16. Biodiversity

Purpose of the Assessment

16.1 This assessment is based on the Proposed Development as set out at **Chapter 5**: **The Proposed Development** and as shown on the Parameters Plan **(Appendix 5.1)**. It accordingly presents an ecological impact assessment (EcIA) following the Guidelines for Ecological Impact Assessment published by the Chartered Institute of Ecology and Environmental Management (**Ref 16.1**).

16.2 In particular, designated sites, habitats and species are noted; baseline ecological conditions are described; potential impacts on ecological features are predicted and assessed (including those due to direct loss of habitat, and those likely to arise in connection with each stage of development from site-clearance and remediation, through various construction phases, to occupation and use of the completed development and decommissioning); proposed mitigation and compensation measures are outlined; and residual impacts after mitigation are then described and assessed. Cumulative impacts arising from interaction with other developments in the area, and intra-relationships, are also addressed.

16.3 This chapter of the Preliminary Environmental Information Report (PEIR) considers ecology relevant to the Order Limits (Potential Development Area (PDA)) (*i.e.* the Main Strategic Rail Freight Interchange (SRFI) Site, the Junction 15a (J15a) Site; and Minor Highway Works) as shown in the Order Limits plan in **Appendix 5.1.** The Main SRFI Site covers approximately 291 ha and the J15a site approximately 70 ha.

16.4 This chapter also considers the potential impact of climate change upon ecological resources and receptors in accordance with the future UKCP09 climatic conditions as set out in **Chapter 23:Climate Change Mitigation & Adaptation** of this PEIR.

16.5 The Main SRFI Site is bounded to the east by the Northampton Loop Line (NLL) and to the south by the West Coast Main Line (WCML), beyond which lie agricultural fields and the village of Blisworth. To the north, the Main SRFI Site is bounded by further agricultural fields and the village of Milton Malsor. The A43 bounds, and is within the site to the west. Northampton Road/Towcester Road runs through the Main SRFI Site from north to south.

16.6 This chapter also considers the ecology at the M1 J15a where the roads will be upgraded to serve the Main SRFI Site. The J15a site comprises the immediate roads for J15a of the M1, and adjoining land parcels which contain farmland and industrial buildings.

16.7 Further, this chapter considers the ecology at other locations where minor highways improvements are necessary and small areas of land take are required:

- Junction 1 - Junction 16 of the M1 (M1/ A4500 (east to Northampton)/ A45 (west to Daventry));
- Junction 3 - A4500, Weedon Road (east)/ Tollgate Way/ A4500, Weedon Road (west)/ A5076, Upton Way;

- Junction 4 - A5076/ A5123/ Upton Way Roundabout (Pineham Park) (Dane Camp Way);
- Junction 6 - A5076 (west)/ Hunsbury Hill Avenue/ Hunsbarrow Road/ A5076, Danes Camp Way/ Hunsbury Hill Road;
- Junction 7 - Towcester Road/ A5076, Danes Camp Way/ A5123, Towcester Road/ Mere Way/ Tesco Access;
- Junction 9 - A45 (south)/ Eagle Drive/ A45 (north)/ Caswell Road;
- Junction 10 - A45, Nene Valley Way (south); A428, Bedford Road (west)/ A5095, Rushmere Road/ A45, Nene Valley Way (north)/ A428, Bedford Road (east);
- Junction 11 - A45, Nene Valley Way (south); A43, Lumbertubs Way/ A45, Nene Valley Way (north)/ Ferris Row;
- Junction 12 - Junction 15 of the M1 (M1/ A45 (north to Northampton and Wellingborough)/ Saxon Avenue/ A508, Northampton Road (south to Milton Keynes));
- Junction 14 - Tove Roundabout (A43, Towcester Bypass (southwest)/ Towcester Road/ A5, (north)/ A43, (northeast)/ A5, Watling Street (southeast));
- Junction 15 - Abthorpe Roundabout (Abthorpe Road/ A43, Towcester Bypass (north)/ Brackley Road/ A43, Towcester Bypass (south));
- Junction 19 - A5076, Upton Way (south)/ Telford Way/ A5076, Upton Way (north)/ Walter Tull Way/ Dustan Mill Lane;
- Junction 20 - A5076, Upton Way (south)/ High Street/ A5076, Upton Way (north)/ Dustan Mill (Stub); and
- Junction 25 - A508, Harborough Road (south)/ A5199, Welford Road/ A508, Harborough Road (north)/ Cranford Road/ Kingsland Avenue.

16.8 There are, however, three aspects of the 'minor highway works' described in **Chapter 5: The Proposed Development** that have not been included in this assessment, due to their late identification as appropriate mitigation for the Proposed Development. These are:

- Junction 29 – A43/St John's Road (signage and road surfacing scheme on the A43),
- Junction 31 – A43 Northampton Road (signage scheme); and,
- Cycleway - Pedestrian/Cycle Way along Northampton Road and between Barn Lane to the junction of Collingtree Road (widening of existing footpaths, provision of new footpath and dropped kerbs, and realignment of the carriageway).

16.9 The first two elements listed above require no physical works to alter the footprint of the road. The pedestrian/cycle way is located within Highways land and will involve minimal disturbance of existing verges. Assessment of all three aspects will be included in the assessment undertaken for the final DCO submission.

16.10 In addition to consideration of the individual aspects of the Proposed Development, the assessment addresses environmental impact arising from all development within the Order Limits as a whole.

16.11 This section summarises the technical information in the following annexes contained in **Appendix 16** which comprise the main ecological survey methods and results, including relevant plans and diagrams:

- Annex A – Background Data Search
- Annex B - Phase 1 Habitat Survey
- Annex C – Phase 2 Botany and NVC Survey
- Annex D - Hedgerow Survey
- Annex E (Part 1) – Bat Surveys Main SRFI Site
- Annex E (Part 2) – Bat Surveys – Junction 15a Site
- Annex E (Part 3) – Bat Survey Figures
- Annex F - Reptile Survey
- Annex G – Otter and Water Vole Survey
- Annex H – Breeding Birds Survey
- Annex I – Golden Plover Survey
- Annex J – Great Crested Newt Survey
- Annex K – Invertebrate Survey
- Annex L – Aquatic Ecology Survey
- Annex M – Veteran Tree Survey
- Annex N – Badger Survey

16.12 This chapter contains the following figures:

- Figure 16.1 The Study Area.
- Figure 16.2 Statutory Designated Sites.
- Figure 16.3 Phase 1 Habitat Survey Maps.

- Figure 16.4 Ecology Mitigation Plans (also contained in Appendix 5.4)

16.13 Figures contained in other chapters which are referred to frequently but not repeated here are:

- Chapter 5, Appendix 5.1: Green Infrastructure Plan (Main SRFI Site)
- Chapter 5, Appendix 5.1: J15a Green Infrastructure Plan
- Chapter 5, Appendix 5.1: Parameters Plan (Main SRFI Site)
- Chapter 5, Appendix 5.2: Illustrative Landscape Masterplan (Main SRFI Site)
- Chapter 5, Appendix 5.2: Illustrative J15a Landscape Plan

16.14 Ecology is addressed as part of the Environmental Impact Assessment (EIA) process because the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 require consideration of the aspects of the environment likely to be significantly affected by the development, including biodiversity. Ecological features are also covered by many legislation and policy documents and these have been reviewed where available.

Legislation, Policy and Best Practice

16.15 A number of legal Acts and Directives aim to conserve and enhance biodiversity and nature conservation interest in the UK by variously providing legal protection to habitats or species. A list of nature conservation legislation relevant to the scheme is provided in **Table 16.1,** along with relevant planning policy and guidance**.**

Table 16.1: Relevant Legislation and policy and guidance

Legislation/policy guidance	Key Provisions	Relevant section of Chapter where key provisions are addressed
Legislation - international		
The Habitats Directive (Council Directive 92/43/EEC) **(Ref 16.2)**.	Natura 2000 comprises a network of ecologically valuable designated areas in Europe. Established under the EU Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (The Habitats Directive) **(Ref 16.2)** and the EU Directive 2009/147/EC on the conservation of wild birds (The Birds Directive) **(Ref 16.3)**.	Designated Sites section, but this is overarching legislation upon which this assessment is based.
The Birds Directive (Directive 2009/147/EC) **(Ref 16.3)**.	The main aim of the Habitats Directive is "to promote the maintenance of biodiversity" through the protection of habitats or species. In this regard, **Annex I** lists habitat types for which sites should be designated, and **Annex II** lists species for which sites should be designated. The main aim of the Birds Directive is to provide a framework for the conservation and management of wild birds in Europe. In this regard, **Annex I** lists habitat types to be protected, and Annex II lists species that can be hunted. Accordingly, the network comprises Special Areas of Conservation (SAC) designated under the Habitats Directive, and Special Protection Areas (SPA) designated under the Birds Directive. Within the UK, it is a matter of policy that Ramsar sites, candidate SACs and proposed SPA are treated as designated areas.	
Legislation - national		
Wildlife and Countryside Act, 1981 (as amended). (Ref 16.4)	The Wildlife and Countryside Act, 1981 (as amended) is the principal mechanism for wildlife protection in the UK. It was originally aimed at consolidating and amending previous legislation to implement the requirements of the Bern Convention and the Birds Directive. Under the Wildlife and Countryside Act, 1981 the main site protection measure in the UK (*i.e.* the statutory designation of Sites of Special Scientific Interest (SSSI)) is established. It provides a range of protection relating to wild birds, other animals, and plants, further details of which are	This is overarching legislation that applies to all aspects of the biodiversity assessment.

	given in the species section in this table.	
The Countryside and Rights of Way Act, 2000 (Ref 16.5)	The Countryside and Rights of Way Act, 2000 extends the ability of the public to enjoy the countryside whilst also providing safeguards for Land Owners / Land Occupiers. Accordingly, the Countryside and Rights of Way Act 2000: Gives a statutory right of access to open country and registered common land; Modernises the rights of way system; Gives greater protection to SSSIs; Provides better management arrangements for Areas of Outstanding Natural Beauty (AONBs); and, Strengthens wildlife enforcement legislation. In addition, the Countryside and Rights of Way Act, 2000 provides stricter enforcement for wildlife offences. These include increased penalties available to the courts for offences committed under the Wildlife and Countryside Act, 1981 (as amended).	This is overarching legislation that applies to all aspects of the biodiversity assessment.
The Natural Environment and Rural Communities (NERC) Act (2006) (Ref 16.6)	Section 41 of the Natural Environment and Rural Communities Act, 2006 requires that the Secretary of State should produce a list of habitats and species of principal importance for conservation. The list guides decision makers in having regard to the conservation of biodiversity when carrying out their normal functions.	This is overarching legislation that applies to all aspects of the biodiversity assessment.
Conservation of Habitats and Species Regulations, 2010 (as amended) (Ref 16.7)	The Conservation of Habitats and Species Regulations, 2010 (as amended) place a duty on planning authorities to have regard to the requirements of the Habitats Directive so far as they may be affected by the exercise of their functions. In this regard, the Conservation of Habitats and Species Regulations, 2010 (as amended) implement the relevant requirements of the Habitats Directive and provide specific protection for European Protected Species	This is overarching legislation that applies to all aspects of the biodiversity assessment.
National Parks and Access to the Countryside Act 1949 (Ref 16.8)	Provided the framework for creating National Parks, Areas of Outstanding Natural Beauty and Local Nature Reserves.	This is overarching legislation that applies to all aspects of the biodiversity assessment.
Hedgerow Regulations,	Certain agricultural hedgerows classified as “important” (for wildlife, landscape or historical reasons) are protected by the Hedgerows Regulations 1997. The regulations specify criteria for identifying “important”	See Baseline Surveys and Data Section (Table 16.6)

1997(Ref 16.9)	hedgerows. Except where a planning consent applies, notice must be given for the removal (*i.e.* up-rooting or otherwise destroying) of any hedgerow to which the regulations apply, and if it is an important hedgerow the competent authority may issue a retention notice to prevent its removal.	for methods used for hedgerow surveys and Baseline Conditions section for hedgerow status.
Policy - national		
National Policy Statement for National Networks (NN NPS), December 2014 **(Ref 16.10)**	Biodiversity and ecological conservation is addressed in the NN NPS which sets out requirements for an assessment where a project is subject to EIA.	
	The PEIR should clearly set out likely significant effects on internationally, nationally and locally designated sites of ecological or geological conservation importance…protected species and habitats and other species identified as being of principal importance for the conservation of biodiversity.	See Baseline Conditions (Designated Sites) which sets out relevant designated sites
	The applicant is required to show how the project has taken advantage of opportunities to conserve and enhance biodiversity and geological conservation interests.	This is addressed in the Embedded Mitigation and Adaptive Mitigation sections
	In order to comply with the Government's biodiversity strategy which aims, amongst other things, to halt overall biodiversity loss, the scheme must be viewed in the context of climate change to avoid significant impacts on biodiversity.	See Climate Change section (and Chapter 23: Climate Change Mitigation & Adaptation)
	The NN NPS states that the development should avoid significant harm to biodiversity through mitigation and consideration of reasonable alternatives. The applicant may also consider using	See Embedded Mitigation section for

	biodiversity offsetting to devise compensation proposals to counteract any impacts on biodiversity which cannot be avoided or mitigated.	specific details on enhancement of biodiversity.
	The Secretary of State will give due consideration to regionally or local designated sites, however the NPF states that these designations should not be used in themselves to refuse development consent.	See Baseline Conditions (Designated Sites) which sets out relevant designated sites including local and non-statutory designations)
	Aged or veteran trees found outside ancient woodland are also particularly valuable for biodiversity and their loss should be avoided. The Secretary of State will not grant consent for any development that will result in the loss or deterioration of irreplaceable habitats including ancient woodland and aged or veteran trees, unless the national need for and benefits of the development outweigh the loss. The applicant should set out proposals for their conservation or explain the reasons for any unavoidable losses.	See **Appendix 16, Annex M**, Veteran Tree Survey and Embedded Mitigation section.
	The Secretary of State will consider whether the applicant has maximised opportunities for building in beneficial biodiversity and may use requirements or planning obligations to ensure that they are delivered. Applicants will identify how and where appropriate mitigation measures will be secured.	See Schedules of Mitigation tables.
National Planning Policy Framework (NPPF) **(Ref 16.11)**	The NPPF states that listed Ramsar sites should have the same protection as European sites. Section 11 of the NPPF entitled Conserving and Enhancing the Natural Environment, includes the following points which are relevant to the proposals: "*The planning system should contribute to and enhance the natural and local environment by minimising impacts on biodiversity and providing net gains in biodiversity where possible, contributing to the Government's commitment to halt the overall decline in biodiversity, including by establishing coherent ecological networks that are more resilient to current and future pressures*".**(Para 109, Ref 16.x)** *"In preparing plans to meet development needs, the aim should be to minimise pollution and other adverse effects on the local and natural environment".* **(Para 110, Ref 16.x)**	Overarching policy which is relevant to the entire assessment.

	"Planning policies and decisions should encourage the effective use of land by re-using land that has been previously developed, provided that it is not of high environmental value". **(Para 111, Ref 16.x)** *"Local planning authorities should set criteria based policies against which proposals for any development on or affecting protected wildlife or geo-diversity sites or landscape areas will be judged. Distinctions should be made between the hierarchy of international, national and locally designated sites, so that protection is commensurate with their status and gives appropriate weight to their importance and the contribution that they make to wider ecological networks".* **(Para 113, Ref 16.x)** In addition, guidance is provided to the Local Planning Authority on planning polices and criteria for planning permission with regard to minimising impacts on biodiversity and geodiversity. **(Para 114-119, Ref 16.x)**	
Policy - local		
Upper Nene Valley Gravel Pits Special Protection Area (SPA) Supplementary Planning Document (SPD) **(Ref 16.12)**	The document helps ensure that development has no significant effects on this SPA/Ramsar site by identifying potential significant effects on the SPA's qualifying features.	A No Significant Effects Report will be presented with the DCO submission – it will initially be subject to consultation with Natural England
Biodiversity SPD for Northamptonshire August 2015 **(Ref 16.13)**	This SPD explains how biodiversity should be integrated into the development process to ensure that legislation and policy requirements are met and best practice standards are achieved. The SPD expands on the main principles set out in the National Planning Policy Framework and relevant local planning policies, and should be used together with expert ecological assessment of the details of each specific case.	Overarching policy that relates to the entire assessment.

South Northamptonshire Supplementary Planning Guidance **(Ref 16.14)**	This guidance describes how planning for nature conservation must be considered as part of the development process.	Overarching policy that relates to the entire assessment.
South Northamptonshire Local Plan Saved Policies **(Ref 16.15)**	There are four saved policies within the South Northamptonshire Local Plan that relate to ecology and nature conservation that would have a bearing on the site: Policy EV19 Proposals for tree felling or pruning will generally not be permitted in a conservation area or to a tree subject to a tree preservation order; exceptions include where proposals are justified in the interests of good arboricultural practice or other clear environmental benefit. Policy EV 21 Proposals will be expected to retain wherever possible, or failing that replace trees, hedgerows, ponds or other landscape features where they make an important contribution to the character of the area. Policy EV24 Permission will only be granted for development where it will not lead to significant loss or harm to regionally important geological and geomorphological sites and county wildlife sites. Where permitted the retention and protection of such sites may be secured through planning conditions or obligations. Policy EV25 The council will not permit development that adversely affects the nature conservation, landscape or wildlife value of dismantled railways or waterways and watercourses.	See **Appendix 16, Annex M Veteran Tree Survey, Annex L Aquatic Ecology Survey;** and **Annex D Hedgerow Survey** and assessment of effects tables relating to these
West Northamptonshire Joint Planning Unit (2014) Joint Core Strategy **(Ref 16.6)**	Objective 14 of The Core Strategy states: *"To protect natural species present in West Northamptonshire and enhance the existing strategic green infrastructure network, including biodiversity corridors, by incorporating and designing these into Sustainable Urban Extensions (SUEs) at Northampton, Daventry, Towcester and Brackley".*	Overarching policy that relates to the entire assessment.

	This is covered by the following policies (relevant to the current scheme):- *"Policy BN2 - Biodiversity* *Development that will maintain and enhance existing designations and assets or deliver a net gain in biodiversity will be supported.* *Development that has the potential to harm sites of ecological importance will be subject to an ecological assessment and required to demonstrate:* • *the methods used to conserve biodiversity in its design and construction and operation;* • *how habitat conservation, enhancement and creation can be achieved through linking habitats; and* • *how designated sites, protected species and priority habitats will be safeguarded.* *Development management decisions will reflect the hierarchy of biodiversity and geodiversity designations attaching appropriate weight to the status of the site which would be affected. In cases where it can be shown that there is no reasonable alternative to development that is likely to prejudice the integrity of an existing wildlife site or protected habitat appropriate mitigation measures including compensation will be expected in proportion to the asset that will be lost. Where mitigation or compensation cannot be agreed with the relevant authority development will not be permitted."* *Policy BN3 – Woodland enhancement and creation measures to enhance existing woodlands and create new* *woodlands in west Northamptonshire will be supported. Woodland enhancement and creation along the Yardley Whittlewood ridge from the village of Yardley Hasting towards Towcester and Brackley will be prioritised in recognition of its importance to the character and biodiversity of west Northamptonshire. Development that would lead to further fragmentation or result in a loss of ancient woodland will not be permitted.* *Policy BN4 – Upper Nene Valley Gravel Pits potential special protection area new development will need to demonstrate through the development management process that there will be no*	This will be addressed

	significant adverse impacts on the potential Special Protection Area and Ramsar site including the loss of supporting habitat and no significant adverse impacts on associated European protected species due to water runoff, water abstraction or discharges from the foul drainage system either as a direct result of the development alone or in combination. New development will need to demonstrate that the impact of any increased recreational activity (indirect or direct) on the Nene Valley Potential Special Protection Area and Ramsar site will not have a detrimental impact and that all necessary mitigation including retention of supporting habitat will be incorporated.	in the No Significant Effects Report
Northamptonshire Local Biodiversity Action Plan (2008, Ver 1.4) **(Ref 16.17)**	The Northamptonshire LBAP is considered in this EcIA. Local Wildlife Sites are sites of local conservation interest designated by the local planning authority. The Northamptonshire LBAP contains useful guidance about incorporating Green Infrastructure into scheme development and refers to GI Strategic Biodiversity Network maps for West and North Northamptonshire. Identifies local and national priority habitats and species, and sets targets for their conservation, outlines mechanisms for achieving these. The latest Northamptonshire Local Biodiversity Action Plan (LBAP) lists 2 Species Action Plans (SAPs) and 16 Habitat Action Plans (HAPs). Those that are relevant to this site are: • Habitats: • Hedgerows. • Lowland fen. • Ponds. • Rivers. • Wet woodland. • Species: • Barn owl.	See **Appendix 16, Annex A Background Data Search** which sets out relevant designated sites including local and non-statutory designations and LBAP/ SAP and HAP species.

	• Dunnock. • Skylark. • Song thrush. • Linnet. • Yellowhammer. • Reed bunting. • Barbastelle bat. • Noctule bat. • Brown Long-eared bat • Soprano pipistrelle • Otter (*Lutra lutra*).	
Non-Statutory policies		
UK Biodiversity Action Plan	In 1994 the UK Government ratified the Convention on Biological Diversity and published the UK Biodiversity Action Plan (BAP). In 2012 the UK Post-2010 Biodiversity Framework was published which sets out the objectives for biodiversity in the UK until 2020. The habitats and species listed in this framework are the same as those listed in the now defunct UK BAP, but are now referred to as Priority Habitats and Priority Species. BAPs determine broad habitat-types and particular species that are of value to the natural environment of the UK, and identify actions and projects that could be undertaken to help protect or enhance the national biodiversity. The UK BAP species relate to requirements of Section 41 of	Overarching policy that relates to the entire assessment.

	Natural Environment and Rural Communities Act, 2006 and include all species of principal importance. Local Biodiversity Action Plans (LBAPs) are implemented through planning policy, identifying habitats and species of particular value or endangerment at the local, county, district or regional level. As such, LBAPs have no statutory status, but provide a framework for implementing conservation requirements. **(Ref 16.18)**	
Local Planning Policy	Local Wildlife Sites (LWS) are sites of local nature conservation interest usually short of that sufficient for SSSI designation but deserving of consideration the planning process. They are designated by the local planning authority (though they may delegate selection, *e.g.* to wildlife trusts). Many planning authorities call them by other names, *e.g.* County Wildlife Sites, Sites of Importance for Nature Conservation. Potential Wildlife Sites (PWS) are identified by the local planning authority. Some may not have sufficient value to qualify as Local Wildlife Sites but could be managed to do so. More commonly it is likely that they do, but confirmation by survey is awaited.	See Designated Sites section which sets out relevant designated sites including local and non-statutory designations)
Species		
Badgers	Badgers (*Meles meles*) are protected under the Wildlife and Countryside Act, 1981 and more specifically under the Protection of Badgers Act, 1992. Under these Acts, it is an offence to wilfully take, kill, injure or ill-treat a badger, to possess a dead badger or any part of a badger or to interfere with, obstruct, destroy or damage a badger sett. Under these Acts, badgers are also protected against disturbance whilst within a sett. Accordingly, badgers can only be disturbed under a licence from Natural England. In terms of badger setts, the Protection of Badger Act, 1992 defines a badger sett as "*any structure or place which displays signs indicating the current use by a badger*". Natural England takes this definition to include seasonally used badger setts.	See **Appendix 16, Annex N Badger Survey** and baseline conditions/ assessment of effects sections in this Chapter.
Bats	All species of bat (*Chiroptera* spp.) and their roosts are fully protected under Schedule 5 of the Wildlife and Countryside Act, 1981 **(Ref 16.4)** and as European Protected Species under the	See **Appendix 16, Annex E Bat Survey** and

Conservation of Habitats and Species Regulations, 2010 **(Ref 16.7)**.

baseline conditions/ assessment of effects sections in this Chapter.

It is an offence for any person to:

Intentionally or recklessly kill, injure or capture a bat;

Intentionally or recklessly disturb a bat;

Intentionally or recklessly damage, destroy or obstruct a bat's place of shelter (bat roost);

Possess or transport a bat (or any part of a bat) unless legally acquired; or,

Sell, barter or exchange a bat (or any part of a bat).

Where an offence is committed there are very limited defenses available. However, no offence is committed where anything is done under and in accordance with the terms of a licence (known as a European Protected Species Licence) granted by Natural England. The circumstances in which a European Protected Species Licence may be granted are set out at Regulation 53 of the Conservation of Habitats and Species Regulation 2010 **(Ref 16.7)**.

In addition, as a signatory to the Bonn Convention (Agreement of Bats in Europe), the UK is also required to protect bat habitat. This requires the identification and protection of important feeding areas from damage or disturbance. Under this interpretation, a bat roost is "*any structure or place which any bat uses for shelter or protection*". As bats tend to reuse the same roosts, legal opinion is that the protection of bat roosts are considered to apply regardless of whether bats are present. However, there is currently no guidance on when a bat roost ceases to be protected if it is not used.

Based on their protection under the Conservation of Habitats and Species Regulations, 2010, all species of bat are designated as a European Protected Species. Therefore, in order to undertake any activity which would result in any of the above offences being committed, it is necessary to obtain a European Protected Species Licence from Natural England.

	In addition to the legal protection afforded to bats, Barbastelle Bat, Bechstein's Bat, brown long-eared bat, greater horseshoe bat, lesser horseshoe bat, noctule and soprano pipistrelle are listed on the UK BAP and on Section 41 as species of principal importance.	
Birds	All species of wild bird and their nests are fully protected under Schedule 5 of the Wildlife and Countryside Act, 1981 (as amended). It is an offence for any person to: Intentionally kill, injure or capture any wild bird; Intentionally damage or destroy the nest (whilst being built or in use) or eggs; or, Possess, transport or sell any wild birds. In addition, certain species of wild bird are given further protection by Schedule 1. For these species, it is also an offence for any person to: Intentionally or recklessly disturb these species while building a nest; Intentionally or recklessly disturb these species while in, on or near a nest containing eggs or young; or, Disturb the dependant young of these species. Therefore, clearance of vegetation during the bird breeding / nesting season could result in an offence under the Wildlife and Countryside Act, 1981 (as amended). The bird breeding / nesting season can be taken to occur between March to August inclusive, although it is subject to variations based on species, geographical and seasonal factors. In addition to the legal protection afforded to birds, 49 bird species are listed on the UK BAP as priority species are listed on the UK BAP and on Section 41 as species of principal importance.	See **Appendix 16, Annex H Breeding Bird Survey,** and **Annex I Golden Plover Survey** and baseline conditions/ assessment of effects sections in this Chapter.
Great crested newts	Great crested newts (*Triturus cristatus*) are fully protected under Schedule 5 of the Wildlife and Countryside Act, 1981 and as European Protected Species under the Conservation of Habitats and Species Regulations, 2010. It is illegal an offence for any person to: Possess a great crested newt (alive or dead); Deliberately kill, injure or capture a great crested newt; Intentionally or recklessly disturb a great crested newt; or,	See **Appendix 16, Annex J Great Crested Newt Survey** and baseline conditions/ assessment of effects sections in this Chapter.

	Deliberately take or destroy the eggs of a great crested newt. It is also illegal to damage, destroy or intentionally or recklessly obstruct access to a breeding or resting place used by great crested newt. All life stages of great crested newts are afforded the same level of protection. Where an offence is committed there are very limited defenses available. However, no offence is committed where anything is done under and in accordance with the terms of a licence (known as a European Protected Species Licence) granted by Natural England. The circumstances in which a European Protected Species Licence may be granted are set out at Regulation 53 of the Conservation of Habitats and Species Regulations, 2010. Based on their protection under the Conservation of Habitats and Species Regulations, 2010, great crested newts are designated as a European Protected Species. Therefore to undertake any activity which would result in any of the above offences, it is necessary to obtain a European Protected Species Licence from Natural England. In addition to the legal protection afforded to great crested newt, they are also listed on the UK BAP as a priority species and on Section 41 as species of principal importance.	
Invertebrates	The following list gives details of the UK's (focusing here on England) domestic wildlife legislation, national biodiversity policies and relevant international statutes. Most of these measures aim to protect vulnerable species, but some invasive alien species are also covered by legislation: UK invertebrate species protected by international statutes *i.e.* The Conservation (Natural Habitats &c.) Regulations 1994 and The Conservation of Habitats and Species Regulations 2010; and The Bern Convention and Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES); Invertebrate species listed on Schedule 5 of the Wildlife and Countryside Act 1981 (as amended) for England and Wales; Invertebrate species listed under Section 41 of the Natural Environment and Rural Communities Act for England and under Section 42 for Wales *i.e.* invertebrate species of principal importance; Invertebrate species endangered by trade and listed under the EU CITES Regulations; and Invertebrate species listed on Schedule 9 of the Wildlife and Countryside Act 9 (as amended) *i.e.*	See **Appendix 16, Annex K Invertebrate Survey** and baseline conditions/ assessment of effects sections in this Chapter.

	invasive invertebrate species. In addition to the legal protection afforded to invertebrate species, many are listed on local Biodiversity Action Plans.	
Reptiles (common species)	In the UK, a number of reptile species are protected under the Wildlife and Countryside Act, 1981 from intentional or reckless killing / injuring. These reptile species include the: common lizard (*Zootoca vivipara*); slow worm (*Anguis fragilis*); adder (*Vipera berus*); and, grass snake (*Natrix natrix*). In addition to the legal protection afforded, all species of UK reptile species are listed as priority species on the UK BAP and Section 41.	See **Appendix 16, Annex F Reptile Survey** and baseline conditions/ assessment of effects sections in this Chapter.
Invasive Plants	The Wildlife and Countryside Act, 1981 provides the primary controls on the release of non-native species into the wild in Great Britain. Under Section 14(2) this Act, it is an offence to "*plant or otherwise cause to grow in the wild*" of any plant listed on Schedule 9, Part II. Over 46 species of plant are listed on Schedule 9, Part II.	See **Appendix 16, Annex B Phase 1 Habitat Survey, and Annex C Phase 2 Botany and NVC Survey** and baseline conditions/ assessment of effects sections in this Chapter.
Bat Survey Guidelines **(Ref 16.19)**	This document provides guidance on designing and implementing a range of different bat surveys.	See **Appendix 16, Annex E Bat Survey** and baseline conditions/ assessment of effects sections in this Chapter.
Ecological assessment guidance		
Chartered Institute of Ecology and Environmental Management (CIEEM) Guidelines on Ecological Impact Assessment (2016) **(Ref 16.1)**	The guidelines are consistent with the British Standard on Biodiversity, and acknowledged as the standard reference on EcIA by the British Standards Institute (BS 2013). They are endorsed by the Institute of Environmental Management and Assessment, Department of the Environment, and the Association of Local Government Ecologists among others.	Overarching policy that relates to the entire assessment.

