihood of these risks. The preliminary assessment is that there would be no observable impact upon, and therefore no change to, the badger population as a result of habitat degradation associated with construction works. As this population is of local importance, this is preliminarily assessed as a neutral effect, which is not significant.

8.9.143 **Severance of habitats and barriers to dispersal:** The clearance of sites in preparation for construction of the proposed scheme could lead to isolation of badger populations both within and between clans. Severance could cause an increase in conflict and competition due to a temporary reduction in territory size and foraging resource. Such impacts would be reduced by careful construction programming so that certain crossing areas remain open and early provision of habitat creation areas to ensure enough foraging areas remain available to badgers prior to final crossing points in the form of wildlife culverts being completed. Temporary fencing would be required to funnel badgers to these areas throughout the construction phase.

8.9.144 The proposed scheme would incorporate mammal ledges within culverts, and dry pipe tunnels, as described in Section 8.8, at key crossing points for badger across the proposed scheme. Following implementation of these measures, and the

habitat creation described as part of the embedded mitigation, severance of habitats and territories would result in temporary/reversible damage to the badger population that would not negatively affect its integrity. Severance of habitat represents a negligible adverse impact on this receptor of local importance and is therefore preliminarily assessed as a neutral effect, which is not significant.

8.9.145 **Disturbance:** Construction of the proposed scheme would cause noise and vibration greater than the background level created by the existing A358 and M5. Noise and vibration could result in temporary disturbance which can lead to abandonment of setts and young or in the case of vibration could lead to collapse of sett tunnels leading to mortality. Suitable working methods would be incorporated into the EMP, including the requirement that no works involving heavy machinery or piling are to be undertaken within at least 0.02 miles (30 metres) of an active badger sett, to avoid likelihood of disturbance. Any construction works within this 0.02 miles (30 metres) buffer may require the temporary closure of the sett(s) under a licence from Natural England. Following implementation of these measures the preliminary assessment is that there would be no observable impact upon, and therefore no change to, the badger population from noise and vibration during construction. As this population is of local importance, this is preliminarily assessed as a neutral effect, which is not significant.

8.9.146 **Mortality, injury and trapping:** To reduce the chance of mortality and injury during construction all haul routes, compound areas and works on the live highway would be temporarily fenced off using suitable badger fencing prior to any construction activities and would be detailed in the EMP. Permanent badger fencing would be shown where it is required on the final Environmental Master Plan and would be installed prior to the completed road network opening. This would be presented in the ES which supports the DCO application. Best practice methods to avoid mortality to badgers during construction as a result of construction vehicle collisions or entrapment in excavations would also be included in the EMP as stated in Section 8.8 Design, mitigation and enhancement. Sett closures would be conducted in accordance with best practice guidance and under a Natural England licence. Following implementation of these measures the preliminary assessment is that there would be no observable impact upon, and therefore no change to, the badger population from mortality, injury or trapping during construction. As this population is of local importance, this is preliminarily assessed as a neutral effect, which is not significant.

Reptiles

8.9.147 The populations of reptiles, including slow worm and grass snake, within the study area are considered to be of local importance.

8.9.148 The potential impacts on reptiles during the construction phase are:

- habitat loss and fragmentation
- mortality, injury or trapping

8.9.149 **Habitat loss and fragmentation:** Construction of the proposed scheme would result in the loss of grassland, pond, scrub and hedgerow habitats used by reptiles. As described in section 8.8, habitat creation measures are included within the proposed scheme for reptiles. The details of these habitat creation measures would be included within the EMP with the ES. Following implementation of the mitigation, whilst recognising the time it takes for

compensatory habitats to establish, the loss of habitat would result in temporary/reversible damage to the reptile populations that would negatively affect their integrity. This habitat loss represents a moderate adverse impact upon reptile populations which are of local importance. This impact is therefore preliminarily assessed as a slight adverse effect, which is not significant. It is anticipated that within two to five years once mitigation strategies have been implemented and grassland, scrub and hedgerow habitats have established to a level they provide an equivalent resource to that lost, that the impact of the habitat loss to construction of the proposed scheme would be reduced to a negligible adverse impact and therefore represent a neutral effect.

8.9.150 **Injury/direct mortality:** Reptiles are present along the length of the proposed scheme within grassland and scrub habitats, this includes the verges of the existing A358 where the suitable grassland habitats are located between the road and adjacent intensively managed agricultural land. In the absence of mitigation, construction activities could result in individual reptiles being injured or killed. Given that the suitable habitats along the A358 falls largely within the land required for construction of the proposed scheme, in many instances it would not be possible to displace reptiles from construction working areas into retained adjacent habitats. Therefore, where displacement cannot be deployed, a capture and exclusion exercise would be required, with individual reptiles captured in the construction zone prior to construction occurring and translocated to one of the areas of habitat creation described above. Following implementation of these measures, injury or direct mortality of reptiles during construction would be minimal and it is preliminarily assessed that there would be no observable impact upon, and therefore no change to, the reptile populations arising from direct mortality of reptiles during construction works. As these populations are of local importance, this is preliminarily assessed as a neutral effect, which is not significant.

Terrestrial invertebrates

8.9.151 The assemblages of terrestrial invertebrates within the study area are considered to be of local importance.

8.9.152 The potential impacts on terrestrial invertebrates during the construction phase are:

- habitat loss

8.9.153 **Habitat loss**: Construction of the proposed scheme would result in the loss of a range of habitats utilised by terrestrial invertebrates including grassland, scrub, hedgerows and woodland. The proposed scheme includes the creation of areas of grassland, hedgerow and woodland habitats to mitigate those lost. Species utilised within these habitat creation areas would include species of benefit to invertebrates, including a high proportion of flowering species for pollinators. Additional features including the retention of dead wood from clearance works and creation of log piles within the new habitats would provide habitat opportunities for terrestrial invertebrates. Following implementation of these measures, habitat loss would result in temporary/reversible damage to terrestrial invertebrate assemblages that would not affect their integrity. This habitat loss represents a negligible adverse impact on terrestrial invertebrate assemblages which are of local importance. This impact is therefore preliminarily assessed as a neutral effect, which is not significant.

Fish

8.9.154 Surveys of the River Ding confirmed the presence of European bullhead, brown trout, stone loach, minnow and 3-spined stickleback. Further surveys are proposed on other watercourses within the proposed scheme in 2021. The fish populations within the study area are considered to be of local importance.

8.9.155 The potential impacts on fish during the construction phase are:

- habitat loss
- degradation of habitat
- direct mortality

8.9.156 **Habitat loss:** Surveys of the River Ding confirmed the presence of European bullhead, brown trout, stone loach, minnow and 3-spined stickleback. Further surveys are being undertaken on other watercourse to be subject to realignment as part of the construction of the proposed scheme, these surveys would further inform the assessment of impacts upon the fish population and would be reported in the ES supporting the DCO application.

