

7. Flora and fauna

7.1. Introduction

This chapter considers the potential effects of the Proposed Scheme on flora and fauna. It describes the impact upon important ecological features: designated sites for nature conservation; habitats; and species, where there is the potential for significant effects from the Proposed Scheme to occur.

7.2. Regulation and policy background

Consideration of the potential impacts of the Proposed Scheme on ecological features takes into account the following legislation:

- The Wildlife and Countryside Act 1981 (as amended)
- Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (the “Habitats Directive”)
- EC Birds Directive (Council Directive 79/409/EEC on the conservation of wild birds)
- The Conservation of Habitats and Species Regulations 2017
- The Protection of Badgers Act 1992
- Eels (England and Wales) Regulations 2009
- Salmon and Freshwater Fisheries Act 1975
- The Countryside and Rights of Way (CRoW) Act 2000
- The Natural Environment and Rural Communities Act 2006

7.3. Methodology

7.3.1. Scope of the assessment

This chapter focusses on how the Proposed Scheme may impact upon the nature conservation status of relevant ecological features, and outlines actions required to ensure legislative compliance in relation to species protected under the Wildlife and Countryside Act 1981 (as amended) and Protection of Badgers Act 1992. Additional detail relating to the actions required to ensure legislative compliance in relation to the Conservation of Habitats and Species Regulations 2017 is provided in Appendices C and D.

The following key issues were identified at the EIA scoping stage for consideration in the assessment (see Table 7.1).

Table 7.1 Scope of assessment

Scoped in	Scoped out
Adverse construction impacts as a result of loss and/or damage to habitats, mortality and/or disturbance effects to species and changes in water quality	Adverse operational effects: for fish, aquatic invertebrates, GCN, reptiles, bats, otter, water vole and badger.

Scoped in	Scoped out
on; statutory designated sites, non-statutory designated sites, habitats of principal importance, fish, aquatic invertebrates, GCN, reptiles (grass snake), birds, roosting bats, otter, water vole and badger	
Adverse operational impacts as a result of changes in flooding extent, frequency and duration on; statutory and non-statutory sites, habitats of principal importance and birds.	
Beneficial operational impacts as a consequence of a net increase in open water and marginal habitat created from species-poor grassland; on habitats (including Section 41 habitats and habitats within statutory and non-statutory designated sites) and on invertebrates and water vole	

7.3.2. Study area

The study area for statutorily designated European sites (i.e. Special Areas of Conservation (SAC), Special Protection Areas (SPA) and Ramsar sites) and Sites of Special Scientific Interest (SSSIs) was based on Natural England's (NE) Impact Risk Zones (IRZ). The IRZs⁵ are a GIS tool developed by Natural England to make a rapid initial assessment of the potential risks posed by development proposals to: SSSIs, SACs, SPAs and Ramsar sites. Where the Proposed Scheme overlaps with an IRZ, the SSSI/European site was included in the study area for the assessment.

A 1km study area based on a 1km buffer of the Proposed Scheme boundary has been used for the local records desk study which comprises records of protected and notable species and non-statutory designated sites.

The Phase 1 habitat survey study area included the area within and 100m either side of Proposed Scheme boundary. This was considered sufficient to cover potential areas of habitat loss as a result of the Proposed Scheme and to provide an understanding of habitat suitability and connectivity in respect of mobile species which could be impacted.

⁵ The Impact Risk Zones are a GIS tool developed by Natural England to make a rapid initial assessment of the potential risks posed by development proposals to: Sites of Special Scientific Interest (SSSIs), Special Areas of Conservation (SACs), Special Protection Areas (SPAs) and Ramsar sites. They define zones around each site which reflect the particular sensitivities of the features for which it is notified and indicate the types of development proposal which could potentially have adverse impacts.

In each case, the aim has been to identify the likely zone of influence⁶ that the Proposed Scheme will have on ecological features. This is informed by published guidance and the professional judgement of suitably qualified and experienced specialists. The distances the study area extends for each ecological feature are summarised in Table 7.2 and detailed in the appended baseline reports (Appendix F).

7.3.3. Guidance

The assessment for flora and fauna has been undertaken in accordance with the common framework set out in Chapter 5 and, specific to this topic, the Chartered Institute of Ecology and Environmental Management (CIEEM) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal (CIEEM, 2018).

To establish the baseline, in conjunction with the desk study, field surveys were carried out using nationally recognised standard survey methodologies, where available, as detailed in Table 7.2.

7.3.4. Establishing the baseline

A number of studies have been undertaken to establish the baseline ecological conditions within the study area. A summary of the work undertaken is provided in Table 7.2.

Works are programmed to avoid the breeding bird season (considered to be March to August inclusive) and as such breeding bird surveys were not undertaken.

National Vegetation Classification surveys were also not considered to be required, due both to the nature of the habitats present and the nature of the Proposed Scheme, however the Phase 1 habitat survey included consideration of the presence of MG4 and MG5 grassland within the study area.

⁶ The 'zone of influence' for a project is the area over which ecological features may be affected by biophysical changes as a result of the proposed project and associated activities. This is likely to extend beyond the project site (CIEEM 2018).

Table 7.2 Summary of ecological information and surveys undertaken to establish the study area baseline

Ecological feature	Survey type	Date	Methodology	Study area
Statutory designated sites	Desk study	October 2019	Compiled from Multi Agency Geographical Information for the Countryside (MAGIC) data (Defra 2019)	The study area for statutorily designated European sites (i.e. SAC, SPA and Ramsar sites and SSSIs) was based on Natural England's Impact Risk Zones (extended for the strategic level Habitats Regulations Assessment (HRA), see Appendix C)
Non-statutory designated sites	Desk study	September 2019	Data provided by Somerset Environmental Records Centre (SERC)	1km either side of the Proposed Scheme (Parchey Bridge to Monk's Leaze Clyce)
Protected and notable species	Desk study	September 2019	Data provided by SERC	1km either side of the Proposed Scheme (Parchey Bridge to Monk's Leaze Clyce)
European Protected Species (EPS)	Desk study	September 2019	Search of MAGIC website for records of EPS licences	1km either side of the Proposed Scheme (Parchey Bridge to Monk's Leaze Clyce)
Birds	Desk study	2011/12-2015/16	Wetland Bird Survey (WeBS) winter count data provided by the RSPB	For selected designated and non-designated sites through the Sowey/KSD corridor
		2012-2015	Annual Breeding Wader Survey Data, supplied by RSPB who co-ordinate the survey	Across the Somerset Levels including designated and non-designated sites

Ecological feature	Survey type	Date	Methodology	Study area
Habitats	Extended Phase 1 habitat survey	August-September 2019	Survey in accordance with Handbook for Phase 1 habitat survey (JNCC, 2010) extended to include consideration of NVC habitats MG4 and MG5 grassland and the potential for habitats to support protected and notable species and non-native invasive plant species (see Appendix F for full details)	Within and 100m either side of the Proposed Scheme (Parchey Bridge to Monk's Leaze Clyce)
	Walkover survey	May 2015	Ecological walkover survey to identify potential constraints	Length of Proposed Scheme (Down End to Langport)
Aquatic invertebrates	Invertebrate sampling focussing on presence/absence of certain key beetle species	June 2016	Pond netting with reference to the Buglife methodology for invertebrate sampling as found in the Survey Manual by Palmer, Drake and Stewart (2013) (see Appendix F for full details)	Nine 50m sections of Sowy selected by Environment Agency/Natural England in stands of marginal and in-channel vegetation
Great crested newts (GCN)	eDNA survey	June 2019	eDNA analysis in accordance with Biggs et al. (2014) (see Appendix F for full details)	Nine ponds within 250m of the Proposed Scheme (Parchey Bridge to Monk's Leaze Clyce)

Ecological feature	Survey type	Date	Methodology	Study area
<i>Triturus cristatus</i>	eDNA survey	June 2015	eDNA analysis (Biggs et al. 2014)	Ponds within 500m of the Proposed Scheme (Down End to Langport) and not separated from the Proposed Scheme by a significant barrier to newt dispersal. Included 2 ponds with an HSI >0.5
	Habitat suitability index survey (HSI)	June 2015	Habitat Suitability Index (Oldham et al. 2000)	Ponds within 500m of the Proposed Scheme (Down End to Langport) and not separated from the Proposed Scheme by a significant barrier to newt dispersal.
Bats (roosting)	Bat roost ground assessment	August-September 2019	Visual inspection of trees and structures for potential roost features (Collins ed. 2016) (see Appendix F for full details)	30m either side of the Proposed Scheme (Parchey Bridge to Monk's Leaze Clyce)
Otter (<i>Lutra lutra</i>)	Presence/likely absence survey	October 2015	The habitat was assessed for its suitability to support otters for foraging, commuting, resting and breeding. Water courses and wetland areas were surveyed for evidence of spraints, slides, anal jelly, footprints, holts, runs, resting sites, feeding areas (see Appendix F for full details)	50m either side of the Proposed Scheme (Down End to Langport)

Ecological feature	Survey type	Date	Methodology	Study area
Water vole (<i>Arvicola amphibius</i>)	Presence/likely absence survey	June-July 2019 and September-October 2019	Two surveys, one in spring/summer and a second in autumn. Habitat suitability assessment and search for field signs with reference to the Water Vole Mitigation Handbook (Dean et al. 2016) (see Appendix F for full details)	Length of the Proposed Scheme (Parchey Bridge to Monk's Leaze Clyce) plus 500m upstream and downstream
	Presence/likely absence survey	September 2015	A single survey in autumn. Habitat suitability assessment and search for field signs with reference to the Water Vole Conservation Handbook (Strachan et al 2011)	Length of the Proposed Scheme (Down End to Langport) plus 500m upstream, and downstream and connecting ditches up to 150m from the channel
Badger (<i>Meles meles</i>)	Presence/likely absence survey	February 2020	Visual assessment for evidence of badger in line with Badger: Survey and Mitigation guidance provided by Natural England and Defra (GOV UK, 2015) (see Appendix F for full details)	50m either side of the Proposed Scheme (Parchey Bridge to Monk's Leaze Clyce)
	Presence/likely absence survey	October 2015	Search for field signs in accordance with Cresswell et al. 1990 and Wilson et al. 1997	30m either side of the Proposed Scheme (Down End to Langport) and an additional 500m of the channel upstream and downstream

7.3.5. Determination of significance

Determining importance (sensitivity)

The CIEEM guidelines (CIEEM, 2018) recommend that the importance of each ecological feature is described in terms of its geographic frame of reference. The following definitions have been used for the geographic frame of reference for the importance of ecological features that may be impacted by the proposal. To allow comparisons with other technical chapters in the ES, importance has also been described (*in brackets*) using the more familiar terms used for sensitivity as per Chapter 5:

- International and European (*High*) - Special Areas of Conservation (SACs), Special Protection Areas (SPAs) and Ramsar sites and habitats or populations of species, outside of protected sites, considered to be important at an international/European level
- National (*Medium*) - Sites of Special Scientific Interest (SSSIs) and habitats or populations of species, outside of SSSIs, considered to be important at a National level
- Regional (*Low*) - Habitats or populations of species considered to be important within the South West of England
- County (*Low*) e.g. Non-statutory designated sites (CWS), habitats or populations of species considered to be important in Somerset
- Local/Site (*Negligible*) e.g. habitats or species populations considered to be important at the site level and its immediate surrounds

It is not necessary to carry out detailed assessment of features that are sufficiently widespread, unthreatened and resilient to project impacts and will remain viable and sustainable (CIEEM, 2018). In this assessment, those features of 'low' value and above and/or which have some sort of legal protection, are included in the detailed assessment and are described as 'important ecological features'. This approach is consistent with the EIA Regulations, which only requires investigation of likely significant effects, as opposed to all effects.

For important ecological features a detailed assessment was undertaken to:

- Identify impacts and characterise effects
- Incorporate measures to avoid, mitigate and compensate for effects (in a hierarchical process)

Characterisation of impacts (magnitude)

Characterisation of impacts makes reference to the following, where relevant, to determining significance:

- Whether the effect is beneficial or adverse
- Extent (e.g. area/length/numbers of individuals)
- Duration (Short-term - the impact is temporary and lasts for up to 12 months; Medium-term – the impact occurs for up to 10 years; and Long-term – the impact remains for a substantial time, perhaps permanently; see chapter 5).
- Frequency and timing (how many times and when)

- Reversibility (i.e. is recovery possible within a reasonable timeframe either spontaneously or with the implementation of mitigation)

For the purpose of this assessment, the level of impact is described as the ‘magnitude’ of impact to provide consistency across technical chapters. The magnitude of impact is reported in accordance with the criteria provided in Table 7.3.

All aspects of construction and operation of the Proposed Scheme have been subject to an assessment of impacts. The assessment is made in relation to the predicted baseline within the zone of influence at the time of the impact, with reference to other assessments (e.g. water quality).

Table 7.3 Level of magnitude (change) and typical descriptions⁷

Level of magnitude (change)		Typical description
High	Adverse	Permanent/irreversible damage. The extent, duration and/or frequency/timing of the impact will negatively affect the integrity or key characteristics of the important ecological feature.
	Beneficial	Permanent addition of, improvement to or restoration of an important ecological feature. The extent, duration and/or frequency/timing of the impact will positively affect the integrity or key characteristics of the important ecological feature.
Medium	Adverse	Temporary/reversible damage. The extent, duration and/or frequency/timing of the impact will negatively affect the integrity or key characteristics of the important ecological feature.
	Beneficial	Temporary addition of, improvement to or restoration of an important ecological feature. The extent, duration and/or frequency/timing of the impact will positively affect the integrity or key characteristics of the important ecological feature.
Low	Adverse	Permanent/irreversible damage. The extent, duration and/or frequency/timing of the impact will not affect the integrity or key characteristics of the important ecological feature.
	Beneficial	Permanent addition of, improvement to or restoration of an important ecological feature. The extent, duration and/or frequency/timing of the impact will not affect the integrity or key characteristics of the important ecological feature.
Negligible	Adverse	Temporary/reversible damage. The extent, duration and/or frequency/timing of the impact will not negatively

⁷ Descriptions based on those outlined in DMRB LA108 Biodiversity (Highways Agency, 2019).

