M25 junction 10/A3 Wisley interchange TR010030
6.3 Environmental Statement: Chapter 7: Biodiversity

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6.3 ENVIRONMENTAL STATEMENT CHAPTER 7: BIODIVERSITY

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7. Biodiversity

7.1 Introduction

7.1.1 This chapter describes the ecological baseline and evaluates the nature conservation resources present within the Ecological Zone of Influence (EZoI) for the Scheme. The assessment characterises the impacts of the Scheme; sets out agreed avoidance, mitigation, compensation and enhancement measures; and assesses the significance of the residual effects of the Scheme on the important nature conservation resources. A Habitats Regulations Assessment (HRA) has also been carried out in relation to international sites. For full details of the HRA, including Stages 1 to 5; i) screening; ii) appropriate assessment; iii) consideration of alternative solutions; iv) Imperative Reasons of Overriding Public Interest (IROPI); and v) compensatory measures, refer to the following documents:

- TR010030 5.3 Habitats Regulations Assessment Stage 2: Statement to inform appropriate assessment;
- TR10030 5.3 Habitats Regulations Assessment Stages 3-5: Assessment of Alternatives;
- TR010030 5.3 Habitats Regulations Assessment Annex A: Stage 1 Screening;
- TR010030 5.3 Habitats Regulations Assessment Annex B: Habitats Regulations Assessment Consultation Report; and
- TR010030 5.3 Annex C: Habitats Regulations Assessment Compensation Annex C: Selection of the Suite of Compensatory Measures.

7.1.2 Due to the sensitive location of the Scheme, an integral part of the Scheme design has been to minimise impacts to biodiversity as much as possible and where this has not been possible, to provide appropriate compensation. As this is so integral to the success of the Scheme, some biodiversity mitigation and compensation measures (including extensive areas identified and secured for habitat creation and management) are embedded into the Scheme design, fall within the DCO boundary of the Scheme and are subject to this assessment as part of the Scheme.

7.1.3 The following sections provide:

- Details of the competent experts who have contributed to the report;
- A summary of the relevant legislative and policy framework;
- A description of the Scheme and the study area;
- A description of the methods of assessment (desk study, surveys, assessment, consultation, assumptions and limitations);
- A description of the baseline ecological conditions (including evaluation of nature conservation resources);
- A description of the potential impacts of the Scheme;
- Details of mitigation and enhancement measures;

- An assessment of the overall significance of effects of the Scheme, taking mitigation and compensation into account;
- A summary of the residual effects of the Scheme;
- An assessment of the cumulative effects of the Scheme;
- Information confirming NPSNN compliance;
- Details of monitoring; and
- A final summary.

7.2 Competent expert evidence

7.2.1 This biodiversity chapter has been written by a Chartered Ecologist and full member of the Chartered Institute of Ecology and Environmental Management (CIEEM) with over ten years' experience working in the ecology sector.

7.2.2 The chapter has been checked by two ecologists. The first is a Chartered Ecologist and full member of CIEEM with over 17 years' experience working in the ecology consultancy sector including roles as design ecology lead on major highways schemes, such as motorway widening, smart motorway and junction improvements; and responsible for production of ecological impacts assessments, mitigation designs and protected species licence applications for these schemes. The second is a Chartered Ecologist and a Fellow of CIEEM with over 25 years' experience in the ecology sector and has presented evidence as an expert witness.

7.2.3 This biodiversity chapter has been reviewed by an ecologist with over 20 years' experience in ecology and nature conservation in the private sector. The reviewer has been involved with a wide range of infrastructure projects including Appropriate Assessments and Environmental Impact Assessments of road schemes across the UK and the Republic of Ireland and as an expert witness at DCO hearings. The reviewer is a full member of the CIEEM.

7.2.4 All surveys have been led by ecologists who are considered to be competent, accomplished or authoritative under the CIEEM competency framework1. Appendices 7.6 - 7.18 contain details of the experience of the leads for each survey type.