8.9.157 In addition to the loss of habitats to construction of the watercourse realignments, the construction of the proposed scheme would result in the localised loss of aquatic and marginal habitats for the construction of new culvert/underbridge structures or the extension of existing structures carrying watercourses under the A358. Construction works required within watercourses, such as the proposed realignments, would be undertaken in accordance with relevant guidance and EA permits. Construction activities where fish populations are noted (through the surveys described above) would be sensitively timed as stated in the construction mitigation section. Realigned sections of watercourse would be designed to provide a range of niches for the different life cycles of the species present on the watercourses, this may include incorporating features, such as root bowls of felled trees and willow faggots, into the channel to provide shelter points for fish fry as the vegetation and natural structure of the watercourse develops.

8.9.158 With the implementation of mitigation, habitat loss would result in temporary/ reversible damage to fish populations that would not affect their integrity. Habitat loss represents a negligible adverse impact upon fish populations, which are of local importance. This impact is therefore preliminarily assessed as a neutral effect, which is not significant.

8.9.159 **Degradation of habitat**: The realignment of watercourses including Black Brook Tributaries, Thornwater Stream, Venner's Water, Five Head River Main Channel 2, and the River Ding Back Stream increase the potential for pollution events from fuel and chemical spills, and from construction related sediment run-off, which could cause degradation of the water quality.

8.9.160 As described in Chapter 13 Road Drainage and the Water Environment, appropriate measures would be implemented to attenuate and treat surface water runoff from construction, including the use of pollution control devices where necessary, thereby avoiding degradation of the water environment. Realigned channels of watercourses would be designed to match existing conditions (as a minimum) to maintain existing flood risk, water quality and geomorphological conditions. Opportunities would be sought to incorporate habitat and hydromorphological improvements through 're-naturalisation' of the bank profile and channel form. With the implementation of these mitigation measures, the

preliminary assessment is that there would be no observable impact upon, and therefore no change to, fish populations as a result of habitat degradation associated with construction works. As these populations are of local importance, this is preliminarily assessed as a neutral effect which is not significant.

8.9.161 **Direct mortality:** Mortality of species is highly likely in the absence of mitigation or suitable working practices. Construction activities could result in adult fish of conservation importance being directly killed or injured, eggs laid in spawning habitats destroyed or damaged, juveniles killed or injured, and hypoxia through dewatering resulting in death.

8.9.162 Pre-construction surveys would be conducted to confirm species presence/ absence and to inform any additional mitigation measures necessary to avoid fish mortality such as fish translocation prior to dewatering and sensitive timing of in-channel works. With this mitigation implemented, direct mortality of fish or fish eggs is considered very unlikely. Any direct mortality would result in temporary/reversible damage to fish populations that would not affect their integrity. Direct mortality represents a negligible adverse impact upon fish populations, which are of local importance. This impact is therefore preliminarily assessed as a neutral effect, which is not significant.

Aquatic macroinvertebrates

8.9.163 The assemblages of aquatic invertebrates within the study area are considered to be of local importance.

8.9.164 The potential impacts on Aquatic invertebrates during the construction phase are:

- habitat loss
- degradation of habitat
- injury and/or mortality

8.9.165 **Habitat loss**: The construction of the proposed scheme would result in the localised loss of aquatic and marginal habitats for the construction of new culvert/underbridge structures or the extension of existing structures carrying watercourses under the A358. The construction of the proposed scheme also requires realignments of sections of at least five watercourses; the Black Brook Tributary 3, Thornwater Stream, Fivehead River Main Channel 2, Venner's Water and the River Ding Back Stream. Terrestrial and aquatic habitat for macroinvertebrates would be lost.

8.9.166 The realigned section of watercourses would be designed with sinuosity to replicate a more natural shape and profile, offering a greater range of micro-habitats for aquatic invertebrate species. The realigned channels would incorporate features such as riffles and pools and depth variation to provide further habitat heterogeneity/diversity where possible. As described in Chapter 13 Road Drainage and the Water Environment, opportunities would be sought to incorporate habitat and hydromorphological improvements through 're-naturalisation' of the bank profile and channel form. Following implementation of the mitigation measures, but recognising the time required for habitats to establish, the habitat loss related to construction would result in temporary/reversible damage to aquatic populations that would not affect their integrity. Habitat loss represents a negligible adverse impact upon aquatic macroinvertebrate assemblages, which are of local importance. This impact is therefore preliminarily assessed as a neutral effect, which is not significant.

8.9.167 **Degradation of habitat**: Habitats hydrologically connected to the proposed scheme, are sensitive to effects from construction such as pollution events from fuel and chemical spills, from change in vehicle emissions, and from sediment run-off. This could result in the temporary reduction of macroinvertebrate abundance and diversity. Construction mitigation to avoid and reduce any such impacts on waterbodies and associated sensitive habitats would follow pollution prevention best practice and would be incorporated in the EMP. With the implementation of these measures, there would be no observable impact upon, and therefore no change to, aquatic macroinvertebrates assemblages as a result of habitat degradation associated with construction works. As the assemblage is of local importance, this is preliminarily assessed as a neutral effect, which is not significant.

8.9.168 **Injury and/or mortality:** Where construction of the proposed scheme requires direct works within the watercourse, such as the construction of new culvert/underbridge structures, the extension of existing structures and the realignments on the Black Brook Tributary and River Ding Back Stream, mortality of macroinvertebrates is highly likely in the absence of appropriate mitigation and working methods.

8.9.169 Construction works within the watercourses would be undertaken under the relevant EA permits. As described above the realigned sections of watercourses would be designed to benefit macroinvertebrate populations, and wider biodiversity once established. It is anticipated that colonisation of realigned stretches of channel would occur naturally as a result of natural drift from upstream and via airborne colonisation. These measures would be further detailed within the EMP as part of the ES.

8.9.170 On implementation of the mitigation measures, direct mortality would result in temporary/reversible damage to aquatic invertebrate populations that would not affect their integrity. Direct mortality represents a negligible adverse impact upon aquatic invertebrate populations, which are of local importance. This impact is therefore preliminarily assessed as a neutral effect, which is not significant.

Other section 41 Species of Principal Importance (SPI)

8.9.171 Survey and desk-based data search confirmed the presence of hedgehog, common toad, polecat, brown hare and harvest mouse within the study area. Habitats suitable for these species are found throughout the land required for construction of the proposed scheme.

8.9.172 During construction potential impacts could occur through permanent and temporary habitat loss, severance and disturbance, as well as individual mortality. However, embedded mitigation and best practice techniques, such as habitat clearance designed and timed to be sensitive to these species, alongside habitat manipulation clearance techniques to deter species away from areas, would remove or reduce these risks. Where any animals found during construction are moved by the Ecological Clerk of Works (ECoW) these would be relocated to the most appropriate nearby mitigation areas, for example, common toad would be moved adjacent to wet areas. This approach would be detailed within the EMP as part of the ES.

8.9.173 With the inclusion of these mitigation measures, and the habitat creation measures incorporated into the proposed scheme, it is considered that construction works would result in in temporary/reversible damage to populations

of other SPI that would not affect their integrity. Construction works would have a negligible adverse impact upon SPI populations of local importance, which is preliminarily assessed as a neutral effect, which is not significant.