Level of magnitude (change)		Typical description
		affect the integrity or key characteristics of the important ecological feature.
	Beneficial	Temporary addition of, improvement to or restoration of an important ecological feature. The extent, duration and/or frequency/timing of the impact will not affect the integrity or key characteristics of the important ecological feature.

Significance of effects

The significance of each effect has been defined based on the importance (sensitivity) of the ecological feature and the level of magnitude of the impact identified using the matrix in Figure 5.1 (p44). For this assessment, significant effects are considered to be those of moderate value or above. The significance of the effects of the Proposed Scheme are assessed before and after the implementation of mitigation.

The initial assessment i.e. before mitigation, includes consideration of embedded mitigation which captures those aspects of the Proposed Scheme design that have been designed to take into account important ecological features. Embedded mitigation includes the placement and dimensions of WFD enhancements which have been designed to maximise benefit to water vole through providing good quality habitat within areas currently identified as sub-optimal, to avoid any tree loss which could impact roosting bats and to ensure that there is no conflict with active badger setts.

Any significant residual effects remaining after the inclusion of mitigation and compensation are the factors to be considered in determining the application.

7.3.6. Assumptions and limitations

Assumptions

It is assumed that if, following further survey effort, trees currently anticipated as requiring removal are found to be tree bat roosts, these trees will not be removed and the required adjustments to the Proposed Scheme design made.

Limitations

Any survey of flora and fauna will be unavoidably constrained in a number of respects. In an effort to mitigate those constraints, nationally recognised standard survey methodologies have been used to minimise these limitations for ecological evaluation and impact assessment.

Specific limitations relevant to each survey, such as access constraints, are detailed in the relevant technical reports (see Appendix F). It is not considered that any of these survey specific constraints represent a significant limitation to adequately assessing the importance/sensitivity of ecological features for the purposes of undertaking a reasonable ecological impact assessment.

Ecological mitigation measures are described in this chapter (see section 7.6. The detailed design of some aspects of mitigation (such as those measures needed to support protected species method statements and licence applications) will be

developed during the detailed design phase. However, the impact assessment has taken account of the worst-case scenarios and mitigation measures are included within the outline design accordingly.

Where it is considered that the status of an ecological feature(s) is likely to be subject to change before construction commences, pre-construction surveys are recommended.

7.4. Existing environment

7.4.1. Baseline context

The Proposed Scheme (see Figure 3.1, Appendix A) lies within the Somerset Levels and Moors Natural Character Area (NCA). It is the largest area of lowland wet grassland and associated wetland habitat remaining in Britain, covering about 65,000ha in the floodplains of the Rivers Axe, Brue, Parrett, Tone and their tributaries. The majority of the area is only a few metres above mean sea level and drains via a large network of ditches, rhynes and rivers, including the Sowy and KSD. The levels are mainly used for summer cattle grazing, often in conjunction with hay or silage production. The NCA supports internationally important numbers of waterfowl in winter, protected by the Somerset Levels and Moors SPA. Breeding birds include significant populations of waders associated with lowland wet grassland and the NCA is regarded as one of the best areas for breeding waders in lowland Britain. A series of Water Level Management Plans (WLMPs) are in place to control the timing, extent, and duration of floodplain inundation in the SSSIs across the levels and moors and to ensure maintenance of Raised Water Level Areas (RWLA) for biodiversity benefit.

7.4.2. Statutory and non-statutory designated sites for nature conservation

A summary of those statutory and non-statutory designated sites within the zone of influence of the Proposed Scheme is provided in Table 7.4 and illustrated in Figure 7.1 (Appendix A). The Proposed Scheme overlaps with a number statutory international and national designations and county level, non-statutory designations for nature conservation.

Table 7.4 Statutory and non-statutory designated sites for nature conservation within the zone of influence of the Proposed Scheme

Site Name	Distance from the Proposed Scheme	Description
Statutory designated sites		
Somerset Levels and Moors SPA/Ramsar	Overlaps	<p>The SPA covers 6,395 ha and includes areas of open water, fen and reed bed. The site attracts important numbers of water birds (swans, ducks and waders) in winter.</p> <p>Qualifying Features:</p> <ul style="list-style-type: none"> • A037 <i>Cygnus columbianus bewickii</i>; Bewick’s swan (Non-breeding) • A052 <i>Anas crecca</i>; Eurasian teal (Non-breeding) • A140 <i>Pluvialis apricaria</i>; European golden plover (Non-breeding) • A142 <i>Vanellus</i>; Northern lapwing (Non-breeding) • Water bird assemblage <p>The Ramsar site attracts internationally important numbers of wildfowl in winter. The network of rhynes and ditches support an outstanding assemblage of aquatic invertebrates, particularly beetles.</p> <p>Qualifies under Ramsar criterion 2, 5 and 6.</p> <p>Ramsar criterion 2</p> <ul style="list-style-type: none"> • Supports 17 species of British Red Data Book invertebrates. <p>Ramsar criterion 5</p> <p>Assemblages of international importance:</p> <ul style="list-style-type: none"> • Species with peak counts in winter: 97,155 waterfowl (5-year peak mean 1998/99-2002/2003) <p>Ramsar criterion 6</p> <p>Species/populations occurring at levels of international importance.</p>

Site Name	Distance from the Proposed Scheme	Description
		Species with peak counts in winter: <ul style="list-style-type: none"> • Bewick's swan (<i>Cygnus columbianus bewickii</i>) • Eurasian teal (<i>Anas crecca</i>) • Northern lapwing (<i>Vanellus vanellus</i>)
Somerset Levels NNR	Overlaps	Covers 463 ha. Main habitats: open water, lowland grassland. Includes parts of the Moorlinch SSSI, Southlake Moor SSSI and Kings Sedgemoor SSSI.
King's Sedgemoor SSSI	Overlaps	The SSSI covers 822ha and is notified for the following features: <ul style="list-style-type: none"> • Aggregations of non-breeding birds; Bewick's swan, dunlin (<i>Calidris alpina alpina</i>), golden plover (<i>Pluvialis apricaria</i>), Green sandpiper (<i>Tringa ochropus</i>), Jack snipe, (<i>Lymnocyptes minimus</i>), lapwing, mallard (<i>Anas platyrhynchos</i>), snipe (<i>Gallinago gallinago</i>) and teal. • <i>Agrostis</i> - <i>Carex</i> inland wet grassland • Assemblages of breeding birds -Lowland damp grasslands • Invertebrate assemblage • Lowland ditch systems • M22 - <i>Juncus subnodulosus</i> - <i>Cirsium palustre</i> fen meadow • MG13 - <i>Agrostis stolonifera</i> - <i>Alopecurus geniculatus</i> grassland • MG5 - <i>Cynosurus cristatus</i> - <i>Centaurea nigra</i> grassland • MG8 - <i>Cynosurus cristatus</i> - <i>Caltha palustris</i> grassland • Otter (<i>Lutra lutra</i>)

Site Name	Distance from the Proposed Scheme	Description
Southlake Moor SSSI	Overlaps	<p>The SSSI covers 196ha and is notified for the following features:</p> <ul style="list-style-type: none"> • Aggregations of non-breeding birds - Bewick's swan, black-tailed Godwit, (<i>Limosa islandica</i>), teal, wigeon (<i>Anas penelope</i>) • Agrostis - Carex inland wet grassland • Invertebrate assemblage • Lowland ditch systems • MG13 - Agrostis stolonifera - <i>Alopecurus geniculatus</i> grassland • MG5 - Cynosurus cristatus - <i>Centaurea nigra</i> grassland • MG8 - Cynosurus cristatus - <i>Caltha palustris</i> grassland • Otter
West Sedgemoor SSSI (part of RSPB reserve)	0.13km (Proposed Scheme is within the SSSI zone of influence)	<p>The SSSI covers 1,016ha and is notified for the following features:</p> <ul style="list-style-type: none"> • Aggregations of non-breeding birds: Bewick's swan, dunlin, golden plover, lapwing, snipe, teal, wimbrel (<i>Numenius phaeopus</i>), wigeon. • Agrostis - Carex inland wet grassland • Assemblages of breeding birds - Lowland fen without open water • Invertebrate assemblage • Lowland ditch systems • M22 - <i>Juncus subnodulosus</i> - <i>Cirsium palustre</i> fen meadow • M23 - <i>Juncus effusus/acutiflorus</i> - <i>Galium palustre</i> rush pasture • M27 - <i>Filipendula ulmaria</i> - <i>Angelica sylvestris</i> mire

Site Name	Distance from the Proposed Scheme	Description
		<ul style="list-style-type: none"> • MG13 - <i>Agrostis stolonifera</i> - <i>Alopecurus geniculatus</i> grassland • MG5 - <i>Cynosurus cristatus</i> - <i>Centaurea nigra</i> grassland • MG8 - <i>Cynosurus cristatus</i> - <i>Caltha palustris</i> grassland
Moorlinch SSSI	0.48km (Proposed Scheme is within the SSSI zone of influence)	<p>The SSSI covers 226ha and is notified for the following features:</p> <ul style="list-style-type: none"> • Aggregations of non-breeding birds: Bewick's swan, golden plover, lapwing, snipe, teal, whimbrel, wigeon. • <i>Agrostis</i> - <i>Carex</i> inland wet grassland • Assemblages of breeding birds – Lowland damp grasslands • Invertebrate assemblage • Lowland ditch systems • M22 - <i>Juncus subnodulosus</i> - <i>Cirsium palustre</i> fen meadow • M23 - <i>Juncus effusus/acutiflorus</i> - <i>Galium palustre</i> rush pasture • MG13 - <i>Agrostis stolonifera</i> - <i>Alopecurus geniculatus</i> grassland • MG5 - <i>Cynosurus cristatus</i> - <i>Centaurea nigra</i> grassland • MG8 - <i>Cynosurus cristatus</i> - <i>Caltha palustris</i> grassland
Aller Hill SSSI	0.86km (Proposed Scheme is within the SSSI zone of influence)	<p>The SSSI covers 18.4ha and is notified for the following features:</p> <ul style="list-style-type: none"> • CG2 - <i>Festuca ovina</i> - <i>Avenula pratensis</i> lowland calcareous grassland • Population of RDB plant - <i>Gastridium ventricosum</i>, nit grass • Population of RDB plant - <i>Lithospermum purpureocaeruleum</i>, purple gromwell • Population of Schedule 8 plant - <i>Althaea hirsuta</i>, rough marsh-mallow

Site Name	Distance from the Proposed Scheme	Description
Wet Moor SSSI	3.89km (scoped in for strategic and project level HRA)	<p>The SSSI covers 491ha and is notified for the following features:</p> <ul style="list-style-type: none"> • Aggregations of non-breeding birds: Bewick's swan, dunlin, gadwall (<i>Anas strepera</i>), golden plover, lapwing, mallard (<i>Anas platyrhynchos</i>), pintail (<i>Anas acuta</i>), pochard (<i>Aythya farina</i>), shoveler (<i>Anas clypeata</i>), snipe, teal, tufted duck (<i>Aythya fuligula</i>), wigeon. • <i>Agrostis</i> - <i>Carex</i> inland wet grassland • Assemblages of breeding birds – Lowland damp grasslands • Invertebrate assemblage • Lowland ditch systems • MG11 - <i>Festuca rubra</i> - <i>Agrostis stolonifera</i> - <i>Potentilla anserina</i> grassland • MG13 - <i>Agrostis stolonifera</i> - <i>Alopecurus geniculatus</i> grassland • MG8 - <i>Cynosurus cristatus</i> - <i>Caltha palustris</i> grassland
West Moor SSSI	4.11km (scoped in for strategic and project level HRA)	<p>The SSSI covers 213ha and is notified for the following features:</p> <ul style="list-style-type: none"> • Aggregations of non-breeding birds: Bewick's swan, curlew (<i>Numenius arquata</i>), dunlin, golden plover, hen harrier (<i>Circus cyaneus</i>), lapwing, little grebe (<i>Tachybaptus ruficollis</i>), mallard, mute swan (<i>Cygnus olor</i>), pintail, pochard, redshank (<i>Tringa tetanus</i>), ruff (<i>Philomachus pugnax</i>), shoveler, snipe, teal and tufted duck. • Assemblages of breeding birds – Lowland damp grasslands • Invertebrate assemblage • Otter

Site Name	Distance from the Proposed Scheme	Description
Severn Estuary SPA	6.8km (scoped in for strategic and project level HRA)	<p>The SPA covers 24,488ha. The Severn Estuary is one of the largest estuaries in Britain and it has the second largest tidal range in the world.</p> <p>Qualifies under Article 4.1 of the EC Birds Directive by regularly supporting an internationally important wintering population of Bewick's swan, an Annex 1 species.</p> <p>Qualifies under Article 4.2 as a wetland of international importance by regularly supporting in winter over 20,000 waterfowl.</p> <p>Qualifies under Article 4.2 by regularly supporting in winter internationally important numbers of the following 5 species of migratory waterfowl:</p> <ul style="list-style-type: none"> • European white-fronted goose <i>Anser albifrons</i> • Shelduck <i>Tadorna tadorna</i> • Gadwall • Dunlin • Redshank
Severn Estuary Ramsar	6.8km (scoped in for strategic and project level HRA)	<p>Qualifies under Ramsar criterion 1, 3, 4, 5, 6</p> <p>Criterion 1 due to its immense tidal range.</p> <p>Criterion 3 due to its unusual estuarine communities, reduced species diversity and high productivity.</p> <p>Criterion 4, as it is particularly important for the run of migratory fish between the sea and rivers via the estuary. Species using the estuary include salmon <i>Salmo solar</i>, sea trout <i>S. trutta</i>, sea lamprey <i>Petromyzon marinus</i>, river lamprey <i>Lampetra fluviatilis</i>, allis shad <i>Alosa</i>, twaite shad <i>A. fallax</i> and eel <i>Anguilla anguilla</i>. It is also important for migratory birds during passage periods in spring and autumn.</p>