7.3 Legislative and policy framework

7.3.1 Policy and plans relevant to the Scheme includes:

- National:
  - National Policy Statement for National Networks (NPSNN) 2014[2];
  - National Policy Planning Framework (NPPF) 2019[3];

[1] CIEEM Competency Framework Competence Levels (https://www.cieem.net/data/files/Resource_Library/Competency_Framework/Competence_Levels.pdf; accessed 01/03/18)
[2] Department for Transport (December 2014). National Policy Statement for National Networks.
[3] Ministry of Housing, Communities and Local Government (2018) National Planning Policy Framework. Accessed at https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/779764/NPPF_Feb_2019_web.pdf

  - Defra 25 Year Environment Plan 2018[4];
  - Department for Transport Road Investment Strategy 2015-2020 (RIS);
  - Highways England: Strategic Business Plan 2015 to 2020; and,
  - Highways England's Biodiversity Plan[5].
- Regional:
  - The South East Plan – Regional Spatial Strategy for the South. Policy NRM6 – Thames Basin Heaths Special Protection Area (SPA)[6].
- County:
  - Surrey Road Verge Habitat Action Plan (RVHAP) - part of the Surrey Biodiversity Action Plan[7].
- Local:
  - Elmbridge Core Strategy (CS) (July 2011) and Elmbridge Local Plan– Development Management Plan (April 2015); CS13: Thames Basin Heaths Special Protection Area (SPA), CS15: Biodiversity, DM6: Landscape and trees and DM21: Nature conservation and biodiversity; and
  - Guildford Borough Local Plan (2019); Policy ID4: Green and blue infrastructure and Policy P5: Thames Basin Heaths Special Protection Area.

7.3.2 Legislation relevant to the Scheme includes:

- Conservation of Habitats and Species Regulations 2017;
- European Commission (EC) Directive on the conservation of natural habitats and of wild fauna and flora (92/42/EEC);
- EC Directive on the conservation of wild birds (79/409/EEC);
- Water Framework Directive (2000/60/EC);
- Convention on Wetlands of International Importance especially as Waterfowl Habitat 1971 (the Ramsar Convention);
- Wildlife and Countryside Act 1981 (as amended);
- National Parks and Access to the Countryside Act 1949 S.21;
- Natural Environment & Rural Communities Act 2006 S.40;
- Protection of Badgers Act 1992 (as amended); and
- Wild Mammals (Protection) Act 1996.

7.3.3 A summary of the policy and UK designated sites, habitats and wildlife legislation relevant to the Scheme is provided in Appendix 7.1. For details of the Water Framework Directive refer to section 3.1 of the M25 junction 10/A3 Wisley

[4] Defra (2018) A Green Future: Our 25 Year Plan to Improve the Environment. This can be accessed at https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/693158/25-year-environment-plan.pdf (Last Accessed 21/01/2019)
[5] For example, infrastructure projects (including nationally significant infrastructure projects, orders under the Transport and Works Act and hybrid bills), where the public benefit would clearly outweigh the loss or deterioration of habitat
[6] As of 25th March 2013, The Regional Strategy for the South East was revoked except for policy NRM6. Full details of the revocation can be found at http://www.legislation.gov.uk/uksi/2013/427/pdfs/uksi_20130427_en.pdf.
[7] Surrey Biodiversity Action Plan (Surrey Biodiversity Partnership, 1999). (NB this BAP is no longer active)

interchange Water Framework Directive assessment report (TR010030/APP/5.4).

Highways England: Licence

7.3.4 The Highways England Licence[8] sets out the Environmental commitments of the licence holder in paragraph 5.23. The licence holder should:

- Ensure that protecting and enhancing the environment is embedded into its business decision-making processes and is considered at all levels of operations;
- Ensure the best practicable environmental outcomes across its activities, while working in the context of sustainable development and delivering value for money;
- Consider the cumulative environmental impact of its activities across its network and identify holistic approaches to mitigate such impacts and improve environmental performance;
- Where appropriate, work with others to develop solutions that can provide increased environmental benefits over those that the Licence holder can achieve alone, where this delivers value for money;
- Calculate and consider the carbon impact of road projects and factor carbon into design decisions, and seek to minimise carbon emissions and other greenhouse gases from its operations;
- Adapt its network to operate in a changing climate, including assessing, managing and mitigating the potential risks posed by climate change to the operation, maintenance and improvement of the network;
- Develop approaches to the construction, maintenance and operation of the Licence holder's network that are consistent with the government's plans for a low carbon future; and
- Take opportunities to influence road users to reduce the greenhouse gas emissions from their journey choices.