Operational effects

Designated sites

Statutory designations

8.9.174 Seven international designated sites are present within the study area of the proposed scheme.

8.9.175 Somerset Levels and Moors SPA and Ramsar is within 2.1miles (3.5 kilometres) of, and hydrologically linked to, the proposed scheme. The SPA and Ramsar are sensitive to any reduction in water quality and the potential impact of water pollution during operation of the proposed scheme poses a threat to the species and habitats for which the SPA and Ramsar are designated. The SPA and Ramsar could be considered functionally linked to the proposed scheme through the bird assemblage utilising the land within the study area of the proposed scheme. All internationally designated sites fall beyond 0.12 miles (200 metres) of the ARN with the exception of Somerset Levels and Moors SPA and Ramsar. Given the distance of the proposed scheme and ARN from these internationally designated sites, no significant air quality impacts are anticipated as a result of air quality changes associated with operation of the proposed scheme. The impact is, therefore, preliminarily assessed as there being no change. As the sites are of international importance, this results in a neutral effect, which is not significant. Somerset Levels and Moors SPA and Ramsar is within 0.12 miles (200 metres) of the ARN. However, it does not meet the annual average daily traffic (AADT) exceedance criteria for requiring further assessment and, therefore, no observable air quality impacts are anticipated. The impact is therefore preliminarily assessed as there being no change. As the site is of international importance, this results in a neutral effect, which is not significant.

8.9.176 Severn Estuary SAC, SPA and Ramsar is 15.5 miles (25 kilometres) downstream of, and hydrologically linked to, the proposed scheme. The SAC and Ramsar are sensitive to any reduction in water quality and the potential impact of water pollution during operation of the proposed scheme poses a threat to the species and habitats for which the SAC and Ramsar are designated. The preliminary assessment is that, due to the distance from the proposed scheme, there will be no observable impact upon, and therefore no change to, the bird populations that form the qualifying features of the SPA, as a result of the operation of the proposed scheme. As the SPA is of international importance this is preliminarily assessed as a neutral effect, which is not significant. The Severn Estuary SAC and Ramsar will be taken forward for appropriate assessment as part of the HRA process, as such a preliminary assessment of the impact of the proposed scheme on the SAC and Ramsar is not provided at this stage.

8.9.177 Hestercombe House SAC, Beer and Quarry Caves SAC, Bracket's Coppice SAC and Exmoor and Quantock Oakwoods SACs are designated for their notable bat populations and are located within 18.6 miles (30 kilometres) of the proposed scheme. Operation of the proposed scheme could impact the populations of notable bat for which the sites are designated through increased mortality arising from vehicle collisions. These internationally important sites will be taken forward

for appropriate assessment as part of the HRA process, as such a preliminary assessment of the impact of the proposed scheme is not provided at this stage.

8.9.178 Bracket's Coppice SAC is designated for its populations of Bechstein's bat. At a distance of 11.4 miles (18.3 kilometres) the proposed scheme is beyond the core sustenance zone of Bechstein's bat, therefore there is unlikely to be any impact of increased mortality arising from vehicle collisions upon this qualifying feature of the SAC. The preliminary assessment is that there will be no observable impact upon, and therefore no change to, the qualifying feature of the SAC, as a result of the operation of the proposed scheme. As the SAC is of international importance, this is preliminarily assessed as a neutral effect, which is not significant.

8.9.179 An HRA screening has been undertaken due to the presence of these internationally designated sites, in accordance with DMRB *LA 115* [19]. The HRA screening report can be found in Appendix 8.1: *Habitats Regulation Assessment*. With the exception of Bracket's Coppice SAC and Severn Estuary SPA these internationally designated sites will be taken forward for appropriate assessment. The results of the appropriate assessment will be reported as part of the HRA that will form part of the DCO application.

8.9.180 The potential impacts of the operation of the proposed scheme on other statutory designated sites would be:

- habitat degradation as a result of change in air quality

8.9.181 **Nitrogen deposition**: The proposed scheme could result in an increase in traffic adjacent to statutory designated sites and ancient woodlands, as described in Chapter 5 Air Quality, this would result in an increase in N deposition that exceeds 1% of the lower critical load at each of the following sites:

- Maiden Down SSSI
- Huntspill River NNR

8.9.182 Given that none of these sites will be subject to an increase in N deposition exceeding 0.4kg N/ha/year, in line with the guidance set out in DMRB LA 105 [23] it is considered unlikely that the N deposition would result in observable degradation of the habitats in these locations, i.e. resulting in the loss of one or more species. No observable adverse effects are anticipated at these sites as a result of N deposition associated with operation of the proposed scheme. The impact is therefore preliminarily assessed as there being no change. As the sites are of international importance, this results in a neutral effect, which is not significant. Further assessment of changes in N deposition at these sites and other relevant statutory and non-statutory sites within 0.12 miles (200 metres) of the ARN will be undertaken and reported in the ES following further refinement of the design and the traffic modelling for the proposed scheme.

8.9.183 The proposed scheme would result in an increase in traffic adjacent to Children's Wood/Riverside Park Local Nature Reserve (LNR). As described in Chapter 5 Air Quality, this would result in an increase in nutrient N deposition of 0.4kg N/ha/year within the LNR. The site comprises areas of grassland and woodland along the River Tone providing an important movement corridor for a range of species. In the absence of mitigation, the increase in nutrient N deposition has the potential to lead to the degradation of the species present within the terrestrial habitats. Consultation would be undertaken with Taunton Deane Borough Council (now Somerset West and Taunton Council), who own the LNR, to better

understand the environmental pressures upon the habitats at the LNR and how N deposition may contribute to these and measures that could be taken to mitigate the effects. In the absence of such mitigation but noting that the nutrient N deposition effect is restricted to a small area within the wider LNR, the operation of the proposed scheme would result in permanent/irreversible damage to the terrestrial habitats of the LNR at a magnitude and extent that does not affect the integrity of the LNR. N deposition as a result of the operation of the proposed scheme would have a minor adverse impact upon Children's Wood/Riverside Park LNR, which is of local importance. This impact is therefore preliminarily assessed as a slight adverse effect, which is not significant.

8.9.184 There are 110 non statutory designated sites, including Local Wildlife Sites (Somerset) and County Wildlife Sites (Devon) within 0.12 miles (200 metres) of the ARN. Potential N deposition impacts upon these sites will be assessed and reported in the ES.

Ancient Woodland

8.9.185 **Nitrogen deposition:** The proposed scheme would bring the carriageway of the A358 closer to Bickenhall Wood ancient woodland and would also result in an increase in traffic within 0.12 miles (200 metres) of the ancient woodland. As described in Chapter 5 Air Quality, this would result in a maximum increase in nutrient N deposition as a result of the proposed scheme in 2023 that is predicted to be 0.5kg N/ha/year at Bickenhall Wood ancient woodland. At this location there is a 5.0% increase in N deposition as a percentage of the lower critical load for the relevant habitat (10 kg N/ha/yr). In the absence of mitigation this increase in N deposition has the potential to directly impact the botanical species and change the vegetative composition and structure of the woodland, leading to degradation of the biodiversity of the ancient woodland.