Site Name	Distance from the Proposed Scheme	Description
		<p>Criterion 5: Assemblages of international importance: species with peak counts in winter: 70,919 waterfowl.</p> <p>Criterion 6: Species/populations occurring at levels of international importance. Bewick's swan, greater white-fronted goose, common shelduck, gadwall, dunlin, common redshank.</p> <p>Criterion 8: The fish of the whole estuarine and river system is one of the most diverse in Britain with over 110 species recorded.</p>
Non-statutory sites		
Aller Moor LWS	Overlaps	Rhyne and wet meadow site, important wintering bird population.
Lang Moor LWS	Overlaps	Improved grassland with extensive rhyne system
Greylake RSPB Reserve/LWS	Overlaps	Historically arable fields now managed for wetland birds and wildlife
River Parrett, Middle Moor to Scree LWS	Adjacent	River with legally protected species and rare invertebrate species
Langport Moor LWS	0.42km	Semi-improved grassland crossed by a network of species rich rhyes
Pendon Hill LWS	0.44km	A long (1km) stretch of unimproved calcareous grassland and scrub, enclosed and subdivided by tall hedges, on the steep, south-facing slope of this outlier of the Poldens
Badgers Wood LWS	0.52km	Semi-natural broadleaved woodland, coppiced with standards, on a north facing slope
Mill Batch LWS	0.64km	Steep south-facing calcareous to neutral grassland
North Street Moor LWS	0.71km	Semi-improved grassland bisected by species rich rhyes

7.4.3. Habitats

The KSD and Sowy are artificial embanked drainage channels. Marginal vegetation is frequent along both banks of the Sowy and KSD. The botanical diversity of marginal vegetation is relatively high.

The dominant land-use across the study area is grassland used for cattle grazing and haymaking. Field sizes are relatively small and field boundaries are defined by water-filled ditches, most without trees, hedgerows or scrub. Fields were either improved grassland, poor semi-improved grassland or semi-improved neutral grassland.

Marshy grassland was the most botanically diverse habitat recorded during the 2019 Phase 1 Habitat Survey (Appendix F). It was scarce across the study area and contains a variety of water tolerant species. However, none of these fields were particularly botanically diverse, and there were no fields recorded during the survey described as NVC types MG4 *Alopecurus pratensis-Sanguisorba officinalis* or MG5 *Cynosurus cristatus - Centaurea nigra* grassland.

The 2019 Phase 1 habitat survey (see Appendix F) also recorded the following habitat types within the study area:

- Semi-natural broadleaved woodland (A1.1.1)
- Broadleaved plantation woodland (A1.1.2)
- Dense scrub (A2.1)
- Scattered scrub (A2.2)
- Broadleaved scattered trees (A3.1.1)
- Neutral semi-improved grassland (B2)
- Improved grassland (B4)
- Marshy grassland (B5)
- Poor semi-improved grassland (B6) – present on many flood defence embankments
- Tall ruderals (C3.1) – present on many flood defence embankments
- Marginal vegetation (F2.1) frequent along margins of watercourses and ponds
- Standing water (ponds) and water filled ditches (G1)
- Running water (G2)
- Arable fields, crops and Cultivated/disturbed ground (J1.1)
- Amenity grassland (J1.2)
- Hedgerows intact, species poor (J2.1.2), (includes intact species poor hedge with trees, J2.3.2)
- Buildings (J3.6)
- Hardstanding (no code)

Based on the Phase 1 habitat survey results, and supported by a review of MAGIC Priority Habitat Inventory data (Defra, 2019), the following Section 41 Habitats of

Principal Importance for Biodiversity Conservation in England (NERC Act, 2006) (hereafter referred to as 'S41 Habitats') are considered to be present in the study area:

- Coastal and floodplain grazing marsh – coastal and floodplain grazing marsh is not a specific habitat but a landscape type which supports a variety of habitats; the defining features being hydrological and topographical rather than botanical. Grazing marsh is defined as periodically inundated pasture or meadow, typically with ditches or rills containing standing brackish or fresh water.
- Hedgerows – which are of limited extent in the study area.
- Ponds – four recorded in the study area, two of which are seasonally dry.

The KSD and Sowy are not considered to be S41 Habitats, given they are not natural or near natural running waters and ditches are excluded from the definition of rivers of Principal Importance.

7.4.4. Species

Through a combination of desk study, consultation, survey work (see Table 7.2) and Environment Agency Technical Specialist local knowledge, the following protected and notable species were considered in the establishment of the baseline.

Notable plant species

Three notable plant species were recorded during the Phase 1 habitat survey, as follows:

- Tubular water dropwort (*Oenanthe fistulosa*)
- Frogbit (*Hydrocharis morsus-ranae*)
- Water violet (*Hottonia palustris*)

Several individuals of tubular water dropwort were recorded in one area of marshy grassland within the study area. Frogbit was a commonly encountered species in many of the field drainage ditches. Water violet was recorded in one field drainage ditch. These species are all classified as 'vulnerable' in the Vascular Plant Red List for England (Stroh et al., 2014).

Fish

All the major watercourses in the Somerset Levels and Moors are important coarse fisheries; regular angling takes place on the KSD, Langacre Rhyne, Sowy and Parrett with roach (*Rutilus rutilus*), bream (*Abramis brama*), pike (*Esox lucius*), tench (*Tinca tinca*), ruffe (*Gymnocephalus cernua*) and eels the dominant species. Rudd, gudgeon, perch and carp are also locally important. Chub (*Squalius cephalus*) and dace (*Leuciscus leuciscus*) are also present though these species may move upstream at certain times of the year.

The Somerset Drainage Boards Consortium (Philip Brewin 07 April 2020 via e-mail) advised that there are fish passes on several of the primary structures in the area and that the area is characterised by a dense network of highly interconnected watercourses so that, although there are some structures with passage issues, there are often many routes into the system, bypassing barriers. Fish passage issues tend to be a seasonal problem, when weirs are raised or valves shut.

Watercourses within the study area are homogenous in nature, with artificial drainage channels limiting habitat diversity for fish. Currently fish passage is restricted during normal and low flows, due to the operation of the KSD water level management structures. During high flows there is enough volume of water for fish to pass through the KSD. Eels migrate through the KSD and beyond via Dunball.

Aquatic invertebrates

The network of rhynes and ditches in the study area provides suitable habitat for a diverse range of aquatic invertebrates. The Somerset Levels and Moors Ramsar wetland site, which overlaps with the Proposed Scheme, is designated in part because the land's network of rhynes and ditches support an outstanding assemblage of aquatic invertebrates, particularly beetles.

Somerset Ecology Services undertook a sampling survey for the purpose of establishing presence /absence of relevant Ramsar invertebrate species, focussing on aquatic beetles, along the length of the Proposed Scheme (see Appendix F). The results of the survey did not indicate that, in terms of the aquatic beetle fauna, the Sowy makes a vital contribution to the diversity or conservation value of the Somerset Levels and Moors Ramsar site. The survey methodology was not designed so as to maximise the chances of finding scarce and rare terrestrial beetles associated with marginal vegetation, nevertheless there is evidence from the survey to suggest that the tall vegetation growing at the very edge of the Sowy may harbour some species of conservation value, the Red Data Book (RDB) 3 species *Donacia bicolor* being the most significant found.

Great Crested Newts (GCN)

The network of rhynes and ditches within the study area were considered unlikely to support amphibians, due to the likely influx of fish from flood waters and high usage by waterfowl.

Several ponds are present within 500m of the Proposed Scheme meaning GCN could, if using these ponds, be present in terrestrial habitat in the study area. No evidence of GCN was found in surveys conducted in 2015. In 2019 a single pond (Pond 5) (see Figure 1 of 2019 GCN survey report, Appendix F) within 500m of the Proposed Scheme was recorded as positive for GCN. However, this pond is separated from the Sowy by the Parrett and Stathe Road. These features are both considered likely to be a physical barrier to GCN dispersal. As such, GCN from Pond 5 are unlikely to be within the immediate area of the Proposed Scheme along the banks of the Sowy. Nonetheless this result does indicate GCN populations are present within the general area of the Proposed Scheme.

Reptiles

Habitat within the study area is considered suitable to support grass snake (*Natrix natrix*). SERC provided records of grass snake within 1km of the Proposed Scheme but no records of any other reptile species, and incidental records of grass snake have been made during the ecological surveys conducted in 2019. Other reptile species are unlikely to be present in the study area due to the generally unfavourable homogenous habitat structure and regular flooding.

Birds

Excluding those qualifying bird features of designated sites (which are described in Table 7.4), the habitats within the study area are likely to offer foraging habitat for

birds listed on Schedule 1 of the Wildlife and Countryside Act 1981 (as amended), such as barn owl (*Tyto alba*), as well as a range of common species including non-water birds in winter.

Scattered, localised trees and scrub, along with lengths of hedgerow, provide nesting opportunities for common bird species. Lowland wet grassland will also provide suitable habitat for ground nesting birds such as snipe, lapwing and skylark (*Alauda arvensis*) which are also listed as birds of conservation concern (Eaton *et al.* 2015).

Bats

SERC provided records of the following species recorded within 1km of the Proposed Scheme in the last 10 years (none of these were for roosts):

- Brown long-eared bat (*Plecotus auritus*)
- Common pipistrelle (*Pipistrellus pipistrellus*)
- Greater horseshoe (*Rhinolophus ferrumequinum*)
- Noctule (*Nyctalus noctule*)
- Serotine (*Eptesicus serotinus*)

Rhynes and ditches and lowland wet grassland habitats in the study area provide extensive foraging habitat for bats.

The bat roost ground assessments conducted in 2019 (see Appendix F) identified 47 trees with potential to support roosting bats within the study area. Of the structures present within the study area, Monk's Leaze Clyce sluice control room had moderate potential for roosting bats. Two bridges had low potential for roosting bats, and one had moderate potential for roosting bats. Two barn owl boxes installed on poles were identified with low potential for roosting bats. On the western end of the Proposed Scheme there was sheep housing with an area of hay storage; this structure had moderate potential for roosting bats.

Otter

The study area provides suitable habitat for breeding, resting, foraging and commuting otters.

The 2015 otter survey (see Appendix F) recorded frequent otter activity between the Aller Drove Bridge and the confluence of the Soway and KSD, including the presence of spraints, slides and an otter running across a field from the Langacre Rhyne to the Soway. Limited activity was observed along the KSD, with the only spraint being observed under a drain bridge of the M5 outside the current study area. No evidence of holts or layups were recorded, but there were areas of potentially suitable habitat that could support these features within the study area.

Incidental records of otter activity were recorded on both the KSD and Soway during the 2019 water vole survey but there was no evidence of any otter holts.

Water vole

During surveys in 2015 (Capita, 2015a), signs of water vole were recorded in four of 23 survey segments suggesting that animals were present within the survey area but in low numbers and in limited locations. There were no latrines recorded during the 2015 surveys and as such the population density could not be estimated.

Surveys in 2019 (see Appendix F) indicate that water voles are present along more extensive stretches of the Proposed Scheme than was the case in 2015. During the first survey conducted in 2019 between June and July, signs of water vole were recorded in 14 out of 20 survey segments in low to medium population densities (based on Dean *et al.* 2016). A second survey conducted between September and October 2019 recorded signs of water vole in 17 of the 20 segments in low to medium population densities. Latrines were more frequently encountered during the first survey however other signs of water vole presence were recorded at a similar level during both surveys.

Badger

The study area was found to support suitable habitat for badgers, with the network of hedgerows and scrub providing cover and permanent grassland for foraging.

The 2015 badger survey (Capita, 2015b) recorded 17 setts, of which eight were within 30m of the Sowy/KSD. The survey identified a total of five main setts (three of which were within 30m of the Sowy/KSD) and ten outlier setts (five of which were within 30m of the Sowy/KSD). This activity was found to be focussed around three main areas of badger activity.

Surveys conducted in February 2020 recorded badger activity across much of the Proposed Scheme (see Appendix F – confidential). Nine setts were recorded within 50m of the Sowy/KSD. Five of these were main setts, one was a subsidiary sett and three were outlier setts (see Table 7.5).

Table 7. 5. Badger setts recorded in February 2020

Sett no.	Classification	Description
1	Outlier	Two partially active, currently flooded, holes. This outlier sett was flooded at the time of survey but showed signs of recent excavation and therefore was considered to be partially active.
2	Main	A partially active main sett containing 19 flooded holes. This sett was largely flooded at the time of survey but showed signs of recent excavation.
3	Main	Main sett containing 10 holes. 8 appear well used with fresh bedding material.
4	Main	Main sett containing 3 well used holes, fresh spoil heap, large entrances and fresh bedding.
5	Main	Main sett under mature willow, well used containing 30 holes.
6	Outlier	Two well defined mammal tracks running toward 2 partially active sett entrances and fresh dung pits.
7	Main	Active main sett containing 15 holes. Lots of fresh bedding and dung pits.

Sett no.	Classification	Description
8	Outlier	Partially used. Recently collapsed/flooded badger sett of approximately 4 holes. One hole intact but appeared inactive at time of survey.
9	Subsidiary	Active sett containing 3 holes and fresh spoil and bedding material.