Planning Inspectorate Advice Note Ten: Habitat Regulations Assessment relevant to nationally significant infrastructure projects (January 2016) **(Ref 16.20)**	Contains advice regarding assessment of potential impacts to internationally designated sites.	This will be addressed in the **No Significant Effects Report** to be submitted with the DCO submission.
BS42020:2013 Biodiversity – Code of practice for planning and development (BSI 2013) (**Ref 16.21**).	The code of practice refers to best practice for planning and development, to meet biodiversity objectives.	Overarching policy that relates to the entire assessment.
Natural England. (2001) Great Crested Newt Mitigation Guidelines. English Nature **(Ref16.22)**	The Great Crested Newt Mitigation Guidelines provide generic guidance for those involved in developing sites where great crested newts occur and assists developers, planners and conservation officers. It covers topics that include legislation and licensing, survey standards, predicting impacts, and, planning and undertaking mitigation.	See **Appendix 16, Annex J Great Crested Newt Survey** and baseline conditions/ assessment of effects sections in this Chapter**.**

Licences and Permits

16.16 **Table 16.2** summarises licences and permits relevant to ecology and nature conservation that may be required.

Table 16.2: Summary licences and permits relating to ecology

Subject of Licence or Permit	Detail
Great crested newts	A pond east of the NLL within 500 m of the Main SRFI Site has a medium-population of great crested newts. The railway is not considered a complete barrier to great crested newts. The Main SRFI Site has habitat suitable for great crested newts. No great crested newts have been found in the ponds there, but an European Protected Species (EPS) Licence will be required to remove and exclude them from terrestrial habitat (using drift fencing)
Common pipistrelle – minor non-maternity roost for small numbers of bats	EPS licencerequired for exclusion of bats from field barns near Barn Lane.
Common pipistrelle – minor non-maternity roost for small numbers of bats	EPS licence required for exclusion of bats from the main house and barn at Lodge Farm prior to demolitions.
Common pipistrelle – minor non-maternity roost for small numbers of bats	EPS licence required for exclusion of these bats from the house and stable block at Manor Farm.
Signal crayfish (*Pacifastacus leniusculus*)	Native white-clawed crayfish (*Austropotamobius pallipes*) are not found in the Milton Malsor Brook, probably excluded by large numbers of non-native signal crayfish which were recorded. Brook diversion works may generate excavated material containing signal crayfish which may carry Crayfish Plague Disease lethal to the native species. Environment Agency approval (but no actual licence) will be needed for on-site retention and handling of such material to avoid transferring disease to native crayfish habitat elsewhere. If precautions were to include the intentional capture of crayfish then a licence would be necessary.
Fish	Prior to works to divert the Milton Malsor Brook, a fish rescue and translocation will require Environment Agency authorisation (but no actual licence) will be needed for '*authorisation to fish using instruments (other than rod and line) under section 27A*

	Salmon and Freshwater Fisheries Act 1975' (FR2 application form*)***(Ref 16.23)***.* This will be sufficient provided that fish are transferred to another section of the same watercourse in close proximity to their original site of capture.

Scoping and Consultation

16.17 As part of the formal EIA scoping process, the Secretary of State issued the Scoping Report **(Ref 16.24)** to the statutory and non-statutory consultees in January 2016. Some responses have been received subsequently. Responses that have been taken into account in the ecological assessment were received from the following.

- Secretary of State.
- Blisworth Parish Council.
- Canal and River Trust.
- Environment Agency.
- Milton Malsor Parish Council.
- Natural England.
- Northamptonshire County Council (NCC).
- South Northamptonshire Council (SNC).
- The Woodland Trust.
- Stop Rail Central.
- The Wildlife Trust for Cambridgeshire, Bedfordshire and Northamptonshire ('The Wildlife Trust').

16.18 Subsequent meetings have been held with Natural England, The Wildlife Trust, SNC and NCC.

16.19 Details of the relevant points made, in regard to ecology, are shown in **Table 16.3.**

Table 16.3: Summary of Scoping Opinion Consultation Comments in relation to ecology

Organisation	Summary of points raised in regard to ecology	Where in chapter comments are addressed
Secretary of State Scoping Opinion	The commitment to adhere to CIEEM guidance on ecological assessment was welcomed. The Secretary of State welcomed proposals for additional field surveys and that the scope of these should be agreed with consultees including Natural England. The Secretary of State requested further explanation of potential impacts on European designated sites. It is expected that comprehensive information will be provided for all sites identified and considered in the PEIR and relevant plans provided to identify their location. Mitigation measures should be adequately secured through provisions in the draft DCO or management plan. The EIA should separately consider impacts on separate receptors as a result of combined impacts (inter-related effects) and the potential cumulative effect of the proposed development together with other identified schemes. The proposals should fully address the needs of protecting and enhancing biodiversity. It was recommended that consultation with Natural England should be undertaken regarding any potential HRA and evidence of any agreements reached submitted with the DCO application. If the applicant has concluded than an EPS Licence is required, the examiner will need to understand whether there is an impediment to the license being granted. Consultation with Natural England to agree appropriate mitigation requirements is encouraged. The applicant is responsible for ensuring draft licence applications are satisfactory for the purposes of informing formal pre-application assessment by Natural England. The applicant is responsible to ensure information is satisfactory to inform the assessment of no detriment to the maintenance of favourable conservation status (FCS) of the population of European protected species (EPS) affected by the proposals.	Comments are incorporated throughout the PEIR chapter.
Canal and River Trust	The potential impacts upon the biodiversity interest of the canal corridor should be fully considered. Options to secure ecological enhancements of the canal corridor should be considered. Light spillage impacts, especially regarding the A43 junction, should be considered.	Comments are incorporated throughout the PEIR

	Section 16 of the Preliminary Environmental Information Report considers the ecological impacts likely to occur. The presence of the canal is acknowledged at 16.45 and the towpath is acknowledged as a feature of nature conservation value at 16.51. We consider that the potential impacts upon the biodiversity interest of the canal corridor and the ecology supported by the canal should be fully considered.	chapter.
Environment Agency	Green Infrastructure (GI) can help to manage flood risk, improve water quality, enhance biodiversity (including fisheries) and opportunities for recreation on and near waterways and beyond. It can also help to promote sustainable development more widely. GI should perform multiple functions and provide multiple benefits and services to communities. Those most relevant considerations to us [the EA] are: • Flood risk management (flood storage, swales). • Water management (surfaces for infiltration and storage). • Habitat creation (river corridors). • Recreation (boating, angling). Biodiversity enhancement alongside improved access to greenspace should be sought wherever possible and opportunities should be taken to improve the landscape, visual amenity and ecology and wildlife value. The PEIR should consider the West Northamptonshire Water Cycle Strategy, GI Strategy, the EU Habitat Directive and UK Regional and local Biodiversity Action Plans. The PEIR should also consider Northampton Borough Councils GI Plan for Northampton and related development. The PEIR should refer to the Woodlands for Water project to consider where planting could also reduce flood risk and achieve the objectives of the Water Framework Directive (WFD). We also refer the applicant to BS42020:2013 Biodiversity Code of practice for planning and development.	Comments are incorporated throughout the PEIR chapter.
Natural England	Highlighted potential impacts to SSSI, SPA/Ramsar. Advised use of Discretionary Advice Service. Provided supplementary Advice related to EIA Scoping Requirements. Key points included: The development site is approximately 6km from the Upper Nene Valley Gravel Pits SSSI and Special Protection Area. Although separated by some distance there may be scope for impacts if the development	Comments are incorporated throughout the PEIR chapter.

	site forms supporting habitat for the notified bird populations, i.e. it could be used as a feeding habitat by overwintering golden plover populations associated with the SPA. ...local wildlife and geological sites. Local Sites are identified by the local wildlife trust, geoconservation group or a local forum established for the purposes of identifying and selecting local sites. They are of county importance for wildlife or geodiversity. The Environmental Statement should therefore include an assessment of the likely impacts on the wildlife and geodiversity interests of such sites. The assessment should include proposals for mitigation of any impacts and if appropriate, compensation measures. The PEIR should thoroughly assess the impact of the proposals on habitats and/or species listed as 'Habitats and Species of Principal Importance' within the England Biodiversity List, published under the requirements of S41 of the Natural Environment and Rural Communities (NERC) Act 2006 **(Ref16.25)**. The England Biodiversity Strategy published by Defra establishes principles for the consideration of biodiversity and the effects of climate change. The PEIR should reflect these principles and identify how the development's effects on the natural environment will be influenced by climate change, and how ecological networks will be maintained. The NPPF requires that the planning system should contribute to the enhancement of the natural environment 'by establishing coherent ecological networks that are more resilient to current and future pressures' (NPPF Para 109 **(Ref 16.11)**), which should be demonstrated through the PEIR.	
Northamptonshire County Council	Out of date county flora is being used: the 2012 edition should be being used. Important arable plants should be scoped in. Detailed surveys should not be needed over much of the site but there are likely to be some field margins – especially in less intensively-managed fields – which have them.	See baseline section and **Annex 16, Appendix B.** The 2012 flora is used and the scope of plants increased.
South Northamptonshire Council	South Northamptonshire Council is unable to provide full comments on the content of this section due to the limited timeframe in which to respond to this consultation, which precludes the appointment of an ecologist. As such the Council seeks further contact from the applicants in accordance with paragraph 14.52 of the Scoping Report **(Ref16.24)**.	Consultation was carried out with SNC after scoping.
	The assessment within this section does not include reference to invertebrates. Inspection of the National Biodiversity Networks Gateway indicates that there are invertebrates in this area. As such an assessment of	See **Annex 16, Appendix K, Invertebrates** and

	the impacts upon this group should be included.	baseline conditions/ assessment of effects sections in this Chapter.
Blisworth Parish Council	The terminal would swallow up good quality arable land that has been continuously farmed for centuries. Ancient hedgerows will be rooted out with a detrimental effect on already diminishing wildlife. There are badgers living on the proposed site area and, possibly, great crested newts in the wetlands by the stream, and bats in the farm buildings.	Adaptive mitigation reduces loss of agricultural land and outlines measures to protect and enhance hedges. Protected species mentioned are included in the assessment.
Stop Rail Central	We consider that the potential impacts upon the biodiversity interest of the canal corridor and the ecology supported by the canal should be fully considered.	Canal and associated species is considered as a receptor throughout the assessment

16.20 In response to the Phase 1 Consultation and issue of the Preliminary Environmental Information Report for that consultation, a number of communications were received, some of which referred to ecological issues. These are summarised below:

Table 16.4: Ecology Responses to Stage 1 PEIR Report

Organisation	Summary of points raised in regard to ecology	Where in chapter comments are addressed
Canals and Rivers Trust	Section 16 of the PEIR considers the ecological impacts likely to occur. The presence of the canal is acknowledged at 16.45 and the towpath is acknowledged as a feature of nature conservation value at 16.51. We consider that the potential impacts upon the biodiversity interest of the canal corridor and the ecology supported by the canal should be fully considered. Mitigation of visual impacts arising from the development in the form of landscape planting offers the opportunity to secure ecological enhancements which would benefit the canal corridor, and this should be further explored.	See **Appendix 16, Annex G Otter and Water Vole Survey and Annex L Aquatic Ecology Survey.** See Embedded and Adaptive Mitigation sections.
Natural England	As outlined in our response to the formal scoping stage, Natural England has identified some potential impacts to the nearby Roade Cutting Site of Special Scientific Interest (SSSI). There could also be indirect impacts to the Upper Nene Valley Gravel Pits Special Protection Area (SPA), Ramsar site and SSSI, which are notified for overwintering and breeding bird populations, as the site for the new rail freight interchange may consist of supporting habitat for certain species. There could also be implications for other protected species at the site. Natural England would welcome the opportunity to discuss these matters with you through our Discretionary Advice Service (DAS). We introduced DAS so that we can work with applicants, developers, consultants to take appropriate account of environmental considerations at an early stage of the process in order to improve the quality of applications before they are submitted. We believe this could help to save our customers time and money in the long term, whilst also securing good outcomes for the natural environment. You will be aware that the formal s42 pre-application stage of the NSIP process is required in due course, however in our view it would be beneficial to meet ahead of this statutory pre-app consultation to ensure impacts are identified and solutions explored as	This will be addressed in the No Significant Effects Report. See Scoping and Consultation section (table 16.5). Natural England has been consulted throughout site design.

	early as possible.	
Northampton Inland Waterways Association	This area, west of the A43 dual carriageway, is very close to both the main Grand Union Canal and the Northampton Arm, plus two large marinas and of course local housing. It is a highly sensitive site, already blighted by noise from the A43 dual carriageway. ... The IWA proposes that low key, noise absorbent land uses such as a country park with significant tree planting would protect the vulnerable land uses, as least to a limited extent, and restrict the commercial development to the east side of the A43, making that a clear boundary. Recreational /leisure use could be linked to existing towpath walking routes and strengthen wildlife corridors in the locality.	See Embedded and Adaptive Mitigation sections.
Stop Rail Central	Damage to our local environment is a common theme from several contributors. Christopher McCowen writes: "Rail Central obviously plans to completely bulldoze the site and shows little intention of retaining anything offering an amenity and wildlife benefit currently in place. Their development attitude shows no importance in what was naturally created by past generations; we need to protect what we have now as a community". Existing trees with TPO's have all been retained which are grouped together just south of Milton Malsor. It is unclear which boundary hedges and trees within the body of the site have been retained. It is certainly very minimal if any at all. This represents a waste of natural resources as many of the trees are over two hundred years old. Many are classified as Veteran or some even Ancient offering quality amenity and wildlife benefits".	See **Appendix 16, Annex M Veteran Tree Survey** and assessment of effects section, Embedded and Adaptive Mitigation sections.
The Woodland Trust	The Woodland Trust is highly concerned about the potential impact of the proposed development on a number of trees identified as being ancient, veteran or notable specimens on our Ancient Tree Inventory (ATI). Reference was made to National Planning Policy Framework **(Ref 16.11)**, paragraph 118; Paragraph 5.2.4 of the UK Biodiversity Action Plan (UKBAP); Trees in relation to design, demolition and construction, BS 5837:2012" **(Ref 16.18)**, and Section 40 of the Natural Environment and Rural Communities Act 2006 **(Ref 16.25)**. Due to the concentration of veteran trees in the area, there is a continuity of varying habitat types that would be severed if this mix of ancient, veteran and notable trees are damaged or lost. This in turn could lead to decline in those species, i.e. saproxylic invertebrates and	See **Appendix 16, Annex M Veteran Tree Survey** and assessment of effects section, Embedded and Adaptive Mitigation sections.

certain fungi, associated with decaying wood habitat, aging bark and old root systems. It is essential that no trees displaying ancient/veteran characteristics are lost or damaged as part of the development. Any loss of veteran trees would be highly deleterious to the wider environment of veteran trees within close proximity, which may harbour rare and important species.

However in some cases, such as for particularly large ancient specimens, the British Standard may not be enough. As such each tree must be considered on a case by case basis to ensure that individual RPAs have been fully examined to help shape avoidance measures.

At a minimum the root protection area for the ancient, veteran and notable trees in close proximity to the proposed scheme should be 15 times (15x) the trunk diameter or 5 metres beyond the crown of the tree, whichever is greater. The Trust is concerned that if the protection area is limited, future risk assessments for the trees will determine that the tree needs to be felled due to past limb failures. The Trust is also concerned because people are inclined to use trees in all weather conditions as areas of protection, thus increasing the health and safety risk that the tree poses.

Our view is that the trees should be managed for their own sake so that as much as possible can be retained for as long possible and that pruning as any form of cutting is a form of damage and should be kept to an absolute minimum.

The Trust believes that further surveys must be undertaken within the development boundary to identify any other possible unrecorded veteran trees likely to be affected. Further studies in relation to the already identified mature, notable and veteran trees would also help determine whether any of these mature/veteran specimens could be classified as ancient trees.

In summary, the Woodland Trust objects to the proposals in their current form as the development will potentially result in damage and/or loss to a significant number of ancient or veteran trees. As the applicant has not recognised that a number of these trees fall under the category of ancient, veteran or notable it is important that in further consideration of the ecological

	aspects of this project the status of these trees is taken into account and referred to. As numerous trees within the development boundary have been identified as ancient, veteran or notable it is important that these are avoided by the proposed infrastructure. If found that any of these trees are likely to be lost or damaged as part of the proposals then we call upon the developer to further examine the layout of the proposed development to ensure that no ancient, veteran or notable trees are lost. These trees are highly important in the context of the local environment and landscape and must be preserved.	
Andrea Leadsom MP	The Woodland Trust has detected 20 veteran and 3 ancient trees which are being threatened by this development. As we have yet to see the exact site layout, my constituents are not sure if the trees will be directly affected but given the wholesale development of the sites, they believe that it is highly likely that some of them will be. My constituents want to see all ancient and veteran trees threatened by the Rail Central development fully protected. Ancient and veteran trees are a vital and treasured part of our natural and cultural landscape, and represent a resource of great international significance. Veteran trees are the ancient trees of the future. It has been estimated that the UK may be home to around 80% of Europe's ancient trees. They harbour a unique array of wildlife and echo the lives of past generations of people in ways that no other part of our natural world is able. The National Planning Policy Framework **(Ref 16.11)** states that planning permission should be refused for development that would result in the loss or deterioration of irreplaceable habitats, including ancient woodland or even aged or veteran trees. This can only be overridden if the need for, and benefits of, the development in that specific location clearly outweigh the loss.	See **Appendix 16, Annex M Veteran Tree Survey** and assessment of effects section, Embedded and Adaptive Mitigation sections.

16.21 Further consultation and/or meetings with the following organisations has also been undertaken to acquire local background data or to discuss particular aspects of ecological survey and mitigation. These are summarised in the table below.

Table 16.5: Summary of Further Consultation

Organisation	Summary of points raised in regard to ecology	Where in chapter comments are addressed
Natural England (Ross Holdgate) Email dated 23 June 2017	[Re J15a] In view of the small areas involved I am satisfied that there would be no impact to golden plover and lapwing populations associated with the SPA.	This will be addressed in the No Significant Effects Report.
Natural England (Kayleigh Cheese) Email dated 20 March 2017	[Re the Main SRFI Site] The low numbers of Lapwing found (and the distance from the Upper Nene Valley Gravel Pits) demonstrate they are very unlikely to be associated with the SPA. For any birds breeding on site the standing advice can be used.	This will be addressed in the No Significant Effects Report.
Natural England (Ross Holdgate) Email dated 13 April 2016	Confirmed method and approach to assessment of golden plover at Main SRFI Site.	See **Annex I Golden Plover Survey Report.** This will be addressed in the No Significant Effects Report.
Natural England (Kayleigh Cheese)	Natural England has published Standing Advice on protected species. For information on birds please see the following link: *Wild birds: surveys and mitigation for development projects*. NE provided specific advice on bats and great crested newts where required.	See **Appendix 16, Annex H Breeding Bird Survey Report** and Baseline Surveys and Data section
Natural England (Madeleine Ryan) Meeting and site visit 21 March 2017, and emails dated 12 July 2017	NE provided a letter under their Discretionary Advice Service, to address queries regarding RSK's approach to bat survey methods and assessment.. The full letter is contained in **Appendix 16, Annex E**.	See **Appendix 16, Annex E Bat Survey Report**
South Northampton shire District Council. (Paul	From email dated 26 May 2017. 1.On the whole I'm happy with the survey approach being taken, the types of habitat and species surveys selected and the methodologies being used. 2.It is good to see consultation being carried out with	Principles are incorporated and relevant all through this chapter.

Evans/Denis Winterbottom) Meetings held 26 May and 24 July 2017.	other conservation organisations including the Wildlife Trust and their input taken into consideration. 3.The approach to mitigation and biodiversity enhancements within the landscaping proposals seems appropriate and sensible. If delivered appropriately and retaining the important ecological features currently contained within the site, this has the potential to provide enhancements for biodiversity in what is currently a predominantly arable landscape. 4.Gaining further information through surveying the adjacent potential local wildlife sites and carrying out the NVC surveys outlined to be done this year will help inform the landscaping proposals to see where habitat linkages are best placed and what appropriate habitats to create to complement those existing. 5.The suggestion of enhancements for farmland birds including scrapes would be beneficial given the proximity to the Nene Valley NIA and SPA. 6.Incorporating species rich neutral and calcareous grassland creation within the landscaping plans is again beneficial in general conservation principle terms and contributing to local conservation strategies e.g. Northamptonshire Biodiversity Action Plan and Green Infrastructure Plans. The grassland creation could be enhanced by utilising local provenance seed sources instead of generic wildflower seed mixes, for example by collecting wildflower seed/utilising green hay as a seed source from local species rich wildlife sites. Wildlife Trust nature reserves may provide a local seed source for example for calcareous grassland creation there are small areas of calcareous grassland within Northampton at Bradlaugh Fields LNR a Wildlife Trust nature reserve. Incorporating calcareous grassland within the south facing slopes of the bunds would reflect the general aspect of where these are found locally and would be beneficial for future invertebrates by providing sunny, sheltered spots.	
Northamptonshire County Council Meeting held 24 July 2017	Progress on surveys and assessment was discussed; initial review of technical chapters sent to NCC was received. Feedback on mitigation proposals was discussed.	Principles are incorporated and relevant all through this chapter.
The Wildlife Trust Site visit and meeting 21	The meeting focussed on explaining the proposals, and the survey work already completed, as well as that still to be carried out. Details of possible additional consultees and interested parties were provided by the	See Embedded and Adaptive Mitigation Sections.

March, and emails dated 22 March, 23 March, 12 April, and 26 July 2017	Wildlife Trust. Potential of the Wildlife Trusts assisting with management of mitigation areas was discussed. Site visit was completed to explain proposals in detail, and show consultees locations of surveys on the Main SRFI site. Specific guidance on J15a PWS as follows: "Does the site area at the location of PWS No. 239 actually qualify as a Local Wildlife Site (LWS) area when measured against the relevant thresholds contained within the current version of the Northants' LWS selection criteria document ?; and If, as you are predicting at the moment, there are indeed going to be direct impacts which will affect this particular PWS area - perhaps even leading to its complete loss / destruction - as a result of the construction of a new slip road feature, please note that The Wildlife Trust would be expecting to see a fully-adequate and acceptable mitigation scheme for such impacts; and, in the case of its total loss to the development scheme proposals here, at the very least, a commitment to a like-for-like habitat re-creation measure would be required."	
The Environment Agency (Kerrie Ginns, Nikki Loveday, John O'Neil) – Email 4 August 2017	"We have reviewed the information provided and have no additional comment to provide at this stage. We will review the finalised scheme/plans when they are submitted for permitting."	n/a
The Environment Agency (Hugh Bunker/Richard Chadd)	EA informed RSK that the Milton Malsor brook has a large population of signal crayfish so the likely hood of native crayfish being present is extremely low if not zero. EA advised RSK on appropriate survey methods and disposal of signal crayfish.	See **Appendix 16, Annex L Aquatic Survey Report**
The Bat Conservation Trust (Northants Bat Group- Phil	Detailed information on bat records were provided to within 2 km of the Main SRFI Site and J15a Site boundaries. In May 2017, PR advised RSK that occasional Barbastelle are known from the area.	See **Appendix 16, Annex E Bat Survey Report**

Richardson)		
Northamptonshire Barn Owl Group	Site meeting November 2017 with Paddy Jackson. Main points discussed as below: • Mr Jackson is in agreement with our proposed mitigation at both the main site and the J15a site and he welcomes the restoration of both sets of field barns. He would like to see off-site mitigation included due to the loss of foraging habitat on site. • The field barns on the main site could have community use as long as they have a sealed ceiling – barn owls will tolerate quite a lot of disturbance. The barns should have two entry/exit points for barn owls. • Mr Jackson has agreed to check our designs for the barns if required. •In addition to the barns (and in line with our proposals) he would like to see pole nest boxes used in preference to tree mounted nest boxes (they last longer than tree mounted boxes). • Pole mounted nest boxes should have wood chippings placed inside the chamber when they are installed as this ensures that owls can use them for breeding rather than wait for a build up of pellets – they will never lay eggs on bare wood. •Boxes should be purchased from a specialist (not from a large company) as they will be of improved modification and constructed of marine ply board. Colin Sawyer makes boxes and Paddy can put us in touch with him. He can also install the boxes. •Boxes should not be placed near footpaths and ideally nettles/ brambles should be allowed to grow at the base to deter vandalism. •He has noted several fatalities of barn owls on the A43, however this is to the south of the proposed site – he hopes that by improving habitats (especially at J15a) that there could be a reduction in fatalities by improving foraging habitats in close proximity to the barns/boxes. Despite the proximity of the road he would still suggest mitigation for the species on site. •3 pole mounted nest boxes should be installed at the main site – less than 500m from the barns to account for double broods (ideally in the area of land off-site where the veteran trees are). • 3 pole mounted nest boxes should be installed at the J15a site – less than 500m from the barns to account for double broods – even spread throughout the J15a	See **Appendix 16, Annex H Breeding Bird Survey Report and Mitigation sections.** Comments from Mr Jackson will be taken into account in the detailed habitat design. (see Adaptive Mitigation section)

	mitigation area but some near the eastern boundary to encourage birds away from the road. • 6 pole mounted boxes installed off site (two groups of 3) – this will be dependent on landowner permissions and I would suggest the Treharn land at their other farm. This could be important as opposition to the scheme could highlight the loss of habitat at the main site. The tree nesting site to the south of the main site cannot be replaced so ideally off-site mitigation would be installed on off-site land. • Pole mounted / tree mounted nest boxes should be installed for kestrel – 6 boxes would be suitable within the area for both sites. The kestrel boxes should be lined with gravel to ensure instant nesting potential. • All boxes should have a clear label with phone number of ecologist responsible and a unique ID number.	
Northamptonshire Bird Club	Detailed information regarding local bird records was provided.	See **Appendix 16, Annex A Background Data Search and Annex H Breeding Bird Survey Report**

Study Area

16.22 In determining a study area, the CIEEM guidelines **(Ref 16.1)** first consider 'important ecological features', defined as those warranting detailed assessment (thus excluding any that are 'widespread, unthreatened and resilient to project impacts and will remain viable and sustainable'). They are to be expressed geographically (international, national, regional, county, local) and to be identified on the basis of expert judgement, including published information (for example designations, guidelines and scientific literature) and also – especially at the local level - that of experienced professionals (ecological facilitators and specialist consultees).

16.23 The zone of influence (referred to as the study area) for the EcIA (the area within which ecological features may be affected) was determined with reference to important ecological features on or around the site (including designated sites), the extent and nature of project activities liable to give rise to potentially significant impacts, any incidence of mobile or migratory species, seasonality of ecological features, and ecosystem functioning including interdependencies between ecological features. The scoping of the study area was discussed with Natural England.

16.24 On this basis the study area includes:

- the land within the boundaries of the Main SRFI Site and the J15a site,
- ecological features adjacent to these boundaries (*e.g.* the canal corridor) or close by (at distances increasing with their likely sensitivity to likely impacts),

- ecological features at moderate distances from the site but within normal ranging distances for certain animal species (*e.g.* ponds suitable for great crested newts within 500m); and

- sites at greater distances if they are important for species that might also depend on the site (*e.g.* river valley and reservoir sites important for bird species that might at least in theory roost on the site).

16.25 In particular, scoping of the study area relied on consultation with Natural England and on information gathered in the background data search, especially in respect of designated sites at a remove from the site. Many of these were scoped out from the study area at an early stage, owing to the implausibility of effects on the ecological features for which they are designated (which ruled them out as important ecological features requiring detailed consideration, *e.g.* geological SSSIs). The study area can therefore be inferred from the site mapping in **Figure 16.1** and the designated site mapping in **Figure 16.2**.

16.26 As "important ecological features" are scarce in the intensively agricultural area surrounding the site, the study area includes rather few outside the Main SRFI Site boundary, and they are mostly concentrated around the canal system in the south-western corner. Far-ranging birds were, however, a major consideration, and even at 5.6km brought the Upper Nene Valley Gravel Pits Special Protection Area (SPA) within the zone of influence, and therefore into the study area.

Baseline Surveys and Data

Survey Methods

16.27 The ecological impact assessment follows the second edition of the CIEEM Guidelines **(Ref 16.1).** The guidelines are endorsed by statutory consultees in EIA and other concerned organisations including Natural England, Environment Agency, Environment and Heritage Service, Association of Local Government Ecologists (ALGAE), Institute of Environmental Management and Assessment (IEMA) and the Wildlife Trusts. The CIEEM Guidelines are also recommended in the planning guidance 'Planning for Biodiversity and Geological Conservation: A Guide to Good Practice' **(Ref 16.26)** as the recommended procedure for the ecological component of an EIA.

16.28 The ecological impact assessment involved the following key stages:

- a background data search to obtain archival records of sites and species, and to gain information to focus the field surveys;

- identifying the zone of influence (study area) arising from the whole lifespan of the project;

- identifying ecological features through field surveys;

- determination of the ecological value of ecological features;

- identification of the potential impacts and assessment of impacts on the integrity or conservation status of the ecological features;

- incorporation of ecological enhancement and mitigation measures to avoid or reduce impacts, and compensation measures to balance any unavoidable significant impacts; and
- assessment of the significance of any residual ecological impacts remaining after the implementation of mitigation and compensation measures.