8.9.186 Woodland planting is proposed adjacent to Bickenhall wood to help to buffer the woodland and compensate for degradation of the habitat. Opportunities would be sought to implement sensitive management within the woodland to benefit biodiversity and mitigate the loss of botanical diversity as a result of N deposition. Further studies would be undertaken to inform the assessment of the effect of N deposition on Bickenhall Wood and mitigation proposed as required, this would be reported in the ES. In the absence of such measures the operation of the proposed scheme would result in permanent/irreversible damage to the ancient woodland habitats of Bickenhall Wood that has the potential to affect its integrity. Operation of the proposed scheme would have a major adverse impact upon Bickenhall Wood ancient woodland, which is of national importance. This impact is therefore preliminarily assessed as a large adverse effect, which is significant.

8.9.187 The proposed scheme would result in an increase in traffic adjacent to the following additional ancient woodlands, as described in Chapter 5 Air Quality, this would result in an increase in N deposition at each of the following sites that exceeds 1% of the lower critical load:

- Unnamed ancient woodland 1/2/3/4 (north of the A30 at Coombe, West Crewkerne)
- Unnamed ancient woodland 5 (north of the A30 at Lower Coombe, West Crewkerne)
- Unnamed ancient woodland 6 (north of A303 at Boxstone Hill, Whitelackington)

- Knights Wood ancient woodland
- Warren Hill ancient woodland

8.9.188 Given that none of these sites will be subject to an increase in N deposition exceeding 0.4kg N/ha/year, in line with the guidance set out in DMRB *LA 105* [23] it is considered unlikely that the N deposition would result in observable degradation of the habitats in these locations, i.e. resulting in the loss of one or more species. The preliminary assessment is that there will be no observable impacts, and therefore no change, at these sites as a result of N deposition associated with operation of the proposed scheme. As these sites are of national importance, this is preliminarily assessed as a neutral effect, which is not significant.

8.9.189 Further assessment of changes in N deposition at ancient woodland sites within 0.12 miles (200 metres) of the ARN will be undertaken and reported in the ES following further refinement of the design and the traffic modelling for the proposed scheme.

Habitats

8.9.190 There is potential for degradation of woodland, hedgerow and grassland habitat as a result of pollution from road traffic or surface water run-off during operation of the proposed scheme. With the embedded mitigation in the form of planting and attenuation basins to manage surface water run-off and pollution events from the road, the preliminary assessment is that there would be no observable impact upon, and therefore no change to, habitats within the ZoI from pollution events during the operational phase of the proposed scheme. As habitats are of up to national importance, this is preliminarily assessed as a neutral effect which is not significant.

Protected species

Bats

8.9.191 The potential impacts of the operation of the proposed scheme on the bat assemblage are:

- increased risk of road mortality or injury
- habitat fragmentation

8.9.192 **Direct mortality**: Collision resulting in mortality of bats occurs in areas where bats would attempt to cross the highway when following existing or new linear features (hedgerows, tree lines, and other features). This is particularly relevant to the low flying woodland species present along the proposed scheme such as horseshoe bats and Bechstein's bats which are more reluctant to fly in the open and tend to commute along linear features in the landscape and woodland edges.

8.9.193 Key crossing points have been identified to date at Griffin Lane and Meare Stream Culvert; at these locations bats are safely crossing beneath the existing A358. New culvert and underbridge structures on the proposed scheme would be designed to tie into existing and proposed vegetation belts to encourage their use as safe crossing points for bats beneath the proposed scheme. At other key points where bats cross over the existing A358, the loss of the mature tree belts and hedgerows along the proposed scheme may increase the risk of bats coming into direct contact with vehicles. In such instances tall planting and 'hop-overs'

would be used to encourage bats to pass over the proposed scheme at a safe height, these would be tied into structural planting along the proposed scheme to funnel bats to safe crossing points. Habitat creation including woodland belts and hedgerows have been included in the environmental design to connect existing and proposed blocks of habitats, once established these will create new commuting routes for bats and help to channel them away from the road to safe crossing locations.

8.9.194 Through the further survey work being undertaken along the proposed scheme during 2021, including crossing point surveys and radiotracking, a better understanding will be gained of the key points along the proposed scheme where bat species are crossing. This will further inform the proposed scheme design and allow mitigation measures, including further habitat creation where required, to be developed appropriately. It is recognised that the habitat creation measures proposed take time to mature and provide the function required, even when they are provided early in the construction of the proposed scheme. However temporary screening will be deployed to serve the same function early in construction to provide mitigation while habitats establish. With these measures in place the risk of vehicular related mortality of bats as a result of the operation of the proposed scheme would result in temporary/reversable damage to the bat assemblage that would not affect its integrity. Direct mortality therefore represents a negligible adverse impact upon the local bat assemblage which is of national importance. This impact is therefore preliminarily assessed as a slight adverse effect, which is not significant.

8.9.195 **Severance of habitat and barrier to dispersal**: The operation of the proposed scheme would result in increased vehicular traffic and associated light spill onto adjacent habitats. This light spill has the potential to alter the behaviour of bats utilising these habitats, and could deter bats from using habitats beyond the proposed scheme. This has the potential to fragment the foraging and commuting routes of the local bat assemblage causing them to expend greater energy and resources by having to utilise more distant foraging grounds. Bats utilising habitats along the offline section of the proposed scheme are particularly vulnerable to displacement by light spill given that these habitats are currently some distance from the existing vehicular passage on the A358. The proposed scheme design incorporates a belt of hedgerow, trees and woodland alongside the proposed road, once established these habitats will help to mitigate the impacts associated with increased light spill from vehicles on adjacent habitats. Increased light levels from traffic would result in permanent/irreversible damage to commuting and foraging bats that would not affect the integrity of the bat assemblage. This represents a minor adverse impact on the bat assemblage of national value, which is preliminarily assessed as a slight adverse effect, which is not significant.

8.9.196 **Disturbance**: The operation of the proposed scheme would result in increased vehicular traffic and associated noise and vibration. Bat roosts have been identified in trees and buildings within 0.01 miles (20 metres) of the proposed scheme, in addition to further roosts between 0.01 miles (20 metres) and 0.06 miles (100 metres). Chapter 11 Noise and Vibration has assessed the increases in noise levels as significant for human receptors, however it is difficult to assess the impact on ecological receptors. There is little evidence to show what constitutes a significant adverse effect for bats. In their paper on the effects of anthropogenic noise on foraging bats, Schaub, et al [64] identify that whilst traffic noise and other sources of intense broadband noise are shown to degrade

the suitability of foraging areas, there are many examples of bats roosting in extremely noisy situations (bell towers of churches or under motorway bridges). Further assessment of the impact of operational noise will be undertaken on completion of the roost identification surveys and reported in the ES. However, given the existing background noise level associated with the traffic on the A358 and the proximity of the M5 traffic to the offline section, vehicular related noise and vibration disturbance as a result of operation of the proposed scheme is not anticipated to result in an observable impact upon, and, therefore, no change to, roosting or foraging bats. As the bat assemblage is of national importance, this is preliminarily assessed as a neutral effect, which is not significant.