Non-native, invasive plant species

The following non-native, invasive plant species, listed on Schedule 9 of the Wildlife and Countryside Act 1981 (as amended), were recorded during the Phase 1 habitat survey:

- Giant Hogweed (*Heracleum mantegazzianum*) was recorded on the Sowy River at Beer Wall.
- Water fern (*Azolla filiculoides*) was recorded on a ditch in a field adjacent to the KSD near Westonzoyland.
- Himalayan Balsam (*Impatiens glandulifera*) was recorded in the study area on the Parrett.
- Canadian pond weed (*Elodea canadensis*) was recorded in an agricultural drainage ditch.
- Nuttall's waterweed (*Elodea nuttallii*) was recorded at two locations in the Sowy.

Further information on non-native, invasive plant species was also provided by the Somerset Drainage Board Consortium (Philip Brewin 07 April 2020 via e-mail) stating that parrots feather (*Myriophyllum aquaticum*) is widespread on Aller moor and known to be present in the Langacre Rhyne. The extent of Parrots feather is increasing as no control measures have been implemented. Also, water lettuce (*Pistia stratiotes*) and water hyacinth (*Eichhornia crassipes*) have been found on the KSD in recent years, but these are not thought to be currently present in the study area. There are also records of floating pennywort (*Hydrocotyle ranunculoides*) in drainage systems connected to the Sowy corridor and there is therefore a significant likelihood that floating pennywort may already be in, or close to the Sowy, or may become present during the implementation period of the scheme.

7.4.5. Summary of importance (sensitivity) of ecological features identified in the baseline

Based on the existing baseline, ecological features have been assigned a level of importance (sensitivity) (see Table 7.6 below) using the approach outlined in section 7.3.

Table 7.6 Importance (sensitivity) of ecological features present within the study area

Ecological feature	Sensitivity (Importance)	Justification
Somerset Levels and Moors SPA / Ramsar Severn Estuary SPA/Ramsar	High (European)	Sites designated as part of a network of internationally important nature conservation sites. The SPA/Ramsar site is taken forward into the assessment of likely significant effects.
Somerset Levels NNR	Medium (National)	Site designated as an NNR as part of a network of nationally important nature conservation sites. The site is split across a number of locations and overlapping SSSIs include Moorlinch, King's Sedgemoor and Southlake SSSIs. The NNR is taken forward into the assessment of likely significant effects.
King's Sedgemoor SSSI/Southlake Moor SSSI/Moorlinch SSSI/West Sedgemoor SSSI/Aller Hill SSSI/Wet Moor SSSI/West Moor SSSI	Medium (National)	Sites designated as a SSSI as part of a network of nationally important nature conservation sites. SSSIs are taken forward into the assessment of likely significant effects.
Aller Moor LWS, Lang Moor LWS, River Parrett, Middle Moor to Scree LWS, Greylake RSPB Reserve LWS, Langport Moor LWS, Pendon Hill LWS, Badgers Wood LWS, Mill Batch LWS, North Street Moor LWS	Low (County)	The LWS classification provides a means of identifying and safeguarding some of the county's best sites for wildlife. The intention is to complement the network of internationally and nationally designated sites, helping to ensure the survival of important areas for wildlife. LWSs are taken forward into the assessment of likely significant effects.
Coastal flood plain grazing marsh	Low (Regional)	Collectively the terrestrial habitats within the study area form part of the S41 Habitat, coastal flood plain grazing marsh. S41 Habitats are considered the most important habitats for wildlife and a focus for conservation

Ecological feature	Sensitivity (Importance)	Justification
		<p>action in England. Given the extent of this habitat within the study area it is considered to be of Regional value.</p> <p>Coastal flood plain grazing marsh is taken forward into the assessment of likely significant effects.</p>
Hedgerows	Negligible (Site)	<p>Hedgerows are a S41 Habitat. However, within the study area they are species poor and limited in extent and are therefore considered to be of site importance only.</p> <p>Hedgerows are not taken forward into the assessment of likely significant effects.</p>
Ponds	Negligible (Local)	<p>Four ponds were recorded within the study area.</p> <p>Ponds are a S41 Habitat. Ponds are considered to be important at the local level.</p> <p>Ponds are not taken forward into the assessment of likely significant effects.</p>
All other individual habitats (see habitat list section 7.4.3)	Negligible (Local or Site)	<p>Individually all other habitats recorded during the Phase 1 habitat survey, with the exception of those detailed above, are considered to be of local or site value.</p> <p>These habitats are not considered to be notable for their botanical diversity and are either common and widespread within the wider area and/or limited in extent within the study area.</p> <p>Habitats in this category are not taken forward into the assessment of likely significant effects.</p>
Notable plant species	Low (County)	<p>Tubular water dropwort, frogbit and water violet were all recorded in the study area.</p> <p>These species are all classified as 'vulnerable' in the Vascular Plant Red List for England (Stroh et al., 2014).</p> <p>Notable plant species are taken forward into the assessment of likely significant effects.</p>
Fish (excluding eels)	Negligible (Site)	<p>Watercourses within the study area are homogenous in nature, with artificial drainage channels having limited habitat diversity for fish.</p> <p>Fish (excluding eels) are not taken forward into the assessment of likely significant effects.</p>

Ecological feature	Sensitivity (Importance)	Justification
Eel (<i>Anguilla anguilla</i>)	Low (Regional)	<p>Eels are present in the watercourses in the study area.</p> <p>The European eel is a critically endangered species listed on the IUCN Red List (IUCN 2020-1), a S41 Species and is protected under the Eels (England and Wales) Regulations 2009.</p> <p>Eels are taken forward into the assessment of likely significant effects.</p>
Aquatic invertebrates	Low (County)	<p>There is evidence to suggest that the tall vegetation growing at the very edge of the Sowy may harbour some species of conservation value, the Red Data Book (RDB) 3 species <i>Donacia bicolor</i> being the most significant found.</p> <p>Aquatic invertebrates are taken forward into the assessment of likely significant effects.</p>
GCN	Negligible (Site)	<p>The GCN is protected under Schedule 2 of the Conservation of Habitats and Species Regulations 2017 and under Schedule 5 of the Wildlife and Countryside Act 1981 (as amended). GCN is also listed as a S41 Species.</p> <p>The species is not uncommon, either in Somerset or the unitary authorities, although their distribution is localised and patchy and they are absent from large swathes of the county (Reptile and Amphibian Group for Somerset, 2020).</p> <p>No evidence of GCN was found in surveys conducted in 2015. A single pond within 500m of the Proposed Scheme was recorded as positive for GCN in 2019. This pond is separated from the Sowy by the Parrett and Stathe Road.</p> <p>The study area is considered to be of no more than site level importance for GCN however, as there is the low risk that GCN could be present in terrestrial habitat in the study area, and therefore that there could be a breach of the legislation, this species is taken forward into the assessment of likely significant effects.</p>
Grass snake	Negligible (Local)	<p>All reptiles are listed on Schedule 5 of the Wildlife and Countryside Act 1981 (as amended) and as S41 Species.</p>

Ecological feature	Sensitivity (Importance)	Justification
		<p>Habitat within the study area is considered suitable to support to support grass snake. And incidental records of grass snake were recorded within the study area during the 2019 ecology field surveys.</p> <p>Grass snakes are widespread in Somerset and the unitary authorities, particularly concentrated wherever there is fresh water. They are common throughout the levels and moors and the population in the study area are considered to be of local importance (Reptile and Amphibian Group for Somerset, 2020).</p> <p>Due the legislation relating to the killing and injury of grass snake, this species is taken forward into the assessment of likely significant effects.</p>
Birds (excluding qualifying features of designated sites)	Low (County)	<p>Beyond statutory designated sites, the habitats within the study area are likely to provide foraging habitat for Wildlife and Countryside Act 1981 (as amended) Schedule 1 birds, such as barn owl, as well as a range of common species.</p> <p>Scattered, localised trees and scrub, along with short lengths of hedgerow, provide nesting opportunities for common bird species. Lowland wet grassland will also provide suitable habitat for ground nesting birds such as snipe (an amber listed bird of conservation concern), lapwing and skylark (both Red Listed birds of conservation concern) (Eaton et al. 2015).</p> <p>Birds are taken forward into the assessment of likely significant effects.</p>
Bat assemblage	Low (County)	<p>All UK bat species are protected under Schedule 2 of the Conservation of Habitats and Species Regulations 2017 and under Schedule 5 of the Wildlife and Countryside Act 1981 (as amended). A number of bat species are also listed as a S41 Species.</p> <p>Rhynes and ditches and lowland wet grassland habitats in the study area provide extensive foraging habitat for bats.</p> <p>Trees and structures within the study area provide potential roost features.</p>

Ecological feature	Sensitivity (Importance)	Justification
		Bats are taken forward into the assessment of likely significant effects.
Otter	Negligible (Local)	<p>Otter is protected under Schedule 2 of the Conservation of Habitats and Species Regulations 2017 and under Schedule 5 of the Wildlife and Countryside Act 1981 (as amended). Otter is also listed as a S41 Species.</p> <p>Records of otter activity were recorded on both the KSD and Sowy however no evidence of holts or lay-ups were recorded.</p> <p>The watercourses present within the study area are likely to provide important commuting and foraging opportunities for otter.</p> <p>Due the legislation relating to otter, this species is taken forward into the assessment of likely significant effects.</p>
Water vole	Low (County)	<p>Water vole is listed on Schedule 5 of the Wildlife and Countryside Act 1981 (as amended) and as a S41 Species.</p> <p>In England and Wales the water vole has suffered an overall decline estimated at 30% between 2006 and 2015 (McGuire and Whitfield, 2017).</p> <p>Water vole were recorded at a low-medium population along the length of the Proposed Scheme.</p> <p>Water vole is taken forward into the assessment of likely significant effects.</p>
Badger	Negligible (Local)	<p>Badgers receive legal protection under the Protection of Badgers Act 1992.</p> <p>Badger are common and widely distributed throughout Somerset and within the study area.</p> <p>2019 surveys recorded nine setts within 50m of the Sowy/KSD. Five of these were main setts.</p> <p>Whilst badgers are common and widespread, due to the potential for breach of the legislation, this species is taken forward into the assessment of likely significant effects.</p>

7.5. Likely significant effects

7.5.1. Construction

The assessment of construction impacts assumes that construction of the Proposed Scheme will commence in September 2020, taking approximately eight weeks for the completion of earthworks activities. Reseeding and planting of the WFD enhancement features (embayments, two-stage channels and backwaters) will also take place during this period, with riparian tree planting taking place in early November (pending agreement with NE).

Statutory designated sites for nature conservation

There are a number of statutory designated sites for nature conservation in the study area (see Table 7.4 and Figure 7.1 (Appendix A)).

European designated sites

In accordance with the Habitats and Species Regulations 2017, a project level HRA has been carried out to assess the implications of the Proposed Scheme on European designated sites and further information on European sites, and those features for which potentially significant effects are likely/have been ruled out, is provided in Appendix D. Those sites and features for which potential significant effects are considered include:

- Somerset Levels and Moors SPA – non-breeding bird qualifying features
- Somerset Levels and Moors Ramsar – non-breeding bird qualifying features only
- Severn Estuary SPA - non-breeding bird qualifying features only
- Severn Estuary Ramsar - non-breeding bird qualifying features and eels only

Non-breeding bird qualifying features

The Proposed Scheme lies directly within the Somerset Levels and Moors SPA/Ramsar at two locations within the King's Sedgemoor Drain SSSI and Southlake Moors SSSI components (see Figure 7.1, Appendix A). Habitats within the study area, outside of the Somerset Levels and Moors SPA/Ramsar, will also provide functional habitat for the qualifying winter bird features of the SPA/Ramsar site. Potential pathways to effects were also considered for the Severn Estuary SPA/Ramsar site due to potential effects on non-breeding bird features that utilise both the estuary and the Somerset Levels and Moors depending on prevailing weather, tidal and other conditions, where it is assumed likely interchange of birds will be with the Bridgewater Bay SSSI component.

Non-breeding bird qualifying features could be impacted by loss of habitat in the study area, which is either directly within the designated sites or functionally linked, and by disturbance effects.

The only habitats being lost to birds during construction are loss of open water habitat and existing marginal plants along the lengths of the WFD enhancement locations (totalling c.0.9km of bank), and the loss of a strip of grassland for material winning, bank raising and landscaping of material won from the WFD enhancement features on the landwards side of the re-profiled flood embankments along an extent

of c. 21km. This 21km takes into account both sides of the main channel, and consists of predominantly poor semi-improved grassland, where material will be won from existing flood banks on the left and right bank sides of the KSD and where the existing informal flood embankments will be raised on the right and left bank sides of the Lower Sowy and right bank only of the Upper Sowy. Some additional small areas of scrub and hedge may also be lost where fencing is removed for access on the left bank of the Sowy/KSD. These losses will be largely temporary, short-term and limited in extent along the corridor of the Proposed Scheme. Loss of open water habitat will only be for the period of construction and marginal vegetation and grassland will re-establish in the short-medium terms. There is significant alternative habitat available in the surrounding area and it is unlikely that this limited habitat loss will undermine site conservation objectives for non-breeding birds either in the Somerset Levels and Moors SPA/Ramsar or Severn Estuary SPA/Ramsar.

In addition to the impact of direct habitat loss, the presence of construction plant, vehicles and operatives could result in disturbance and displacement of birds. However, construction works are proposed to take place between September and October/very early November (pending agreement with NE) thus avoiding the most sensitive times for wintering birds. Given that the works will be programmed outside of the winter period when the largest numbers of non-breeding birds are present and also when temperatures are at their lowest (making birds more vulnerable to the effects of disturbance), the risk of there being a significant effect is low. There is the potential for disturbance during autumn months when numbers of some species will be beginning to build. However, the localised nature of the works, with a relatively small zone of influence (maximum of 300m for noise and visual disturbance) and with a degree of habituation once works are underway, means that there is unlikely to be any impacts that will undermine site conservation objectives for non-breeding birds either in the Somerset Levels and Moors SPA/Ramsar or Severn Estuary SPA/Ramsar.