16.29 This section discusses the field survey methods which are relevant to collection of baseline data. The assessment methods used to determine magnitude of effect, sensitivity of receptor and therefore significanceare described in the **Method of Assessment** section later in this chapter.

Background Data Search

16.30 A desk study was undertaken in 2016 and subsequently updated in 2017 and 2018 to allow for changes to the study area and highways works. The data search involved collating information from statutory and non-statutory bodies including

- Multi-Agency Geographic Information for the Countryside (MAGIC);
- Northamptonshire Biodiversity Records Centre;
- Northamptonshire Bird Recorder; and
- Northants Bat Group.

16.31 Information was requested for an area of 10km radius for International and European importance e.g. Special Protection Area (SPA), Special Area of Conservation (SAC) and Ramsar Sites; 5km radius for national importance and bat records, and 2km for sites of local importance and protected and notable species records. These search areas are considered sufficient to include the potential zone of influence for nationally important or lower, sites, habitats and species. The methods and results of the data searches are held in **Appendix 16, Annex A.**

Field Surveys

16.32 Field surveys were undertaken at the Main SRFI Site and J15a Site. No field surveys have been completed for the Minor Highway Works, beyond a drive-past site visit. At this stage, there is insufficient information about the nature of the vegetation clearance required, to be able to define the scope of field surveys at the Minor Highway Works locations.

16.33 Full methods for all of the survey types are provided in the technical annexes (**Appendix 16, Annexes A-N**). A summary of all surveys undertaken to inform this assessment is provided in **Table 16.6**, with full methods contained in the relevant annexes in **Appendix 16**.

16.34 Surveys were carried out at appropriate times of the year by suitably experienced and appropriately licensed ecologists.

Table 16.6: Summary of ecological surveys undertaken

Survey Type	Details of Survey	Main Site Month/ Year	Junction 15a Month/Year	Other Minor Junction Improvements Month/Year
Ecological Background Data Search	Data search of records from the local record centre, and freely available data. A 10km search area was used for internationally designated sites, 5km search area was used for statutory designated sites and 2km for non-statutory designated sites and protected species records. Results are held in **Appendix 16, Annex A**.	October 2016, updated in January 2018.	May 2017, updated in January 2018.	July 2017, updated in January 2018.
Phase 1 Habitat Survey and assessment of habitat for protected animals	Identification of broad habitat types and habitat suitability for protected species following the JNCC methodology for Phase 1 Habitat Survey **(Ref 16.27)** and CIEEM Preliminary Ecological Assessment methods **(Ref 16.20).** Methods and results are held in **Appendix 16, Annex B**.	March 2015 and 2016 (Additional areas surveyed in February 2017 where access has previously been denied).	February, April and May 2017.	No field surveys completed.
Phase 2 Botany – NVC and other surveys	Species listing throughout the site and NVC surveys in selected areas, mostly grassland, but also representative examples of other vegetation types. Methods and results are held in **Appendix 16, Annex C**.	April to July 2017.	May to July 2017	No field surveys completed.
Phase 2 Botany - Hedgerow surveys	Survey of all hedges to estimate their ecological value, principally by reference to ecological aspects of the Hedgerow Regulations. Methods and results are held in **Appendix 16, Annex D**.	June 2016.	May to July 2017.	No field surveys completed.
Veteran Tree Survey	All trees were viewed from ground-level and from within the site boundary only. The trees were inspected and data recorded following guidance from 'Ancient and other veteran trees; further guidance on management' **(Ref 16.29).** Methods and results are held in **Appendix 16, Annex M**.	2016 [Development Tree Survey]	July 2017	No field surveys completed.

Amphibians - Habitat Suitability Index and presence / absence for great crested newt	Nineteen ponds where access was granted were assessed for their suitability for great crested newts using a Habitat Suitability Index. This was followed by eDNA surveys and presence / likely absence surveys. These involved undertaking four surveys between mid-April and mid-June. The surveys were undertaken by licensed ecologists and in accordance with English Nature survey guidelines **(Ref 16.22).** Methods and results are held in **Appendix 16, Annex J**.	May and June 2016 (Pond 13 surveyed in 2017 due to access restrictions in 2016)	March to June 2017	No field surveys completed.
Aquatic invertebrates	Surveys of a single baseline sample site in each of the watercourses (Milton Malsor Brook and Rothersthorpe Stream) were carried out on 5 October 2017 by RSK Ecologists This used a combination of the standard three minute hand-net sampling surveys with one minute visual search technique, developed for the National Pond Survey **(Ref 16.30)** and the Natural England protocol for shallow waterbodies **(Ref 16.31).** Samples were collected in order to assess diversity and conservation importance of aquatic macro-invertebrates present within the watercourses on the site. Methods and results are held in **Appendix 16, Annex L**.	October 2017	Not required	No field surveys completed.
Badger	Habitat assessment of the study area for its suitability for badgers. Locations of setts and foraging activity were recorded. Methods and results are held in **Appendix 16, Annex N**.	March 2016 (to be updated in August 2017)	August 2017	No field surveys completed.
Bats (tree roost potential)	Ground-level Tree assessment – to establish which trees had potential roosting features for bats and to grade those trees as: Grade 1 – low potential, Grade 2 - medium potential or Grade 3 - high potential for roosting bats and to identify where more detailed surveys such as tree climbing assessments would be required (if individual trees were to be impacted during development). Methods and results are held in **Appendix 16, Annex E**.	January to May 2016	May and June 2017	No field surveys completed.
Bats – tree climbing surveys	Trees with medium of high potential identified during the ground level tree assessment were subject to climbing surveys to inspect features that were identified to have potential for roosting bats. Methods and	May to September 2017	May and June 2017	No field surveys

	results are held in **Appendix 16, Annex E**.			completed.
Bats – tree emergence and dawn surveys	Emergence surveys were completed for some trees that were identified as high or moderate following the climbing surveys. Results are held in **Appendix 16, Annex E**.	May to August 2016	June to August 2017	No field surveys completed.
Bats (initial building assessment)	The buildings within the red line boundary of the main SRFI site were surveyed for roosting bats. Buildings surveyed included farm houses and associated barns at Manor Farm and Lodge Farm. This involved consideration of the age and condition of the structure, and identifying features that roosting bats may favour (e.g. holes, cracks and cavities that might be used as bat-entrance points or roost sites). Detailed searches were made for signs of bats using ladders, high powered torches, binoculars and an endoscope. All accessible cracks crevices and voids were searched. Where definite signs of bats or other evidence was found (such as actual sightings, droppings, urine stains, odour, scratch marks, grease stains and feeding remains), they were recorded. Results are held in **Appendix 16, Annex E**.	May-August 2016 (further surveys undertaken in April 2017 for properties where access was unavailable in 2016).	April 2017	No field surveys completed.
Bats (emergence / dawn re-entry)	Following the initial building surveys, any buildings which were identified as Low, Moderate or High potential for roosting bats were subject to emergence and dawn re-entry surveys. Surveyors were positioned at pre-selected survey points so that potential bat roosting features were visible. Surveyors used bat detectors and edirols to record bat calls to allow analysis at a later date. Results are held in **Appendix 16, Annex E**.	May to July 2016	June, July and August 2017	No field surveys completed.
Bats (activity)	Three transect surveys were completed – to assess the level of activity of commuting and foraging bats. Each transect commenced 15 minutes before sunset and lasted for approximately 3 hours. Results are held in **Appendix 16, Annex E**.	May to October 2016 (April surveys were called off due to unsuitable weather).	May to October 2017 (April surveys were called off due to unsuitable weather).	No field surveys completed.

Breeding birds and barn owls	Breeding bird survey, consisting of three surveys in March to June was undertaken using methods based on Common Bird Census (CBC) methodology **(Ref 16.32)** . A specific barn owl survey, involving an inspection of the buildings and trees on site for nests, was undertaken on 4 May 2016. Further activity surveys were conducted throughout 2017 were undertaken to assess the known barn owl breeding sites. Method and results are held in **Appendix 16, Annex H**.	May and June 2016	April to June 2017	No field surveys completed.
Golden plover and lapwing surveys	Golden plover surveys were conducted by experienced ornithologists using pre-selected viewpoints to observe the site from pre-dawn or pre-dusk. Surveys were undertaken for 6 hours and all golden plover or lapwing observations marked on a map of the site. Habitat was assessed for suitability for golden plover within the PDAand for 500m outside the Potential Development Area. Methods and results are held in **Appendix 16, Annex I**.	February and March 2016. November, December and January 2017.	Not required.	Not required.
Reptiles	Protected species presence/absence survey using 200 felt tiles (artificial refuges) placed in three areas across the Main SRFI Site. These were checked on seven separate occasions in line with guidance by Froglife, **(Ref 16.33).** Surveys on the J15a site focused on the boundary of the canal and stream within the tall herb swamp to the west of the canal and involved 120 felt tiles. The surveys were conducted in September 2017. Method and results are held in **Appendix 16, Annex F**.	May and September 2016	September 2017	No field surveys completed.
Otter and water vole	During the Phase 1 Habitat Survey the suitability of the site for otters and water voles was assessed. Specific surveys were subsequently carried out and signs were recorded, if present, including footprints and slides, feeding remains, holts and couches (resting places) and spraint (droppings). Habitat was classified as suitable, suitable (sub-optimal), or unsuitable. Method and results are held in **Appendix 16, Annex G**.	3 May and 27 July 2016	3 May and 27 July 2016	No field surveys completed.

White clawed crayfish	A walkover survey was undertaken at both watercourses in May 2017 to assess their suitability for white-clawed crayfish. Both watercourses were subsequently surveyed using day time hand searching / hand netting methods and night time torch surveys which are in accordance with standard survey methods for white-clawed crayfish (e.g. see Peay, 2003 **(Ref16.34)**) Methods and results are held in **Appendix 16, Annex L**.	May 2017	Not required.	No field surveys completed.
Fish	Two survey sites were electrofished, one on each of the two watercourses on the Main SRFI Site, and these were selected following the crayfish walkover survey. Electrofishing took place on 5 October 2017 and the site locations are given with methods and results in in **Appendix 16, Annex L**.	May 2017	Not required.	Not required.
Terrestrial invertebrates	An initial walkover survey of the Main SRFI Site was performed on 21 July 2016 and 23 June 2017 at J15a. Invertebrate species sampling was then undertaken on 22 July, on 7 August and 18 September 2016 at the Main SRFI Site and 5-7 July 2017 at J15a. This spread of dates recognises the seasonal appearance of most invertebrate species and was aimed at maximising the number of taxa available for listing and analysis. Sampling affected the whole area of the Main SRFI site. However, for practical reasons it was concentrated in a number of areas that were judged likely to generate samples that were representative of the whole area. Methods and results are held in **Appendix 16, Annex K**.	July 2016	July to September 2017.	Not required.

Baseline Conditions

2016-17 Baseline - Study Area Description and Context

Main SRFI Site

16.35 The *c.* 291ha site is described in detail in **Chapter 2: The Site and Surroundings**. **Figure 16.1** shows the study area and the site boundary.

16.36 Much of the the Main SRFI Site is bounded by railways - to the east by the NLL and to the south by the WCML(both railway lines partly included within the Order Limits), beyond which lie agricultural fields and the village of Blisworth. To the north, it is bounded by further agricultural fields and the village of Milton Malsor. The A43 bounds the site to the west (and is partly included within the Order Limits). Northampton Road and Towcester Road are parts of a single road running through the Main SRFI Site from north to south.

16.37 The Main SRFI Site is largely agricultural and sits topographically in a natural bowl. Milton Malsor Brook runs through the site from north to south west of Towcester Road, with a network of hedgerow ditches. The Grand Union Canal abuts the Main SRFI Site to the south-west and west.

16.38 The Main SRFI Site comprises large fields most of which are arable, though semi-improved grassland is more common in the south-western and north-eastern parts of the site. The fields are mostly separated by relatively species-poor hedgerows probably dating from around the end of the 18th century or the beginning of the 19th, though there are a few more species-rich and therefore potentially older hedges along Towcester Road and elsewhere. The field margins generally support brambles, rough grassland and tall-ruderals. There are in excess of 130 mature trees, mainly mature *Quercus robur* (pedunculate oak) and *Fraxinus excelsior* (ash) in the hedgerows and as lone field trees. There are few small field-corner ponds surrounded by scrub or trees, but the site lacks woodland save for one small spinney next to Barn Lane and a modern plantation next to the A43. Commercial premises line the southern part of Towcester Road.

16.39 Beyond the site boundary to the north there is housing in the village of Milton Malsor. To the south and south-west the canal system includes a junction and basins at Blisworth Junction just beyond the south-western corner of the site. The canal system here has a concentration of biodiversity that has importance in the Northamptonshire context. Otherwise the immediately surrounding area contains mixed arable farmland similar to that in the site.

Junction 15a (J15a) Site

16.40 The J15a Site includes a range of habitats. There are roads and associated hedges, verges and amenity plantings, a canal and a wetland on abandoned land. Farmland around J15a includes sheep-grazed (and horse grazed pasture not yet surveyed) pasture, arable land under wheat and the biomass crop *Miscanthus xgiganteus* (giant miscanthus). Field boundaries are mainly hedges and there are two small streams. Semi-natural vegetation is limited to the abandoned land and wetland west of the A43. **Figure 16.1** shows the study areas and the site boundary.

Minor Highway Works

16.41 The Minor Highway Works are all within (or effectively within) adopted highways, with the exception of J14 (Tove) and 15 (Abthorpe). Typical roadside habitat, which does include some trees exists on verges, roundabouts and embankments.

2016-17 Baseline - Ecological Background Data Search

Main SRFI Site

16.42 A list of data sources is given in **Table 16.7**. A full list of references and other relevant documentation is given in the Background Data Search report (**Appendix 16, Annex A**) and at the end of this chapter.

Table 16.7: Summary of background data obtained in relation to ecology

Information Obtained	Available From
Protected and Noteworthy species-records	Northamptonshire Biodiversity Records Centre
Designated site locations and citations	Natural England website (**Ref 16.35**)
Designated site locations and citations	Northamptonshire Biodiversity Records Centre
Designations and legal protection of noteworthy species	JNCC website (**Ref 16.36**)
Details of species and habitats listed on the LBAP	Northamptonshire County Council BAP website (**Ref 16.17**)

Statutory Designated Sites

16.43 There are five statutory designated sites within 5km of the boundary of the Main SRFI Site: - two SSSIs and three Local Nature Reserves (LNRs). These sites are listed in **Table 16.8** in order of proximity to the site; short descriptions (when available) are given for the sites within 2km of the boundary of the Main SRFI Site. Roade Cutting SSSI is designated for its geology and is not considered further in this chapter. They are shown in Figure 16.2a.

16.44 In addition the Upper Nene Valley Gravel Pits Special Protection Area (SPA) is within 5.6km of the Main SRFI Site, which means that any potential impacts upon it may need to be considered. It is designated for bird species that may roost on agricultural land even at considerable distances from the SPA. The qualifying interests are great bittern (*Botaurus stellaris*), golden plover (*Pluvialis apricaria*), and gadwell (*Anas strepera*) (all non-breeding). Additionally the site has an assemblage of waterfowl species numbering more than 20,000 birds and the main component species are northern lapwing (*Vanellus vanellus*) , great cormorant (*Phalacrocorax carbo*), mute swan (*Cygnus olor*), great-crested grebe (*Podiceps cristatus*), tufted duck (*Aythya fuligula*), pochard (*Aythya ferina*), northern shoveler (*Anas clypeata*), mallard (*Anas platyrhynchos*), and wigeon (*Anas penelope*).

16.45 Surveys found no golden plover, and only small numbers of lapwing at the Main SRFI Site. Consultation with Natural England has confirmed that no impacts to the SPA/Ramsar site are likely to arise from the construction or operation of the Main SRFI Site or J15a works. Impacts to this site are scoped out and not considered further in this assessment. A No Significant Effects Report is in preparation and will be submitted with the DCO application, following consultation with Natural England. A Statement of Common Ground will be agreed with Natural England.

Table 16.8: Statutory sites within 5km of the boundary of the Main SRFI Site

Site Name	Designation	Approximate Distance (m)
Roade Cutting	SSSI (geology)	On site/ Adjacent
This is a new site identified as being of national importance in the Geological Conservation Review. Roade Cutting exhibits one of the most complete Bathonian (Middle Jurassic) sections in central Northamptonshire, potentially exhibiting complete Rutland Formation and White Limestone sections together with the basal Forest Marble (Blisworth Clay). The cutting is particularly important because it shows the typical rhythmic rock units developed within the Rutland Formation in this area.		
Blisworth Rectory Farm Quarry	SSSI	1460
This is a new site identified as being of national importance in the Geological Conservation Review. The site exposes one of the most interesting White Limestone Formation (Bathonian) sections in the English Midlands.		
Tiffield Pocket Park	LNR	2270
Storton's Pits	LNR	4060
Barnes Meadow	LNR	4730
Upper Nene Valley Gravel Pits	Ramsar Site & SPA	5930
Located within the Northamptonshire Vales National Character Area, the cluster of disused sand and gravel pits which make up the SPA extends for approximately 35km along the alluvial deposits of the River Nene floodplain from Clifford Hill on the southern outskirts of Northampton, downstream to Thorpe Waterville north of Thrapston. They form an extensive series of shallow and deep open waters which occur in association with a wide range of marginal features, such as sparsely-vegetated islands, gravel bars and shorelines, and habitats including reed-swamp, marsh, wet ditches, rush pasture, rough grassland and scattered scrub. The habitat and the varied topography of the lagoons provides valuable resting and feeding conditions for major inland concentrations of wintering water birds, especially ducks and waders.		

Non-statutory Designated Sites

16.46 There are 107 non-statutory designated sites within 5km of the Main SRFI Site, comprising 1 Local Geological Site (LGS), 38 Local Wildlife Sites (LWS), 3 Pocket Parks (PP), 58 Potential Wildlife Sites (pWS), 3 Protected Wildflower Verges (PWV) and 4 Wildlife Trust Reserves (WTR). These sites are listed in**, Appendix 16 Annex A** (Background Data Search) and shown in Figure 16.2b. **Table 16.9** shows descriptions for those non-statutory designated sites within 100m of the Order Limits. Two pWSs are within the Order Limits but one has primarily geological interest (Roade Cutting), and the other is barely within the Order Limits. **Table 16.9** lists those sites within 100m of the Order Limits.

Table 16.9: Non-statutory Sites within 100m of the Main SRFI Site

Site Name	Designation	Approximate Distance (m)
241	pWS	On-site
No description available for this potential wildlife site. The site is located in the South West corner of the Order Limits. Aerial imagery appears to show a mosaic of scrub and grassland.		
Roade Cutting	pWS	On-site
This narrow arm of the Grand Union connects the main Grand Union Canal with the River Nene via Northampton City. Despite its usefulness as a through fare the locks are neglected and frequently stopped and the waterway at the city end has litter hazards and rampant aquatic vegetation; on the whole it seems the waterway is not used. Located in the southeastern corner of the site Roade Cutting is a nationally important geological SSSI, identified in the Geological Conservation Review. A virtually complete Middle Jurassic Limestone section is present, exhibiting complete Rutland Formation and White Limestone sections, plus the Blisworth Clay underneath. The site is therefore of great value for the study of the formation and deposition that occurred to create the relationship between the layers visible. See SSSI sheet for full details. Possibly the most important geological SSSI in the county.		
Grand Union Canal - Northampton Arm	LWS	<10
This narrow arm of the Grand Union connects the main Grand Union Canal with the River Nene via Northampton City. Despite its usefulness as a through fare the locks are neglected and frequently stopped and the waterway at the city end has litter hazards and rampant aquatic vegetation; on the whole it seems the waterway is not used.		
238	pWS	<10
No description available for this potential wildlife site. The site is located adjacent to the central northern boundary of the proposed development area. Aerial imagery appears to show an area of trees, scrub and grassland with a possible wet area.		
240	pWS	<10
No description available for this potential wildlife site. The site is located to the South West of the proposed development area on the far side of the Grand Union Canal. Aerial imagery appears to show an area of woodland with possible clearings of scrub or grassland. Given the close proximity to the Grand Union Canal there might also be wet areas.		
242	pWS	15
No description available for this potential wildlife site. The site is located to the south of the proposed development area. Aerial imagery appears to show a strip of woodland adjacent to the railway and field.		
236	pWS	90
No description available for this potential wildlife site. The site is located to the east of the proposed development area. Aerial imagery appears to show a small area of woodland.		

16.47 85 non-statutory designated sites are between 2km and 5km from the Main SRFI Site and are sufficiently far from the Main SRFI Site to ensure they will not be affected during construction or operation, and these are not considered further in this assessment.

Protected and Noteworthy Species

16.48 The background data search results show that there are at least 99 protected or noteworthy species are recorded from places within 2 km of the site boundary, extending to 5km for bats. Of these, 2 are amphibians, 22 are birds, 1 is a crustacean, 1 is a fish, 13 are invertebrates, 13 are mammals (of these 9 are bats), 46 are plants and 1 is a reptile. Species that are protected by law under Schedules 2 and 5 of *The Conservation of Habitats and Species (Amendment) Regulations 2012*, Schedules 2, 5 and 8 of *The Wildlife and Countryside Act 1981* or *The Protection of Badgers Act 1992* and have been recorded in the search area are and a full species list is given in **Appendix 16, Annex A (2)**.

J15a Site

16.49 There are seven statutory designated sites within 5km of the J15a site boundary comprising three SSSIs and four LNRs. The closest is over 2km from the Order Limits. They are listed in **Table 16.10** in order of proximity to the site; short descriptions (when available) are given for the sites within 2km of the site boundary.

Table 16.10: Statutory Sites within 5 km of J15a

Site Name	Designation	Approximate Distance (m)
Storton's Pits	LNR	2080
The site is a series of old gravel pits, fen ditch and an area of wet meadow next to the River Nene. It is good for wetland birds and insects with 350 recorded wetland invertebrates. The eastern pit has been planted with common reed for wetland birds such as reed and sedge warblers, and reed bunting. Snipe feed on the bare mud and rare water rail are regular Winter visitors. The wet meadow is important for butterflies.		
Blisworth Rectory Farm Quarry	SSSI	3130
Roade Cutting	SSSI (geological)	3520
Tiffield Pocket Park	LNR	3560
Barnes Meadow	LNR	4180
Kingsthorpe	LNR	4760

Non-statutory Designated Sites

16.50 There are 41 non-statutory designated sites within 2km of J15a comprising one Local Geological Site, 16 Local Wildlife Site, 22 potential Wildlife Sites and two Wildlife Trust Reserves. **Table 16.11** shows descriptions for those non-statutory designated sites within 100m of the Order Limits. They are shown on Figure 16.2b.

Table 16.11: Non-statutory Sites within 100m of J15a

Site Name	Designation	Approximate Distance (m)
Grand Union Canal - Northampton Arm	LWS	On-site
This narrow arm of the Grand Union connects the main Grand Union Canal with the River Nene via Northampton City. Despite its usefulness as a through fare the locks are neglected and frequently stopped and the waterway at the city end has litter hazards and rampant		

Site Name	Designation	Approximate Distance (m)
aquatic vegetation; on the whole it seems the waterway is not used.		
239	pWS	On-site
No description available for this potential wildlife site. The site is located south of the M1 and West of the A43. Aerial imagery suggests that the area consists of woodland or scrub and an area of grassland which is also adjacent to the Grand Union Canal so it may also be marshy.		
250	pWS	10
No description available for this potential wildlife site. The site is located southwest of the proposed development area. Aerial imagery shows a small area of woodland.		

Protected and Noteworthy Species

16.51 At least 170 protected or noteworthy species are recorded from places within 2 km of the site boundary, extending to 5km for bats. Of these, 2 are amphibians, 35 are birds, 1 is a crustacean, 1 is a fish, 63 are invertebrates, 14 are mammals (of these 9 are bats), 53 are plants and 1 is a reptile. Species that are protected by law under Schedules 2 and 5 of The Conservation of Habitats and Species (Amendment) Regulations 2012, Schedules 2, 5 and 8 of The Wildlife and Countryside Act 1981 or The Protection of Badgers Act 1992 have been recorded in the search area and a full list is given in **Appendix 16, Annex A (2)**.

Minor Highway Works

16.52 Minor highway works are listed below. Plans showing the locations of these works are contained in **Appendix 5.1.**

16.53 A high level appraisal has been carried out using satellite photography (Lidar), of the habitat that may be directly affected by minor highways works. **Table 16.12** sets out the provisional proposals for data collection and further survey to be completed prior to construction, assuming that there will be habitat loss from within the red line area identified.

16.54 Two of the minor highway works have statutory designated sites within 100m: Junction 10 Barnes Meadow Interchange, and Junction 19 Upton Way/Telford Way Roundabout.

Table 16.12: Statutory Designated Sites within 2km of Minor Highway Works

Name	Road	Drawing Reference (Appendix 5.1)	Nearest Statutory Designated Site	Designation	Distance from Order Limits (red line)
Junction 1	M1 Junction 16	PL01	Bugbrooke Meadows	SSSI	440
Junction 3	A4500/Upton Way/Tollgate roundabout	PL03	Storting's Pits	LNR	480

Junction 4	A5076/A5123/Upton Way	PL04	Storting's Pits	LNR	820
Junction 5	M1 Junction 15A	PL05	Storting's Pits	LNR	2080
Junction 6	A5076/Hunsbury Hill Road Roundabout	PL06	Storting's Pits	LNR	740
Junction 7	A5076/Towcester Road/Tesco Roundabout	PL07	Storting's Pits	LNR	1880
Junction 9	A25/Brackmills roundabout	PL09	Barnes Meadow	LNR	640
Junction 10	Barnes Meadow Interchange	PL10	Barnes Meadow	LNR	0
Junction 11	A45/A43 Roundabout Lumbertubs	Pl11	Upper Nene Valley Gravel Pits	SPA & Ramsar	710
Junction 12	M1 Junction 15	PL12	Roade Cutting	SSSI	1600
Junction 14	A43/A5 Tove Roundabout	PL14	Greens Norton Pocket Park Nature reserve	LNR	2020
Junction 15	A43 Abthorpe	PL15	Greens Norton Pocket Park Nature reserve	LNR	1750
Junction 19	Upton Way/Telford Way Roundabout	PL19	Storting's Pits	LNR	90
Junction 20	Upton Way / High Street Roundabout	PL20	Storting's Pits	LNR	210
Junction 25	A508 Harborough Road/ A5199 Welford Road	PL25	Kingsthorpe	LNR	740

16.55 **Table 16.13** below shows the habitat types within the red line boundaries of the Minor Highway Works, as identified from aerial photography and satellite images.

Table 16.13: Initial Appraisal of Minor Highway Works – Lidar

Name	Road	Area Within Order Limits (ha)	Potential Habitat Within Red Line
Junction 1	M1 Junction 16	4.75	Scrub, scattered trees, grassland, ruderal.
Junction 3	A4500/Upton Way/Tollgate roundabout	0.34	Grassland, scattered trees / scrub / ornamental shrubs.
Junction 4	A5076/A5123/Upton Way	1.44	Grassland, scrub ,possible scattered trees.
Junction 9	A25/Brackmills roundabout	0.15	Grassland, scrub.
Junction 10	Barnes Meadow Interchange	1.55	Grassland, scrub, adjacent trees / woodland.
Junction 11	A45/A43 Roundabout Lumbertubs	0.63	Grassland, adjacent trees / woodland
Junction 12	M1 Junction 15	3.51	Grassland, Plantation woodland, scrub.
Junction 14	A43/A5 Tove Roundabout	2.70	Grassland, scrub, woodland, scattered trees hedge, ditch, pond within 10m
Junction 15	A43 Abthorpe	3.45	Grassland, scrub, woodland, hedge
Junction 19	Upton Way/Telford Way Roundabout	1.74	Grassland, scrub, scattered trees / scrub, hedge?
Junction 20	Upton Way / High Street Roundabout	1.79	Grassland, scrub, scattered trees / scrub, hedge?
Junction 25	A508 Harborough Road/ A5199 Welford Road	0.13	Adjacent hedge / ornamental planting

ll Development within Order Limits

16.56 In summary, no statutory designated sites for ecology are within the Order Limits for the scheme. The works at Junction 10 (Barnes Lane Interchange) are adjacent to a LNR. Two PWS are within the Order Limits at the Main SRFI site, and One Local Wildlife Site (Grand Union Canal), and an un-named PWS are within the Order Limits, at the J15a Site. There is some overlap in study areas for designations from the Main SRFI Site, J15a and Minor Highways Works, which is considered further in the assessment section (i.e. the potential for works at different areas within the Order Limits to affect the same designation).

2016-17 baseline - Field Surveys

Main SRFI Site

Habitats and Plants

16.57 The site contains habitat types that are ubiquitous throughout lowland Britain.

16.58 Semi-improved agricultural grassland in the western part of the Main SRFI Site may have been species-rich in the past (especially on ridge-and-furrow), but agricultural improvement has reduced the diversity of broad-leaved herbs. Though a wide range of grasses are locally present, it is regarded as semi-improved grassland.

16.59 Other features making a large contribution to local biodiversity include:

- the network of hedges with mature hedgerow trees, ditches and (rarely) small streams;
- ponds and field-corner patches of woodland or scrub;
- mixed rough grassland and scrub at the disused service area on the A43; various brickwork structures adjacent to the Main SRFI Site support collections of plants that are noteworthy in the county context, especially ferns;
- railway embankments;
- veteran trees;
- road verges especially those along Towcester Road, along the northern edge of the Main SRFI Site, and in the vicinity of Navigation Cottages; and
- a single old field-barn that may be used by bats or owls.

16.60 Other features making above-average contributions to biodiversity in areas immediately adjacent to the Main SRFI Site include the following:

- canal towpaths and other features adjacent to the south-western boundaries of the Main SRFI Site (though probably outside them), including embankments in a field south east of the A43 and north east of the canal.