White-clawed crayfish

8.9.197 The survey information gathered to date has concluded the likely absence of white-clawed crayfish within the study area of the proposed scheme. Surveys are being undertaken in 2021 to validate the findings of the previous surveys, however no change in status is expected given the national retreat in the range of white-clawed crayfish. As such the preliminary assessment is that there will be no observable impact upon, and therefore no change to, white-clawed crayfish populations as a result of the operation of the proposed scheme. As this species is of national importance, this represents a neutral effect which is not significant.

Hazel Dormouse

8.9.198 Given the high level of existing traffic related background noise, light and vibration disturbance upon dormouse habitats along the A358, additional disturbance impacts are not anticipated on this receptor of county importance as a result of operation of the proposed scheme. The preliminary assessment is that there will be no observable impact upon, and therefore no change to, the integrity of the dormouse population, as a result of operation of the proposed scheme. As this population is of county importance, this represents a neutral effect which is not significant.

Breeding & wintering bird assemblages

8.9.199 The potential impacts on the breeding and wintering bird assemblages during the operational phase are:

- road mortality
- disturbance

8.9.200 **Road mortality:** The existing A358 poses a risk to birds from collision with vehicles, however the proposed scheme would increase this risk through the widening of the road for dualling, and the operation of the offline section of the proposed scheme through insertion of the road into previously open countryside. Areas of habitat creation have been proposed along the proposed scheme, this would include the planting of tree belts and tall hedgerow planting to encourage birds up and over the carriageway, however it is recognised that this would take time to establish, therefore opportunities will be taken to begin habitat creation early within the construction programme, in advance of substantial vegetation clearance. Following the establishment of such planting, while recognising that the risk of road mortality cannot be fully mitigated, road mortality would represent permanent/irreversible damage to birds however this would not affect the integrity of the assemblage. Direct mortality represents a minor adverse impact

upon bird assemblages which are of local importance. This impact is therefore preliminarily assessed as a neutral effect, which is not significant.

8.9.201 **Disturbance:** The operation of the offline section of the proposed scheme would result in increased vehicular traffic and associated noise and lighting disturbance on adjacent habitats utilised by the bird assemblage. While it is recognised that birds utilising habitats along the existing A358 are likely to be habituated to disturbance associated with a busy road, the increased disturbance along the offline section is likely to displace birds both away from the immediate proposed scheme area, but also adjacent habitats where sound level changes are significant, and disturbance can cause functional habitat loss.

8.9.202 The proposed scheme includes the provision of areas of hedgerow, tree belt and woodland planting that would help to screen lighting impacts beyond the road. In addition, the proposed scheme includes the provision of hedgerows, grassland and woodland creation set back from the A358 where operational levels of noise and light pollution would be similar, or less than, background levels (pre-proposed scheme) in order to mitigate with functional habitat. Following the implementation of this mitigation, disturbance would result in permanent/irreversible damage to bird assemblages that would not affect their integrity. Disturbance represents a minor adverse impact upon bird assemblages which are of local importance. This impact is therefore preliminarily assessed as a neutral effect, which is not significant.

Barn owl

8.9.203 The potential impacts on the breeding and wintering bird assemblages during the operational phase are:

- increased risk of road mortality

8.9.204 **Road mortality:** alignment and widening of the road, improvements to traffic congestion and increased traffic speed would cause an increased risk of road mortality of barn owls. This is particularly relevant to young birds dispersing in the autumn months. While the closest OBS is located approximately 0.46 miles (750 metres) from the proposed scheme, there is one ARS and seven PNS within 0.31 miles (500 metres) of the proposed scheme. Studies estimate that between 3,000 and 5,000 barn owls are killed on roads annually, with over 90% of these fatalities occurring on major roads (motorways and dual carriageways) [65]. The rough grass verges alongside major roads provide long stretches of habitat for barn owl prey species and birds would frequently fly across the road at low height, resulting in the potential for direct conflict with traffic. The presence of major roads can cause the absence of breeding barn owls within 0.31 miles (500 metres) on either side of the road, with negative impacts detected up to 15.5 miles (25 kilometres) away from a major road [66]. Where the road realignment crosses existing areas of Type 1 and 2 habitats, mortality through collision with vehicles is likely to be highest. Type 1 and 2 habitats are present on either side of the A358 and within the land required for construction of the offline section of the proposed scheme.

8.9.205 Mitigation would include strategic planting of woody species of a height of at least 3 metres in areas considered to be of high collision risk to encourage barn owls to fly high over the road network and planting and management of grassland verges, keeping grassland short in specified areas or planting scrub to reduce the habitat suitability for small mammals and therefore decrease the foraging potential alongside the road verges for barn owls. The landscape design for the proposed

scheme has aimed to provide suitable foraging habitat set back from the road, as well as enhancement to hedgerows into the wider landscape to act as commuting routes for barn owls and connect existing habitat each side of the road corridor. Following the implementation and establishment of these measures, while recognising that the risk of road mortality cannot be fully mitigated, increased mortality of barn owl would result in permanent/ irreversible damage to barn owl however this would not affect the integrity of the barn owl population. Increased mortality risk represents a minor adverse impact on the barn owl population, which is of county importance. This impact is therefore preliminarily assessed as a slight adverse effect, which is not significant.

Great crested newt

8.9.206 No observable direct or indirect impacts upon the integrity of the great crested newts population, of county importance, are anticipated as a result of the operational phase of the proposed scheme. This is therefore preliminarily assessed as a neutral effect, which is not significant.

Otter

8.9.207 The potential impacts of the operation of the proposed scheme on otter are:

- injury or mortality

8.9.208 Otter are present on watercourses crossed by the proposed scheme. This includes watercourses that pass beneath the existing A358 and the Black Brook which would be crossed by the offline section of the proposed scheme. The operation of the proposed scheme has the potential to increase vehicular related injury and mortality of otter crossing the proposed scheme. Field sign evidence would suggest that otter use the existing culvert and underbridge structures to pass along watercourses under the A358, this in combination with the absence of otter mortality records in the data search, suggests that otter do not routinely cross over the existing A358 and risk being injured by vehicles. The operation of the proposed offline section of the proposed scheme is considered to represent a greater risk to otter as this would introduce a dual carriageway into otherwise open countryside and require culverting of watercourses, including the Black Brook. Fencing will be installed along the carriageway in key locations assessed as being at higher risk of otter crossing and as described above, mammal ledges would be installed on new culvert and underbridge structures, where size and vertical alignment can accommodate these, to allow passage of otter during flood events. This would be combined with hedgerow, scrub and tree planting and fencing to direct otter, and other species, through the safe crossing points under the proposed scheme.

8.9.209 While it is recognised the risk of the road vehicle related injury or mortality of otter cannot be completely removed, with the implementation of the measures described above the preliminary assessment is that the risk of mortality associated with the operation of the proposed scheme would be reduced to a level at which it has no observable impact, and therefore no change to, the otter population. As the otter population is of county importance, this is preliminarily assessed as a neutral effect, which is not significant.