The magnitude of effects on the non-breeding bird qualifying features of the Somerset Levels and Moors SPA/Ramsar or Severn Estuary SPA/Ramsar (High / European sensitivity) is considered to be negligible adverse and the significance of effect, minor. Mitigation measures to further reduce the magnitude of effect are outlined in section 7.7 and Table 7.9

Eels

For the Severn Estuary Ramsar site, potential effects are also considered for eels which migrate through the KSD and beyond via Dunball.

In-channel activities could kill or injure eels as well as adversely affect water quality. Given the limited nature of the in-channel works at the seven WFD enhancement features locations and sluice upgrades, the likelihood of killing/injuring eels is considered low and is unlikely to significantly reduce population levels. Any impacts on water quality will be temporary and reversible and will not compromise the habitat used by eels or reduce population levels.

The magnitude of effects on the eel qualifying feature of the Severn Estuary Ramsar (Low / Regional sensitivity) is considered to be negligible adverse and the significance of effect, negligible. Mitigation measures to further reduce the magnitude of effect are outlined in section 7.7 and Table 7.9.

Somerset Levels NNR

The NNR is split over several sites including components in the Moorlinch, King's Sedgemoor and Southlake SSSIs. There will be no habitat loss within the NNR as a result of the Proposed Scheme and no impacts on this designation exist during construction.

Sites of Special Scientific Interest

Of the seven SSSIs identified within the study area, no impacts are assessed for Aller Hill SSSI. This site is 0.86km north-east of the Proposed Scheme and is designated for habitats and plant species which will not be impacted by the Proposed Scheme.

Of the remaining six sites, King's Sedgemoor Drain SSSI, Southlake SSSI, Moorlinch SSSI, West Sedgemoor SSSI, Wet Moor SSSI and West Moor SSSI, potential significant effects were identified at the scoping stage in respect of habitat loss and impacts to breeding and non-breeding qualifying bird features and are discussed below.

Direct habitat loss within SSSIs

The Proposed Scheme passes directly through the King's Sedgemoor Drain SSSI on both bank sides of the Lower Sow, and through the Southlake Moors SSSI on the left bank side only on the Upper Sow (see Figure 7.1, Appendix A). Habitat from within a SSSI will be directly lost within the King's Sedgemoor Drain SSSI, but no works are proposed on the left bank of the Upper Sow thus there will be no direct loss of habitat in the Southlake Moors SSSI.

The King's Sedgemoor Drain SSSI is cited for its neutral grassland habitats which include; M22 - *Juncus subnodulosus* - *Cirsium palustre* fen meadow, MG13 - *Agrostis stolonifera* - *Alopecurus geniculatus* grassland, MG5 - *Cynosurus cristatus* - *Centaurea nigra* grassland and MG8 - *Cynosurus cristatus* - *Caltha palustris* grassland, and for its standing water (lowland ditch systems).

The only habitats that will be lost in the Kings Sedgemoor Drain SSSI during construction are open water habitat and existing marginal plants along the lengths of the five WFD enhancement locations within the SSSI; and the loss of grassland, predominantly poor semi-improved grassland, where flood banks will be raised on the right and left bank sides of the Lower Sow. None of the habitats recorded in the Phase 1 habitat survey were considered to match those habitats listed on the SSSI citation and the grassland habitat lost will be predominantly poor semi-improved grassland. Some additional small areas of scrub and hedge may also be lost where fencing is removed for access on the left bank of the Sow/KSD. These losses are largely temporary, short-term and limited in extent along the corridor of the Proposed Scheme. Loss of open water habitat will only be for the period of construction and marginal vegetation and grassland will re-establish in the short-medium term.

The magnitude of effects of habitat loss on the King's Sedgemoor SSSI (medium / national sensitivity) is considered to be negligible adverse and the significance of effect, minor. Mitigation measures to further reduce the magnitude of effect are outlined in section 7.7 and Table 7.9.

Impacts to breeding and non-breeding qualifying bird features

King's Sedgemoor Drain SSSI, Southlake SSSI, Moorlinch SSSI, West Sedgemoor SSSI, Wet Moor SSSI and West Moor SSSI are all designated for non-breeding birds and all except Southlake Moors SSSI are also designated for breeding bird features. These features could be impacted by loss of habitat in functionally linked habitats within the study area, and for habitat loss within the SSSI at Kings Sedgemoor Drain SSSI, as well as via disturbance of birds in SSSIs (Kings Sedgemoor Drain SSSI, Southlake Moors SSSI) and functionally linked habitat.

The only habitats being lost to birds during construction are loss of open water habitat and existing marginal plants along the lengths of the WFD enhancement locations (totalling c.0.9km of bank), and the loss of a strip of grassland for material winning bank raising along an extent of c. 21km. This 21km takes into account both sides of the main channel, and consists of predominantly poor semi-improved grassland, where material will be won from existing flood banks on the left and right bank sides of the KSD and where flood banks will be raised on the right and left bank sides of the Lower Sowey and right bank only of the Upper Sowey. Some additional small areas of scrub and hedge may also be lost where fencing is removed for access on the left bank of the Sowey/KSD. These losses will be largely temporary, short-term and limited in extent along the corridor of the Proposed Scheme. Loss of open water habitat will only be for the period of construction and marginal vegetation and grassland will re-establish in the short-medium term. There is significant alternative habitat available in the surrounding area and it unlikely that this limited habitat loss will undermine site conservation objectives for breeding or non-breeding birds in any of the SSSIs considered.

In addition to the impact of direct habitat loss, the presence of construction plant, vehicles and operatives could result in disturbance and displacement of birds. However, construction works are proposed to take place between early September and October/November thus avoiding the most sensitive times for wintering and breeding birds and meaning the risk of there being a significant effect is low. There is the potential for disturbance during autumn months when numbers of some species will be beginning to build. However, the localised nature of the works, with a relatively small zone of influence (maximum of 300m) and with a degree of habituation once works are underway, means that there is unlikely to be any impacts that will undermine site conservation objectives for breeding non-breeding birds for any of the SSSIs considered.

The magnitude of effects on breeding and non-breeding qualifying bird features of SSSIs (medium / national sensitivity) is considered to be negligible adverse and the significance of effect, minor adverse. Mitigation measures to further reduce the magnitude of effect are outlined in section 7.7 and Table 7.9.

Non-statutory designated sites for nature conservation

Nine LWS were identified in the study area. Of these, three overlap with the Proposed Scheme, these are Aller Moor LWS, Long Moor LWS and Greylake LWS (see Figure 7.1, Appendix A) and these three sites are considered below. For those six that do not overlap with the Proposed Scheme, no impacts are considered likely. The River Parrett LWS runs adjacent to the Upper Sowey section of the Proposed Scheme on the left bank but no works are proposed on the left bank here and there will be no impacts on the LWS. The Langport, Pendon Hills, Badgers Wood, Mill

Batch and North Street LWSs are all >0.4km from the Proposed Scheme and cite habitats as their reason for designation. There will be no impacts on these sites.

Aller Moor LWS overlaps with the Proposed Scheme on the right bank of the Upper Sowy. This site is designated as a 'rhyne and wet meadow site, important wintering bird population'. In this location there are no WFD enhancement locations and only limited bank raising is proposed. As discussed for statutory designated sites, habitat loss will be limited and temporary, short-medium term, and disturbance to will avoid the most sensitive times for wintering birds and be localised, with a relatively small zone of influence (maximum of 300m) and with a degree of habituation once works are underway. The magnitude of impact on Aller Moor LWS is considered to be negligible adverse and the significance of effect, minor adverse. Mitigation is outlined in section 7.7 and Table 7.9 to further reduce the magnitude of this effect.

Greylake LWS overlaps the Proposed Scheme on the right bank of the KSD at the confluence with the Sowy and is a site managed for wetland birds. In this location there is a WFD enhancement feature location and proposed bank raising works which will include the loss of three trees. Habitat loss will be limited and temporary, short-medium term with the exception of tree loss. Disturbance will avoid the most sensitive times for breeding and wintering birds and be localised, with a relatively small zone of influence (maximum of 300m) and with a degree of habituation once works are underway. The magnitude of impact on Greylake LWS (low / county sensitivity) is considered to be negligible adverse and the significance of effect, minor adverse. Mitigation is outlined in section 7.7 and Table 7.9 to further reduce the magnitude of this effect.

Longmoor LWS overlaps the Proposed Scheme on the left bank of the KSD. The site is designated for 'improved grassland with extensive rhyne system'. In this location there are no WFD enhancement locations and habitat loss will be limited to locations where material will be won from existing informal flood embankments and where bank raising is proposed. Some additional small areas of scrub and hedge may also be lost where fencing is removed for access on the left bank of the Sowy/KSD. Habitat loss will largely be limited to poor-semi-improved and semi-improved neutral grassland, will be temporary, short-medium term. The magnitude of impact on Longmoor LWS (low / county sensitivity) is considered to be negligible adverse and the significance of effect, minor adverse. Mitigation is outlined in section 7.7 and Table 7.9 to further reduce the magnitude of this effect.

Coastal and flood plain grazing marsh

Grazing marsh is defined as periodically inundated pasture, or meadow with ditches which maintain the water levels. The habitats being lost during construction are loss of open water habitat and existing marginal plants along the lengths of the WFD enhancement locations (totalling c.0.9 km of bank), and the loss of a strip of grassland for material winning and bank raising along an extent of c. 21km. This 21km consists of predominantly poor semi-improved grassland, where material will be won from existing flood banks on the left and right bank sides of the KSD and where flood banks will be raised on the right and left bank sides of the Lower Sowy and right bank only of the Upper Sowy. Some additional small areas of scrub and hedge may also be lost where fencing is removed for access on the left bank of the Sowy/KSD. These losses are considered to be largely temporary, short-term as, even the absence of mitigation, vegetation will be expected re-establish.

Given the extent of this landscape type within the study area and the limited and temporary nature of the impacts, the magnitude of impact on flood plain grazing marsh (low / regional) is considered to be negligible adverse and the significance of effect, minor adverse. Mitigation is outlined in section 7.7 and Table 7.9 to further reduce the magnitude of this effect.

Notable plant species

Three notable plant species classified as 'vulnerable' in the Vascular Plant Red List for England (Stroh et al. 2014) were recorded in the study area.

Several individuals of tubular water dropwort were recorded in one area of marshy grassland within the study area. This location is adjacent to bank raising works on the KSD right bank. The bank raising works will be in poor-semi-improved and ruderal habitat and are not within the marshy grassland habitat. However, incidental damage to the marshy grassland habitat in which the tubular water dropwort was recorded is possible as a consequence of vehicle and machinery access although any damage, should it occur, will be temporary and limited in extent. Given the limited nature of the potential impacts the magnitude of effects on tubular water dropwort (low / county sensitivity) is considered to be negligible adverse, and the significance of effect, minor adverse. Mitigation is outlined in Table 7.9 to further reduce the magnitude of this effect.

Frogbit was found to be most abundant in the study area in side draining ditches where it was often abundant occurring across their width and these ditches are one of its strongholds nationally (Online Atlas of the British and Irish Fauna, None Dated). In the Sowy/KSD itself, it was much less abundant (occasional to rare) and occurred only at the margins of these larger channels. This will be due to the ditches having much less water movement than the main channel. Strengthening works to two existing culvert crossings and WFD enhancement features on the main channel will impact frogbit potentially via direct loss and indirectly through changes in water quality. Given the limited nature of the in-channel works at the culvert crossings and seven WFD enhancement feature locations, the magnitude of effect on frogbit (low / county sensitivity) is considered to be negligible adverse, given its prevalence at this locality, and the significance of effect, minor adverse. Mitigation is outlined in Table 7.9 to further reduce the magnitude of this effect.

Water violet was recorded in one field drainage ditch away from the main Sowy and KSD channels. This location will not be impacted by the Proposed Scheme and no pathways to effects on water violet are considered to exist.

Aquatic invertebrates

During works at culvert crossings and the creation of the WFD enhancement features there is the potential for the direct loss/death of individual aquatic invertebrates due to the removal of silt and marginal and aquatic plants and potential pollution incidents. There is also the potential for sediment remobilisation during works with potential for smothering downstream channel bed features. Construction impacts will be localised. The loss of individuals will likely be a temporary, short-term effect on aquatic invertebrate populations and impacts on water quality will be temporary during construction only. The magnitude of impact on aquatic invertebrates (low / county sensitivity) is considered to be negligible adverse and the significance of effect, minor. Mitigation is outlined in section 7.7 and Table 7.9 to further reduce the magnitude of this effect.

Eels

In-channel activities could kill or injure eels as well as adversely affect water quality. Given the limited nature of the in-channel works at the seven WFD enhancement locations and two sluices, the likelihood of killing/injuring eels is considered low and is unlikely to significantly reduce population levels. Any effects on water quality will be temporary and reversible and will not compromise the habitat used by eels or reduce population levels.

The magnitude of effects on eels (low / regional sensitivity) is considered to be negligible adverse and the significance of effect, minor. Mitigation measures to further reduce the magnitude of effect are outlined in section 7.7 and Table 7.9.

GCN

The majority of the construction works will be undertaken during September and October when GCN are increasingly moving into terrestrial habitats as opposed to being in ponds. During both the raising and re-profiling of existing flood embankments and channel widening, GCN could be killed or injured, as a result of conflict with machinery during access and earthworks albeit the risk is considered low based on the baseline data.

No ponds are being impacted by the Proposed Scheme and the potential for death or injury to a small number of animals only exists in the short-term during construction and is not considered likely to have a significant effect on their conservation status in this area. The magnitude of impact is therefore considered to be negligible adverse and the significance of effect, negligible. However, death or injury to individual animals will constitute an offense under the legislation and mitigation is therefore proposed (see Table 7.9).