16.61 Otherwise, the Main SRFI Site contains broad habitat and vegetation types of lower nature conservation value as follows:

- arable fields;
- improved agricultural grassland;
- species-poor semi-improved agricultural grassland;
- rough grassland;
- amenity-turf;

- recent broad-leaved plantation woodland;
- scattered broad-leaved and coniferous trees;
- nettle-bed and other tall ruderal vegetation; and
- ephemeral vegetation.

16.62 Though detailed vegetation surveys have not generally been carried out (except for some semi-improved and rough grasslands), the following National Vegetation Classification (NVC) types are present within the Main SRFI Site:

- improved grassland MG7a *Lolium perenne* leys and related grasslands, *Lolium perenne-Trifolium repens* leys;
- in semi-improved grassland MG6a *Lolium perenne-Cynosurus cristatus* grassland, typical sub-community (this includes more species-rich examples where quadrat recording and NVC analysis was carried out) ;
- in rough grassland on road verges, field margins, hedge-bottoms and ditch banks MG1a *Arrhenatherum elatius* grassland, *Festuca rubra* sub-community or where tall semi-ruderal herbs such as *Urtica dioica* (common nettle) are abundant MG1b *Arrhenatherum elatius* grassland, *Urtica dioica* sub-community.
- in more ruderal grasslands on road edges, trackways etc. various sub-communities of OV23 *Lolium perenne-Dactylis glomerata* community;
- in diverse places on roadsides, field corners, railway linesides etc. semi-ruderal tall-herb vegetation types mostly referable to the NVC type OV24a *Urtica dioica-Galium aparine* community, typical sub-community or – where *Chamerion angustifolium* (Rosebay Willowherb) is abundant mainly on railway land OV27b *Epilobium angustifolium* community, *Urtica dioica-Cirsium arvense* sub-community or – where *Rubus fruticosus agg*. (bramble) is abundant on railway land and transitions to scrub elsewhere (especially hedge-bottoms) OV24b *Urtica dioica-Galium aparine* community, *Arrhenatherum elatius-Rubus fruticosus* sub-community;
- in field-corner scrub, low-growing W24a *Rubus fruticosus-Holcus lanatus* underscrub, *Cirsium arvense-Cirsium vulgare* sub-community or taller W21a *Crataegus monogyna-Hedera helix* scrub, *Hedera helix-Urtica dioica* sub-community and more locally W22a *Prunus spinosa-Rubus fruticosus* scrub, *Hedera helix-Silene dioica* sub-community;
- in semi-ruderal scrub the proposed NVC type *Sambucus nigra-Urtica dioica* community (Rodwell et al. 2000); and
- on wet ditch banks and in ditch bottoms OV26e *Epilobium angustifolium* community, *Urtica dioica-Cirsium arvense* sub-community and S23 Other water margin vegetation.

16.63 Secondary woodland is more-or-less lacking from the Main SRFI Site save for a very small copse surrounding a pond beside Barn Lane. It is scarce even in immediately adjacent areas where it is largely confined to roadside strips and mostly consists of *Acer pseudoplatanus* (Sycamore) and *Fraxinus excelsior* (ash) with common shade-tolerant plants in the field-layer. Owing to its fragmentary character its NVC affinities would be hard to assess, though its closest affinities are likely to lie with W8d *Fraxinus excelsior-Acer campestre-Mercurialis perennis* woodland, *Hedera helix* sub-community. .

16.64 Additional but similar vegetation types may be present in areas that could not be accessed. This includes all of the operational railway land included within the Main SRFI Site, though the complex of rough grassland, tall-herb vegetation and scrub that predominates there mostly consists of NVC types mentioned above. The same applies to the verges of the A43 dual-carriageway.

16.65 Full habitat descriptions including species-lists and hedgerow sheets are given in **Appendix 16, Annex D**. **Figure 16.3** shows extended Phase 1 Habitat survey mapping for the Order Limits.

16.66 Further details for the most significant of these habitat types are outlined below. Approximately 54% of the Main SRFI Site Order Limits i.e. 158 ha, is arable farmland, and about 34% is agricultural grassland, i.e. 97.73 ha. The remaining 12% (34.27 ha) variously supports hedgerows, rough grassland, scrub (mostly bramble), field-corner woodland fragments, ditches (including one small stream) and ponds.

Arable and Agricultural Grassland

16.67 Arable farmland is the most extensive habitat on the Main SRFI Site.

16.68 Arable weed communities are present, though none of special interest have been noted. Many arable fields on the Main SRFI Site have headlands sown with grass mixtures. While they may have many nature conservation benefits, they tend to reduce the incidence of the weed species most characteristically associated with arable, often producing a very sharp edge to the crop so that arable weeds if any are confined to zones around 0.5m wide. Where the arable crops do have weedy edges it is mostly very common species that form species-poor assemblages, often dominated by grassy weeds such as *Alopecurus myosuroides* (black-grass), or by species characteristic of highly eutrophic soils such as *Chenopodium album* (fat-hen), or by generalist ruderal species that are not especially associated with arable such as *Epilobium tetragonum* (square-stalked willowherb). A few arable weeds of modest note in the vice-county context were encountered, *e.g. Sherardia arvensis* (field madder) a few plants of which were seen in 2016 but not refound in 2017. One field within the Main SRFI site but in an area where no development is proposed has abundant *Lepidium campestre* (field pepperwort) though only in a very narrow and discontinuous weedy margin. But otherwise arable weeds of note are very scarce, occurring in ones and twos rather than substantial populations. Nowhere are they abundant in the arable weed vegetation and nowhere do they act as a characterising feature of it.

16.69 Improved agricultural grassland strongly dominated by the grass *Lolium perenne* (perennial rye-grass) together with *Trifolium repens* (white clover) and referable to the NVC type MG7a *Lolium perenne* leys and related grasslands, *Lolium perenne-Trifolium repens* leys is also widespread on the Main SRFI Site. JNCC (2010) **(Ref 16.37)** permits this to be mapped as arable, but this can make it hard to appreciate that large areas are under grass. In **Figure 16.3** it has therefore been mapped as improved

grassland where it seems long-term, and as arable where it looked recently sown at the time of the survey.

16.70 Amenity-turf is very scarce in the Main SRFI Site, but it was recorded in a few places.

16.71 More permanent agricultural grassland is locally extensive, mostly in the south-western and north-eastern parts of the Main SRFI Site. It is mostly rather species-poor mesotrophic grassland referable to the NVC type MG6a *Lolium perenne-Cynosurus cristatus* grassland, typical sub-community. A few fields beside Towcester Road have more species-rich swards that are probably recent in origin, but these too are MG6.

Rough grassland, Nettle-bed and Scrub

16.72 Rough grassland on road verges tends to be dominated by the grasses *Arrhenatherum elatius* (false oat-grass), *Dactylis glomerata* (cock's-foot) and *Elytrigia repens* (common couch) occasionally - in the eastern part of the Main SRFI Site - with *Schedonorus arundinaceus* (tall fescue). Grassland forbs such as *Ranunculus repens* (creeping buttercup) and *Vicia sativa* ssp. *segetalis* (common vetch) are scattered, while tall semi-ruderal herbs are frequent, especially *Urtica dioica* (common nettle). The swards are referable to the NVC type MG1a *Arrhenatherum elatius* grassland, *Festuca rubra* sub-community or – more commonly – where the tall semi-ruderal herbs rise to prominence to MG1b *Arrhenatherum elatius* grassland, *Urtica dioica* sub-community. Where the tall semi-ruderal herbs become dominant there is a transition to nettle-bed vegetation referable to the NVC type OV24a *Urtica dioica-Galium aparine* community, typical sub-community or more commonly in the presence of scattered *Rubus fruticosus* agg. (bramble) to OV24b *Urtica dioica-Galium aparine* community, *Arrhenatherum elatius-Rubus fruticosus* sub-community. These NVC types commonly occur in mosaic and transition with one another.

16.73 Pure stands of *Galium aparine* (cleavers) and *Urtica dioica* (common nettle) referable to OV24a often occur on their own in field corners too. In such situations they are often highly eutrophic, and then *Conium maculatum* (hemlock) is often abundant. Where bramble in OV24b increases to the point of dominance there is a transition from OV24b to W24a *Rubus fruticosus-Holcus lanatus* underscrub, *Cirsium arvense-Cirsium vulgare* sub-community. This kind of mosaic and transition is common on the railway line-sides bounding the Main SRFI Site where tall-herb vegetation containing *Chamerion angustifolium* (rosebay willowherb) may also be referable to the NVC type OV27b.

Hedgerows

16.74 Many hedges on the Main SRFI Site are species-poor hedges of *Crataegus monogyna* (hawthorn) with small amounts of *Sambucus nigra* (elder). However, *Prunus spinosa* (blackthorn) and *Ulmus procera* (English elm) are dominant in some hedges and present in appreciable quantity (more than 10%) in many. Also present in small quantity in most or many of the hedges are *Fraxinus excelsior* (ash), *Rosa canina* (dog-rose), *Quercus robur* (pedunculate oak) and rather less commonly *Salix cinerea ssp. oleifolia* (rusty willow). Where hedges contain only these species they are seldom sufficiently species-rich in an average 30m-stretch to qualify as Important Hedges within the meaning of *The Hedgerows Regulations 1997* **(Ref 16.38)** (except alongside PRoWs where lowered thresholds for qualification apply). In the western part of the Main SRFI Site *Salix ×fragilis* (crack willow) occurs in some hedges. In the central part of the Main SRFI Site west of Towcester Road, *Malus sylvestris* (crab apple) occurs in many hedges, as does a hybrid complex involving *Crataegus laevigata* (midland hawthorn) and *Crataegus ×media* (hybrid hawthorn); these species are more scattered elsewhere in the Main SRFI

Site. They tend to be indicators of more species-rich hedges, and additional species occasionally associated with them include *Acer campestre* (field maple), *Cornus sanguinea* (dogwood), *Ligustrum vulgare* (wild privet) and *Rhamnus cathartica* (buckthorn). These are typical of the few hedges on the Main SRFI Site that do qualify as Important Hedges under the Hedgerows Regulations. Woody species that do not, under the Regulations qualify for estimating the number of woody species in a hedge are relatively few here, though *Acer pseudoplatanus* (sycamore) and *Malus pumila* (apple) are occasional in road hedges and in hedges bounding private properties. A few other species occur in just one or two hedges.

16.75 Most of the hedges are trimmed to a height of about 2m but some have grown tall (to about 4 or 5m). In grazed areas (especially the south-western corner of the Main SRFI Site) these tall hedges are defunct with extensive grazed-out gaps between the stems of the bushes even though the crowns meet. But more generally the tall hedges are intact though few if any are species-rich.

16.76 Many of the hedges have ordinary farm-ditches, either wet or dry, but very few have appreciable banks, and those that do are mostly on half-banks that exist for reasons unconnected with the hedge (unlike for example ancient hedges on lynchets that have formed because the hedgerow has for centuries intercepted down-slope soil-creep on one side only).

16.77 A moderate proportion of the hedges (44%) contain mature standard trees, almost exclusively ash and *Quercus robur* (pedunculate oak) though *Salix fragilis* (crack willow) also occurs in the eastern part of the Main SRFI Site. A smaller proportion (25%) have more than an average of 1 per 50m. A few hedges have coppiced *Fraxinus excelsior* (ash) or *Ulmus procera* (English elm) re-sprouting after Dutch Elm Disease forming large numbers of small poles (which can be difficult to assess for tree-counting). Some boundaries without hedges (or with remains of former hedges that no longer qualify as hedges under the Hedgerows Regulations) also have similar standard trees.

16.78 A veteran tree assessment (**Appendix 16 Annex M**) identified 63 trees (of approximately 130 in total) on the main site that were either locally notable, notable, veteran or ancient. 40 of these were veteran or ancient. Many, but not all of these (**Figure M1.1 in Annex M**) were associated with the hedgerows.

16.79 The status of hedges on the Main SRFI Site is shown in **Appendix 16 Annex D, Figure D3.1**. Hedges that qualify as Important Hedges under the Hedgerows Regulations are concentrated on either side of a short stretch of Towcester Road, and along one sinuous field boundary near the southern edge of the Main SRFI Site just east of Towcester Road. These qualify primarily on account of their richness in woody species. There is also one plus a fragment west of Towcester Road. These qualify on account of having just sufficient species-richness together with a high number of qualifying features (ditches, high scores for connection points etc.).

16.80 At the hedge foot there is usually rough grassland dominated by by *Arrhenatherum elatius* (false oat-grass) and *Dactylis glomerata* (cock's-foot) together with *Urtica dioica* (common nettle) referable to the NVC type MG1b *Arrhenatherum elatius* grassland, *Urtica dioica* sub-community or – perhaps rather more commonly in the presence of *Rubus fruticosus* agg. (bramble) – to OV24b *Urtica dioica-Galium aparine* community, *Arrhenatherum elatius-Rubus fruticosus* sub-community**.** These two NVC types intergrade and mostly this vegetation is intermediate between them. Woodland species are extremely scarce in the hedges of the Main SRFI Site, even in those qualifying as Important Hedges

under the Regulations; and in so far as there are any, only the commonest species are represented – mainly *Arum maculatum* (Lords-and-Ladies), *Brachypodium sylvaticum* (False Brome) and *Geum urbanum* (wood avens).

16.81 In the central part of the Main SRFI Site east of Towcester Road, most of the hedges have been removed; and to the north of this area most are defunct, many to the extent that they can no longer be regarded as hedges under any reasonable definition of a hedge. Elsewhere a relatively intact hedgerow network has survived. However, there are almost no hedges on the railway and A43 boundaries of the Main SRFI Site (where it looks from a distance a if there might be, it is almost always because of scrub adjacent to the boundary on railway or road embankments).

Scrub

16.82 Thorn scrub variously consisting of *Crataegus monogyna* (hawthorn), *Prunus spinosa* (blackthorn) and *Sambucus nigra* (elder) occurs in several places, most extensively on the railway embankments, but also around field corner pits and ponds. It is mostly referable to the NVC types W21a *Crataegus monogyna-Hedera* helix scrub, *Hedera helix-Urtica dioica* sub-community or W22a *Prunus spinosa-Rubus fruticosus* scrub, *Hedera helix-Silene dioica* sub-community but more ruderal scrub may be referable to the proposed NVC type *Sambucus nigra-Urtica dioica* community (Rodwell et al. 2000).

16.83 The banks of the A43 dual-carriageway main road have planted woodland mostly consisting of *Acer campestre* (field maple) and *Salix* cf. *×fragilis* (crack willow) though other species are almost certainly present (hard to assess without access in March) .

Ditches, Streams and Ponds

16.84 Many hedges have large ditches or rarely small streams with flowing water. Where they are wooded the banks may have shade-tolerant species such as *Alliaria petiolata* (Garlic Mustard), *Arum maculatum* (Lords-and-Ladies) and *Geum urbanum* (wood avens), but more often they have rough grassland referable to the NVC type MG1b *Arrhenatherum elatius* grassland, *Urtica dioica* sub-community or nettle-bed vegetation referable to the NVC type OV24a *Urtica dioica-Galium aparine* community, typical sub-community or OV24b *Urtica dioica-Galium aparine* community, *Arrhenatherum elatius-Rubus fruticosus* sub-community. Where the nettle-bed vegetation includes *Epilobium hirsutum* (great willowherb) it may be referable to the NVC type OV26e *Epilobium angustifolium* community, *Urtica dioica-Cirsium arvense* sub-community.

16.85 Fragmentary aquatic vegetation in a small minority of the ditches mostly consists of rooted and emergent aquatics. Where these are relatively small species including the grass *Glyceria fluitans* (floating sweet-grass) and broad-leaved herbs including *Apium nodiflorum* (fool's water-cress), *Myosotis scorpioides* (water forget-me-not), *Nasturtium officinale* (water-cress) and *Veronica beccabunga* (brooklime) the vegetation may be loosely referable to the NVC type S23 Other water margin vegetation. Elsewhere taller grasses including *Phalaris arundinacea* (reed canary-grass) and *Phragmites australis* (common reed) may lead to other communities but they are fragmentary and scarce. The very few ponds in the Main SRFI Site have rather similar aquatic vegetation but it tends to feature more shade-tolerant species as all the ponds are surrounded by scrub.

Other Habitats

16.86 In a few places brick structures – mainly blue-brick structures along the railways and the canals – have a species-rich assemblage of plants growing from cracks. Mostly these are just outside the Main SRFI Site or part of the railway infrastructure. Species present include the ferns *Asplenium adiantum-nigrum* (black spleenwort), *Asplenium ruta-muraria* (wall-rue), *Asplenium trichomanes* (maidenhair spleenwort) and *Asplenium scolopendrium* (hart's-tongue). Others are the grass *Poa angustifolia* (narrow-leaved meadow-grass) and broad-leaved herbs including *Fragaria vesca* (wild strawberry) and *Inula conyzae* (ploughman's-spikenard).

Noteworthy Plant Species

16.87 No statutorily protected plant species or Red List species (vulnerable or above) have been recorded during any of the surveys. Many species that are widespread and locally common elsewhere in southern England are scarce in Northamptonshire, partly due to lack of suitable habitat, and also due to species impoverishment consequent on modern agriculture and habitat loss.

16.88 On the Main SRFI Site, species of note in the Northamptonshire context according to the latest county Flora **(Ref 16.39)** - *i.e.* described there as 'occasional' (or in some way implying greater scarcity than that) and recorded there from fewer than 100 tetrads - are listed below.

- *Adoxa moschatellina* (moschatel) occurs in small quantity in two deeply shaded places about 150m apart on the banks of the stream in the north-western part of the main SRFI. It is occasional in Northamptonshire (26 tetrads) according to the Flora.

- *Allium vineale* (wild onion) was seen in very small quantity in road-verge grassland in the north-eastern part of the site in 2015; it was not refound in 2016 or 2017. It is very occasional (33 tetrads) in Northamptonshire according to the Flora, though it notes that it has been recorded more frequently in recent years.

- *Asplenium adiantum-nigrum* (black spleenwort) occurs on the engineering brick bridges on the eastern edge of the main SRFI site and on other engineering-brick structures adjacent to the main SRFI site. It is occasional in Northamptonshire *(c.*60 tetrads) according to the Flora, and mainly found on railway and canal bridges as here.

- *Asplenium trichomanes* (maidenhair spleenwort) occurs on the engineering brick bridges on the eastern edge of the main SRFI site and on other engineering-brick structures adjacent to the main SRFI site. It is occasional in Northamptonshire (*c.*75 tetrads) according to the Flora, and mainly found on railway and canal bridges as here.

- *Bromus* cf. *secalinus* (rye brome) was recorded in disturbed ground in a grassland field where the use of wild-flower seed-mixture is suspected. It is rare in Northamptonshire (9 tetrads) according to the Flora, but in other parts of lowland Britain it has increased dramatically in very recent years, and its rarity in Northamptonshire may have changed.

- *Carex* cf. *spicata* (spiked sedge) is in Northamptonshire the most likely identification for a sedge in the *Carex spicata* – *Carex divulsa* – *Carex muricata* ssp. *pairae* group, which was encountered in a few places in grassland west of Towcester Road and in the canal corridor adjacent to the main SRFI site. It is described as occasional (*c.*145 tetrads) by the Flora. The other two species are much less common in the county, but the serious difficulty of identification in this group of sedges means that they are under-recorded.

- *Hypericum maculatum* (imperforate St John's-wort) was recorded in very small quantity on the main SRFI site on the verges of Towcester Road. It is rare in Northamptonshire (26 tetrads) according to the Flora, though they note that it is increasingly being recorded (possibly overlooked in the past).

- *Iris foetidissima* (stinking iris) was recorded in very small quantity. It is occasional in Northamptonshire (*c.*75 tetrads) according to the Flora, and mainly associated with gardens or old woodland plantings as here.

- *Lathyrus nissolia* (grass vetchling) had clearly been sown in a wild-flower seed-mixture on set-aside arable in the south-eastern corner of the main SRFI site. It is occasional in Northamptonshire (40 tetrads) according to the Flora but they express a degree of uncertainty about the reasons for its increase. Elsewhere in lowland Britain it is a common constituent of wild-flower seed-mixtures, and seems to have been sown in vast amounts in grass-seed mixtures used on those motorways and dual-carriageway roads that were added to the highways network in the late 1960s or early 1970s.

- *Lemna gibba* (fat duckweed) was recorded from a small pond east of Towcester Road. It is occasional in Northamptonshire (37 tetrads) according to the Flora. Since 2012 experts have suggested that the non-inflated form of *Lemna gibba* has been widely overlooked and recorded as *Lemna minor*, which has always been regarded as the ubiquitous duckweed in lowland Britain. On closer examination (using additional identification characters) *Lemna minor* is now - in many counties at least – turning out to be uncommon, *i.e.* what botanists were until very recently mostly recording as *Lemna minor* they are now discovering to be *Lemna gibba*.

- *Lepidium campestre* (field pepperwort) is abundant in the margins of an arable field east of the railway on the eastern edge of the main SRFI site. It is occasional in Northamptonshire (29 tetrads) according to the Flora.

- *Oenanthe crocata* (hemlock water-dropwort) was recorded in very small quantity (*c.* 3 plants) from a ditch west of Towcester Road, and more commonly from the canal corridor adjacent to the main SRFI site. It is rare in Northamptonshire (10 tetrads) according to the Flora mainly being known from the canal system near Blisworth. It was thought extinct in the county, but has been found in several places in recent years.

- *Primula veris* (cowslip) was recorded in very small quantity in the edge of a field east of the railway on the eastern edge of the main SRFI. It is occasional in Northamptonshire according to the Flora but its status throughout lowland

Britain is greatly confused by frequent planting in wild-flower seed-mixtures on roadsides and elsewhere.

- *Rumex hydrolapathum* (water dock) occurs very occasionally by the stream in the north-western part of the main SRFI site and in associated ditches. It is occasional and mainly confined to the canal system in Northamptonshire (*c.*70 tetrads) according to the Flora. It is also present in small quantity on the water-margins of the canal adjacent to the main SRFI site.

- *Sison amomum* (stone parsley) was recorded on the edge of a field east of the railway on the eastern edge of the main SRFI. It is occasional in Northamptonshire (*c.*65 tetrads) according to the Flora, but rare in the west of the county.

- *Vulpia myuros* (rat's-tail fescue) occurs on the engineering brick bridges on the eastern edge of the main SRFI site and probably on other engineering-brick structures adjacent to the main SRFI site including some in the canal corridor. It is occasional in Northamptonshire (41 tetrads) according to the Flora, though it may be under-recorded on railways and in brown-field sites.

16.89 The following species recorded at the Main SRFI Site are also either described as occasional in the Flora though present in between 100 and 150 tetrads (species in more than 150 are disregarded here) or else noted as being garden escapes in the great majority of places where they occur: *Aphanes arvensis* (parsley-piert), *Campanula persicifolia* (peach-leaved Bellflower), *Carduus nutans* (musk thistle), *Dactylorhiza fuchsii* (common Spotted-orchid), *Digitalis purpurea* (foxglove), *Erigeron acris* (blue fleabane), *Euphorbia lathyris* (caper spurge), *Fragaria vesca* (wild strawberry), *Humulus lupulus* (hop), *Iris pseudacorus* (yellow iris), *Malva moschata* (musk-mallow), *Moehringia trinervia* (three-nerved Sandwort), *Rhinanthus minor* (yellow-rattle)and *Sherardia arvensis* (field madder). Further detail on these species is given in **Appendix 16, Annex C**.

16.90 The following species of note (as explained above) were recorded only on land adjacent to the Main SRFI Site:

- *Carex pseudocyperus* (cyperus sedge) is locally abundant on the water-margins of the canal adjacent to the main SRFI site. It is very occasional in Northamptonshire (18 tetrads) according to the Flora and mostly found on the Grand Union Canal.

- *Inula conyzae* (ploughman's-spikenard) occurs in small quantity on engineering brick structures at Towcester Road and in the canal corridor. It is occasional in Northamptonshire (*c.*65 tetrads) according to the Flora, but rare in the west of the county.

- *Lythrum salicaria* (purple-loosestrife) was recorded in small quantity in the canal corridor adjacent to the main SRFI site. It is occasional in Northamptonshire according to the Flora but recorded from over 100 tetrads.

- *Poa angustifolia* (narrow-leaved meadow-grass) was recorded in small quantity from several places adjacent to the main SRFI site, especially on engineering-brick structures. It is occasional in Northamptonshire according to the Flora but

they consider it to be under-recorded. Throughout lowland Britain it is under-recorded, partly because it is often lumped into the *Poa pratensis* aggregate, and partly because it often grows in inaccessible places, especially railways.

Protected Vertebrate Species

Badgers

16.91 At the Main SRFI Site no definitive evidence of badgers was recorded within the areas surveyed in 2016 or 2017. There is potential for badgers to be present in wooded and scrub areas in the north of the site which were not accessible at the time of survey. A possible sett was noted in one area of woodland to the east of Towcester Road and a sett was previously recorded to the west of Towcester Road. A push-through was noted under a railway fence on the southern boundary. While there were no prints, hairs or other evidence to confirm that it was made by badgers, the force that must have been used to make it suggests that badgers did it. Perhaps they use the nearby culvert to cross the railway for occasional foraging.

Bats

16.92 Roosting bats have been confirmed by survey or strongly indicated from other evidence at four locations on the Main SRFI Site and at two locations adjacent to it (locations of buildings are shown in figures contained in **Appendix 16, Annex E (part 3)**:

- BG1 – Field Barns, in the northern part of the site, consists of two linked barns and a former stable block, all of which are in poor condition with holes in the roofs and walls. There are historical records of bat roosts including common pipistrelle, Brown long-eared and Myotid species. Survey confirmed common pipistrelles using the largest barn in very small numbers, but none of the other species were refound.

- BG2 – Lodge Farm, in the north-eastern part of the site, has a stone house with an attached stone barn and stable block. It also has a number of barns and sheds for livestock and hay storage. An initial assessment found evidence of bats in the roof of the house and in the attached barn (four old droppings in each), and both had numerous access points that could be used by bats. Three emergence surveys in 2016 recorded single common pipistrelle bats emerging from the roof of the house. This is not a maternity roost. None of the other buildings were suitable for roosting bats.

- BG3 – The Nursery on the western side of Farm Lane in the south-western part of the site appears from aerial photographs to have buildings suitable for roosting bats, but no access has been possible.

- BG4 – Manor Farm, on the western side of Farm Lane immediately north of The Nursery, has a house, a stable block, and a group of barns used for storage. An initial assessment found evidence of bats in the roof of the house (a single dropping). Emergence and dawn re-entry surveys in 2016 recorded small numbers of common pipistrelle bats emerging from the house and stable block. These are not maternity roosts. Other buildings were suitable for bats to varying degrees, but none of the surveys found any evidence of bats using them.

- BG6 – Arm Farm adjacent to (but outside of) the south-western boundary of the Main SRFI Site has a varied group of buildings all of which are suitable for roosting bats. Initial assessments found no evidence of bats, but subsequent emergence and dawn re-entry surveys recorded small numbers of common pipistrelles. No maternity roost was found.

- BG8 – Deveron House adjacent to (but outside of) the site boundary towards the northern part of Towcester Road appears from aerial photographs to have a house and a number of outbuildings potentially suitable for bats. These buildings are no longer within the development footprint for the site. However information from the owner at a public consultation has suggested that a roost may be present within the stable block. Access to the buildings to carry out an initial bat survey was refused. Therefore emergence surveys were carried out around the boundary of Deveron House from the surrounding field and the roadway on three occasions during the bat active season during 2017. This was carried out to establish if any bats were emerging from the site along the boundary line at or just after dusk to establish if a maternity roost of any species was present. During all of the surveys small numbers of bats of common species were recorded flying over and around the site. There were no large numbers of bats recorded during any of the surveys. It is possible to say from these surveys that no maternity roost was present within the grounds of Deveron House during 2017. It is probable that individual bats of common species are roosting here as individual bats were noted flying over the boundary during these surveys.

16.93 At two other locations buildings have either been discounted or surveys are in progress.

- BG7 – A former petrol station on the western edge of the Main SRFI Site (and within it) and on the eastern side of the A43 dual-carriageway has a small retail outlet and a canopy over petrol pumps. Initial assessment showed the buildings and structures to be unsuitable for roosting bats and was discounted for further survey.

- BG11 – Rathvilly Farm towards the north-east of the site on the eastern side of Farm Lane has a house, a detached garage, a former chicken shed, a modern storage barn and a small number of containers used for storage. An initial assessment in early 2017 found the house, garage and former chicken shed to be suitable for roosting bats, and old bat-droppings were found in the latter. Surveys of all of the buildings found no evidence of use by bats in buildings 1, 2 and 4. Building 3 was found to have a single bat dropping deposited on a machine within the building. Emergence surveys have confirmed that building 3 – Poultry shed was being used by a single Common Pipistrelle bat. This bat was noted exiting and entering the building during the surveys at dusk and dawn. On one of the dusk surveys a single Common Pipistrelle was observed flying within the building before emergence. This was the only bat observed using this building and it is using it as a day roost throughout the season.

16.94 Tree surveys consisting of ground level tree assessments (GLTA), were carried out in 2016 and 2017 and a large number of trees were found to contain suitable Potential Roost Features (PRFs) for bats. This trees with PRFs graded as either moderate or high were climbed and the features examined.

Results have revealed no evidence of roosting bats in any trees during the GLTA and tree climbing surveys. It should be noted that it is often difficult to identify bat use in trees because bats use individual trees infrequently and for short periods of time, and evidence of bats use such as droppings and urine staining break down and disappear very quickly. A single tree was found to be used by a single Common Pipistrelle bat on one occasion.

Birds

16.95 Forty-nine bird species were recorded – of these forty-three species were confirmed breeding, probable breeding or possible breeding. A complete species list summarising breeding status, based on EOAC criteria is presented in**, Appendix 16, Annex H**.