Water vole

8.9.210 No observable direct or indirect impacts upon the integrity of the water vole population, of county importance, are anticipated as a result of the operational phase of the proposed scheme. This is therefore preliminarily assessed as a neutral effect, which is not significant.

Brown hairstreak

8.9.211 No observable direct or indirect impacts upon the integrity of the brown hairstreak population, of local importance, are anticipated as a result of the operational phase of the proposed scheme. This is therefore preliminarily assessed as a neutral effect, which is not significant.

Badger

8.9.212 The potential impacts on badgers during the operation phase are:

- injury or mortality

8.9.213 **Injury or mortality**: The dualling of the A358, and the operation of the offline section of the proposed scheme would result in an increased risk of vehicle collision related injury/mortality of badgers. The inclusion of fencing and crossing points in the form of mammal ledges in culverts and underbridges, and provision of badger tunnels in key locations where the proposed scheme severs identified badger territories would restore safe crossing points for badgers within their territories and across the wider landscape. Badger fencing and hedgerow, woodland and scrub planting would be included at crossing points to encourage and channel movement of badgers away from the highway and through safe culverts, underpasses and tunnels.

8.9.214 While it is recognised the risk of the road vehicle related injury or mortality of badger cannot be completely remove, with the implementation of the measures described above the preliminary assessment is that the risk of injury or mortality associated with the operation of the proposed scheme would be reduced to a level at which it has no observable impact upon, and therefore no change to, the badger population. As the badger population is of local importance, this is preliminarily assessed as a neutral effect, which is not significant.

Reptiles

8.9.215 No observable direct or indirect impacts upon the integrity of the reptile population, of local importance, are anticipated as a result of the operational phase of the proposed scheme. This is therefore preliminarily assessed as a neutral effect, which is not significant.

Terrestrial invertebrates

8.9.216 No observable direct or indirect impacts upon the integrity of the terrestrial invertebrate assemblage, of local importance, are anticipated as a result of the operational phase of the proposed scheme. This is therefore preliminarily assessed as a neutral effect, which is not significant.

Fish

8.9.217 Potential indirect impacts of the operation of the proposed scheme on fish communities include increased sedimentation, hydrological changes and

increased pollution events through surface run off or groundwater feeds. This may result in changes to water quality and associated degradation of habitats utilised by fish species. All operational impacts that are likely to affect aquatic receptors are identified within Chapter 13 Road Drainage and the Water Environment.

8.9.218 Embedded mitigation in design to avoid or reduce these impacts have been included and described within Chapter 13 Road Drainage and the Water Environment, including road drainage and attenuation ponds to mitigate impacts. As such, the preliminary assessment is that there would be no observable impact upon, and therefore no change to, fish populations, as a result of the operation of the proposed scheme. As the fish populations are of local importance, this is preliminarily assessed as a neutral effect, which is not significant.

Aquatic macroinvertebrates

8.9.219 Potential indirect impacts of the operation of the proposed scheme on macroinvertebrate communities include increased sedimentation, hydrological changes and increased pollution events through surface run off or groundwater feeds. Some species of aquatic macroinvertebrates are sediment sensitive and thus changes to suspended sediment or the bed substrate could result in loss of potential species. All operational impacts that are likely to affect aquatic receptors are identified within Chapter 13 Road Drainage and the Water Environment.

8.9.220 Embedded mitigation in design to avoid or reduce these impacts have been included and described within Chapter 13 Road Drainage and the Water Environment, including road drainage and attenuation ponds to mitigate impacts. As such, the preliminary assessment is that there would be no observable impact upon, and therefore no change to, the aquatic macroinvertebrate assemblage as a result of the operation of the proposed scheme. As the aquatic macroinvertebrate assemblage is of local importance, this is preliminarily assessed as a neutral effect, which is not significant.

Other Section 41 Species of Principal Importance

8.9.221 There is an inherent risk of mortality through traffic collision associated with SPIs crossing the carriageway. Crossing points have been included in the design in the form of culverts, underbridges and mammal tunnels, to improve connectivity and reduce mortality risk, providing fencing within key locations to funnel animals to safe crossing points. With the incorporation of this embedded mitigation the risk of mortality would be reduced to a level at which it would result in permanent/ irreversible damage to the SPIs, that does not affect the integrity of the SPI populations which are of local importance. Traffic related mortality as a result of the operation of the proposed scheme represents a minor adverse impact, on SPIs, which are of local importance, preliminarily assessed as a slight adverse effect, which is not significant.

8.10 Monitoring

8.10.1 Where significant adverse environmental effects are reported for a scheme, projects shall undertake monitoring in accordance with DMRB *LA 104 Environmental assessment and monitoring* [17].

8.10.2 Details of monitoring would be discussed with Natural England and the Environment Agency as required and agreed with Highways England. This would

be summarised in the Environmental Statement and detailed within the LEMP developed as an Annex of the EMP to be submitted with the ES.

8.11 Summary

8.11.1 The preliminary assessment of impacts of the proposed scheme on biodiversity has identified a range of effects during construction and operation. The likely residual significant effects during construction and operation are summarised in Table 8-11 and Table 8-12 below.

Table 8-11 Summary of preliminary assessment of likely significant construction effects

Ecological receptor	Description of potential impact	Embedded design, mitigation, and enhancement measures	Importance of receptor	Duration and reversibility	Magnitude of impact	Significance of potential effect
Road Verges West of Hatch Beauchamp LWS	Total loss of all habitats within the Road Verges West of Hatch Beauchamp LWS	Compensatory grassland planting to include a diverse mix of species of local provenance.	County	Permanent/ irreversible	Major adverse	Moderate adverse (significant)
Jordans Park LWS	Loss of 16% of the area of Jordans Park LWS, including loss of parkland habitats and mature (potentially veteran) trees.	Areas of species rich grassland, hedgerows, trees and woodland will be provided at Jordans park. Areas temporarily required will be reinstated post-construction.	County	Permanent/ irreversible	Major adverse	Moderate adverse (significant)
Bickenhall Wood ancient woodland	Direct impacts to the root protection zone of trees within the ancient woodland due to vegetation clearance.	It is not possible to mitigate against the loss of ancient woodland.	National	Permanent/ irreversible	Major adverse	Large adverse (significant)
Saltfield Copse LWS	Loss of 0.25 ha of ancient woodland habitat.	It is not possible to mitigate against the loss of ancient woodland.	National	Permanent/ irreversible	Major adverse	Large adverse (significant)
Veteran trees	Loss of two veteran pedunculate oak trees within Jordans Park	It is not possible to mitigate against the loss of veteran trees.	National	Permanent/ irreversible	Major adverse	Large adverse (significant)
Broadleaved semi-natural woodland	Loss of 28ha of broadleaved semi-natural woodland	Retention and protection of woodland and trees	National	Permanent/ irreversible	Major adverse	Large adverse (significant)

	along the verges and embankments of the existing A358.	wherever loss can reasonably be avoided.				
Broadleaved semi-natural woodland	Planting of approximately 42.8 ha of broadleaved semi-natural woodland and10.3ha of open woodland and grassland mosaic.	n/a	National	Permanent	Major beneficial	Large beneficial (significant)
Hedgerows	Loss of important and priority habitat hedgerows and fragmentation of the hedgerow network.	Protection of retained hedgerows.	National	Permanent / irreversible	Major adverse	Large adverse (significant)
Hedgerows	Planting of approximately 28.7 miles (46.2 kilometres) of native species-rich hedgerows.	n/a	National	Permanent	Major beneficial	Large beneficial (significant)
Species-rich grassland	Creation of 43.9ha of species rich grassland.	n/a	National	Permanent	Major beneficial	Large beneficial (significant)
Bats	Loss of foraging and commuting habitats for the bat assemblage, including the four Annex II species, leading to habitat fragmentation.	Retention and protection of high value habitats wherever loss can be reasonably avoided. Creation of a linked mosaic of higher quality habitats of suitability for bats.	National	Temporary/ reversible	Moderate adverse	Moderate adverse (significant)