Grass snake

During both the raising of existing flood embankments and channel widening, grass snakes could be killed or injured as a result of conflict with machinery during access and earthworks.

Construction works will be undertaken between September and October when reptiles are active and thus more likely to escape harm.

Grass snakes are widespread in Somerset and the unitary authorities and are common throughout the levels and moors. The potential death or injury to a small number of animals only exists in the short-term during construction and is not considered likely to have a significant effect on their conservation status in this area. The magnitude of impact on grass snake (negligible / local sensitivity) is therefore considered to be low adverse and the significance of effect not significant. However, death or injury to individual animals will constitute an offense under the legislation and mitigation is therefore proposed (see Table 7.9).

Birds

For birds excluding those which form part of the qualifying features of designated sites, potential effects were identified via loss or damage to active nests and disturbance.

There is potential for breeding birds to be killed and active nests damaged or destroyed during the vegetation removal process, particularly for ground nesting birds. Works are programmed to start in September and thus avoid the majority of

the main breeding bird season (March-August) however works in September could impact on nests.

The presence of construction plant, vehicles and operatives could result in disturbance and displacement of birds. However, construction works are proposed to take place between September and October thus avoiding the most sensitive times for wintering and breeding birds and meaning the risk of there being a significant effect is low. The localised nature of the works, with a relatively small zone of influence (maximum of 300m) and with a degree of habituation once works are underway, means that there are unlikely to be any impacts that will undermine conservation status for breeding or non-breeding birds.

The magnitude of impacts on birds (low / county sensitivity) is considered to be negligible adverse and the significance of effect, minor adverse. Damage and destruction of nests will constitute an offense under the legislation and mitigation is therefore proposed (see Table 7.9).

Bats

Given the nature of the proposed works, no impacts are considered likely for commuting and foraging bats as there will be no significant impacts on habitat connectivity and habitat loss is limited and largely temporary.

A limited number of trees with bat roost potential, estimated at thirteen of the 47 identified, are proposed for removal. However, subject to the appropriate survey effort, should any of these trees prove to be bat roosts, they will not be removed.

The magnitude of impacts on bats (low / county sensitivity) is considered to be negligible adverse and the significance of effect, minor adverse as a result of the loss of a small number of trees with bat roost potential and mitigation is proposed to ensure no breach of the legislation (see Table 7.9).

Otter

Otter activity was recorded along the Proposed Scheme and although no holts and/or resting places have been recorded, suitable habitat exists.

During channel widening, impacts on otter could include direct loss/injury or disturbance of individuals and loss of holts or resting places. During both channel widening and raising of existing informal flood embankments, otters could be also be directly and indirectly impacted by changes in water quality as a result of sedimentation and pollution incidents.

Given the lack of any recorded holts or resting places, the direct loss/injury of individuals and loss of holts is considered very unlikely. However, as any loss/injury or disturbance to individuals or loss/damage to holts will constitute a breach of the legislation, pre-construction surveys are recommended to ensure baseline data is up-to-date prior to construction commencing, see Table 7.9.

Changes in water quality as a result of sedimentation and pollution incidents could impact otters directly or indirectly through impacts on its prey species. Severe pollution incidents could result in the death of individuals however, due to the nature of the proposals, the likelihood of such a severe incident is low. Changes in water quality as a result of sedimentation and pollution incidents could affect the availability of prey species. However, given the limited nature of the works, the temporary nature of construction impacts and the large home ranges of animals, the magnitude of any impact on otter (negligible / local sensitivity) is considered likely to be

negligible adverse in terms of the local population and the significance of effect, negligible.

Water vole

A low water vole population size was estimated within the majority of the Proposed Scheme. During channel widening, impacts on water vole could include direct loss/injury of individuals and loss of burrows/habitat. During channel widening, raising of existing flood banks, sluice and culvert works, water voles could be impacted by changes in water quality as a result of pollution incidents.

Direct killing and injury to water voles and a temporary loss of habitat/burrows could have an effect on the conservation status of the local water vole population. Low population sizes can be particularly vulnerable to habitat loss, predation and disturbance. Displacement of animals, potentially into other water vole territories, could reduce survival rates due to territorial behaviour and increased predation. This combined with direct deaths and injury to animals during construction could, in combination with other pressures on water vole populations such as mink predation, increase the chance of local extinctions in a species which has suffered a significant decline in England and Wales.

Bank raising works have been designed to have a minimum 5m standoff from the main Sowy and KSD channels, where possible, and therefore should not impact upon water voles directly. The length of the seven WFD enhancement locations in total is c. 0.9km. Therefore, c. 0.9 km of habitat with a low water vole population will be temporarily lost during construction. This habitat could support between 10-48 female water vole territories given that the length of female territories typically varies between 30-150m (Strachan *et al.* 2011). To reduce the impacts on water vole, embedded mitigation includes placing WFD enhancement areas in areas currently identified as sub-optimal habitat, for water vole and avoiding the one area of the Proposed Scheme identified as having a medium sized population. These locations are likely to support relatively fewer water voles than optimal habitat areas and have a greater potential for enhancement. All the WFD enhancement areas are on the right bank of the KSD and Lower Sowy and are separated by a minimum of c.100m and generally 300m, thus allowing plenty of alternative suitable habitat for any water voles temporarily displaced by construction.

Changes in water quality as a result of pollution incidents during the construction period could also directly impact upon the conservation status of the location water vole population.

In the absence of mitigation, effects on water vole could be permanent, if the death of animals leads to local extinctions, and temporary, short-term in respect of the loss of burrows, as bank habitat will be available again following construction and establishment of vegetation, and potential water quality impacts. The magnitude of impact on water vole (low / county sensitivity) is considered to be high adverse in terms of the local population and the significance of effect, moderate. Any direct loss/injury of individuals and loss of burrows constitute an offense under the legislation and mitigation is therefore proposed (see section 7.7 and Table 7.9).

Badger

During both the raising of existing flood embankments and channel widening, there is a risk of direct death or injury to individual badgers, destruction or damage/obstruction of setts and disturbance to badger in setts.

Direct death or injury could occur as a result of badgers colliding with construction machinery, however the likelihood of this impact is considered low due to the relatively slow speeds vehicles will be travelling and the absence of night working, which means construction activity will not be occurring when badgers are most active. Death or injury could also occur if badgers fall into uncovered excavations and become trapped, or if badgers are killed, injured or trapped in destroyed/damaged or obstructed setts during construction activities.

Bank raising works over or in close proximity to i.e. within 30m, of a sett could cause damage to, destroy or cause obstruction of access to a badger sett. Damage or destruction of a sett could occur as a result of machinery causing sett tunnels to collapse. Obstruction of a sett entrance could occur where material used in bank raising works blocks a sett entrance or where a sett entrance is collapsed as a result the pressure from machinery. Noise and activity created by bank raising works could also potentially disturb a badger occupying a sett.

Construction access also poses a risk to badgers and their setts. Key construction access risks are considered likely to relate to those setts on the right bank of the KSD between the KSD and left bank of the KSD Back Ditch. Vehicle access, including excavators, will require tracking back and forth within 30m (and in some cases the distance is likely to be <10m) of badger setts whilst accessing bank raising and WFD enhancement locations from Parchey Bridge. These setts include main setts 3, 2 and 7 (noting that sett 2 was only in partial use at the time of survey) and outlier sett 1. The plant used will need to pass these setts on multiple occasions to get to the WFD enhancement areas on the right bank of the KSD as well as proposed bank raising locations. Table 7.7 summarises anticipated numbers of vehicle passes at main setts 3 and 7.

Table 7.7 Vehicle movement over badger setts on right bank KSD

Sett no.	Number of Journeys			
	8-ton dumper loads	Bulldozer	4x4	13-ton excavator
3	344	4	250	4
7	120	2	10	2

The repeated passing of vehicles and machinery in close proximity to setts are considered to have the potential to damage, destroy or obstruct a sett as a result of sett tunnel collapse. These risks could be exacerbated by soft ground conditions at the time of work, depending on the weather at the time, and the associated risk that tunnels are close to the surface due to the high level of the ground water. Repeated access close to setts could also be considered to constitute a disturbance offense in relation to badgers occupying a sett (as per Natural England, 2009).

A review of the badger sett locations against the proposed works and identification of where impacts may exist is summarised in Table 7.8.

Potential effects on badger populations are likely to be temporary, short-term-medium term (i.e. setts destruction/damage or obstruction and disturbance affecting the success of the inhabiting clan, particularly where a main sett is impacted). During the proposed construction period September -November, badgers spend less time underground than in the winter months and don't have dependant cubs, and so they will be less vulnerable to impacts on setts and from disturbance. In the absence of mitigation, the magnitude of impacts on badger populations (negligible / local sensitivity) is likely to be negligible adverse in terms of the conservation status of the local population and the significance of effect not significant. However, damaging/destroying or obstructing setts and/or disturbing badgers in their sett will constitute an offense under the legislation and mitigation is therefore proposed (see Table 7.9).

Table 7.8 Potential impacts identified on individual badger setts

Sett no.	Classification	Location	Description	Potential impacts
1	Outlier	Right bank KSD	Two partially active, currently flooded, holes. This outlier sett was flooded at the time of survey but showed signs of recent excavation and therefore was considered to be partially active.	No bank raising proposed within 30m. Access for WFD enhancement and bank raising works will pass within 30m of sett and will involve significant vehicle movements due to limited access options on KSD right bank. Risk of damaging, destroying or obstructing badger setts and of disturbance if crossing sett.
2	Main	Right bank KSD	A partially active main sett containing 19 flooded holes. This sett was largely flooded at the time of survey but showed signs of recent excavation.	Bank raising proposed within 30m. Access for WFD enhancement and bank raising works will need to pass within 30m of sett and will involve significant vehicle movements due to limited access options on KSD right bank. Risk of damaging, destroying or obstructing badger setts and of disturbance if crossing sett.
3	Main	Right bank KSD	Main sett containing 10 holes. Eight appear well used with fresh bedding material.	No bank raising proposed within 30m. Access for WFD enhancement and bank raising works will need to pass within 30m of sett and will involve significant vehicle movements due to limited access options on KSD right bank. Risk of damaging, destroying or obstructing badger setts and of disturbance if crossing sett.
4	Main	Left bank Upper Sowey	Main sett containing three well used holes, fresh spoil heap, large entrances and fresh bedding.	No impacts identified

Sett no.	Classification	Location	Description	Potential impacts
5	Main	Left bank Upper Sowy	Main sett under mature willow, well used containing 31 holes.	No impacts identified
6	Outlier	Left bank Upper Sowy	Two well defined mammal tracks running toward two partially active sett entrances and fresh dung pits.	No impacts identified
7	Main	Right bank KSD	Active main sett containing 15 holes. Lots of fresh bedding and dung pits.	No bank raising proposed within 30m. Access for WFD enhancement and bank raising works will need to pass within 30m of sett and will involve significant vehicle movements due to limited access options on KSD right bank. Risk of damaging, destroying or obstructing badger setts and of disturbance if crossing sett.
8	Outlier	Right bank Upper Sowy	Partially used. Recently collapsed/flooded badger sett of approximately four holes. One hole intact but appeared inactive at time of survey.	Bank raising proposed within 30m. Access for bank raising works will need to pass within 30m of sett. Risk of damaging, destroying or obstructing badger setts and of disturbance if crossing sett.
9	Subsidiary	Right bank Upper Sowy	Active sett containing 3 holes and fresh spoil and bedding material.	Bank raising proposed within 30m. Access for bank raising works will need to pass within 30m of sett. Risk of damaging, destroying or obstructing badger setts and of disturbance if crossing sett.

7.5.2. Operation

Operational effects are limited to potential adverse effects as a result of changes in flooding extent, frequency and duration as a result of the enhanced capacity of the Soway/KSD system and potential beneficial effects as a consequence of a net increase in open water and marginal habitat created from species-poor grassland.

The potential for significant effects during operation was scoped out at scoping stage for the following important ecological features; eels, GCN, grass snake, bats, otter and badger and additionally here, no effects are considered likely for notable plants. The impacts of the changes in flooding extent, frequency and duration as a result of the enhanced capacity of the Soway/KSD are also not considered likely to have any significant effects on habitats (either inside designated sites or S41 Habitat outside designated sites). The implementation of the Proposed Scheme to increase the carrying capacity of the Soway/KSD flood relief channel will reduce the duration and extent of flooding from the current low-level events that result in the flood relief channel from spilling onto the adjoining floodplain. These changes in flooding will therefore be changes in small scale, out of banks events. Habitats in the study area are not reliant on direct inputs from the Soway/KSD system thus should not be impacted by the operation of the Proposed Scheme.

Statutory designated sites for nature conservation

European designated sites

The Proposed Scheme has the potential to result in a reduction in the frequency and extent of shallow-water fluvial flooding within the Somerset Levels and Moors SPA/Ramsar and functionally linked habitat for both the Somerset Levels and Moors SPA/Ramsar and Severn Estuary SPA/Ramsar.

The implementation of the Proposed Scheme to increase the carrying capacity of the Soway/KSD flood relief channel will reduce the duration and extent of flooding from the current low-level events that result in excess water from the flood relief channel spilling onto the adjoining floodplain. Hydraulic modelling has confirmed that there will be reductions in the extent and duration of flooding following implementation of the full River Soway and King's Sedgemoor Drain Enhancements Scheme and once the operational procedures for Monk's Leaze Clyce have been amended to reflect the increased capacity of the Soway/KSD system, albeit the majority of the areas affected will be outside of the designated sites (see strategic level HRA, Appendix C). Nevertheless, for the purpose of the assessment all land within the floodplain has been assumed to represent supporting, functional habitat (see project level HRA, Appendix D).