16.96 Of all the bird species recorded, ten (including barn owl) are designated as Annex 1 on the EU Birds Directive, Schedule 1 on The Wildlife and Countryside Act 1981 or are Birds of Conservation Concern (BOCC). Their associated conservation and breeding status are presented in **Table 16.11**. A summary of the number of designated bird species recorded and their associated EOAC breeding status is given in **Table 16.12**. Key points from the data are summarised below.

16.97 Nine Red listed bird species were recorded on site. These are fieldfare, house sparrow, lapwing, linnet, grey partridge, skylark, starling, song thrush, and yellowhammer. Lapwing and skylark have been confirmed as breeding on site. House sparrow, linnet, song thrush and yellowhammer are classified as probable breeders at the site. Fieldfare are winter visitors to this country and therefore are not classified as breeding on site. It is possible for all of the other species to be breeding on site owing to the habitats present, which are suitable for nesting.

16.98 Eight Amber listed species have been recorded on site. These are dunnock, kestrel, mallard, meadow pipit, mute swan, reed bunting, stock dove, and willow warbler. Dunnock and kestrel have been confirmed as breeding on site. It is possible that the remaining species are breeding on site, with the exception of the mute swan for which nesting habitat is not present on site.

16.99 A barn owl was found to be using a barn (Building 1) (see **Figure H1, Appendix 16, Annex H**) for breeding at the farm during the internal building inspection for bats. The barn owl was using an inaccessible ledge on the upper floor of the building and there was extensive evidence (pellets) on the ground floor. For health and safety reasons, the nest could not be accessed due to the unstable nature of the walls of the barn. They were also found to be breeding in three trees on the Main SRFI Site.

Table 16.11: Bird Species of Conservation Concern Recorded during the Breeding Bird Surveys at the Main SRFI Site: their Conservation Status and their Breeding Status

English name	Scientific name	EU Birds Directive Annex 1	WCA 1981 Sch 1	BoCC Red / Amber	UK or Local BAP	Species Summary	Breeding Status
Dunnock	*Prunella modularis*			Amber	UK BAP	Nesting pair observed and frequent singing noted	Confirmed
Feral pigeon	*Prunella modularis*				UK BAP	Pair observed	Possible
Fieldfare	*Turdus pilaris*		Yes	Red		Flying overhead	Non Breeding
Grey partridge	*Perdix perdix*			Red	UK BAP	One pair seen	Possible
House sparrow	*Passer domesticus*			Red	UK BAP	Multiple calls heard	Probable
Kestrel	*Falco tinnunculus*			Amber		Nest found and female seen on the Main SRFI Site	Confirmed
Lapwing	*Vanellus vanellus*			Red	UKBAP	Known breeding activity	Confirmed
Linnet	*Carduelis cannabina*			Red	UK BAP	Pair witnessed on the Main SRFI Site	Probable
Mallard	*Anas platyrhynchos*			Amber		Pair seen on the Main SRFI Site	Possible
Meadow pipit	*Anthus pratensis*			Amber		Calls heard	Possible
Mute swan	*Cygnus olor*			Amber		Flying overhead	Non Breeding
Red kite	*Milvus milvus*	Yes	Yes			Flying overhead	Non Breeding
Reed bunting	*Emberiza schoeniclus*			Amber	UK BAP	Heard singing	Possible
Skylark	*Alauda arvensis*			Red	UK BAP	Frequent singing heard and one nest identified	Confirmed
Song thrush	*Turdus philomelos*			Red	UK BAP	Singing heard on multiple occasions	Probable
Starling	*Sturnus vulgaris*			Red	UK BAP	Calls heard on a few occasions	Possible
Stock dove	*Columba oenas*			Amber		One pair seen on the Main SRFI Site	Possible

English name	Scientific name	EU Birds Directive Annex 1	WCA 1981 Sch 1	BoCC Red / Amber	UK or Local BAP	Species Summary	Breeding Status
Willow warbler	*Phylloscopus trochilus*			Amber		Singing heard	Possible
Yellowhammer	*Emberiza citrinella*			Red	UK BAP	Frequent and varied activity across the Main SRFI Site	Probable

Table 16.12: A summary of the number of all the designated birds species recorded at the Main SRFI Site and their associated EOAC breeding status.

Designation	Confirmed Breeding	Probable Breeding	Possible Breeding	Non Breeding	Total
EU Birds Directive Annex 1	0	0	0	1	1
WCA 1981 Schedule 1	0	0	0	2	2
BoCC Red List	2	4	2	1	9
BoCC Amber List	2	0	5	1	8
UK BAP	3	4	4	0	11
No Designation	4	11	12	3	30

Great Crested Newts

16.100 HSI Assessments were carried out on all ponds on the Main SRFI Site (see **Figure J1, Appendix 16, Annex J** for pond locations) that were considered suitable for great crested newts (see **Table 16.13).**

Table 16.13: Habitat Suitability Index (HSI) Summary – Main SRFI Site.

Pond Number	Suitability
1	Below Average
2	Average
3	Below Average
4	Average
7	Below Average
8	Poor
10	Poor
11	Average
13	Average
14	Average

16.101 Two ponds (ponds 3 and 4) returned positive results for eDNA analysis but after four population estimate survey visits no great crested newts were recorded in either. The positive eDNA results of these ponds were probably 'false positives' and great crested newts are not present in any of the ponds on the site that could be accessed. Standard survey methods rather than eDNA are considered definitive in determining the presence or absence of great crested newts as positive eDNA can be the result of contamination or historic use by the species.

16.102 Access for surveys was refused for five of the ponds (15, 16, 17, 22 and 23).

16.103 A large population of great crested newts was recorded by others in pond 13 in 2014. Pond 13 is approximately 330m from the Main SRFI Site boundary (within the Study Area). An active railway line on an embankment lies between the site and Pond 13 and may form a partial barrier of unsuitable habitats, but it is not considered an impassable barrier to great crested newt movement. The topography of the embankments could hinder the movement of newts further decreasing its suitability. Following presence/absence surveys for this pond in 2017, it was confirmed that a medium population is present and it is considered likely that a large population remains due to the difficulties in surveying this waterbody due to high vegetation growth.

Other Vertebrate Species

16.104 No reptiles were recorded at the Main SRFI Site during surveys in 2016 or 2017. Anecdotal sightings of grass snake were made by RSK surveyors in 2017. One individual was observed along the southern boundary of the site adjacent to the canal.

16.105 No evidence of water voles were found at the Main SRFI Site. A single otter spraint was observed on the banks of the Milton Malsor brook during white-claw crayfish surveys.

16.106 Milton Malsor Brook on the Main SRFI Site is considered unsuitable for white-clawed crayfish due to the high numbers of signal crayfish present. This was confirmed by presence-absence surveys for white-clawed crayfish undertaken in 2017.

Invertebrates (Terrestrial)

16.107 A total of 289 invertebrate species were recorded in the survey.

16.108 No Species of Principal Importance for Conservation of Biological Diversity in England were recorded at the site during the survey.

16.109 One "Research Only" moth species was recorded. Details of this species are provided in **Table 16.14**.

Table 16.14: Research only moth species

Species	English name	Caterpillar foodplant	Actual status in England
Tyria jacobaeae	Cinnabar moth	Ragworts	Widespread and common, though perhaps declining numerically

16.110 One of the species recorded – a leaf beetle *Psylliodes luteola* - is listed in the British Red Data Book (Shirt, 1987) **(Ref 16.40)** where it is in the "indeterminate" category of species for which there are inadequate data. Its puzzling distribution is centred on the Oxford area, where it was first reported in Britain in 1912. A second population in Dorset and Hampshire has smaller numbers. The early stages are known to feed on various grasses, although most reports relate to adults, which tend to be most easily found by beating the foliage of trees over a collecting tray.

16.111 Two species recorded during the survey are designated as "Nationally Scarce". Both are included in the former Nationally Notable Na category (see **Annex K, Appendix 16**):

16.112 The yellow-faced bee *Hylaeus cornutus* is largely confined to the south-central and south-eastern counties of England. Alongside the River Thames it is found in post-industrial habitats and disused mineral extraction sites where wild carrot *Daucus carota* or other white umbellifers grow in quantity. There is a close association with these flowers, especially wild carrot, from which the bee collects pollen to provision its cells. Nest chambers are constructed in hollow plant stems, especially those of bramble, but these may be some distance away from feeding areas so that in most cases a mosaic of grassland and scrub habitat is essential to support this bee.

16.113 The leaf hopper *Iassus scutellaris* was discovered for the first time in Britain in Surrey in 1978, and is now found widely across southern and central England despite its classification as Nationally Scarce (category Notable A). Associated with English elm and able to persist on low re-growth following die-back due to Dutch elm disease, it is similar in appearance to the common oak-feeding *I. lanio* but the colour of the forewings is generally a much brighter lime-green.

16.114 Thirteen of the recorded species are listed formally as Nationally Local (species which, whilst fairly common, are evidently less widespread than truly common species, but also not qualifying as Nationally Notable, see **Appendix 16, Annex K**). These are listed, together with their primary associations, in **Table 16.15**, below.

Table 16.15 List of Nationally Local Invertebrates recorded at the Main SRFI Site

Species	English name	Main ecological associations
Amara convexior	a ground beetle	open gravelly ground
Anomoia purmunda	a picture-winged fly	larva feeds in the flesh of hawthorn berries
Apolygus lucorum	a plant bug	low plants
Ceutorhynchus alliariae	a weevil	ecology unclear
Chrysotoxum verralli	a hoverfly	grassland with associated scrub
Coremacera marginata	a snail-killing fly	dry habitats, especially grasslands
Cryptocephalus pusillus	a leaf beetle	trees, especially birch, often sallow
Eupteryx florida	a froghopper	various labiates
Oedemera lurida	a beetle	a common grassland species
Orchestes alni	a weevil	larva mines in leaves of elms
Psylliodes chrysocephala	a leaf beetle	various Cruciferae
Rhamphus oxyacanthae	a weevil	larva mines in leaves of hawthorn
Sphecodes monilicornis	a solitary bee	cleptoparasite of halictid mining bees.

J15a Site

Habitats and Plants

16.115 J15a includes a range of habitats. There are roads and associated hedges, verges and amenity plantings, a canal and a wetland on abandoned land. Farmland around J15a includes sheep-grazed (and horse grazed pasture not yet surveyed) pasture, arable land under wheat and the biomass crop *Miscanthus xgiganteus* (giant miscanthus). The area earmarked for ecological mitigation is principally agricultural farmland bounded but not divided by hedges and cropped with *Miscanthus*. Field boundaries are mainly hedges and there are two small streams. Semi-natural vegetation is limited to the abandoned land and wetland west of the A43.

16.116 Further details for the most significant of these habitat types are outlined below. About 33.5% of the study area (i.e. the area surveyed, excluding areas where access was not available), i.e. 7.45ha, is arable farmland, and about 2.6% is agricultural grassland, i.e. 0.58 ha. The remaining 63.8% (14.17ha) variously supports hedgerows, rough grassland, scrub (mostly bramble), field-corner woodland fragments, ditches (including one small stream) and ponds.

16.117 The edge of the Grand Union Canal where it falls inside the J15a Site mostly has a fringe of swamp vegetation formed of tall emergent graminoids. This curtails the incidence of species-rich dry grassland at the lip of the towpath sward where it tops the canal bank, though such grassland does also occur fragmentarily at locks.

16.118 West of the Grand Union Canal the J15a Site includes a field containing tall-herb swamp which is clearly semi-ruderal in character in large areas away from the canal, at least to the extent that it contains among its dominants such species as *Cirsium arvense* (creeping thistle) and *Urtica dioica* (common nettle). Towards the canal tall herbs wetland herbs such as *Epilobium hirsutum* (great

willowherb) and *Filipendula ulmaria* (meadowsweet) are more abundant, and locally there are patches of **S6 *Carex riparia* swamp** sedge swamp.

16.119 Of the 32 individual trees or tree groups on the site, 12 were identified as being ancient, veteran, notable or locally notable, two of which were either veteran or ancient.

Noteworthy Plant Species

16.120 On the J15a Site, species of note in the Northamptonshire context include *Oenanthe crocata* (hemlock water-dropwort) discussed in connection with the Main SRFI site, which grows beside the canal. Others are:

- *Arctium lappa* (greater burdock) was recorded in small quantity. It is occasional in Northamptonshire according to the Flora **(Ref 16.39)** but recorded from over 100 tetrads.

- *Cardamine amara* (large bitter-cress) was recorded scattered all through the marsh west of the canal and south of J15a, though mainly in the southern half. It is rare in Northamptonshire (14 tetrads) according to the Flora, and mostly found near canals.

- *Dactylorhiza praetermissa* (southern marsh-orchid) was recorded in a few places in the marsh west of the canal and south of J15a, though mainly in the southern half. It is rare in Northamptonshire (26 tetrads) according to the Flora, though spreading owing to its ability to colonise brown-field sites.

- *Elodea nuttallii* (Nuttall's waterweed) was seen in the canal. It is occasional in Northamptonshire (63 tetrads) according to the Flora but spreading and under-recorded. Since 2012 it has been added to *Schedule 9* of the The Wildlife and Countryside Act 1981 (as amended) as an invasive alien.

- *Impatiens capensis* (orange balsam) in the marsh and woodland west of the canal and south of J15a and along the canal. It is occasional in Northamptonshire (*c.*92 tetrads) according to the Flora, but occurs along most of the rivers and canals.

- *Oenanthe crocata* (hemlock water-dropwort) grows along the canal. It is rare in Northamptonshire (10 tetrads) according to the Flora mainly being known from the canal system near Blisworth. It was thought extinct in the county, but has been found in several places in recent years.

- *Potamogeton* cf*. lucens* (shining pondweed) was noted in the canal but not critically determined. If the identification is correct then it is occasional in Northamptonshire (37 tetrads) according to the Flora.

- *Sagittaria sagittifolia* (arrowhead) was recorded in considerable quantity in the canal. It is occasional in Northamptonshire (87 tetrads) according to the Flora.

- *Sparganium emersum* (unbranched bur-reed) was noted in the canal but not critically determined. If the identification is correct then it is occasional in Northamptonshire (75 tetrads) according to the Flora.

16.121 In addition the following species occur along the canal outside the boundary of the J15a Site but close to it. The possibility that they are present in small quantity near the lock that is within the J15a Site cannot be ruled out, but they were principally seen further to the south. They grow in dry grassland in a narrow (0.3m strip at the lip of the towpath sward where it tops the canal bank, mostly close to the several locks.

- *Avenula pubescens* (downy oat-grass) was recorded in dry turf forming a narrow strip at the lip of the canal bank near locks. It is occasional in Northamptonshire (c.57 tetrads) according to the Flora.

- *Bidens cf. connata* (London bur-marigold) was seen in brickwork around locks. This alien species is still rare in Northamptonshire (6 tetrads) according to the Flora which documents its spread along the canal system from Buckinghamshire.

- *Briza media* (quaking-grass) was recorded in dry turf forming a narrow strip at the lip of the canal bank near locks. It is now occasional in Northamptonshire (c.94 tetrads) according to the Flora, having been much more common in the past.

- *Erodium cicutarium* (common stork's-bill) was recorded in dry turf forming a narrow strip at the lip of the canal bank near locks. It is occasional in Northamptonshire (*c.*66 tetrads) according to the Flora.

- *Koeleria macrantha* (crested hair-grass) was recorded in dry turf forming a narrow strip at the lip of the canal bank near locks. It is rare in Northamptonshire (23 tetrads) according to the Flora, and very rare away from the extreme northern tip of the county.

- *Linum catharticum* (fairy flax) was recorded in dry turf forming a narrow strip at the lip of the canal bank near locks. It is occasional in Northamptonshire according to the Flora but recorded from over 100 tetrads.

Protected Vertebrate Species

Badgers

16.122 Potential signs of badger have been identified at the J15a Site. Badger walkover surveys were undertaken in 2017 and no badger setts were observed.

Bats

16.123 The principal feature used by bats at the J15a Site is the Grand Union Canal. An assessment has been carried out of the commuting and foraging potential of the canal along a 2km length with the J15a Site at its centre. An assessment has also been made of the existing road bridges that cross the canal for their potential to support roosting bats. These are included in the Order Limits.

16.124 The canal has been assessed as having high potential and It is likely that the canal is an important commuting and foraging resource for bats within the overall landscape and it is important to understand the potential for potentially disrupting foraging and commuting bats particularly bats commuting through the site to other foraging areas to the north and south.

16.125 Surveys including transect surveys (2 per month), and static bat detector surveys (two per month) were carried out during 2017 to understand the use made of the canal by bats and the potential impacts of the junction re-design on bats using the canal and the bridges.

16.126 Emergence surveys were carried out on the bridges that carry the A34 (north and south) and the M1. All of these bridges have been assessed as having high roosting potential and three dusk emergence and dawn re-entry surveys were carried out during the peak activity months of June, July and August 2017 to establish any roosting by bats in these structures. No roosting bats were recorded in the bridges.

16.127 No evidence of roosting bats was observed within any of the trees during the surveys and it is considered that these trees are not used by roosting bats.

16.128 All assessments for the buildings, bridges and the canal have been carried out using the criteria shown in the Bat Surveys for Professional Ecologists, Good Practice Guidelines **(Ref 16.41).**

Birds

16.129 Breeding bird surveys were completed in 2017 at the J15a Site where access was available. Results are shown in **Tables 16.16** and **16.17**.

Table 16.16: Bird Species of Conservation Concern Recorded during the Breeding Bird Surveys at the J15a Site: their Conservation Status and their Breeding Status

English name	Scientific name	EU Birds Directive Annex 1	WCA 1981 Sch 1	BoCC Red / Amber	UK or Local BAP	Species Summary	Breeding Status
Dunnock	*Prunella modularis*			Amber	UK BAP	Frequent singing noted	Probable
Kingfisher	*Alcedo atthis*	Yes	Yes	Amber		Flying along canal	Possible
Linnet	*Carduelis cannabina*			Red	UK BAP	Pair witnessed on the site	Possible
Mallard	*Anas platyrhynchos*			Amber		Pair seen on site (on Canal)	Possible
Mistle thrush	*Turdus viscivorus*			Red		Observed on site	Possible
Reed bunting	*Emberiza schoeniclus*			Amber	UK BAP	Heard singing	Possible
Skylark	*Alauda arvensis*			Red	UK BAP	Frequent singing heard	Probable
Song thrush	*Turdus philomelos*			Red	UK BAP	Observed on multiple occasions	Probable
Stock dove	*Columba oenas*			Amber		One pair seen on site in a nest box	Confirmed
Common swift	*Apus apus*			Amber		Flying over the site	Non Breeding
Willow warbler	*Phylloscopus trochilus*			Amber		Singing heard on multiple occasions	Probable
Yellowhammer	*Emberiza citrinella*			Red	UK BAP	Heard singing	Possible

Table 16.17: A summary of the number of all the designated birds species recorded at J15a and their associated EOAC breeding status.

Designation	Confirmed Breeding	Probable Breeding	Possible Breeding	Non Breeding	Total
EU Birds Directive Annex 1	0	0	1	0	1
WCA 1981 Schedule 1	0	0	1	0	1
BoCC Red List	0	1	4	0	5
BoCC Amber List	1	2	3	1	7
UK BAP	0	1	4	0	6
No Designation	2	8	6	0	20

Great Crested Newts

16.130 HSI Assessments were carried out on all ponds on the J15a Site that were considered suitable for great crested newts (**Table 16.18**).

16.131 Of the nine ponds identified on the J15a Site and subject to HSI survey, two were considered to be suitable for great crested newts and presence-absence surveys were carried out in 2017. No great crested newt were found.

Table 16.18: Habitat Suitability Index (HSI) Summary – Junction 15a.

Pond Number	Suitability
2	Below Average
7	Excellent

16.132 Four presence/absence surveys were carried out on ponds 2 and 7 in 2017. No great crested newts were found in either of the ponds during any of the surveys.

16.133 Common frogs, common toads and smooth/palmate newt hybrids were observed in pond 2 and common frogs, common toads, smooth newts, stickleback (*Gasterosteus aculeatus*) and signal crayfish were observed in pond 7. Summaries of the presence absence surveys can be found in **Appendix 16, Annex J.**

16.134 Although no great crested newts were recorded a further two surveys of the pond were carried out in order to confirm the smooth/palmate newt hybrid populations in the ponds.

Other Vertebrate Species

16.135 The majority of habitat available to survey at J15a is unsuitable for reptiles. However, habitat surrounding the canal is optimal. However, presence-absence surveys in 2017 showed no reptiles to be present. An anecdotal sighting of a grass snake was observed during other site surveys (one individual on the banks of the canal) indicate that the site is likely to support a low population of grass snake.

16.136 Otter evidence was found on the Grand Union Canal that passes through the J15a Site and on the Rothersthorpe stream within the site boundary. There are no habitats within the J15a Site Order Limits that are considered suitable for otter holts.

16.137 The surveys are sufficient to prove the likely absence of water voles on site.

16.138 White-clawed crayfish surveys were undertaken on the Grand Union Canal and the Rothersthorpe stream along the site boundary. The crayfish surveys in both watercourses encountered crayfish identified as the invasive non-native signal crayfish. No other crayfish species were found.

16.139 No direct works to the Grand Union Canal in the vicinity of J15a will be required and no surveys for white-clawed crayfish have been undertaken here.

Invertebrates (Terrestrial)

16.140 The invertebrate survey at J15a concentrated on the parcel of land identified as a PWS, as other areas within the Order Limits were typical of arable farmland and comparable to habitat on the Main SRFI Site. The dominant habitat is wet grassland that occupies the majority of the site, with a transition to deciduous woodland at the edges, where mature willows and oaks are present. Scattered willow scrub is also present throughout the central area. The infield vegetation is species-rich, with numerous elements of tall-herb fen, including abundant meadowsweet, marsh thistle, horsetail, willowherb, figwort, dock, as well as rushes, tall sedges and stands of reed canary-grass. Meadow vetchling was abundant throughout and several orchids (Dactylorhiza species) were also noted. Lush marshes, fens and wet meadows are generally very important for invertebrates and several groups likely to be well-represented in such habitats, particularly species of flies with aquatic larvae, such as many soldierflies, hoverflies and craneflies. Various other groups, including plant-feeding beetles and true bugs may also have rich faunas, since the raised botanical interest predicts that numerous invertebrate host plants are likely to be represented. In a wider content, the site may also be of indirect importance as a foraging area for solitary bees and wasps, given its open nature and abundance of meadow vetchling, which can be a key pollen resource for various species, some of which are of high conservation value.

16.141 The most valuable invertebrate habitats present at the site in question are those associated with wetland, in particular marshland and peatland. In combination the species dependent on these two habitats are broadly representative of a fen assemblage. Although the wetland invertebrate assemblage present does not meet the criteria for national o regional significance, the site supports some species which are rare and important in a local context, such as the ground bug *Drymus pumilio*, the weevil *Acalyptus carpini* and the rove beetle *Lathrobium pallidum*. In particular, *D. pumilio* and *L. pallidum* are not previously known from Northamptonshire.

Minor Highway Works

16.142 No surveys have been undertaken at the locations of the minor highway works. Where appropriate, the results will be presented in the ES accompanying the DCO Application.

Predicted Future Baseline Scenario

16.143 Since the land within the Order Limits of the Proosed Development is overwhelmingly in intensive agricultural use there is little scope for baseline change driven by natural processes. Where degradation of species-rich vegetation due to the side effects of agriculture might be an issue (*e.g.* nitrogen release, spray-drift) the process is already far advanced and has nowhere further to go: the hedge-bottoms already support coarse grassland, nettle-bed vegetation and brambles; the pastures are already semi-improved and poor in forbs.

16.144 It follows that developments in agriculture – economic, technological and perhaps aesthetic - and land management policy are likely to be the main drivers of future change. These things cannot be predicted over time-scales relevant to the lifetime of the project, although assuming current trends to promote biodiversity continue, larger and more species-diverse populations of plants and animals would seem to be (marginally) the most likely outcome.

16.145 By contrast, trends in biodiversity over the last 30 years have been towards loss, and the methodological approach of projecting trends would suggest the opposite conclusion to that of the preceding paragraph. That said, trend projection is probably a poor basis for prediction in

this case, because the biota of the site has probably already been reduced to the species that can survive in an intensively agricultural landscape.

16.146 On balance therefore, there is no reason to predict substantial change in the ecological baseline that might be relevant to this ecological impact assessment.

Climate Change Influenced Baseline

16.147 **Chapter 23: Climate Change Mitigation and Adaptation** provides the potential future baseline climatic conditions within the East Midlands, based on the UKCP09 data, as a result of the climate change scenario identified as relevant to this PEIR by the NN NPS. Qualitatively this may result in the following future baseline climatic conditions within the region around the Order Limits:

- an increase in annual average temperature;
- more very hot days particularly during long term operation;
- more intense downpours of rain;
- increase in winter rainfall; and
- an increase in dry spells particularly in summer months.

16.148 With regards to the ecological assets present within the study area, the potential effects due to climate change have been considered qualitatively and in the context of a low likelihood of occurrence can be summarised as follows;

- The Order Limits predominantly contain species adapted to the relatively continental climate of eastern England, and lacks any habitats or vegetation types (and in the main any species) that are typical of the cooler and wetter west of Britain, and therefore liable to be especially at risk from the changes predicted, e.g. peat bogs, woodland floor communities rich in mosses and lichens.
- The hedges, agricultural grasslands and rough grasslands of the Order Limits do not support vegetation types that would change significantly under climate change predictions. For comparison, habitats and vegetation types similar to those in the Order Limits occur to within about 100 miles of the southern coast of France, i.e. into much warmer and drier climates and would therefore appear suited to the potential climatic conditions that may occur albeit this is considered a low risk of occurrence.
- There are likely to be mixed impacts from climate change on specific species which, in combination, may result in overall improvements in biodiversity. For example warmer and drier Summers may improve breeding success in bats and some birds, while at the same time reducing the supply of insect prey, which, as compensation, may have longer to forage (owing to an increased number of suitable warm dry nights).

- One species group recorded from the Order Limits that might benefit from the future climate is that of arable weeds. Many species of declining arable weeds are currently the focus of conservation concern in the UK are actually thermophilous species from southern Europe such as *Sherardia arvensis* (field madder) and which may benefit from the warmer conditions.

- The proposed planting schemes will not use woody species that might become woody weeds (*i.e.* capable of seeding and establishing widely in the landscape) under warmer and drier summer conditions, *e.g.* species that are invasive in southern Europe but not Britain such as *Ailanthus altissima* (tree-of-heaven), *Robinia pseudacacia* (false-acacia). This can be secured through the DCO via the detailed planting schemes.

16.149 Based on the qualitative assessment above and in combination with professional judgement, it is considered that there are no additional significant effects upon the ecological assets identified within the study area from the changes to the future climate baseline. It is therefore not considered necessary to assess this issue further within this PEIR chapter.

Method of Assessment

Overview

16.150 This section describes the assessment methodology that has been applied. Step one involves identifying and valuing important ecological features. Step two is to identify the potential effects arising from the construction, operation and decommissioning of the proposed development as specified in the parameters plan will be constructed, (including any mitigation that is embedded into the scheme). Step three considers the potential effects in relation to the important ecological features in order to identify any impacts that might arise. Step four describes mitigation that is specifically designed to address these impacts (referred to as adaptive mitigation in this assessment). And step 5 lists any residual impacts remaining after adaptive mitigation has been taken into account.

Step 1: Identifying and Valuing Important Ecological Features

16.151 Having established the baseline ecology within the study area, the important ecological features (IEFs) are identified, i.e. those considered to be both potentially affected and important. It is not necessary to carry out detailed assessment of features that are potentially unaffected because they are widespread, unthreatened and resilient to impacts, and will remain viable and sustainable. Importance may relate, for example, to the quality or extent of designated sites or habitats, to habitat/species rarity, to the extent to which they are threatened throughout their range, or to their rate of decline.

16.152 The importance level of any existing designations (e.g. SSSI, LWS, Red Data species), provides the starting point for identifying IEFs, since such designations embody a wide range of established knowledge and reflect consensus views about what is important.

16.153 CIEEM Guidance **(Ref 16.1)** states that "*Ecologists may identify ecological features that are not included in lists of important sites or features, but considered important on the basis of expert judgment e.g. because of their local rarity or because they enable effective conservation of other important features*." A wide range of properties of IEFs may contribute to such judgements e.g.

habitat connectivity issues, information on the distribution of species (e.g. from county Floras), restriction to ancient features of the countryside that cannot easily be re-created, dependencies between one species and another etc.

16.154 The ecological impact assessment guidelines **(Ref 16.1)** require that the value or importance of ecological features should be defined in terms of geographical scale. Therefore, the value (or potential value) of ecological features within the zone of influence for the project has been considered at the scales outlined below.

16.155 These values are applied to the ecological features within a defined geographical context on the basis of existing designations and expert judgement, as in selecting the IEFs. For example:

- an internationally designated site such as a Special Area of Conservation (SAC) or a key population of an internationally important species would be valued at *international level*;
- a nationally designated site such as a Site of Special Scientific Interest (SSSI) or National Nature Reserve (NNR) would be valued at *national level*;
- key areas of BAP habitat or sites of SSSI quality not selected as SSSIs under the system (which only requires a certain number to be selected in an area of search) might be valued at *regional level*;
- first-tier sites designated by local authorities such as Local Wildlife Sites would be valued at *county level*;
- extensive hedgerow networks or key areas of ancient woodland might be valued at *county level* or *district level* depending on judgment;
- second–tier sites designated by local authorities such as Sites of Borough importance (SBIs) would be valued at *local level.*

16.156 For the purposes of assessing impact significance, the value expressed geographically may be translated into categories such as negligible, low, medium or high, as explained in the following section.