Table 8-12 Summary of preliminary assessment of likely significant operation effects

Ecological receptor	Description of potential impact	Embedded design, mitigation, and enhancement measures	Importance of receptor	Duration and reversibility	Magnitude of impact	Significance of potential effect
Bickenhall Wood	Degradation of ancient woodland habitat due to increased nutrient nitrogen deposition of 0.5kg N/ha/year.	Planting of woodland adjacent to Bickenhall Wood ancient woodland to buffer from air pollution and compensate for habitat degradation. Opportunities will be sought to implement sensitive management within the woodland itself.	National	Permanent/ irreversible	Major adverse	Large adverse (significant)

Abbreviations List

Please refer to PEI Report Chapter 17 Abbreviations

Glossary

Please refer to PEI Report Chapter 18 Glossary.

References

[1] Highways England, Transport Scotland, Welsh Government, and Department for Infrastructure, “Design Manual for Roads and Bridges Sustainability and Environment Appraisal LA 108 Biodiversity Revision 1,” 2020.

[2] Department for Environment, Food and Rural Affairs, “The Biodiversity Metric 2.0,” 29 July 2019. [Online]. Available: http://publications.naturalengland.org.uk/publication/5850908674228224. [Accessed May 2021].

[3] Department for Transport, “National Policy Statement for National Networks,” Williams Lea Group on behalf of the Controller of Her Majesty's Stationery Office, 2014.

[4] Ministry of Housing, Communities and Local Government, “National Planning Policy Framework,” 2021.

[5] Joint Nature Conservation Committee, “UK Post-2010 Biodiversity Framework | JNCC - Adviser to Government on Nature Conservation,” 2012. [Online]. Available: https://jncc.gov.uk/our-work/uk-post-2010-biodiversity-framework/. [Accessed 04 May 2021].

[6] Department for Environment Food and Rural Affairs, “Biodiversity 2020: A strategy for England's wildlife and ecosystem services,” 2011.

[7] HM Government, “A Green Future: Our 25 Year Plan to Improve the Environment,” 2018.

[8] The Wildlife Trusts, “Towards a Wilder Britain - Creating a Nature Recovery Network to bring back wildlife to every neighbourhood,” 2018.

[9] Highways England, “Highways England Delivery Plan 2020-2025 2020,” 2020. [Online]. Available: https://www.gov.uk/government/publications/highways-england-delivery-plan-2020-2025. [Accessed 04 May 2021].

[10] Department for Transport, “Road Investment Strategy: for the 2020 – 2025 Road Period,” 2020.

[11] Taunton Deane Borough Council, “Taunton Deane Local Plan,” 2004. [Online]. Available: https://www.somersetwestandtaunton.gov.uk/media/1063/taunton-deane-local-plan.pdf. [Accessed 11 May 2021].

[12] Taunton Deane Borough Council, “Taunton Deane Local Biodiversity Action Plan,” 2008. [Online]. Available: https://www.yumpu.com/en/document/read/22943711/biodiversity-action-plan-taunton-deane-borough-council. [Accessed 11 May 2021].

[13] Taunton Deane Borough Council, “Adopted Core Strategy 2011-2028,” 2011. [Online]. Available: https://www.somersetwestandtaunton.gov.uk/media/1061/adopted-core-strategy-2011-2028.pdf. [Accessed 11 May 2021].

[14] Somerset County Council, " Somerset Highways Biodiversity Manual," 2015. [Online]. Available: https://www.travelsomerset.co.uk/wp-content/uploads/2018/05/Somerset-Highways-Biodiversity-Manual-v5.pdf. [Accessed 11 May 2021].

[15] Somerset County Council, " Pollinator Action Plan 2018-2028," 2018. [Online]. Available: https://www.somerset.gov.uk/waste-planning-and-land/biodiversity/. [Accessed 11 May 2021].

[16] Somerset Biodiversity Partnership, ", "Wild Somerset - The Somerset Biodiversity Strategy 2008 – 2018," 2008. [Online]. Available: https://modgov.southsomerset.gov.uk/Data/District%20Executive/20081106/Agenda/8B.pdf%2006-11-2008.pdf. [Accessed 11 May 2021].

[17] Highways England, Transport Scotland, Welsh Government, and Department for Infrastructure, "Design Manual for Roads and Bridges Sustainability and Environment Appraisal LA 104 Environmental Assessment and Monitoring," 2020.

[18] Highways England, Transport Scotland, Welsh Government, and Department for Infrastructure, "Design Manual for Roads and Bridges Sustainability and Environment Design LD 118 Biodiversity design," 2020.

[19] Highways England, Transport Scotland, Welsh Government, and Department for Infrastructure, "Design Manual for Roads and Bridges Sustainability and Environment Appraisal LA 115 Habitats Regulations Assessment," 2020.

[20] Chartered Institute of Ecology and Environmental Management, "Guidelines For Ecological Impact Assessment In The UK And Ireland Terrestrial, Freshwater, Coastal And Marine," 2019.

[21] Natural England, "Ancient Woodland: Ancient trees and veteran trees: protecting them from development," 2018.

[22] S. Wray, E. Wells and M. J. Tony, "Valuing Bats in Ecological Impact Assessment," *Institute of Ecology and Environmental Management: In Practice,* pp. 23-25, 2010.

[23] Highways England, Transport Scotland, Welsh Government and Department for Infrastructure, "Design Manual for Roads and Bridges Sustainability and Environment Appraisal LA 105 Air quality," 2019.

[24] R. S. Oldham, J. Keeble, M. J. S. Swan and M. Jeffcote, "Evaluating the suitability of habitat for the great crested newt (Triturus cristatus)," *Journal of Herpetology,* vol. 10, no. 4, pp. 143-155, 2000.

[25] Natural England, "The Ancient Woodland Inventory," [Online]. Available: https://naturalengland-defra.opendata.arcgis.com/datasets/ancient-woodland-england. [Accessed May 2021].

[26] Joint Nature Conservation Committee, Handbook for Phase 1 Habitat Survey - A technique for environmental audit, 2010.