Of the qualifying bird species/species which are part of the water bird assemblage, for these European designated sites, a number will not be impacted by changes in areas of splash and shallow flood, either because they are not present in significant numbers or because they do not rely on these specific habitat conditions. The following species are considered to be highly dependent upon the existence of temporary areas of splash and shallow flood in the study area during the core winter period (December to February inclusive) (see project level HRA, Appendix D):

- Mute swan
- Dabbling ducks – shoveler, teal (qualifying feature), pintail, wigeon (mostly grazing but always in close proximity to water)
- Little egret
- Waders – lapwing (qualifying feature), dunlin (qualifying feature), snipe and black-tailed godwit

Increasing the channel capacity to accommodate flows of 27m³/s in the KSD and 17m³/s in the Sowy (to be increased to 24 m³/s following implementation of later phases of the full River Sowy and King's Sedgemoor Enhancements Scheme) will result in a number of potential impacts that could compromise the Conservation Objectives of the European designated sites (see strategic level HRA, Appendix C): D):

- A reduction in the frequency and duration of small-scale flood events through King's Sedgemoor SSSI, which provide valuable feeding and roosting conditions for many of the non-breeding bird features
- The increased capacity and ability to divert water along the Sowy in advance of a flood event could mean that some of the moors along the River Parrett will no longer flood
- For larger events where land along the River Parrett was flooded then the ability to reduce river levels quicker, through sending more water down the Sowy, will mean that the pumps could operate earlier and thereby remove standing flood water

These impacts could affect all the species scoped into the assessment but especially the large numbers of dabbling ducks, mute swan and lapwing that rely on the additional areas of temporary flooded grassland outside of designated sites, for at least part of the time. Depending on the presence and extent of additional flooding outside of RWLAs, most birds will usually spend the daytime loafing and roosting at undisturbed sites with extensive areas of open water, such as the RSPB reserves at West Sedgemoor and Greylake. They will then fly out to feed over a more extensive area at night-time, so these additional areas of flood are important for their survival over the winter period (Chown, 2003). Changes in surface water flooding are therefore the highest risk hazard to maintaining the integrity of the designated sites (see project level HRA, Appendix D). The loss of suitable foraging and roosting habitat will put additional pressure on qualifying wintering bird features to find alternative sites, including potential displacement outside of the Somerset Levels. An increase in energy requirements could lead to loss of condition and ultimately death if only sub-optimal sites subject to disturbance are available. These impacts will be long-term, permanent.

The potential magnitude of effects on the non-breeding bird qualifying features of the Somerset Levels and Moors SPA/Ramsar and Severn Estuary SPA/Ramsar (High / European sensitivity) is considered to be high adverse and the significance of effect, substantial adverse.

This could be further exacerbated once the full River Sowy and King's Sedgemoor Drain Enhancements Scheme has been implemented with the capacity of the Sowy has been increased to 24m³/s throughout (Monk's Leaze Clyce to Beer Wall), and the operational procedures for Monk's Leaze Clyce amended accordingly, however even following the capacity enhancement works undertaken under Phase 1 more water will be able to travel down the Sowy and KSD corridor without overtopping the banks than is currently possible. No specific modelling has been undertaken for the Proposed Scheme (Phase 1) but that is not an issue given that the mitigation measures detailed in section 7.7 and Table 7.9 for the full River Sowy and King's Sedgemoor Drain Enhancements Scheme are to be implemented before completion of the construction phase for the Proposed Scheme.

Sites of Special Scientific Interest

The King's Sedgemoor Drain SSSI, Southlake SSSI, Moorlinch SSSI and West Sedgemoor SSSI are all component SSSIs of the Somerset Levels and Moors SPA and the non-breeding bird qualifying features of these sites could be impacted via the same pathways as discussed above for European designated sites as a result of the Proposed Scheme and the full River Sowy and King's Sedgemoor Drain Scheme.

The potential magnitude of effects on the non-breeding bird qualifying features of the Somerset Levels and Moors SPA/Ramsar and Severn Estuary SPA/Ramsar (High / European sensitivity) is considered to be high adverse and the significance of effect, major adverse. Mitigation measures to reduce the magnitude of effect are outlined in section 7.7 and Table 7.9.

The increased capacity of the Sowy/KSD system and associated increased flexibility to manage flood flows once the full River Sowy and King's Sedgemoor Drain Enhancements Scheme is implemented, also represents a potential beneficial effect for SSSI designated site features. Prolonged and/or deep flooding on the moors can result in damage to vegetation and other supporting features. The potential magnitude of beneficial effects on the qualifying features of SSSIs (medium / national sensitivity) is considered to be low beneficial and the significance of effect, minor adverse.

Non-statutory designated sites for conservation

Of those LWSs identified within the study area, potential significant effects during operation of the Proposed Scheme are considered to exist where birds are a qualifying feature. This includes Aller Moor LWS and Greylake LWS. The non-breeding bird features of these sites could be impacted via the same pathways as discussed above for European designated sites and SSSIs as a result of the Proposed Scheme and the full River Sowy and King's Sedgemoor Drain Enhancements Scheme.

The potential magnitude of effects on the non-breeding bird features of the Aller Moor LWS and Greylake LWS (low / county sensitivity) is considered to be high

adverse and the significance of effect, moderate adverse. Mitigation measures to reduce the magnitude of effect are outlined in section 7.7 and Table 7.9.

Aquatic invertebrates

During operation it is considered that the Proposed Scheme will be beneficial for aquatic invertebrates.

The embayments, two stage channel and backwaters created as part of the WFD enhancement works will create additional habitats for benthic invertebrates.

The creation of a two-stage channel will also lead to decreased sediment loads to the main channel following flooding events due the increased storage capacity resulting in decreased nutrient enrichment caused by major flooding of agricultural land, highways, and developed areas.

These impacts will lead to permanent, long-term, beneficial effects for aquatic invertebrates. The potential magnitude of effects on aquatic invertebrates (low / county sensitivity) is considered to be medium beneficial and the significance of effect, minor beneficial. Proposed landscaping will further increase the beneficial effects of the Proposed Scheme for aquatic invertebrates see section 7.7 and Table 7.9.

Birds

The potential impacts on non-breeding birds of conservation concern in the study area are captured in the assessment for operational effects on statutory and non-statutory designated sites (see above). The operation of the Proposed Scheme will not have any significant effects on breeding birds or non-breeding birds which are not covered by the designations assessed above.

Water vole

During operation it is considered that the Proposed Scheme will be beneficial for water vole.

The embayments, two stage channel and backwaters created as part of the WFD enhancement works will create additional habitats for water voles.

These impacts will lead to permanent, long-term, beneficial effects for water vole. The potential magnitude of effects on water vole (low / county sensitivity) is considered to be medium beneficial and the significance of effect, minor. Proposed landscaping will also increase the beneficial effects of the Proposed Scheme for water vole see section 7.7 and Table 7.9.

7.6. Mitigation

7.6.1. Landscaping

The landscape proposals have been designed to mitigate adverse effects identified for a number of important ecological features (see Table 7. 9). Full landscaping proposals are illustrated on the LMP provided in Appendix I and further details on landscaping are provided in Chapter 9.

To mitigate the impacts of soil stripping, re-profiled flood embankments, channel banks and working areas reseeded with a neutral wet grassland or other appropriate seed mix which includes species listed as present within the King's Sedgemoor SSSI citation.

To mitigate tree losses, trees will be replaced at a ratio of 5:1.

To maximise the benefits of channel widening the LMP (Appendix I) includes riparian planting to the backwater location on the right bank of the KSD immediately downstream of the confluence with the Sowy and pre-vegetated coir rolls and/or pallets at all seven WFD enhancement feature locations. Continuous lengths of pre-vegetated coir rolls will protect the river edge of the berm from erosion and pre-vegetated coir pallets will seed the bank side of the berm with marginal species. Backwater channels will be planted with either/both pre-vegetated coir rolls and pallets. The extents of newly created habitats are estimated to be:

- Marginal wetland – 4184m²
- Rough/wet grassland – 2031m²
- Willow scrub – 250m²
- Open water – 750m²

Reseeding and planting of the embayments, two stage channels and backwaters will take place throughout the construction period as soon as practicable following completion of earthworks.

7.6.2. Standard construction practices for drainage / run off management

To reduce the risk of pollution to the water environment via pollution incidents and sedimentation during construction, which could impact upon a number of important ecological features (see Table 7.9), standard construction practices for drainage / run off management will be followed (see Chapter 6 for further details). These will be detailed in a SWMP and EPRP (as per EAP, Appendix K). These will include the following measures:

- Appointment of an environmental site supervisor
- Plant and vehicle to be kept in good working order
- Use of biodegradable hydraulic fluids where possible
- Plant and vehicles will be kept in the site compound overnight, securely fenced
- Refuelling to take place away from the river in a designated refuelling area
- Fuels, oils and chemicals will be kept within the offsite compound
- Spill kits will be available on site
- Drip trays to be used under vehicles and plant when not in operation
- Use of silt curtains and/or booms to contain and control the dispersion of suspended solids in the water column during channel widening. Dissolved oxygen (DO) monitoring will be required during summer months if these measures cannot be implemented.
- Plant up newly excavated WFD enhancement areas immediately following creation.

7.6.3. Non-native invasive plant species

Given the recorded presence of, and potential for, a number of non-native invasive plant species, an Invasive Species Management Plan will be required. This will

highlight the species likely/with potential to be present in the construction area and the biosecurity measures needed to prevent the spread of these species and thus to ensure compliance with Wildlife and Countryside Act 1981 (as amended) where species are listed on Schedule 9 of the Act. These biosecurity measures will include;

- Pre-construction survey for non-native invasive plant species
- Environmental Clerk of Works to undertake toolbox talk for all site workers (and visitors when appropriate) to aid identification and appropriate responses to encountering invasive species
- Areas of possible contamination should be identified in the site management plan
- Where contaminated soil, materials or water are located, signage should be erected to indicate them
- Only accepting machinery to site that is clean. Pressure washing in a designated area for all vehicles before entering and after leaving site to avoid accidental transfer of invasive plant material.
- Personnel working on or between sites should ensure their clothing and footwear are cleaned where appropriate to prevent spread
- All wash facilities including waste water from washing vehicles, equipment or personnel should be managed in a responsible way so as not to not cause harm to the environment.

7.6.4. Specific important ecological features

Mitigation measures, beyond those discussed above, have been identified to address the specific adverse effects identified for important ecological features. These are captured in the EAP (Appendix K), are summarised in Table 7.9 and are discussed in further detail for statutory designated sites, water vole and badger where key constraints have been identified.

Designated sites for nature conservation

Due to the potential for the full River Sowy and King's Sedgemoor Drain Enhancements Scheme and the Proposed Scheme (Phase 1 of full River Sowy and King's Sedgemoor Drain Enhancements Scheme) to result in a reduction in the frequency and extent of shallow-water fluvial flooding across the Somerset Levels and Moors SPA/Ramsar, component SSSIs and other supporting habitat, it has been agreed with Natural England that a package of mitigation measures will be implemented as a separate programme of works.

The proposed mitigation measures include the repair and refurbishment of several structures within RWLAs of three of the component SSSIs at King's Sedgemoor (Egypt's Clyce), Moorlinch and West Moor to maintain condition status of the designated sites during operation of the Proposed Scheme. The selection of these structures is based on the potential impacts identified by hydraulic modelling (see project level HRA, Appendix D). It has been agreed with NE and other SRA delivery partners to reduce the previous design life for the structures from 25 years down to a shorter 5-10 year life expectancy. This reduction is to make the mitigation proportionate to the full River Sowy and King's Sedgemoor Drain Enhancements Scheme and reflect the uncertainty surrounding the future of the agri-environment

schemes in these areas (all current schemes will end within the next 5 years). Works on the mitigation structures were started in May/June 2020 ahead of construction of the Proposed Scheme.

In addition to the work on the structures, a MAP has been drafted and accepted by delivery partners to ensure mitigation for the Scheme is in place for the short and longer term.

The primary purpose of the MAP is to ensure that there will be no deterioration in SPA habitat availability or quality as a result of the full River Sowy and King's Sedgemoor Drain Enhancements Scheme. The MAP contains a range of general and site specific mitigation measures to achieve this. These measures include:

- Ensuring water level management meets the operational requirements (target water levels) of the agreed WLMPs
- Maintaining and updating WLMPs and extending them to Functionally Linked Land (FLL) where necessary
- Sustaining the existing RWLA
- Maintaining and improving the water management infrastructure required to achieve the conservation objectives of protected sites and FLL.
- Ensuring channel maintenance is sympathetic to nature conservation.
- Mitigating for the changes in small winter flooding within SSSIs through such actions as:
 - the replacement of failing water control structures or the provision of new structures to effect 'no change' to existing winter surface water conditions
 - adjustments to operational protocols to effect 'no change' to existing winter surface water conditions; a review of WLMPs with partner organisations by 2022
 - maintaining a minimum 300mm water depth in ditches through the winter within and outside designated sites (where this will not increase flood risk)
 - creation of in-field wet features such as shallow water scrapes and wet field gutters.

The delivery of the MAP and thereafter future management of the outcomes will be facilitated through the existing governance framework established for the current Water Level Management Plans and the SRA Management Group; to agree the outcomes and actions outlined in the MAP, based on results of ongoing monitoring.

This will be achieved through their regular meetings, as deemed necessary and managed by a small group of officers from each partner organisation (Natural England, Environment Agency and the SDBC).

For additional information regarding the MAP see Appendix J, and also the strategic level HRA (Appendix C).