7.4 Scheme description

7.4.1 The principles of the mitigation hierarchy have been applied to the Scheme design to avoid and minimise losses as far as practicable, for example:

- With regards to ancient woodland, initial draft designs would have resulted in the direct loss of 1.0 ha of ancient woodland[9] at four separate sites. Through careful collaborative working by the environmental and engineering design team this has been reduced to losses at two ancient woodlands, limited to a total loss of 0.4 ha. Measures to address this loss include salvaging ancient woodland soils and plant material from the Scheme footprint and translocating these into areas of new woodland planting; these areas have

[8] Department for Transport (2015) Highways England: Licence Secretary of State for Transport statutory directions and guidance to the strategic highway company. Department for Transport: London.
[9] Regional Investment Programme M25 junction 10/A3 Wisley interchange Preliminary Environmental Information Report. Volume 1 – Main Text. Document Ref: HE552512-ATK-EAC-RP-LM-000001.docx

been located where they will link existing ancient woodland with other nearby woodland to enhance ecological connectivity. There will also be enhancement of existing ancient woodland of 4.2 hectares at the former Chatley Farm;

- The Scheme falls partially within the Thames Basin Heaths SPA Ockham and Wisley Commons Site of Special Scientific Interest (SSSI) component. Therefore, a suite of compensatory measures has been designed under consultation with key stakeholders (the stakeholders included Natural England, Forestry Commission, Surrey Wildlife Trust (SWT), Royal Society for the Protection of Birds (RSPB) and Surrey County Council[10]). This suite of compensatory measures consists of a mixture of provision of SPA compensation land for the permanent land take at a ratio of 1:1, and enhancement areas within the SPA at the ratio of 3:1 for the permanent and temporary land take. This is additional to the restoration of the areas of temporary land take. To compensate for the negative effects of the Scheme, these measures will maintain the overall coherence of the Natura 2000 Network and increase the carrying capacity of the SPA for all three SPA qualifying bird species (Dartford warbler (*Sylvia undata*), nightjar (*Caprimulgus europaeus*) and woodlark (*Lullula arborea*)), thereby improving the long term resilience of the SPA;
- In order to reduce encroachment of the Scheme into Bolder Mere (a Water Framework Directive (WFD) waterbody) by an estimated 10 m, the non-motorised users (NMU) route has been located on the northern side of the A3.

7.4.2 The Scheme description for the highways proposals is provided in Chapter 2 and shown on the Scheme layout plans (TR010030/APP/2.8).

7.4.3 As well as the highways proposals, biodiversity mitigation measures form an integral part of the Scheme design, with land identified and secured for habitat creation and management also falling within the DCO boundary and being subject to this assessment. As such some biodiversity mitigation and compensation proposals are also included within the Scheme description below. In addition to this embedded mitigation and compensation, Highways England have also committed to the mitigation measures as described in section 7.10.

Replacement land and SPA suite of compensatory measures

Replacement land

7.4.4 The Scheme is located within an area of land designated as common land, open space and open public access. Land take from these areas is required to accommodate the Scheme and suitable replacement land is therefore required to compensate for the loss of this land. More detail on the replacement land process, the special category land to be acquired and the replacement land areas proposed can be found in Section 2 and in the Appendix C to the Statement of Reasons (Application Ref: TR010030/APP/4.1).

7.4.5 As well as fulfilling the requirement to compensate for the loss of common land,

[10] Please refer to HRA consultation report (application document TR010030/APP/5.3) in Annex B of Habitat Regulations Assessment Stage 2: Statement to Inform Appropriate Assessment (application document TR010030/APP/5.3) for details of the consultation with stakeholders with regards to the suite of compensatory measures.

open space and open public access land, the replacement land also provides scope for the provision of mitigation or compensatory habitats for land lost from ecological designations, where this is compatible with the works required to make the land equally advantageous to the public.