Identification of Important Ecological Features

16.157 **Tables 16.21- 16.23** list the important ecological features and the geographical levels at which they are valued. In addition they distinguish between the value that might be inferred from their designation status (*e.g.* national for a SSSI) and their actual value in the context of this assessment, which may be different *e.g.* where the designation features of a designated site are little affected. Separate tables address important ecological features separately, by Main SRFI Site and J15a Site.

16.158 The assessment has been carried out on Important Ecological Features (as defined in Step 1). Not all aspects of the baseline (as outlined in the Baseline Conditions section above) are such IEFs (as defined in the CIEEM guidance **(Ref 16.1)**. A number of ecological features considered there have been scoped out of the assessment because they are widespread, unthreatened and resilient to impacts, and will remain viable and sustainable *e.g.* low ecological value, minimal representation within the study area,

isolation from the Order Limits *etc*. The following ecological features are examples of those which are not considered to be 'important':

- Badgers. No setts were found on the site and this species is widespread. Embedded green infrastructure will provide a higher quality habitat for badgers to forage and build setts. Pre-development surveys will ensure that the Applicant's responsibilities under regulations such as the Protection of Badgers Act, 1992 are met.

- Arable weeds. A few arable weeds of modest note were encountered, but their incidence in the Order Limits is minimal, and well-developed arable weed vegetation is either lacking or mundane. Surveys therefore failed to show that arable margins are an 'important ecological feature' in this instance.

- Rough grassland, nettle-bed and scrub. Though sometimes contributing to biodiversity in the strictly local context, these vegetation types are ubiquitous in lowland Britain, and here represented only by fragmentary and mundance examples.

- Though specific surveys for reptiles found none, two grass snake were spotted incidentally (one on the Main SRFI Site and one on the J15a Site) by an ecologist. These are not considered to be IEFs in this instance, although embedded mitigation in the CEMP will ensure that any present are unharmed during the construction phase.

- Specific surveys for white-clawed crayfish and water voles found none at all.

Table 16.20: Summary of important ecological features – Main SRFI Site

Ecological feature	General UK value inferred by Legislation and Action Plans	Intrinsic value of ecological feature in the context of the development area	Comments and reference to baseline
Designated Sites			
Upper Nene Valley Gravel Pits SPA/Ramsar Site	International	Local	Internationally important wetland area within 10km of the Main SRFI Site.
Non-statutory designated sites (within 100 m): PWSs 241 and Roade Cutting PWS are within the Order Limits. (Roade Cutting SSSI is also in the Order Limits but designated for geological importance) Grand Union Canal LWS and PWS 238, 240, 242 and 236 are within 100m of the Order Limits.	County	Local-County	Shortage of good wildlife habitat in Northamptonshire means that the Grand Union Canal has importance for biodiversity in excess of the protection it receives from local designations. There are several non-statutory designated sites within 100m of the Main SRFI Site and the J15a Site. Many of them are un-surveyed and no data is available regarding their habitat and species.
Habitats			
Species-rich hedges (Important under *The Hedgerows Regulations 1997*	District		Important hedgerows (as defined by the *Hedgerow Regulations 1997)* are recognized as of District importance through the IEEM guidelines (2006). The Main SRFI Site contains seven species-rich hedgerows (900m) that qualify as Important under the regulations

Ecological feature	General UK value inferred by Legislation and Action Plans	Intrinsic value of ecological feature in the context of the development area	Comments and reference to baseline
			and five borderline (933m). They are concentrated in an area to the west of Towcester Road (though a few lie to the east).
Largely intact hedgerow network	District	Local	There is a hedgerow network of c 12.3km. The site contains a network of hedges with 103 hedgerow sections (hedgerows in the sense of the regulations). Being of roughly enclosure act age it was probably never much more complex, and over much of the site it has suffered modest fragmentation. Hedges are a Habitat of Principal Importance and Priority Habitat in the Northamptonshire BAP.
Ancient and Veteran Trees	National	National	As an irreplaceable habitat, loss of ancient or veteran trees should be avoided in accordance with the National Policy Statement for National Networks. 26 veteran, 1 notable and 17 locally notable trees will require removal.
Semi-improved neutral agricultural grassland	Local	Local	The Main SRFI Site contains mesotrophic grassland of quality exceeding that of poor semi-improved grassland (but often only just) in fields in three places within the Main SRFI Site. The swards are mostly referable to the NVC type MG6 *Lolium perenne-Cynosurus cristatus* grassland in three areas though one sward relatively rich in forbs has affinities with additional types. As compared with unimproved swards, most of the swards are relatively impoverished in broad-leaved herbs, though one – perhaps relatively recently sown – is relatively rich in broad-leaved herbs but poor in grasses.
Tall-herb Swamp	County		The general scarcity of wetland habitat in Northamptonshire, the PWS status of the site, the proximity of the Grand Union Canal corridor, and the presence of at least 2 plant species rare in the county suggest that this site should be valued at county level.
Milton Malsor Brook,	Local	Local	The Milton Malsor Brook has a biodiverse corridor with mature

Ecological feature	General UK value inferred by Legislation and Action Plans	Intrinsic value of ecological feature in the context of the development area	Comments and reference to baseline
connecting ditches, and associated wetland plants			trees, scrub, tall-herb vegetation, water-margin swamp and other water-margin vegetation. Several ditches connecting to it and others in the Barn lane area also have some aquatic plants. A largely tree-lined section immediately south of Gayton Road has plant species of modest note in Northamptonshire in very small quantity.
Species			
Farmland birds and breeding birds	District	Local	Nine species are designated as Annex 1 on the EU Birds Directive **(Ref 16.3)**, Schedule 1 on The Wildlife and Countryside Act 1981 **(Ref 16.4)** or are Species Birds of Conservation Concern (BOCC) **(Ref 16.42)** (fieldfare, house sparrow, lapwing, linnet, grey partridge, skylark, starling, song thrush, and yellowhammer). The value of the breeding bird assemblage (BoCC and BAP species) is again due to the mosaic of habitats – the canal corridor with tall-herb swamp, rush pasture, wet ditches, a brook and trees, which allow species of conservation concern to breed and forage.
Barn owls	National.	County	Schedule 1 species of the *Wildlife and Countryside Act 1981.* Three pairs of nesting barn owls were recorded on the main site, which represents an unusually high density for this species when considering the size of the Order Limits. The number of mature/veteran trees on site is providing a valuable resource for nest sites along with the agricultural buildings that are being utilised for breeding sites.
Bats (commuting and foraging)	International –	Local	Bats are listed as a European Protected Species in the *Conservation (Natural habitats, &c.) Regulations 1994* **(Ref 16.43)**. In addition, bat species are listed on the UK and Warwickshire, Coventry and Solihull BAP **(Ref 16.44)**. Bats commute and forage along hedgerows and

Ecological feature	General UK value inferred by Legislation and Action Plans	Intrinsic value of ecological feature in the context of the development area	Comments and reference to baseline
			tree lines throughout the Main SRFI Site in low numbers. In surveys 247 out of 300 bat records were common pipistrelles and 53 were 7 other species. Small areas of woodland that might also be important for foraging and commuting bats are lacking. The hedgerows along Barn Lane in the south-east of the site and hedgerows linked to them were found to be particularly important , probably owing to the proximity of buildings where the bats roost.
Bats (roosting and hibernating)	International	Local	Bats are listed as a European Protected Species in the *Conservation (Natural habitats, &c.) Regulations 1994* **(Ref 16.43)**. In addition, bat species are listed on the UK and Warwickshire, Coventry and Solihull BAP **(Ref 16.44)**. Small non-maternity roosts of common pipistrelle were found in four buildings. Hibernation surveys were not carried out (bats hibernating in buildings are hard to find) but it isy likely that the small number of resident common pipistrelle bats on site will hibernate in the buildings.
Great crested newt	International –	Local	Great crested newts are listed as a European Protected Species in the *Conservation (Natural habitats, &c.) Regulations 1994.* There is a medium population of great crested newts outside the Main SRFI Site to the east of the NLL, within 500m of the Proposed Development Area. Under the current guidance **(Ref 16.22)** an EPS licence will be required in order for works to proceed. Although no earthworks are proposed for the area east of the NLL, fencing is required to prevent movement of great crested newts into the potential development area. Mitigation is likely to include Exclusion of the site using drift fencing and pitfall traps to ensure any great crested newts potentially on site are relocated prior to any works commencing.

Ecological feature	General UK value inferred by Legislation and Action Plans	Intrinsic value of ecological feature in the context of the development area	Comments and reference to baseline
Plant species	Local	Up to county	Several plant species are of note owing to their scarcity in Northamptonshire according to information in the most recent Flora for the county. Several are locally frequent along the canals but nowhere else in the county. A few are frequent on the limestone in the north of the county but not in the parts of the county south of Northampton. Though none have any statutory protection or BAP status, some are nevertheless to be valued in the county.

Table 16.21: Summary of important ecological features – Junction 15a Site

Ecological feature	General UK value inferred by Legislation and Action Plans	Intrinsic value of ecological feature in the context of the development area	Comments and reference to baseline
Designated Sites			
Upper Nene Valley Gravel Pits Special Protection Area (SPA/Ramsar Site)	International	International	Internationally important wetland area within 10km of the Main SRFI Site.
Non-statutory designated sites Grand Union Canal LWS and PWS 239 are within the Order Limits. PWS 250 is within 100m of the Order Limits.	County	County	Shortage of good wildlife habitat in Northamptonshire means that the Grand Union Canal has importance for biodiversity in excess of the protection it receives from local designations. There are two non-statutory designated sites within the Order Limits and a further one within 100m of the Order Limits.
Habitats			

Tall-herb Swamp within PWS 239	District	County	The general scarcity of wetland habitat in Northamptonshire, the PWS status of the site, the proximity of the Grand Union Canal corridor, and the presence of at least 2 plant species rare in the county suggest that this site should be valued at district level.
Woodland and scrub	Local	Local	The J15a site includes willow scrub and wet woodland within PWS 239. Secondary woodland and plantation woodland associated with the M1/A43 junction.
Aquatic and Water Margin Vegetation	District	County	These occur in the Grand Union Canal itself where there are well developed water margin habitats, and limited aquatic vegetation.
Ancient and veteran trees	National	National	As an irreplaceable habitat, loss of ancient or veteran trees should be avoided in accordance with the NN NPS. One locally notable tree may require removal as part of the Proposed Development of 12 identified as being veteran (2no.), notable (2no.) or locally notable (8 no.).
Species			
Farmland birds and breeding birds	Local to International (dependent upon bird species and numbers).	Local	Key legislation relating to birds is the *Wildlife and Countryside Act 1981.* Many bird species are listed on the UK BAP. Of 30 species recorded 27 were confirmed as breeding, probable breeding or possible breeding. Using the adapted criteria set out by Fuller **(Ref 16.45)** the site has a breeding bird assemblage that is of importance at a District level (25 to 49 species). The value of the breeding bird assemblage (BoCC and BAP species) is again due to the mosaic of habitats - the canal corridor with tall-herb swamp, rush pasture, wet ditches, a brook and trees, which allow species of conservation concern to breed and forage.
Bats (commuting and foraging)	International	County	Bats are listed as a European Protected Species in the *Conservation (Natural habitats, &c.) Regulations 1994.* In addition, bat species are listed on the UK and Warwickshire, Coventry and Solihull BAP. Both

			transect surveys and static surveys have shown that the canal is used extensively by bats for commuting and foraging. At least 7 species of bat were recorded during both types of survey including passes recorded of Barbastelle bat an Annexe II species.
Otters	International	Local	Signs of otter were recorded along the Grand Union Canal, although habitat in this area is generally unsuitable for holts due to insufficient undisturbed habitat with dense understorey vegetation. However it is an active commuting an foraging route for this species.
Invertebrates	Local	County	The most valuable invertebrate habitats present at the site in question are those associated with wetland, in particular marshland and peatland. In combination the species dependent on these two habitats are broadly representative of a fen assemblage. Although the wetland invertebrate assemblage present does not meet the criteria for national or regional significance, the site supports some species which are rare and important in a local context, such as the ground bug *Drymus pumilio*, the weevil *Acalyptus carpini* and the rove beetle *Lathrobium pallidum*. In particular, *D. pumilio* and *L. pallidum* are not previously known from Northamptonshire.
Plant species	County	Up to county	Several plant species in the canal corridor are of note owing to their scarcity in Northamptonshire according to information in the most recent Flora for the county. Most are locally frequent along the canals but nowhere else in the county. A few are frequent on the limestone in the north of the county but not in the parts of the county south of Northampton. Though none have any statutory protection or BAP status, some are nevertheless to be valued in the county, especially two in the PWS - *Cardamine amara* (Large Bitter-cress) and *Dactylorhiza praetermissa* (Southern Marsh-orchid) – which are generally scarce in the county.

Step 2: Assessment of Likely Significant Effects

16.159 The assessment focuses on the effects of the Proposed Development on the Main SRFI Site and J15a site. The minor highway works largely take place within the limits of the existing highway and are considered unlikely to result in any significant adverse effects. A consideration of any effects at Junctions 14 (Tove Roundabout) and 15 (Abthorpe Roundabout) where works may extend outside the highway boundary will be made in the ES accompanying the DCO Application.

16.160 The assessment assumes incorporation of mitigation which has been embedded into the scheme design. This is shown in the Parameters Plan (**Appendix 5.1**) and described in **Chapter 5: The Proposed Development**. Embedded mitigation specific to ecology is described in the Embedded Mitigation section below.

16.161 Having considered the parameters plan and the embedded mitigation, the magnitude of each likely significant effect on an IEF (at the construction, operation and decommissioning stages) is specified, taking into account a range of factors specified in the CIEEM guidelines as follows:

- positive or negative;
- extent;
- size;
- duration;
- timing;
- frequency; and
- reversibility.

16.162 Whether or not an effect qualifies as significant, depends on whether it is likely to have an effect on the integrity of the relevant IEF. Effects are significant if they materially alter the structure and function of sites or habitats or the conservation status of habitats and species.

16.163 The EC Habitats Directive (Article 1, sections (e) and (i)) provides definitions for the conservation status of habitats and species, and the CIEEM guidance **(Ref 16.1)** uses modified versions of these definitions so that evaluation of conservation status can be applied to habitats or species within any defined geographical area:

- "For habitats, conservation status is determined by the sum of the influences acting on the habitat, that may affect its extent, structure and functions as well as its distribution and its typical species within a given geographical area"; and
- "For species, conservation status is determined by the sum of influences acting on the species concerned that may affect its abundance and distribution within a given geographical area."

16.164 CIEEM Guidance **(Ref 16.1)** states that for the purposes of ecological impact assessment a 'significant effect' is an effect that either supports or undermines biodiversity conservation objectives for 'important ecological features' or for biodiversity in general, it can be positive or negative.

16.165 The overall level of significance of each effect is determined qualitatively by comparing its magnitude against the value (sensitivity) of the IEF. For this purpose, magnitude of effect is expressed synoptically on a scale of **high, medium,** and **low** (or negligible, if the magnitude of effect would have no perceptible effect on the integrity of the IEF). The value (sensitivity) of the affected IEF (already assessed on a geographical scale) can similarly be expressed as **negligible, low, medium, high** (or combined classifications, such as low/medium) as shown in the table below. The significance of the effect is identified on a scale of **negligible, minor, moderate** and **high**. Where the matrix below identifies a combined classification, either professional judgement is used to choose one classification or the other, or a "mid" level between the two significance levels is assumed.

Table 16.22 Significance of Effects

		Value of Important Ecological Feature					
		Local (low)	**District (low/medium)**	**County (medium)**	**Regional (medium/high)**	**National (high)**	**International (high)**
Magnitude of Effect	Low	Negligible	Minor	Moderate/ Minor	Moderate	Moderate /High	Moderate /High
	Medium	Minor	Moderate/ Minor	Moderate /High	Moderate /High	High	High
	High	Minor/ Moderate	Moderate /High	High	High	High	High

16.166 Direct, indirect, residual and cumulative impacts are also considered:

- Direct impacts are changes directly attributable to a defined action of the Proposed Development such as the physical loss of a habitat or the immediate mortality of an individual of a particular species
- Indirect impacts are attributable to an action which affects ecological resources through effects on an intermediary ecosystem, process or receptor, e.g. a loss of food resources for a species downstream of a site due to fish-kill by polluted runoff entering a river.
- After assessing the impacts of the proposal all attempts should be made to avoid and mitigate ecological impacts. Once measures to avoid and mitigate ecological impacts have been finalised, assessment of the residual impacts should be undertaken to determine the significance of their effects on ecological features.
- Cumulative impacts are the collective effects of changes that may be insignificant individually but in combination, often over time, have the potential to be significant.

Embedded Mitigation

General Principles

16.167 The Proposed Development has been carefully designed to avoid significant ecological effects by applying the mitigation hierarchy:

- Avoidance – adopt options that avoid harm to ecological features, *e.g.* retention of veteran trees where possible, seasonal timing of works specified in the Construction Environmental Management Plan (CEMP).
- Mitigation – where effects cannot be avoided, adopt options that reduce and minimise them, *e.g.* reduction of noise, dust *etc.* through good construction practice specified in the CEMP.
- Translocation – where effects on certain IEFs (not all) cannot be avoided in a particular location it may sometimes be possible to move the IEF to a new and safe location (this approach is only possible for specific environmental disciplines, most obviously ecology).
- Compensation – where ecological effects cannot be avoided or fully mitigated and therefore give rise to significant residual adverse effects, appropriate compensatory provisions should be made.
- Enhancements – encouraged in various planning policies are measures to provide benefits to biodiversity or ecosystem functioning over and above what is required for avoidance, mitigation or compensation of effects. Opportunities to provide nature conservation enhancement have been incorporated in the Proposed Development (mostly) through the Green Infrastructure Plan.

16.168 This section describes design features embedded into the Proposed Development that act as ecological mitigation. They qualify as embedded mitigation id they are shown in the Green Infrastructure Plan and the Parameters Plan **(Appendix 5.1)** or if they are outlined in the CEMP (**Appendix 13.4**). This section does not describe additional mitigation required to address specific impacts (Adaptive Mitigation), which is described in the **Adaptive Mitigation** section later in this chapter and shown on the Ecology Mitigation Plan**, Appendix 5.4.** It is intended that all identified mitigation (as identified in the DCO Schedule of Mitigation) would be secured through a requirement in the DCO.

Green Infrastructure Plan

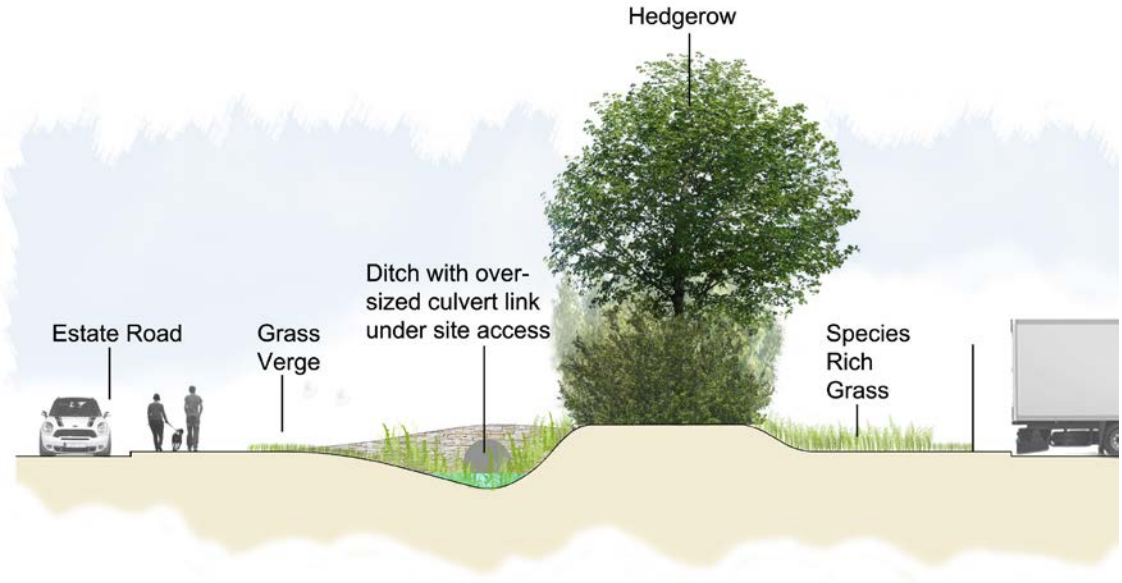
16.169 The Green Infrastructure Plan and the Parameters Plan have been developed iteratively with inputs from various environmental disciplines (see **Chapter 3: Reasonable Alternatives** and **Chapter 5: The Proposed Development**). They show the locations of the following features that are key to delivering the embedded ecological mitigation:

- locations of retained vegetation;
- locations of different landscape zones, some of which would be publically accessible;
- locations of proposed and retained water bodies; and

- locations of proposed green infrastructure and linkages through the site including new and retained water courses, hedgerows, ditches and woodland.

16.170 The embedded mitigation is based on principles of Green Infrastructure, as defined by the Northamptonshire Green Infrastructure Plan (**Ref 16.46**), in that there are clearly defined areas of landscape-scale open space which link to the surrounding countryside. These include where hedgerows are shown, that they will be wildlife hedgerows with oversized culverts to facilitate passage of small mammals through the site (see **Plate 16.1**, below). However there is potential to further enhance and improve the function of the proposed green infrastructure within the Order Limits and these are described in the **Adaptive Mitigation** section.

Plate 16.1 Illustration of Oversized Culvert



Typical Section Through Estate Road Landscape at 15 Years

Measures embedded in Statute

16.171 It is assumed that all licences and permits listed in the **Licences and Consents** section will be obtained, and that any requirements of those licences set out by Natural England or the Environment Agency will be adhered to (mitigation, additional survey, monitoring *etc.*), as a matter of law.

16.172 With specific reference to EPS licences for bats, the mitigation measures that will be required are not shown on the Green Infrastructure Plan (**Appendix 5.1**) and are therefore described in the **Adaptive Mitigation** section and shown on the illustrative landscape design plan (**Appendix 5.1**).

CEMP

16.173 The CEMP has been developed to manage environmental issues associated with construction, and principles outlined within it are considered embedded mitigation for the purpose of this PEIR. The CEMP will be secured through a requirement of the DCO and will be able to be amended with agreement of the Llocal Planning Authority. It addresses the following matters that are of particular relevance to ecology:

- installation and maintenance of fencing at the start of construction – providing that all retained and immediately adjacent habitat, including PWSs and watercourses, will be appropriately buffered or fenced to ensure there is no accidental damage or encroachment from construction traffic;
- environmental awareness training for construction personnel;
- dust control;
- appropriate storage of fuels, lubricants and chemicals following general best practice methods such as the Environment Agency Pollution Prevention Guidelines (although now withdrawn);
- construction lighting; and
- environmental management.

16.174 The CEMP specifies that an Ecology Manager will be appointed to supervise the habitat clearance activities and licensable activities, an Ecological Clerk of Works (ECoW). They will also plan and oversee implementation of ecology mitigation including habitat creation, protection of retained habitat, and the licensable activities. The Ecology Manager will be responsible for the implementation of the Habitat Management Plan for the site.

16.175 The CEMP also contains specific advice on ecological issues to be followed during construction, particularly during clearance of vegetation for groundwork including the following: protection of breeding birds, great crested newts, retained trees and hedgerows.

16.176 Potential impacts that are avoided due to measures contained in the CEMP include sediment laden run off into watercourses, dust deposition on adjacent habitats, disturbance to animals in adjacent habitat from noise generation, construction site lighting, traffic and the presence of personnel *etc*. These will be reduced to minimal levels acceptable for wider purposes (including health and safety) by measures set out in the CEMP. There remains a possibility of some level of disturbance to IEFs on adjacent land, especially the Grand Union Canal corridor (and species resident there), which will be addressed by adaptive mitigation. In particular there may be temporary disturbance – mainly noise and visual disturbance - in the canal corridor during landscaping works on immediately adjacent land within the main SRFI site (works that will later buffer the canal corridor against disturbance when the site is operational).

16.177 Reference should be made to the CEMP for detail regarding this construction-phase mitigation, but examples of measures are described below.

Lighting

16.178 After-dark lighting during construction phases will be directed away from retained natural habitat, as directed by the Ecological Clerk of Works (ECoW) i.e. wetland habitats, hedgerows or specimen trees. These dark corridors will reduce the impact on bats, allowing free movement between foraging and resting sites.

16.179 To minimise disruption to bats, light sources utilised will employ lamps with minimal or zero ultra violet (UV) emission (insects are attracted to UV).

16.180 To minimise disturbance to commuting/foraging otters and bats, there will be no night working within 100m of the Grand Union Canal. No lighting will be left on within 50m of the canal, and none within 100m unless it is screened and directed away.

16.181 In ecologically sensitive areas, the lighting design will adopt a light quality that minimises disruption to existing ecological systems in the form of 'LED' light sources (<4200K) which emit minimal UV and blue light.

Habitat Management Plan

16.182 The Habitat Management Plan will set out the specific management prescriptions for the areas of habitat to be managed for wildlife benefit. It will be designed by ecologists who are knowledgeable about the scheme, and implemented by the Ecology Manager. The plan will include a schedule of monitoring to measure the success of mitigation measures and implement changes if necessary, for a period of 5 years. It is intended that the Habitat Management Plan will be secured through a requirement in the DCO.

Ecological Protection during Construction

16.183 All retained habitat (as shown in the Green Infrastructure Plan) will be appropriately buffered or fenced to ensure there is no accidental damage or encroachment from construction traffic, as laid out in the CEMP.

16.184 Unless otherwise specified, there will be fenced-buffers of at least 15m from retained potential wildlife sites within and adjacent to the development area.

16.185 Retained watercourses and hedgerows will similarly be protected from damage during construction by 10m and 5m buffers respectively. Silt fencing will be installed to prevent run-off from spoil piles into watercourses and ponds as directed by the ECoW.

16.186 Specific advice on ecological issues to be adhered to during construction will be further developed by the appointed contractor (Ecology Manager), as detailed below, and supervised by the ECoW if appropriate.

Grand Union Canal

16.187 Disturbance to sensitive ecology areas will be minimised by measures designed to avoid lighting impacts. In particular, to avoid disturbance to commuting bats and otters, no lighting will be left on within 50m of the Grand Union Canal, and none within 100m unless it is screened and directed away.

16.188 There will be no night working within 100m of the canal.

Nesting Birds

16.189 Where possible, habitat should be removed during the winter period, before the end of February. Trees and scrub should be cut to ground level and where possible roots removed. Where this is not possible, appropriate action must be taken to ensure relevant habitats remain unsuitable for nesting birds during the nesting season. This could include trimming scrub prior to the nesting season, and as above keeping the grass short. If removal at this time is not possible then the vegetation will require checking by an ecologist prior to removal.

16.190 If a nest is found then works around the nest will be stopped and the Ecology Manager will be informed. Works within the immediate area will be delayed until the young have fledged.

16.191 Trees with Barn Owl nesting sites will be excluded at a suitable time of year following the installation of pole mounted nest boxes both within the red-line and in neighbouring land to provide compensatory roost sites. No works will take place within 500 m of the nest sites if they are being used by nesting Barn Owls.

Tree Removal - Potential Bat Roosts

16.192 A high proportion of trees on the site have the potential for use by roosting bats. A thorough survey of all trees on the site has been undertaken, but however final surveys are required for medium and high potential trees prior to them being felled. A detailed tree removal plan will be supplied to the contractor and no trees should be removed without first being surveyed by an ecologist to prevent the possible destruction of a roost site. Nothing should be stored against tree trunks and the site compound and excavation works should be undertaken outside the spread of the trees canopy.

Veteran Tree Removal

16.193 A CIEEM registered ecologist/arboriculturalist will be consulted at least one month in advance of tree felling, so that an appropriate receptor location for the felled veteran tree can be identified. Possible options for veteran trees are addressed in the Adaptive Mitigation section.

Great Crested Newts

16.194 There is a medium population of great crested newts outside the Main SRFI Site to the east of the NLL, but within 500m of the Order Limits. Under the current guidance an EPS licence will be required in order for works to proceed. Although no earthworks are proposed for the area east of the NLL, fencing will be required to prevent movement of great crested newts moving into the potential development area. Exclusion of the site using drift fencing and hand searches pitfall traps to ensure any great crested newts potentially on site are relocated prior to any works commencing.

Construction of Bat and Barn Owl Roosts in Buildings

16.195 Renovation of the field barns on the Main SRFI site and J15a Site are part of the ecology mitigation proposals as shown on the Parameters Plan. However, details of the renovation and specific guidance from ecologists will be sought regarding the design and construction of the buildings, and the works will be subject to an EPS licence.

16.196 Any other bat roosts in buildings due to be demolished will be the subject of an EPS licence. The Ecology Manager in collaboration with the licence holder will be responsible for ensuring that the mitigation measures are implemented and that subsequent monitoring is undertaken.

Badgers

16.197 The site will be re-surveyed for badgers within 1 month of construction starting as badgers can set up a new territory very rapidly. Should a new sett be discovered near the construction area an ecologist will monitor the holes for activity. If any new holes are discovered on site the use of heavy machinery within 530 m of the sett must be avoided and the Ecology Manager contacted.

16.198 While construction is ongoing all contractors should be aware badgers are active on the site could use the site and therefore precautions such as any pits or / trenches dug should be covered up or left with an escape ramp if left overnight.

16.199 A 'good housekeeping' policy will be adopted e.g. chemicals should be stored securely at night time, food waste should be removed at frequent intervals, and any machinery should be prevented from not encroaching into root protection areas for all retained vegetation including woodland and hedgerows. the woodland.

Additional Elements within the CEMP

16.200 Other elements of the site will require specific inputs from an ecologist during and in advance of construction (as well as subsequent monitoring) and will be overseen by the Ecology Manager. These are likely to include the following related to site construction:

- Sign-off on source and composition of grass seed mixes to be used in areas of natural habitat creation.
- Inputs to design of attenuation ponds.
- Inputs to design and planting of re-aligned river corridor.
- Advice on location, type and source of bat boxes, bird boxes, and barn owl boxes.
- Detailed inputs to design and implementation of ecology mitigation area at J15a.
- Wildlife pond creation including location, design and planting.
- Location of deadwood piles.
- ECoW assistance in watching briefs during removal of potential reptile habitat.