Water vole mitigation

The following mitigation strategy will minimise the risk of disturbing or injuring a water vole during the works by displacing them from the areas where the WFD

enhancement works are proposed and will also ensure that there are no burrows within the footprint of works during construction. These works will be carried out under the Environment Agency's Organisational Licence to ensure there is no breach of the Wildlife and Countryside Act 1981 (as amended). The vegetation clearance works to displace water vole is as follows:

- The vegetation clearance is being carried out under licence, under the supervision of the accredited ecologist and at the appropriate seasonal timescales.
- Prior to undertaking vegetation clearance, the area cleared has been surveyed, with any burrow locations marked up, and any other water vole signs noted.
- The Contractor should clear vegetation from each WFD habitat enhancement area along its whole 160m length. Vegetation has been scraped to bare earth using long reach excavator to avoid compression of burrows. Where vegetation was encountered that exceeds 250mm in sward length, the area was flailed in the first instance, which was undertaken under the direction of an accredited ecologist.
- Field signs were removed from the footprint of the enhancements upon completion of vegetation clearance, so that no evidence of water vole field signs are present. This has minimised any confusion with fresh field signs that may be recorded during the monitoring period.
- Once first cut the vegetation is being kept at <100mm and unsuitable for water vole re-colonisation until the commencement of the works on the ground. The timing of these maintenance cuts will vary depending on growing season and will be agreed with the accredited water vole environmentalist.
- Prior to the WFD habitat enhancement works commencing, the cleared sites will be monitored by a suitably qualified ecologist for fresh signs of water vole activity for a period of seven days (minimum) after the last maintenance cut. If fresh signs of activity are observed the monitoring period may need to be extended and further vegetation clearance may be required.
- Should no fresh signs of water vole use be observed, any burrows within the affected area will be subject to a destructive search and the burrow will be dug out from the bankside using the long reach excavator as advised by the accredited agent.
- If any animals are encountered during the destructive search, they will be relocated into adjacent unaffected habitat areas as soon as possible. No animals will be kept in captivity overnight or for any length of time. Where no water vole burrows are located within the cleared area, no destructive search will be required.

To adhere to the requirements of the Environment Agency's Organisational Licence it will be necessary to monitor the sites impacted upon by the works for the presence/absence of water voles for up to three years following displacement, or until it is confirmed that water voles are present in similar numbers to that prior to works taking place. Records will be supplied to Natural England.

In addition to the water vole mitigation measures required at the WFD enhancement feature locations, outlined above, in any locations where a minimum 5m standoff from the main Sowy and KSD channels cannot be maintained, pre-construction checks for water vole burrows will be undertaken and appropriate mitigation measures agreed, which may include avoidance.

Badger mitigation

A badger mitigation strategy will be developed to ensure that works do not contravene the Protection of Badgers Act 1992 and if required, works will be carried out under licence, either the Environment Agency, Organisational Licence for exclusion of badgers from their setts, or a Natural England licence to 'interfere with a badger sett for development purposes' (which will cover potential disturbance impacts if appropriate).

General mitigation recommendations are summarised below and the approach specific to each sett will be detailed in a method statement:

- Where possible all works within 30m of a badger sett should be avoided, including the passage of machinery and vehicles for access.
- Pre-construction survey of Proposed Scheme.
- Should it not be possible to rule out the potential for interference and/or disturbance of an active sett, an appropriate licence will need to be sought to permit activities that will otherwise be unlawful.
- All works/access within 30m of a sett should be supervised by a suitably qualified Ecological Clerk of Works (ECoW)
- A 30m buffer should be marked out around each active sett ahead of construction.
- Ahead of accessing works areas via locations within 30m of a sett, the ECoW should mark out with surface flags, cones or ground marking paint, the location of all active sett entrances. Subsequently the ECoW should agree the appropriate route for access and again mark this out with cones or ground marking paint.
- Measures to prevent tunnel collapse during access may need to include ground protection measures, including selecting appropriate low ground pressure plant and the use of track matting.
- Sett closure under licence may be considered for non-main setts where closure does not require the creation of an artificial sett. Sett closure can only be undertaken between 1st July and 30th November.
- Use of heavy plant and machinery should cease at least two hours before sunset.
- Excavations should be covered at the end of each working day, or a means of escape provided for any animal that could fall into a trench. This can be in the form of a wooden plank sloping into the trench or a slope in the construction of the trench itself.

Table 7.9. Summary of mitigation appropriate to important ecological features

Ecological feature	Potential impact	Potential effects	Mitigation measure(s)
Statutory designated sites (SPA, Ramsar, NNR and SSSIs) Non-statutory designated sites (LWSs)	Construction - raising of existing flood embankments/channel widening	Loss or damage to habitats within designated sites	Protective fencing and defined working areas should prevent incidental loss or damage to retained habitats. Reseeding grassland areas with an appropriate seed mix (to be agreed with NE) (see section 7.6.1 and Chapter 9 and Appendix H for further details).
		Disturbance of qualifying wintering and/or breeding bird features	Working restrictions in the event of any severe, cold weather that will make bird displacement due to disturbance an issue. Monitoring by an ECoW to record presence of any significant numbers of birds (>1% of the current 5-year peak mean for any species) within the disturbance zone of influence (up to 300m). No working or lighting after dark close to any areas known to be favoured by birds (to be identified and agreed with Natural England).
	Operation - reduction in extent, frequency and duration of beneficial 'splash' conditions provided by small-scale flood events when the Sowy reaches capacity	Loss of suitable foraging and roosting habitat will put additional pressure on qualifying wintering bird features to find alternative sites, including potential displacement outside of	Refurbishment and installation of water level control structures across several sites where adverse effects have been identified. Implementation of the MAP designed to ensure no deterioration in SPA habitat availability or quality, including functionally linked land. See section 7.6.4 and strategic level HRA (Appendix C) for further detail.

Ecological feature	Potential impact	Potential effects	Mitigation measure(s)
	and spills onto the floodplain.	the Somerset Levels. Increase in energy requirements could lead to loss of condition and ultimately death if only sub-optimal sites, subject to disturbance are available.	
Coastal Grazing Marsh	Construction - raising of existing flood embankments/channel widening	Loss or damage of S41 Habitat	Defined working areas should prevent incidental loss or damage to retained habitats. Riparian planting to the two backwater WFD enhancement feature locations. Provision of pre-vegetated coir rolls and/or pallets at all seven WFD enhancement feature locations. Reseeding grassland areas with an appropriate seed mix (to be agreed with Natural England) (see section 7.6.1 and chapter 9 and Appendix I for further details).
Notable plant species	Construction - raising of existing flood embankments/channel widening	Direct loss of tubular water dropwort due to incidental construction damage Indirect loss of frogbit due to changes in water quality as a result of sedimentation and pollution incidents	Protective fencing and defined working areas should prevent incidental loss or damage to tubular water dropwort. Standard construction best practice for drainage / runoff management. See section 7.6.2 and Chapter 6 for further details.

Ecological feature	Potential impact	Potential effects	Mitigation measure(s)
Eel	Construction - raising of existing flood embankments/channel widening	Changes in water quality as a result of sedimentation and pollution incidents	Standard construction best practice for drainage / runoff management. See section 7.6.2 and Chapter 6 for further details/
Aquatic invertebrates	Construction channel widening	Direct loss of individuals due to removal of silt and marginal/aquatic plants	Material won from the edge of the existing river should be pulled back a short distance from the margin of the river and allowed to rest for a short time to allow animals that can to escape back to the water.
		Changes in water quality as a result of sedimentation and pollution incidents	Standard construction best practice for drainage / runoff management. See section 7.6.2 and Chapter 6 for further details
GCN / grass snake	Construction - raising of existing flood embankments/channel widening	Direct death or injury to GCN / grass snake	In suitable habitats works should take place under a method statement and supervision of an ECoW. Mitigation will include timing of works and phased vegetation clearance. These measures are required to ensure compliance with the Wildlife and Countryside Act 1981 (as amended) and the Species and Habitats Regulations 2017.
Birds (excluding qualifying features of designated sites)	Construction - raising of existing flood embankments/channel widening	Loss or damage to active nests	Where works cannot be conducted outside of the main breeding bird period (March to August inclusive), an ECoW should check potential nesting habitat prior to construction works. Where nesting is occurring, appropriate restrictions for the species should be put in

Ecological feature	Potential impact	Potential effects	Mitigation measure(s)
			place to avoid the nest from being damaged or abandoned. These measures are required to ensure compliance with the Wildlife and Countryside Act 1981 (as amended).
Bats	Construction - raising of existing flood embankments/channel widening	Loss of trees with potential bat roost features.	Trees with bat roost potential that are proposed for removal will be subject to appropriate survey effort to determine likely presence/absence of a roost. Trees found to be roosts will be retained. A pre-construction check will also be carried out immediately prior to felling. These measures are required to ensure compliance with the Wildlife and Countryside Act 1981 (as amended) and the Species and Habitats Regulations 2017.
Otter	Construction - channel widening	Direct loss/injury of individuals	Pre-construction check for otter holts should be conducted prior to works commencing. If otter holts present a European Protected Species licence may be required to permit activities that will otherwise be unlawful.
		Direct loss of holts	
	Construction - raising of existing flood embankments/channel widening	Disturbance of individuals	These measures are required to ensure compliance with the Wildlife and Countryside Act 1981 (as amended) and the Species and Habitats Regulations 2017.
		Changes in water quality as a result of	Standard construction best practice for drainage / runoff management.

Ecological feature	Potential impact	Potential effects	Mitigation measure(s)
		sedimentation and pollution incidents affecting prey species and/or otters directly.	See section 7.6.2 and Chapter 6 for further details
Water vole	Construction - channel widening	Direct loss/injury of individuals	<p>Works should be carried out under the Environment Agency Organisational licence.</p> <p>Working methods under the licence will involve working within restricted time periods, displacement techniques and limitations on the extent of potentially damaging activities.</p> <p>Pre-construction checks for burrows at any locations where a 5m standoff from the main Sowy and KSD channels cannot be maintained.</p> <p>See section 7.6.4 for further details.</p> <p>These measures are required to ensure compliance with the Wildlife and Countryside Act 1981 (as amended).</p>
		Loss of burrows	
	Construction - raising of existing flood embankments/channel widening	Changes in water quality as a result of sedimentation and pollution incidents	
Badger	Construction - raising of existing flood embankments/channel widening	Direct loss/injury of species	Works carried out under a badger method statement (see section 7.6.4 for further details).
		Loss of setts	
		Disturbance of species	

Ecological feature	Potential impact	Potential effects	Mitigation measure(s)
			<p>A pre-construction survey should be undertaken to determine if any new badger setts are present on site.</p> <p>Ensure buffer zones around known badger setts.</p> <p>Where active badger setts will be lost/disturbed by the works, working under licence may be required to permit activities that will otherwise be unlawful.</p> <p>Cover excavations at night.</p> <p>These measures are required to ensure compliance with the Protection of Badgers Act 1992</p>

7.7. Conclusions and summary of residual effects

Table 7.10 provides a summary of residual effects, where significant effects are predicted in the absence of mitigation

During the construction of the Proposed Scheme, the only predicted significant effect (i.e. an effect of moderate or greater significance) is an adverse effect for water voles, where the potential death and injury to animals, in combination with temporary habitat loss and changes to water quality has the potential to affect the conservation status of a population considered to be of County value. Mitigation is proposed in the form of working under a licence within restricted time periods, using displacement techniques and limiting the extent of potentially damaging activities. Following the implementation of this mitigation, no significant adverse effects are considered likely for water vole.

During operation, significant adverse effects are predicted for some of the qualifying non-breeding bird features of statutory and non-statutory designated sites as a result of a reduction in the extent, frequency and duration of beneficial 'splash' conditions provided by small-scale flood events when the Sowy reaches capacity and spills onto the floodplain. Mitigation is proposed to refurbish and install water level control structures across several sites where adverse effects have been identified. The MAP has been designed to ensure there will be no deterioration in SPA habitat availability or quality, including functionally linked land, through a range of general and site specific measures (these are summarised in section 7.6.4).. Following implementation of mitigation, it is considered that there will be a negligible or possible minor beneficial effect for non-breeding bird features of designated sites given the improved management of RWLAs.

The increased capacity of the Sowy/KSD may also represent a beneficial effect for the designated site features. Prolonged and/or deep flooding on the moors can result in damage to vegetation, other supporting features and water level management control structures.

Minor beneficial effects were also identified for aquatic invertebrates and water voles as a result of the creation of embayments, two stage channels and backwaters which will create additional habitats for these features.

Table 7.10 Summary of residual effects where significant effects are predicted in the absence of mitigation

Receptor (sensitivity)	Nature of impact (magnitude)	Significance (pre-mitigation)	Mitigation	Residual effect
Construction				
Water vole (low)	Death/injury to animals, temporary habitat loss/indirect affects via temporary changes in water quality (medium).	Moderate adverse (significant)	Works under licence to include timing of works and displacement techniques.	Minor adverse (not significant)
Operation				
Somerset Levels and Moors SPA/Ramsar and Severn Estuary SPA/Ramsar (non-breeding bird qualifying features only) (high)	Loss of suitable foraging and roosting habitat will put additional pressure on qualifying wintering bird features to find alternative sites, including potential displacement outside of the Somerset Levels. Increase in energy requirements could lead to loss of condition and ultimately death if only sub-optimal sites, subject to disturbance are available. The impact will be permanent (high).	Substantial (significant)	Repair and upgrade of key structures that control levels in the RWLAs at Moorlinch, West Moor and King's Sedgemoor (Othey rhyne). Implementation of the MAP, including updates to WLMPs by 2022.	Negligible/ minor beneficial (not significant)
King's Sedgemoor SSSI/Southlake Moor SSSI/Moorlinch SSSI/West Sedgemoor SSSI/Wet Moor SSSI/West Moor SSSI (non-breeding bird qualifying features only) (medium)		Major adverse (significant)		Negligible/minor beneficial (not significant)
Aller Moor LWS and Greylake RSPB Reserve LWS (non-breeding bird		Moderate adverse (significant)		Negligible/minor beneficial (not significant)

Receptor (sensitivity)	Nature of impact (magnitude)	Significance (pre-mitigation)	Mitigation	Residual effect
qualifying features only) (low)				