[27] B. Butcher, P. Carey, R. Edmonds, L. Norton and J. Treweek, “UK Habitat Classification - Habitat Definitions V1.1.,” 2020. [Online]. Available: https://ukhab.org/. [Accessed July 2021].

[28] Environment Agency, The River Habitat Survey in Britain and Ireland Field Survey Guidance Manual, Peterborough, 2003.

[29] National Rivers Authority, River Corridor Surveys: Methods and Procedures - Conservation and Technical Handbook, Bristol, 1992.

[30] L. J. Shuker, A. M. Gurnell, G. Wharton, D. J. Gurnell, J. England, B. F. Finn Leeming and E. Beach, “MoRPh: a citizen science tool for monitoring and apprasing physical habitat changes in rivers,” *Water and Environment Journal,* vol. 31, no. 3, pp. 418-424, 2017.

[31] A. M. Gurnell, J. England and L. J. Shuker, “A Guide To Assessing River Condition Part of the Rivers and Streams Component of the Biodiversity Net Gain Metric,” March 2020. [Online]. Available: https://modularriversurvey.org. [Accessed July 2021].

[32] A. Gurnell, J. England, L. Shuker and G. Wharton, “The MoRPh Survey Technical Reference Manual 2020 Version,” 2020. [Online]. Available: https://modularriversurvey.org/professional-help/. [Accessed July 2021].

[33] Department for Environment Food and Rural Affairs, Hedgerow Survey Handbook: A standard procedure for local surveys in the UK (2nd Edition), 2007.

[34] J. Rodwell, “British Plant Communities Volumes 1-5,” Cambridge University Press, 1991-2000.

[35] J. Rodwell, NVC Users' Handbook, Peterborough, 2006.

[36] C. Stace, New Flora of the British Isles 3rd Edition, 2010.

[37] I. Atherton, S. Bosanquet and M. Lawley, Mosses and Liverworts of Britain and Ireland - A Field Guide, 2010.

[38] Bat Conservation Trust, “Bat Surveys for Professional Ecologists Good Practice Guidelines,” 2016.

[39] J. Altringham and A. Berthinussen, “WC1060 Development of a cost-effective method for monitoring the effectiveness of mitigation for bats crossing linear transport infrastructure,” 2015.

[40] Highways England, Transport Scotland, Welsh Government, and Department for Infrastructure, “Design Manual for Roads and Bridges Volume 10 Environmental Design and Management Section 4 Nature Conservation Part 2 HA 59/92 Mitigating Against Effects on Badgers,” 2001.

[41] P. Cresswell, S. Harris and D. J. Jefferies, The history, distribution, status and habitat requirements of the badger in Britain, Nature Conservancy Council, 1990.

[42] C. Bibby, M. Jones and S. Marsden, Expedition Field Techniques - Bird Surveys, Birdlife International, 2000.

[43] C. Shawyer, Barn Owl Tyto alba Survey Methodology and Techniques for use in Ecological Assessment, Institute of Ecology and Environment Management, 2011.

[44] English Nature, Great Crested Newt Mitigation Guidelines, 2001.

[45] Froglife, “Advice Sheet 10 - Reptile Survey,” 1999.

[46] Joint Nature Conservation Committee, “Common Standards Monitoring Guidance for Mammals,” 2004.

[47] Highways England, Transport Scotland, Welsh Government, and Department for Infrastructure, “Design Manual for Roads and Bridges Volume 10 Environmental Design and Management Section 4 Nature Conservation Part 4 HA 81-99 Nature Conservation Advice in Relation to Otters,” 2001 [Withdrawn 2019].

[48] R. Strachan, T. Moorhouse and M. Gelling, Water Vole Conservation Handbook Third Edition, 2011.

[49] Joint Nature Conservation Committee, Common Standards Monitoring Guidance for Freshwater Fauna, 2015.

[50] S. Peay and English Nature, Monitoring the White-clawed Crayfish: Conserving Natura 2000 Rivers Monitoring Series No. 1, 2003.

[51] UK Butterfly Monitoring Scheme, “Ng3: Brown Hairstreak Egg Counts”.

[52] The Mammal Society, 2017. [Online]. Available: http://www.ecobat.org.uk/.

[53] A. Berthinussen and J. Altringham, “WC1060: Development of a cost-effective method for monitoring the effectiveness of mitigation for bats crossing linear transport infrastructure.,” Department for Environment, Food and Rurual Affairs, 2015.

[54] P. Bright, P. Morris and T. Mitchell-Jones, The dormouse conservation handbook, 2006.

[55] Natural England, “Ancient woodland, ancient trees and veteran trees: protecting them from development,” 2018.

[56] Joint Nature Conservation Committee, “UK Biodiversity Action Plan Priority Habitat Descriptions,” [Online]. Available: http://data.jncc.gov.uk/data/ca179c55-3e9d-4e95-abd9-4edb2347c3b6/UKBAP-BAPHabitats-17-Hedgerows.pdf. [Accessed May 2021].

[57] Environment Agency, “Ecology and Fish Data Explorer,” [Online]. Available: https://environment.data.gov.uk/ecology-fish/. [Accessed November 2020].

[58] D. Jacoby and M. Gollock, “Anguilla anguilla. The IUCN Red List of Threatened Species e.T60344A152845178,” 2020. [Online]. Available: https://www.iucnredlist.org/species/60344/152845178. [Accessed 12 May 2021].

[59] British Standards Institution, “BS 5837:2012 Trees in relation to design, demolition and construction,” 2012.

[60] Devon County Council, “Devon ash dieback resilience forum advice note,” 2018.

[61] Highways England, Transport Scotland, Welsh Government, and Department for Infrastructure, “Design Manual for Roads and Bridges Drainage General Information CG501 Design of highway drainage systems Revision 2,” 2020.

[62] Highways England, Transport Scotland, Welsh Government, and Department for Infrastructure, “Design Manual for Raods and Bridges Sustainability and Environment Appraisal LA113 Road drainage and the water environment Revision 1,” 2020.

[63] Forestry Commission, “Forest Operations and Birds in Scottish Forests - The Law and Good Practice. Guidance Note 32,” 2007.

[64] A. Schaub, J. Ostwalk and B. Siemers, “Foraging bats avoid noise,” *The Journal of Experimental Biology,* vol. 211, pp. 3174-3180, 2008.

[65] D. J. Ramsden, “Barn Owls and Major Roads: results and recommendation from a 15-year research project,” The Barn Owl Trust, Ashburton, 2003.

[66] C. Shawyer and N. Dixon, “Impact of Roads on Barn Owl Tyto alba Populations,” 1999.

[67] Highways England, Transport Scotland, Welsh Government, and Department for Infrastructure, “Design Manual for Roads and Bridges Sustainability and Environment Appraisal LA 108 Biodiversity Revision 1,” 2020.

[68] Natural England, “Ancient woodland, ancient trees and veteran trees: protecting them from development,” 05 November 2018. [Online]. Available: https://www.gov.uk/guidance/ancient-woodland-and-veteran-trees-protection-surveys-licences. [Accessed 06 July 2021].