16.201 The characteristics of the embedded mitigation insofar as they affect specific habitats and species at particular locations during operation, are discussed in more detail below.

Embedded Mitigation during Operation

Main SRFI Site

16.202 The Proposed Development has been designed to retain features of ecological value wherever possible.

Vegetation and Planting

16.203 As outlined in **Chapter 3: Reasonable Alternatives**, the Main SRFI Site has been designed to include Green Infrastructure links between the site and the wider countryside (including designated sites). It will primarily serve landscape and visual purposes, but mostly it will have a dual role, serving ecological purposes as well. The total area of the site available for landscaping that may benefit ecology is approximately 116.7ha. Of this 13.8 hectares is retained farmland to the east of the NLL (though no specific mitigation is proposed here as addressed below) and 3.2 hectares will be developed as a new pocket park to the west of the A43. Whilst the Parameters Plan does not stipulate any specific planting or habitat types to be created in the Green Infrastructure, it indicates they should have a landscape and screening function. However it is here assumed that the planting will consist of native species and comprise a mixture of grassland, scrub and woodland planting. There is no specific requirement in the Parameters Plan for the location or quantity of hedgerow planting, although some will be included in the Green Infrastructure provision. However, to mitigate

for loss of the hedgerow network and species-rich hedgerows, hedgerows in the Green Infrastructure will need to replicate the form and function of typical farmland hedgerows. This will be part of the detailed landscape design and is dealt with in **Adaptive Mitigation** section**.**

16.204 The Parameters Plan shows significant green buffers between the development area and the Grand Union Canal, and also around the edge of the Order Limits as a whole, making a soft-boundary into the surrounding countryside. This buffer zone, which also lies in close proximity to two PWSs (240 and 241), will be managed to provide a continuous area of mixed habitat including woodland, scrub and species-rich grassland. Lighting will need to be carefully managed to minimise spill from the operational area but this adaptive mitigation will be described in the **Adaptive Mitigation** section.

16.205 This planted buffer strip along the Grand Union Canal edge of the Main SRFI Site, will mean there are no impacts on pWS240 or 242. Likewise habitat will be retained and protected in the area identified as pWS 241 adjacent to the A43 in the south-western corner of the site, meaning that there will be no direct loss of habitat from pWS 241. PWSs that are within or immediately adjacent to the Order Limits will be protected from construction impacts such as dust emissions by measures contained in the CEMP.

16.206 To the east of the NLL is an area of proposed retained farmland of approximately 13.8ha. No screen planting is required in this area. However, to achieve any ecological benefit from this area, specific enhancements will be necessary, and these are not embedded in the Proposed Development, nor are any proposed. It is possible that if the Northampton Gateway project does not go ahead, this area could be used for positive ecological benefit.

16.207 A north-south green corridor along Northampton Road will provide connectivity for wildlife both within the Main SRFI Site and between it and the wider countryside. Approximately half of a stretch of Important Hedgerow will be retained near the location of the new underpass at Northampton Road. Where the majority of Important Hedgerows, and other hedgerows will be removed, specific adaptive mitigation is required as described in the **Adaptive Mitigation** section**.**

Watercourses and Waterbodies

16.208 The length of the Milton Malsor Brook that will need to be diverted has been minimised thereby avoiding effects on plants and animals including *Adoxa moschatellina* (moschatel), which is uncommon in Northamptonshire. In the diverted section, adaptive mitigation will include channel profiling for a variety of flow rates, depths and widths thus providing enhancements for fish and aquatic invertebrates, as well as features to encourage otters, water voles and white-clawed crayfish.

16.209 New water attenuation ponds will be created as part of the Sustainable Drainage Scheme (SuDS) scheme, along the northern boundary of the Main SRFI Site. These will provide valuable new aquatic habitat and have potential for a significant positive effect. However the embedded mitigation does not include enhancements specifically for ecology. In order to maximise their benefit for wildlife, adaptive mitigation is necessary. Further information on the water resources assessment is set out in **Chapter 14**.

Species

16.210 Individual species including bats, barn owls, locally important plant species and veteran trees will require adaptive mitigation which will be delivered through Requirements within the DCO (**see Table 16.26, Adaptive Mitigation** section).

16.211 As indicated above, measures included in the CEMP will protect species such as badgers during the construction phase – although no evidence of badgers on the site was found during surveys. Likewise, a lighting strategy for bats is included in the CEMP that will also prevent disturbance to otters and other wildlife using the canal corridor. The following section describes embedded mitigation to protect species on the Main SRFI Site prior to and during construction works. While the Parameters Plan doesn't specifically address individual species, benefits to many will arise from the embedded green infrastructure design, and especially from planting that will create habitat for a range of species.

16.212 The proposed Green Infrastructure will provide foraging and commuting habitat for bats. By area this will more than replace habitats that will be lost along hedge-lines in the Main SRFI Site (since the greater central part of any large arable field is suboptimal for bats). The effectiveness of the Green Infrastructure in providing mitigation for effects on bats will be enhanced by landscape, planting and lighting design dealt with as adaptive mitigation in the **Adaptive Mitigation** section**.**

16.213 A lighting scheme will be designed for the site during the operational phase and this is described in **Chapter 21: Lighting.** Lighting is likely to be used along the primary and secondary roads. In ecologically sensitive areas, the lighting design will, adopt a light quality that minimises disruption to existing ecological systems in the form of 'LED' light sources (<4200K) which emit minimal UV and blue light. Specific measures to minimise light effects on bats are described in the **Adaptive Mitigation** section.

16.214 As the green infrastructure will include grassland as a substantial element in mosaic with scrub and woodland, and given that there will be attenuation ponds along the northern boundary of the Main SRFI Site and a stream corridor, there will be provision of large areas of non-intensively managed habitat suitable for a wide range of animals including breeding birds, reptiles and a wide range of invertebrates, including species not present in the Main SRFI Site due to the predominance of intensive agriculture.

J15a Site

16.215 The Order Limits for the J15a site includes a 26ha parcel of land which is specifically designated for ecological mitigation to address habitat loss from the Main SRFI Site (and to a lesser extent the J15a Site). Without adaptive mitigation, this area would remain as farmland with no enhancements, and it would add no specific ecological benefit. Likewise there would be no adverse effects on ecology, from its preservation in its current condition. For example there may be great crested newts in ponds within 500m of the ecology mitigation area, but this assessment assumes that there will be no adverse impacts as no works are proposed. Indeed, if they are present, it may be possible to improve habitat for great crested newts and extend their range into the ecology mitigation area (see **Adaptive Mitigation** section).

16.216 In order to mitigate for adverse ecological effects arising from a range of habitats and species over the scheme as a whole, the ecological mitigation area will be subject to baseline surveys and detailed design in consultation with ecologists, as described in the **Adaptive Mitigation** section.

16.217 pWS 239 is inside the Order Limits at J15a. However, the CEMP will ensure that the majority of it (approximately 90% of the area) will be fenced-off and protected during the construction phase.

However, a small part at the north of the pWS (approximately 10%) will be lost for the construction of the new A43 sliproad.

16.218 The Grand Union Canal LWS is within the Order Limits where there will be a new road bridge crossing constructed. In addition to its intrinsic value aquatic, water-margin and other habitats, and its value for plants uncommon in Northamptonshire, it is an important route for foraging and commuting bats and is particularly sensitive to lighting. It is also used by commuting otters. The CEMP will ensure construction is conducted in a way that prevents or minimises possible effects on the canal – especially addressing such matters as spillages that might affect the water quality and thence IEFs - but additional adaptive mitigation is required in order to avoid adverse effects on animal species.

Minor Highway Works

16.219 There is no specific embedded mitigation for the Minor Highway Works, other than the Order Limits are largely within highway land. General measures in the CEMP will apply as described previously.

Assessment of Construction Phase Effects

16.220 This section uses the ecological baseline and the scheme description as set out in **Chapter 5: The Proposed Development** and illustrated in the Parameters Plan and Green Infrastructure Plan (**Appendix 5.1**) to identify potential effects on the important ecological features assuming the embedded mitigation described above, but not any adaptive mitigation.

16.221 The effects predicted here were used to identify priorities for adaptive mitigation. The significance of any effects remaining after additional (adaptive) mitigation (i.e. residual impacts) were then assessed.

16.222 Temporary and permanent effects on IEFs that might arise from the construction phase of the Proposed Development between 2019 to 2029 are shown in Table 16.23 (Main SRFI Site) and 16.24 (J15a). In summary, this includes phased clearance of vegetation from the Main SRFI Site and J15a (other than areas identified in the Green Infrastructure Plan as retained vegetation), development of construction compounds, and construction of the Proposed Development as described in Chapter 5. At the Main SRFI Site this includes internal roads, parking, development plateaus with warehousing, intermodal area with associated rail connections and infrastructure including utility diversion and new utility development.

Table 16.23 – Main SRFI Site – Construction Phase Effects

Important Ecological Feature	Value of IEFerred by Legislation and Action Plans	Intrinsic value of IEF in Context of Order Limits	Effect	Magnitude of effect	Duration of effect	Significance of Effect
Upper Nene Valley Gravel pits SPA/Ramsar site	International	Local	Surveys show that birds for which the SAC is designated do not use the site, and effects on birds from the SAC will therefore be minimal.	Low	Temporary	Negligible
Roade Field pWS(241)	County	County	Although there will be no loss of habitat from the site, it is barely outside the Order Limits and the proposed Green Infrastructure works are immediately adjacent and may encroach upon the habitat if it is not protected by fencing during construction.	Low.	Temporary	Minor Adverse
Grand Union Canal LWS	County	County	Although there will be no permanent loss of habitat from the site, 0.93ha is within the Order Limits and the new slip road will pass over the canal. Habitat may be damaged if it is not protected by fencing during construction.	Low	Temporary	Minor Adverse
Species-rich hedges (important)	District	District	Loss of 7 species-rich hedgerows (and 5 borderline species-rich hedgerows).	High	Permanent	Moderate Adverse
Largely intact hedgerow network	District	District	The existing hedgerow network (c.12km) will be removed for the construction, but new hedgerow planting will create a new hedgerow network that will, in time, fulfil the same function. Permanent loss of foraging habitat and commuting routes for bats in the southern section of the site Loss of farmland and hedges, temporary disruption to bat commuting routes between the north and south of the site during construction of the spine road through	High	Temporary (until hedgerow planting is established across the site)	Moderate Adverse

			the site and the construction of the pedestrian underpass.			
Ancient and Veteran Trees	National	County	Loss of 44 trees (26 veteran, 17 Locally notable and 1 Notable tree.	High	Permanent	Major adverse
Semi-improved neutral agricultural grassland	Local	Local	Loss of *c.*158 ha of arable farmland habitat and up *c.*90 ha of agricultural grassland.	High	Permanent	Minor adverse
Milton Malsor Brook	Local	Local	Rerouting of c.780m of the Milton Malsor Brook and loss of some wet ditches connecting to it.	Low	Temporary (until realignment and habitat re-established)	Minor Adverse
Farmland birds	Local	Local	Loss of a landscape used by farmland birds with large fields and narrow boundary features (hedges and mature trees – the grassland and scrub of the Green Infrastructure will favour many bird species but less so these. There is nevertheless other similar habitat in the local area.	High	Permanent	Moderate Adverse
Breeding birds	Local	Local	Partial loss of nesting habitat during construction period while green infrastructure is becoming established.	High	Temporary	Minor Adverse
Breeding birds	Local	Local	Provision of extensive nesting habitat in green infrastructure of grassland and scrub	Medium	Permanent	Minor Beneficial
Barn owls	National	County	Loss of breeding sites in trees and buildings and foraging habitat, arising from vegetation clearance.	High	Permanent	Major Adverse
Bats (roosting and hibernating)	International	Local	Loss of small non-maternity roosts in four buildings. EPS licence will be required.	High	Permanent (in absence	Minor Adverse

					of mitigation associated with EPS licence)	
Birds & bats	International	Local/County	Disturbance through noise and vibration, lighting or physical presence of people and plant during construction	Low/ medium	Temporary	Minor Adverse
Great crested newt	International	Local	Pond off-site contains medium population of great crested newts which may use terrestrial habitat within the Order Limits. EPS licences will be required.	Low	Temporary (only for duration of construction)	Minor Adverse
Plant species	County	County	Several plant species scare in Northamptonshire will be lost as a result of vegetation clearance for the development.	Medium, because only small numbers of plants of any species are affected.	Permanent	Moderate Adverse
Provision of new Green Infrastructure	Local	Local	Since a large percentage of the Main SRFI Site is arable supporting very little biodiversity (on an amount per unit area basis), the green infrastructure would provide a net increase in biodiversity even without the incorporation of ecological mitigation into the landscape design. It is not to be expected that the green infrastructure will provide habitat suitable for all of the farmland plant and animal species that are likely to be lost, and therefore it is not to be expected that all adverse impacts will be avoided by provision of the green infrastructure (in the	High	Permanent	Minor Beneficial

			absence of adaptive mitigation). However, other species are likely to benefit, and the effect on net biodiversity is likely to be beneficial.			
Provision of Ecology Mitigation Area	Local	Local	An area of approximately 26ha will be dedicated to ecological mitigation at J15a. This will primarily mitigate habitat loss from the Main SRFI Site. This area is currently under agricultural use. In the absence of adaptive mitigation, the beneficial effects are not significant, but stem from the fact that there will be no adverse change.	Low	Permanent	Negligible

Table 16.24 – J15a Site – Construction Phase Effects

Important Ecological Feature	General UK value inferred by Legislation and Action Plans	Intrinsic value of IEF in Context of Order Limits	Effect	Magnitude of effect	Duration of effect	Significance of Effect
Grand Union Canal LWS	County	County	Loss of c. 0.93ha habitat and shading effects on a section of the Grand Union Canal with well developed aquatic and water margin vegetation.	Medium	Permanent	Moderate Adverse
pWS 239	County	County	0.5ha (approximately 10%) from the north of this site will be permanently lost for the construction of the new A43 sliproad. The remainder of the site will be protected and retained. However, the new slip road will mainly cause loss of willow scrub and perhaps some tall-herb fen vegetation in the northern part of the PWS close to the existing road network. Though this scrub contributes to the overall biodiversity of the PWS, it is the tall herb fen to the south that is the unusual and important element in the make-up of the PWS; and this tall-herb fen – along with the scarce plants associated with it including *Cardamine amara* (large	Medium	Permanent	Moderate Adverse

			bitter-cress) and *Dactylorhiza praetermissa* (southern marsh-orchid) – will be mostly outside the area of landtake. Moreover being to the south, the fen and its scarce plant species will not be shaded.			
Invertebrates	Local	Local	Loss of 0.5ha wetland habitat with locally rare invertebrate species.	Medium	Permanent	Minor Adverse
Bats (commuting and foraging)	County	County	The Grand Union Canal is an important feature for commuting and foraging bats. Temporary impacts will occur during the construction phase, when disturbance from lighting and noise may occur.	High	Temporary	Moderate Adverse
Otters	International	Local	Otters use the Grand Union Canal to forage and commute, but there is no suitable habitat for holts. Impacts may arise from temporary obstruction of the canal towpath, lighting and noise.	Medium	Temporary	Moderate Adverse
Birds, bats & otters	International	Local/County	Disturbance through noise and vibration, lighting or physical presence of people and plant during construction	Low/ medium	Temporary	Minor Adverse
Plant species – tall herb swamp	County	County	Loss of county importance species arising from vegetation clearance.	High	Permanent	Moderate Adverse
Locally notable tree	Local	Local	Potential loss of one locally notable tree adjacent to the current southern roundabout for Highway works	High	Permanent	Minor Adverse
Provision of Ecology Mitigation Area	Local	Local	An area of approximately 26ha will be dedicated to ecological mitigation (although to mitigate habitat loss primarily from the Main SRFI Site, there will also be some habitat loss from J15a) . This area is currently under agricultural use. In the absence of adaptive mitigation, the beneficial effects are not significant, but the overall negligible effect stems from the fact that there will be no adverse change.	Low	Permanent	Negligible

Assessment of Operation Phase Effects

16.223 This section again uses the ecological baseline and the scheme description as set out in **Chapter 5: The Proposed Development** and illustrated in the Parameters Plan and Green Infrastructure Plan (**Appendix 5.1**) to identify potential effects on the important ecological features assuming the embedded mitigation described above but not any adaptive mitigation.

16.224 The effects predicted here were used to identify priorities for adaptive mitigation. The significance of any effects remaining after additional (adaptive) mitigation (i.e. residual impacts) were then assessed.

16.225 The impacts of the Proposed Development will mostly arise at the construction stage, and relatively few effects arising during the operational phase can be related to either the current baseline or that indicated in the Parameters Plan and Green Infrastructure Plan. This section does however consider failure to achieve the aims of the Green Infrastructure Plan so that the matter can be duly addressed in the adaptive mitigation through requirements for ecological management DCO documents.

16.226 The following temporary and permanent effects on IEFs might arise from the operation of the Main SRFI Site and surrounding road network (including J15a and Minor Highway Works) between 2021 and 2089. Effects are shown in Table 16.25 (Main SRFI Site) and 16.26 (J15a).

Assessment of Decommissioning Phase Effects

16.227 Given the long-term proposed life of the Proposed Development, a specific assessment of decommissioning effects has not been made. It is assumed that decommissioning would involve removal of the hardstanding areas of the site and buildings (development plateaus, internal roads, intermodal areas) and restoration of that part of the site to previous usage (agriculture). In this case, assuming the green infrastructure were maintained, there would be limited adverse effects on any mature landscaping, other than “construction-style” effects of noise, dust and traffic. However, it is more likely industrial use would continue in another form, on some or all of the site with re-commissioned buildings or similar. Given the uncertainties, no assessment is provided.

Table 16.25 – Main SRFI Site – Operation Phase Effects

Important Ecological Feature	Value of IEF	Intrinsic value of IEF in Context of Order Limits	Effect	Magnitude of effect	Duration of effect	Significance of Effect
Foraging and commuting bats	County	County	Bats in the Grand Union Canal corridor and in the green infrastructure could be deterred by poorly designed lighting or noise from the operational site.	Medium	Permanent	Minor adverse
Foraging and commuting bats	County	County	The Grand Union Canal is an important feature for commuting and foraging bats. The new bridge over the canal may provide new permanent roosting opportunities. There will be redistribution of lighting and traffic noise.	High	Permanent	Negligible
Otters	International	Local	Otters moving along the Grand Union Canal or the Milton Malsor Brook could be deterred by badly designed lighting or noise from the operational site.	Minor	Permanent	Minor adverse
Breeding birds	Local	Local	Use of the green infrastructure by the public and their dogs or noise from the operational site could lead to disturbance of breeding birds, though extensive scrub will provide extensive sequestered areas.	Minor	Permanent	Minor adverse
Breeding birds, invertebrates, plants	Local	Local	Neglect of management in the green infrastructure could lead to loss of species or reduced population sizes.	Minor	Permanent	Minor adverse
Mixed habitat	Local	Local	Complete failure of mitigation plantings is implausible, but partial failure including slow development could detract from levels of ecological provision.	Minor/medium	Temporary	Minor adverse
Mixed habitat	Local	Local	Use of the green infrastructure by the public will provide ecological amenity	Minor	Permanent	Minor beneficial

Mixed habitat	Local	Local	Emissions of dust, particulates or NOx from vehicles could adversely affect vegetation within or adjacent to the Main SRFI Site	Minor	Permanent	Minor adverse

Table 16.26 – J15a Site – Operation Phase Effects

Important Ecological Feature	General UK Value of IEF inferred by Legislation and Action Plans	Intrinsic value of IEF in Context of Order Limits	Effect	Magnitude of effect	Duration of effect	Significance of Effect
Breeding birds, invertebrates, plants	Local	Local	Neglect of management in the *c.*25 ha ecology mitigation area could lead to loss of species or reduced population sizes.	Minor	Permanent	Minor adverse
Mixed habitat	Local	Local	Complete failure of habitat creation plantings in the *c.*25 ha ecology mitigation area is implausible, but partial failure including slow development could detract from levels of ecological provision.	Minor/medium	Temporary	Minor adverse
Mixed habitat	Local	Local	Use of the footpath through the *c.*26 ha ecology mitigation area by the public will provide ecological amenity	Minor	Permanent	Minor beneficial
Mixed habitat	Local	Local	Emissions of dust, particulates or NOx from vehicles could adversely affect vegetation within or adjacent to J15a	Minor	Permanent	Minor adverse

Cumulative Assessment: Inter-Project Effects

16.228 Lists of proposed plans and projects within 5km of the Main SRFI Site and 2km of the J15a Site were filtered to extract those that required significant land-take (e.g. applications for more than 100 new houses). These were examined in further detail to see whether there might be any accumulated impact. The details for these projects are in **Table 16.27.**

Table 16.27 Summary of Projects Considered for Cumulative Effects

ID	Application Reference	Site Address	Description	Distance from Project	Comments and reference to baseline
CI.1	S/2016/0400 /EIA Policy E8	Northampton Junction 16 Strategic Employment Site (SNC)	B1, B2 and B8 uses, the site will be 42ha gross, a minimum of 2ha will be a secure lorry park, proposals for B1(A) office will not exceed 1,000sqm, the max size of any unit will be 40,000sqm gross. Submitted by Midway South LTD & Henry Bletsoes & Son LLP	5.5km	42ha of land required for this development, the majority of which is arable farmland. The EIA showed no significant adverse effects.
CI.2	N/A	Northampton Gateway Land west of M1 Junction 15 and west of the A508, south of Collingtree (SNC)	Strategic Rail Freight Interchange now proposed 'Northampton Gateway' 5.0m sq. Ft. – Up to 468,000 sq. M (approximately 5 million sq. Ft.) (gross internal area) of warehousing and ancillary buildings, with up to 155,000 sq. M of additional floorspace provided in the form of mezzanine floorspace; Applicant: Roxhill (Junction 15) Ltd	Adjacent: Order Limits could include (overlap) part of the Rail Central site	See **Assessment of Cumulative Effects, Northampton Gateway** for discussion.
CI.49	S/2015/2492 /MAF and S/2015/1233 /MAF	Land to the South of Knock Lane Blisworth	Installation of a solar PV array plus ancillary development Applicant: Solar Power Inc UK Services Limited / SPI China (HK) Ltd	1.5km	Ecology issues identified in the PEA were hedgerows, nesting birds, reptiles and bats. Mitigation measures are proposed for all impacts.
CI.4	Application	Northampton	1,000 dwellings, site for a	0.8 km	The proposal

	ref N/2013/1035 allowed at appeal (3028151) August 2016 for 1,000 dwellings, N/2013/1063 for full permission for 380 of the 1,000 units dismissed at same appeal. Policy N5 (S/2013/1376/NA)	South SUE (NBC)	primary school, green infrastructure including formal and informal open space, reconfiguration and extension of Collingtree Park Golf Course, demolition of all existing buildings and structures within the site, new vehicular accesses off Windingbrook Lane and Rowtree Road, car parking, sustainable drainage systems (including flood risk betterment) and infrastructure (including highway improvements) Applicant: Bovis Homes		results in loss of arable farmland. However, no detailed ecological information or assessment is available.
Cl.5	N/2013/0338 (S/2013/1286/NA) N/2016/0758 S/2017/0081/SCO Policy N6	Northampton South of Brackmills SUE (NBC) Application address Land to the east of Hardingstone and north of Newport Pagnell Road	Outline planning application for the development of sustainable urban extension to include up to 1000 dwellings (Use Class C3), supporting retail facilities of up to 1,320 sqm net (Use Classes A1, A2 and A3), food and drink premises of up to 375 sqm net (Use Class A4), a two form entry primary school (Use Class D1) and up to 750 sqm of community uses which may include a medical centre, pharmacy and community centre (Use Class D1). Infrastructure improvements including a new pumping station, green infrastructure and highway access from Landimore Road and Newport Pagnell Road Applicant: Homes and Communities Agency, Martin Grant Homes and Harcourt Developments submitted Scoping Opinion	4.0km	The Scoping Report identified ecology as being a consideration for EIA. The development is likely to result in the loss of arable farmland, hedgerows and trees. There is no data available on the results of the planned ecological surveys for the site, or about the proposed mitigation measures and any residual effects.
Cl.19	S/2007/0813/PO	Land east of Wootton	Residential development for up to 300 dwellings , with all	3.8km	A report on biodiversity at

	S/2011/0989 /MAR	Fields Newport Pagnell Road Northampton (SNC)	associated highway and other infrastructure works.(Outline) Applicant: Twigden Homes		this site concluded that the grassland affected had no ecological value. Hedgerow networks were recommended to be kept in tact and provisions were recommended for exclusion of great crested newts.
Cl.9	N/2011/0997 (S/2011/1308/CW) Policy N9	Northampton Upton Park SUE (NBC)	Outline planning application for up to 1000 residential units, primary school and local centre up to 2000 square metres. All matters reserved except access Applicant: Homes and Communities Agency	3.8km	41ha of agricultural land will be affected by the proposals although no detail is available and it is unclear whether this application was progressed.
Cl.10	S/2016/1324 /EIA (N/2016/0830) Policy N9A	Northampton Norwood Farm/Upton Lodge SUE (SNC)	Hybrid planning application seeking both full and outline planning permission for: Part A: Outline planning permission for a sustainable urban extension comprising: Up to 1,900 dwellings (use class C3);Public open space and children's play areas; Landscape areas, new landscape planting and hydrological attenuation features and sustainable drainage systems; Primary school (use class D1); and Mixed use local centre which may include residential (use class C3), retail (use classes A1, A2, A3, A4 and A5), and health and community facilities (use class D1). Part B: Full planning permission for:	5.0km	The Environmental Statement states that residual impacts for the proposed development are predicted to be neutral to beneficial for all ecological features..

			Demolition of any on site buildings or structures; and Routing of Sandy Lane Relief Road and associated vehicular access points Applicant: Barwood Development Securities Limited		
Cl.16	S/2014/2513 /MAF	Land at Grange Park, Zone C Saxon Avenue Grange Park (SNC)	Erection of two Class B8 use distribution warehouses including ancillary Class B1(a) offices, service yards, gatehouse, car parking, landscaping, removal and works to trees protected by a Tree Preservation Order, lighting, drainage infrastructure, plant and works, access improvements and vehicular circulation. Applicant: Goodman Real Estate (UK) Limited	1.5km	An ecological appraisal of the site states that the grassland and ephemeral vegetation are negligible value, their loss of this area will not lead to any significant effects. Measures were suggested to enhance the site for biodiversity.
Cl.85	S/2014/1522 /MAF	Land at Handley Park Farm Towcester	Solar Farm, to include transformer housings, substation, security fencing and cameras, landscaping and other infrastructure and associated works	within 2km of works to no.15 Phase 1 junction	An ecological appraisal of the site states that the current arable land within the construction area is of low ecological value. The inclusion of habitat enhancement measures such as the development and management of structured grassland is expected to provide a net

					biodiversity gain at a local level.
Cl.91	S/2017/3060 /MAO	Land West of Rothersthorpe Road Kislingbury NN7 4AA	Outline planning application for up to 44 dwellings, including vehicular access; land for use by the Village Hall; and agricultural access to field.	4.5km from Main SRFI	Information about the likely habitat loss arising from this proposal was not identified.
Cl.92	S/2017/2620 /MAO	Land south of Kislingbury Road Rothersthorpe	Outline planning permission for up to 66 dwellings with associated landscaping, open space and vehicular and pedestrian access.	1.km	Information about the likely habitat loss arising from this proposal was not identified.
Cl.98	N/2016/068 8 N/2017/159 9	Nectar Way, Zone E, Northampton, Northamptons hire	Construction of units for Use Class B8 (Warehouse and Distribution) with ancillary office space and car parking; lorry parking; service yard; sub-station and associated earthworks; engineering; drainage; and landscaping works	2.7km	Information about the likely habitat loss arising from this proposal was not identified.

16.229 Only where another project gives rise to appreciable effects can this project add to the cumulative impact of other projects. Given the impact assessments reached in respect of other projects listed above there are no cases where the impacts of this project could add to something identified as an impact in another project.

16.230 There is, however, potential to add to cumulative impacts of hedgerow loss, which could be significant at a county scale. Here it is the integrity of hedgerow networks that is likely to be the main concern, though loss of individually important hedges may also occur. And there is some potential for cumulative effects on commuting and foraging bats in consequence of this.

16.231 Similarly there is potential to add to the cumulative impacts of farmland habitat loss on specialist farmland bird species which could be significant at county scale. Though habitat provided in compensation for the Rail Central project, and others, is likely to lead to a net gain in habitat for a broad spectrum of birds, especially garden birds, the compensatory habitat would not be suitable for specialist farmland birds which favour the traditional landscape of hedgerows and large open fields.

16.232 An additional cumulative project will include the proposed grid connection for the Main SRFI Site to the Northampton West primary substation. This is anticipated to be an underground connection following existing utilities conduits in the highway boundary. Given this will largely be in an urban setting with different ecological receptors, and the additional impact to the construction of the

Proposed Development (which is anticipated to be constructed at the same time) will be negligible, there is not considereed to be the potential for significant cumulative impact on ecological receptors.

16.233 A full assessment of cumulative effects will be made in the DCO application, using information available at the time.

Assessment of Cumulative Effects, Northampton Gateway

16.234 A review of the scoping report for the Northampton Gateway project indicates that the sensitive ecological receptors are very similar to those at the Main SRFI Site, comprising hedgerows, mature trees, bat foraging and commuting habitat, and farmland bird habitat.

16.235 However in addition there are great crested newt breeding and terrestrial habitat; golden plover over-wintering habitat (in regular use); and reptile habitat (including a low population of common lizard).

16.236 There is approximately 13.8ha of land that lies within both Order Limits, which is here earmarked for retained farmland although not for ecological mitigation. If the Northampton Gateway Project were to secure this land as proposed, for rail infrastructure associated with that project, then the green infrastructure provision would be reduced. If the Northampton Gateway Project were to not proceed, there is potential for Rail Central to enhance this area for ecology, as it is not required for other purposes.

Assessment of Cumulative Effects, Minor Highway Works

16.237 As the minor highway works are largely within the adopted highway, no significant cumulative effects to ecological features are expected. An assessment of junctions with development proposed outside the highway boundary will be made in the DCO submission.

Cumulative Assessment: Intra-Project Effects

16.238 Predicted levels of noise impact and air pollution impact will not cause significant impacts on the ecological receptors most sensitive to these sources. Residual effects, taking into account good practice measures to avoid noise and vibration as outlined in **Chapter 18: Noise and Vibration** will be not significant in EIA terms.

16.239 The ecology mitigation has been developed in conjunction with the landscape mitigation so that the latter does not give rise to adverse ecological impact. In fact the landscape mitigation has been designed to enhance biodiversity, and should lead to a beneficial intra-project effect.

16.240 Flood alleviation and realignment plans for the Milton Malsor Brook has taken full account ecological concerns, and ecological mitigation should not be adversely affected by the flood alleviation provisions.

16.241 Ecological mitigation should enhance the perceived environment for users of footpaths and other provisions for public use in the green infrastructure.

Adaptive Mitigation

Introduction

16.242 The schedule of mitigation below outlines the key non-embedded measures (i.e. adaptive) that will be required to ensure impacts on wildlife are minimised during construction and operation of the Main SRFI Site and J15a Site. Adaptive mitigation will deliver potential benefits tailored to species that it is desirable to promote in the Northamptonshire context. In addition, it will ensure that any adverse impacts on biodiversity are more than counterbalanced by benefits from green infrastructure and ecological mitigation areas in accordance with planning policy.

16.243 The development and adoption of detailed landscape prescriptions will ensure the delivery and long-term management of open spaces within the Order Limits, including those which are to be managed for wildlife. These areas are shown on the ecological mitigation plan **(Figure 16.4**). The green infrastructure has been designed to take account of habitats and species that are already present on the site, and highlighted in the Northamptonshire local biodiversity action plan. Specifically, the key areas of habitat creation across the main SRFI site are described in **Table 16.28**.

Table 16.28: Schedule of Mitigation

Potential Effect	Proposed Mitigation	Means of Implementation	Mechanism for securing mitigation	Predicted effect of mitigation[1]
Disturbance to wildlife by lighting and noise & vibration – during construction	Construction work (excluding archaeological investigations, landscaping and any non-intrusive internal fit-outs) is not assessed to take place other than between 7.00am – 7.30pm weekdays and 8.00am – 1.00pm on Saturdays After-dark lighting during construction phases will be directed away from retained natural habitat, as directed by the Ecological Clerk of Works (ECoW) i.e. wetland habitats, hedgerows or specimen trees. To minimise disruption to bats, light sources utilised will employ lamps with minimal or zero ultra violet (UV) emission (insects are attracted to UV). To minimise effects on otters and bats, there will be no after-dark working within 100m of the canal. No lighting will be left on within 50m of the canal, and none within 100m unless it is screened and directed away.	CEMP	EPS licence (Bats) and Requirement in DCO	Noise and vibration and lighting will be limited to daytime hours to minimise disturbance to nocturnal species. Creation of dark corridors will allowi free movement between foraging and resting sites. Lights chosen will not attract bats due to insect attraction
Disturbance to wildlife by lighting and noise & vibration – during operation	To maintain connectivity along the eastern side of the site a proposed pedestrian tunnel beneath the main spine road through the site will have lighting designed to activate as people pass through the tunnel during the hours of darkness. When no human activity is present the tunnel will remain dark allowing bats to commute along the dark hedgerows that line the proposed footpath along the eastern boundary. This will maintain a direct commuting link with the north and south areas of the site allowing bats to commute into the wider landscape. There will be no lighting of attenuation ponds or river corridors. New	Lighting Scheme	Requirement of DCO EPS Licence (Bats)	

[1] A brief qualitative assessment of how the proposed mitigation will affect the potential effect will be provided in the DCO submission. An example is provided.

Potential Effect	Proposed Mitigation	Means of Implementation	Mechanism for securing mitigation	Predicted effect of mitigation[1]
	habitat will not be directly lit at night. It is proposed that lighting will be erected on buildings and other structures throughout the site. This lighting will be for health and safety purposes and security, in conjunction with CCTV cameras. Where possible lighting used for security away from areas where staff may require access, infrared illumination in conjunction with cameras sensitive to infrared will be used. This will create some dark areas throughout the site that may allow bats to forage around the warehouses particularly where there are proposals to create swales and ponds. Lighting on buildings and other structures will be designed in consultation with a CIEEM registered bat ecologist. Operational noise at night will be controlled through a requirement of the DCO, which will ensure minimal noise outside warehouses.	Noise limits	Requirement of DCO	
Loss or damage to Potential Wildlife Site (J15a) , loss of hedgerows and farmland birds	A new c26ha area will be dedicated to ecology mitigation. The site will be designed by ecologists but will consider the following features: A mixture of field sizes and shapes with new hedges. Near the canal create some fields smaller still (about 100x100 m) but interlinked so that cattle can move through freely through them, and separated by substantial areas of wet scrape or willow scrub. Manage the 'winter bird' fields with winter stubbles and ploughed but unsown headland strips c.6 to 7 m wide. Plant new species-rich native-species hedges to form most of the field boundaries, so far as possible in such a way as to restore damaged networks. All hedges should have a bank and a ditch, should connect to other hedges. About 35% of hedges should have standard trees at on average 50 m intervals – *Quercus robur* (Pedunculate Oak) but *Castanea sativa* (Sweet	Habitat Management Plan	Requirement of DCO and s106 agreement	

Potential Effect	Proposed Mitigation	Means of Implementation	Mechanism for securing mitigation	Predicted effect of mitigation[1]
	Chestnut) could be used in a limited area to provide some diversity. • Create field corner or field edge ponds of varying design (shape, profile, depth etc.) • In the canal corridor, i.e. a 100 m wide strip east of the canal, create small interconnected pasture fields (see above) totalling c.66% of the area, broken up by wet scrapes c.18% and blocks of willow scrub 18%. Wet scrapes can be allowed to colonise naturally, but some should be just deep enough to maintain areas of standing water with deep pools at the centre Create a few 'follies' of traditional engineering brick in the low-lying fields for scarce plants including ferns and mosses. These not need to be elaborate. If they can be given some meaning, e.g. sides of cattle track-ways over wet scrapes then so much the better. • Manage the canal corridor and the fields closest to the M1 as pasture, and whatever else needs to be. under grass to make livestock farming viable. • Where there is land under grass outside the canal corridor – close to the M1 and the A43 perhaps - consider planting parkland trees			
Failure of mitigation due to inadequate planning and management.	Ongoing management of new habitat areas. The Habitat Management Plan (HMP) will cover an initial period of at least five years after construction. Ongoing ecological management will be undertaken for the lifetime of the site as part of the ongoing landscape work, and prescribed management actions will be rolled forward, with a 5-year review. The management plan will provide details on who will be responsible for management works and set out how this will be funded. This will be secured through a legal agreement (e.g. section 106). Once agreed, the HMP will be adequately funded to achieve its targets.	Habitat Management Plan and 15yr management and Maintenance Plan	Requirement of DCO and s106 agreement	

Potential Effect	Proposed Mitigation	Means of Implementation	Mechanism for securing mitigation	Predicted effect of mitigation[1]
	The HMP will set out management requirements following construction for these created, retained and protected areas including pond management, river corridor planting, scrub control, retention of dead wood and pruning management of hedgerows.			
Failure of newly created habitat to thrive and achieve aims of ecological enhancement.	Ensuring success of habitat creation and mitigation. Ongoing monitoring of habitats created and enhanced will be needed to ensure it meets the required level of quality. Monitoring will initially be undertaken annually during the summer for the first 3-years while the vegetation becomes established, in year 5 and then subsequently every three years. Following these annual monitoring visits, a short report outlining the survey results and details on any necessary remediation works (required to improve the quality of the created or enhanced habitat) will be made available to the County Ecologist. Ongoing surveys could be undertaken by local wildlife groups or community volunteers to encourage ownership of the ecological area. However, they must be overseen by professional ecologists (CIEEM registered).	Habitat Management Plan and 15yr management and Maintenance Plan	Requirement of DCO and s106 agreement	
Loss of wet ditches, field corner ponds etc.	Enhancement of embedded mitigation – attenuation ponds. The water attenuation ponds will be with inputs of a CIEEM registered ecologist, to maximise their wildlife benefit. The specifications of the design will be over and above that required for attenuation, to benefit ecology (subject to engineering and hydrological constraints). The margins will be planted with a range of aquatic and emergent species appropriate to Northamptonshire including *Alisma plantago-aquatica* (water-plantain), *Apium nodiflorum* (fool's water-cress), *Butomus umbellatus* (flowering-rush), *Caltha palustris* (marsh-marigold), *Carex pseudocyperus* (cyperus sedge), *Iris pseudacorus* (yellow iris), *Potamogeton* sp. (pondweed) *Ranunculus*	Detailed landscape design	Requirement of DCO	

Potential Effect	Proposed Mitigation	Means of Implementation	Mechanism for securing mitigation	Predicted effect of mitigation[1]
	flammula (lesser spearwort) and *Ranunculus* sp. (water crowfoot).			
Adverse ecological effects arising from diversion of Milton Malsor Brook corridor.	Enhancement of embedded mitigation – Milton Malsor Brook corridor A c.780m length of Milton Malsor Brook will need to be diverted. It will be profiled to provide a variety of flow rates, depth and widths. Further detailed design of the brook corridor, and planting scheme will be developed in consultation with CIEEM registered ecologists. The brook will be planted with water-margin species currently found there and in adjacent ditches. Excessive shading will be avoided. Watercourse design will use guidance from the River Restoration Centre's publications and benefit from the knowledge and experience of an aquatic ecology team. The aim would be to create a hydromorphologically diverse channel with habitat features to encourage aquatic and riparian wildlife (e.g. shallow berms for aquatic vegetation and associated invertebrates, pools and riffles, substrates suitable for gravel-spawning fish, and etc.). Features would be included to encourage water voles and white-clawed crayfish, which are not currently present.	Detailed landscape design/planting scheme. Habitat Management Plan	Requirement of DCO	
Loss of hedgerows and field margins for invertebrates.	Enhancement of embedded mitigation - for invertebrates. Mitigation for invertebrates focuses on maintaining and enhancing the physical network of hedges across the landscape into the long term future. All new plantings will involve species that are native to this general area of Britain, so that they might service residual populations of insects; A hedgerow management regime will be established that allows for some sections of hedge to develop without regular cutting (this is particularly important to the survival of some moths whose eggs are laid on the tips of twigs and may rest in this position for several months before hatching). Any solar panels fitted on the site in the future will include a pattern of	Habitat Management Plan	Requirement of DCO and s106 agreement	

Potential Effect	Proposed Mitigation	Means of Implementation	Mechanism for securing mitigation	Predicted effect of mitigation[1]
	roughened or painted glass or a horizontal light blocking grid so that they are no longer attractive to aquatic invertebrates. The lighting plans designed to minimise impacts on bats will also help reduce the impact on light sensitive invertebrates. The creation of new grassland areas and wetland will lead to a significant increase in suitable habitat for most of the UK BAP priority species recorded within 1km of the site.			
Loss of semi-improved agricultural grasslands, rough grasslands etc.	Enhancing embedded mitigation - ensuring appropriate mix of grassland species. Where new grasslands are created they will use a native and locally appropriate seed mix which mimics typical wildflower meadows for Northamptonshire. To support populations of the yellow-faced bee, mixes will include *Daucus carota* ssp. *carota* (wild carrot). Grass seed mixes will be chosen in consultation with CIEEM registered ecologists, with an understanding of the site and its local characteristics.	Landscape Masterplan	Requirement of DCO	
Effects of hedgerow loss on foraging and commuting bats	Hedgerow removal can lead to the loss of important connections within the landscape for commuting bats and also a reduction in insect diversity and hence foraging opportunities. Where roadways cross hedgerows (likely to be used by bats for foraging and commuting) the hedgerow gap will be minimised. To minimise disruption of commuting routes of bats vehicle crossings along the primary road are will not exceed 20m. For the secondary roads, footpaths and cycle-ways this width will be reduced. In addition, where severed the retained ends of the hedgerow will be maintained at its existing height wherever possible so that bats have a feature that they can navigate from. Hedgerow features will be retained where possible in total darkness during	Detailed site design Lighting strategy	Requirement of DCO EPS Licence (bats) & Requirement of DCO	

Potential Effect	Proposed Mitigation	Means of Implementation	Mechanism for securing mitigation	Predicted effect of mitigation[1]
	night time periods, as this will also aid light sensitive species of bats in moving around the landscape. Areas that are illuminated are actively avoided by many species of bat. Artificial lighting disrupts the normal 24-hour pattern of light and dark which is likely to affect the natural behaviour of bats. Bright light may reduce social flight activity and cause bats to move away from the light area. Studies have shown that continuous lighting along roads creates barriers which some bat species cannot cross			
Loss of green corridors and connectivity to wider habitat.	Enhancement of embedded mitigation - Green infrastructure A43 Ecological Corridor. The footpath that links the Grand Union Canal to Milton Malsor will be diverted around the western edge of the main SRFI site. The underpass that will be required at the main site access road will be designed to facilitate passage of wildlife, including bats. This includes native tree planting and calcicolous grassland and managing this area as a dark zone.	Detailed landscape plan and planting scheme.	Requirement	
Loss of bat roosts in buildings	The mitigation will include the renovation and repair of BG1 – Barns 1 and 2. The renovation of these building could provide long-term roosting opportunities for a number of bat species. This will include crevice roosting around the edges of the roof of each of the buildings, crevice roosting within cavities designed into the walls of the buildings, and also roosting opportunities within the roof voids. A range of mitigation and compensation will be included for the plans for the site to provide alternative roosting opportunities for the bats using these buildings. The majority of these new roosting opportunities will be in place well in advance of the demolition of the existing roosts in order for the bats on site to discover the new roosting opportunities and to start using them. This will provide roosting opportunities for the three historically recorded	Detailed site design.	EPS licence (Bats) Requirement of DCO	

Potential Effect	Proposed Mitigation	Means of Implementation	Mechanism for securing mitigation	Predicted effect of mitigation[1]
	species of bat and help provide an opportunity for these bats to potentially re-colonise the north of the site, along with mitigation to maintain commuting routes and foraging areas. The renovation of the barns is a priority and will be completed prior to works commencing on the demolition of the existing buildings on the site. Final design of the buildings will be in consultation with a bat licenced ecologist. BG3 – The nursery. This building group has not been surveyed but is close to BG2 – Manor Farm where day roosts have been identified, and transect surveys have identified consistent commuting and foraging by bats along Farm Lane and adjacent hedges. It is possible that a roost is present here and should be subject of at least an initial inspection prior to any development of the site, which includes the demolition of these buildings. The new bridge across Grand Union Canal will have bat boxes of an appropriate design attached to it to complement the existing potential in the other three bridges. The Design Manual for Roads and Bridges Chapter 10 Section 4 details where such bat boxes should be used and this will be followed in deciding where boxes will be erected. The boxes will be appropriate for a range of species.			
Loss of barn owl roosts	• Pole mounted nest boxes will have wood chippings placed inside the chamber when they are installed as this ensures that owls can use them for breeding rather than wait for a build up of pellets – they will never lay eggs on bare wood. •Boxes will be purchased from a specialist (not from a large company) as they will be of improved modification and constructed of marine ply board. •Boxes should not be placed near footpaths and ideally nettles/ brambles	Detailed site design. Habitat Management Plan	Requirement of DCO	

Potential Effect	Proposed Mitigation	Means of Implementation	Mechanism for securing mitigation	Predicted effect of mitigation[1]
	should be allowed to grow at the base to deter vandalism. •3 pole mounted nest boxes should be installed at the main SRFI site – less than 500m from the field barns to account for double broods (ideally in the area of land off-site where the veteran trees are). • 3 pole mounted nest boxes should be installed at the J15a site – less than 500m from the barns to account for double broods – even spread throughout the J15a mitigation area but some near the eastern boundary to encourage birds away from the road. • 6 pole mounted boxes installed off site (two groups of 3) subject to landowner agreements. The tree nesting site to the south of the main site cannot be replaced so ideally off-site mitigation would be installed on off-site land. • Pole mounted / tree mounted nest boxes should be installed for kestrel – 6 boxes would be suitable within the area for both sites. The kestrel boxes should be lined with gravel to ensure instant nesting potential. • All boxes should have a clear label with phone number of ecologist responsible and a unique ID number.			
Loss of potential bat roosts in trees	Bat boxes will be used throughout the site and a bat box scheme will be initiated using retained trees. The purpose of these boxes is to supply compensatory roosting opportunities for lost roosts in buildings, additional roosting over and above that which would be necessary to compensate for that loss, the purpose being to provide a large range of varied roosting opportunities. These bat boxes should be a range of boxes constructed from woodcrete or a similar material for longevity. They will include a range of box designs that promote roosting by the species identified on site. These boxes should include Schwegler 1FF and Schwegler 3FF both flat boxes that are known to be attractive to all *Pipistrelle* species and *Plecotus*	15yr Management and Maintenance Plan (M&MP) Habitat Management Plan	EPS Licence (Bats) Requirement of DCO Habitat Management Plan	

Potential Effect	Proposed Mitigation	Means of Implementation	Mechanism for securing mitigation	Predicted effect of mitigation[1]
	species, Schwegler 1FD box suitable for Pipistrelle and Plecotus spp. Maternity roosts. These boxes should be mounted on trees at least 4 m from the ground. Bat boxes particularly the Schwegler 3FF should also where practicable be mounted on the sides of some of the new units particularly along the dark corridors along the western edge of the site and through the central area of the site adjacent to the re-aligned stream. At this stage it is not possible to identify specific locations for bat boxes on buildings. Bat licensed ecologists will be consulted immediately before construction of each new building, to identify appropriate types of bat boxes and locations. Trees that have potential roost features will, where possible, be retained so that bats can roost in the gaps and cavities. As trees are removed where roost features are present, these features will be sectioned out where possible and attached to trees around the site that are to be retained. This provides new roosting opportunities in areas where they do not currently exist or augments the existing opportunities. A Habitat Management Plan will be drawn up by CIEEM registered ecologists, so that trees can be actively managed for their potential for roosting bats			
Loss of ancient and Veteran Trees and species associated with eg Invertebrates, bats and birds	Around 39.2ha of woodland planting and c. 2,300 large stature trees will be incorporated into the scheme design. Principal tree species will be field maple and oak, with some crab apple, aspen, hornbeam, and limes and alder (latter along the watercourse). The following methods will be utilised where ancient and veteran trees are to be removed. A CIEEM registered ecologist will be consulted at least one month in advance of tree felling, so that an appropriate receptor location can be identified.	Detailed landscape and planting plan.	Requirement of DCO	

Potential Effect	Proposed Mitigation	Means of Implementation	Mechanism for securing mitigation	Predicted effect of mitigation[1]
	Tree Resurrection – Large diameter stems should be utilised in as large a single length as possible/appropriate and installed resting on the ground at the base of an existing tree and attached at the top with non-invasive methods. The location and method should be coordinated by a CIEEM registered ecologist and an arboriculturist in order to choose the best combination of providing habitat for a variety of species with connectivity to nearby features, together with safe positioning and attachment in an appropriate location for health and safety reasons. This should be the first consideration for large stems. **Limb/feature re-attachment** – Deadwood and newly cut limbs can be affixed to living tree branches to provide habitat for saproxylic invertebrates, woodpeckers and bats. This again should be undertaken with ecologist/arboriculturist advice. **Deadwood habitat piles** – Any stems and branch wood that cannot be utilised as above should be retained in appropriate areas as close their origin in as large sections that are possible and compatible with other aspects of land use. This again provides value habitat for an array of common and rare species. Consideration will be given to using seeds (and cuttings where viable) from veteran trees that require removal, that will be propagated by a specialist nursery and incorporated into woodland mixes.			
Loss of species rich hedgerows and hedgerow network	Enhancement of embedded mitigation. There is insufficient variation in the existing hedges to warrant several different planting mixes. Planted hedges are often too much overplanted with 'exciting' species to look like any real agricultural hedge. The planting mixes here will be carefully designed around the composition of the better	Habitat Management Plan and detailed	Requirement of DCO	

Potential Effect	Proposed Mitigation	Means of Implementation	Mechanism for securing mitigation	Predicted effect of mitigation[1]
	hedges of the Main SRFI Site. They will not all be identical, and again the variation will be designed to be realistically reflect the character of the existing hedges. All planting material will be of local provenance. The integrity of the hedges will be secured by separating them from nearby scrub and woodland plantings. Typically each hedge will have a wide ditch on one side and a species-rich grassland strip on the other. The commonest species in the hedges is *Crataegus monogyna* (hawthorn), and this will form much of the compensatory hedgerow matrix. The best hedges also contain *Crataegus laevigata* (midland hawthorn) and its hybrid with hawthorn – *Crataegus* x *media* (hybrid hawthorn) and these will be included. In some parts of the Main SRFI Site *Prunus spinosa* (blackthorn) is the main species, so this will also be reflected in the planting scheme. There will be some *Crataegus*-type hedges and some *Prunus*-type hedges. Some of the hedges are *Ulmus* cf. *procera* (English elm), but this takes over in hedges, and will be avoided. *Fraxinus excelsior* (ash) will be avoided owing to ash die-back disease.	landscape design.		
	The planting mixes will be: A - *Crataegus monogyna* (hawthorn) 50% in 70% of hedges; B - *Prunus spinosa* (blackthorn) 60% in 30% of hedges in the lowest lying areas; 10% *Crataegus monogyna* (Hawthorn) in the 'B' 60% *Prunus spinosa* (blackthorn) hedges, and 10% blackthorn in the 'A' 50% hawthorn hedges; *Crataegus laevigata* (midland hawthorn) and *Crataegus* x *media* (hybrid hawthorn) 10% in all the 'A' 50% *Crataegus monogyna* (hawthorn) hedges; Rosa *canina* (dog-rose) and *Sambucus nigra* (elder) together 15% each in all hedges;	Detailed landscape design.	Requirement of DCO	

Potential Effect	Proposed Mitigation	Means of Implementation	Mechanism for securing mitigation	Predicted effect of mitigation[1]
	Malus sylvestris (crab apple) 10% in 50% of hedges and *Corylus avellana* (hazel) 10% in the other 50%; • in the 'A' 50% *Crataegus monogyna* (hawthorn) hedges, the remainder to be made up from *Acer campestre* (field maple), *Cornus sanguinea* (dogwood), *Corylus avellana* (hazel), *Ilex aquifolium* (holly), *Ligustrum vulgare* (wild privet), *Malus sylvestris* (crab apple), *Quercus robur* (pedunculate oak), *Rhamnus cathartica* (buckthorn) and *Ulmus glabra* (wych elm) – any 4 of these in 50% of the hedges, any 6 in another 35%, and all of them in the last 15% . in the 'B' 60% *Prunus spinosa* (blackthorn) hedges, the remainder to be made up from *Corylus avellana* (hazel), *Ilex aquifolium* (holly), *Malus sylvestris* (crab apple), *Rhamnus cathartica* (buckthorn), *Salix caprea* (goat willow), *Salix cinerea* ssp. *oleifolia* (rusty willow), *Salix fragilis* (crack willow) and *Viburnum opulus* (Guelder-rose) – any 3 of these in 50% of the hedges, any 5 in another 35%, and all of them in the last 15% .			
Loss of habitat for farmland birds, great crested newts and hedgerows	**Arm** Habitat Creation – General **Farm Pocket Park**. To the west of the A43, a Pocket Park will be created which will contain native trees and shrubs as well as areas of calcareous grassland. It will be readily accessible from areas much frequented by the public at Blisworth Junction, providing additional scope for the enjoyment of nature there. Calcareous grassland would occupy banks sloping away from the A43 junction after incorporation of calcareous material (e.g. chalk spoil or limestone chipping) into the surface-soil dressings and would be created by using appropriate seed mixes of green hay from other calcareous grassland sites in the county. The park is in close proximity to the Grand Union Canal and will offer foraging habitat for bats.	Detailed site design Habitat Management Plan	Requirement of DCO	

Residual Effects

16.244 The following **Table 16.29** details each important ecological feature, identifies it value in context with the site and identifies the likely impacts. For each significant impact (considered after mitigation) the following is given, Magnitude, Extent, Duration, Reversibility, Timing, Frequency, and Confidence. The table then summarises the proposed avoidance, mitigation, compensation, and enhancement measures that should be used to minimise the proposed impact. The residual impacts are those adverse impacts that cannot be avoided or mitigated.

16.245 Mitigation described in the previous section reduces predicted impacts to the extent that they are not significant in many instances. This can be assumed to apply to any matters not carried through to this section. Some important cases are the following:

- The green infrastructure buffering will adequately protect the Grand Union Canal corridor.
- The green infrastructure will provide extensive habitat for terrestrial invertebrates.
- The reprofiling, channel design and planting of rerouted sections of the Milton Malsor brook will be sufficient to offset any impacts and may result in a beneficial impact.
- The renovation of derelict farm buildings on Barn Lane will secure the precarious roosting habitat of bats and barn owls.

Table 16.29. Summary of adverse residual impacts on important ecological features

Important Ecological Feature	Value	Type of Effect	Extent Duration Reversibility Timing Frequency Confidence	Summary of Effect and Proposed Avoidance/ Mitigation/ Compensation/ Enhancement Measures	Significance of Mitigated Impact
Bats – Commuting and Foraging	Local	Reduced total area for commuting and foraging arising from land take for development	Permanent loss of foraging habitat.	Even with mitigation and compensation, the overall loss of habitat will be great. It is important that hedgerows that remain through the centre of the site and along the eastern and western boundaries of the site are re-enforced with new planting prior to construction commencing, This will allow new planting to become established and enhance the hedgerows allowing bats to find these new routes through the site. These hedgerows will need to be monitored through the construction phase to ensure that bats are adopting these new routes.	Minor adverse

Loss of up to 12 important or borderline important hedges	Local	Loss	Loss of 7 species-rich hedgerows (and 5 borderline species-rich hedgerows). permanent, irreversible	Hedgerow planting in the buffer and compensatory habitat zones will offset the loss, but because some of the character of Important hedges related to their development over many decades there cannot quite be like for like replacement in under 100 years.	Minor adverse
Loss of a hedgerow network	Local	Loss	Loss of 12.9km of hedge, permanent, irreversible	Planting of wildlife hedge (10.9km) in the buffer and compensatory habitat zones will offset the loss, but the patterns of the network will be different to those typical of enclosure act landscapes, and there cannot be like for like replacement, even though many biodiversity measures may not deteriorate or may even improve.	Minor adverse
Veteran Trees (including notable and locally notable)	National	Loss	Permanent loss of 44 veteran/ notable/ locally notable trees plus one (locally notable) at J15a.	Veteran trees are an irreplaceable resource. Efforts have been made to avoid ancient and veteran trees wherever possible. Adaptive mitigation proposed will use important features of the trees (for example deadwood which is of value to invertebrates) in mitigation areas.	Minor Adverse

Monitoring

16.246 Ongoing monitoring of habitats created and enhanced will be needed to ensure it meets the required level of quality. A Habitat Management Plan will be produced (to be secured by a DCO Requirement) which will include a monitoring plan. Monitoring will initially be undertaken annually during the summer for the first 3-years while the vegetation becomes established, in year 5 and then subsequently every three years. A 15 year Management and Maintenance plan will also be produced which will guide maintenance of the soft landscaping on the Main SRFI Site.

Limitations and Assumptions

16.247 Specific limitations on the assessment of ecological features are given in the respective Technical Appendices (**Appendix 16, Annexes A-M**).

16.248 Access to land parcels has become available at different times between 2015-2017 and there are a few land parcels, particularly on the J15a Site, which have not been accessible for survey, including: the Nurseries; six ponds that are within 500m of the Order Limits (not including the ecology mitigation area which has four ponds within 500m); and trees within the Order Limits (rail land and the Nurseries) and immediately adjacent.

16.249 Assessment of cumulative impacts has been undertaken where information has been available. Some applications/proposals had none or insufficient data available to assess the scale or significance of potential habitat or species loss.

16.250 Proposed mitigation strategies described in this chapter, whilst discussed in principle, have yet to be formally agreed in full by all interested parties including the statutory environmental bodies and therefore may be subject to changes.

16.251 Natural England recommend that surveys should not be over two to three years old for medium to high impact schemes or multi-plot or phased developments. All the surveys completed on the site were undertaken from 2015-2017 and are valid for use until 2017 to 2019 respectively. Where an EPS licence is required after the DCO, Natural England expects applicants to check - by walk-over survey not more than three months before submission of a licence application - that conditions have not changed significantly since surveys were carried out for the original application.

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Ref 16.3 The Birds Directive (Directive 2009/147/EC)

Ref 16.4 The Wildlife and Countryside Act, 1981 (as amended)

Ref 16.5 The Countryside and Rights of Way Act, 2000

Ref 16.6 The Natural Environment and Rural Communities (NERC) Act (2006)

Ref 16.7 The Conservation of Habitats and Species Regulations, 2010 (as amended)

Ref 16.8 The National Parks and Access to the Countryside Act 1949

Ref 16.9 The Hedgerows Regulations, 1997

Ref 16.10 National Policy Statement for National Networks (NN NPS), December 2014

Ref 16.11 National Planning Policy Framework (NPPF)

Ref 16.12 Upper Nene Valley Gravel Pits Special Protection Area (SPA) Supplementary Planning Document (SPD)

Ref 16.13 Biodiversity SPD for Northamptonshire August 2015

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Ref 16.15 South Northamptonshire Local Plan Saved Policies

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