7.4.6 Areas of replacement land have been included in the Scheme in three locations and are shown on the Scheme layout plans (TR010030/APP/2.8) and detailed in the TR010030/4.1 Statement of Reasons Appendix C: Common land and open space report. The replacement land includes:

- Three parcels of land in the north-western quadrant at Park Barn Farm;
- Four parcels of land in the north-eastern quadrant in the former Chatley Farm land; and
- Two parcels of land in the south-eastern quadrant near Hatchford End.

7.4.7 The environmental proposals within the replacement land areas vary according to the level of work needed to facilitate public access, the existing vegetation types and the underlying ground conditions. Native tree and shrub planting in these land parcels will provide compensation for the loss of existing woodland required for the construction of the Scheme, and will be a major contributor to the overall outcome of limited woodland loss for the Scheme.

7.4.8 The three parcels at Park Barn Farm (PBF)[11] total 21.8 ha in size and will include 8.1 ha of native tree and shrub planting, 5.7 ha of woodland enhancement and 5.8 ha of grassland management as summarised below:

- PBF1: Land between Buxton Wood and the River Wey - 5.1 ha of damp meadow west of the farm and close to the River Wey will be developed into an informal pattern of native species woodland planting and glades, to create habitat links with the adjacent Buxton Wood;
- PBF2: Field southeast of Park Barn Farm - 8.3 ha of open parkland will have some native species tree and shrub planting to create habitat connectivity between the adjacent areas of wooded common land. This will include the translocation of ancient woodland soils from the 0.4 ha of ancient woodland to be lost to the Scheme. The grassland will be managed to reduce the nutrient levels in the soil and encourage dry grassland and, in time, heathland species to become established; and
- PBF3: Fields and woodland east of PBF2 - 8.4 ha formed of grassland and deciduous woodland. The deciduous woodland parcel east of the farm is covered by a TPO, but will have some selective thinning of a dense stand of birch in the southern part to create openings to link the existing grassland glade through the potential Scots pine clearance areas in the adjacent common land. There is some ancient woodland in the northern part that will be managed carefully to enhance its biodiversity. There will be some native species tree and shrub planting in part of the grassy area within the parcel to enhance habitat and visual links and the remainder of the grassland will be managed as in the parcel above.

[11] Appendix B Figure B4 of TR010030/4.1 Statement of Reasons Appendix C: Common land and open space report provides an overview of the Park Barn Farm area and around Buxton Wood.

7.4.9 The four parcels at the former Chatley Farm (CF)12 will include 14.5 ha of woodland management, and 0.5 ha of replanting, as summarised below:

- CF1: Chatley Wood – 6.7 ha of scots pine plantation with an area of birch woodland in the eastern corner and mature oaks along some of the boundaries. The woodland will have considerable selective tree thinning and some replanting with deciduous woodland species, to create an informal patchwork of woodland with dry and damp glades, whilst being mindful to maintain the remnants of the former dam within the wood;
- CF2: Wood south of Pointers Road, west of Chatley Cottage – 2.2 ha of Breach Hill Wood. A parcel 0.5 ha in size will be completely cleared in its western part prior to construction as it will be used for a construction compound; the remaining 1.7 ha will have considerable selective tree thinning and the whole parcel will have some replanting with deciduous woodland species, to create an informal patchwork of woodland with glades;
- CF3: Wood south of Pointers Road, near Hatchford Park bridge – 1.9 ha to have considerable selective thinning of the mature mixed woodland alongside the M25, including removal of rhododendron and other non-native species and some replanting with deciduous woodland species, to create an informal patchwork of woodland with glades.
- CF4: Wood north of Pointers Road (The Bogs) – 4.2 ha to be managed carefully to enhance the condition of the ancient woodland; this will include substantial clearance of rhododendron (*Rhododendron ponticum*) and other non-native species. Some deciduous tree and shrub planting may be needed to maintain the health of the woodland; and

7.4.10 For the two parcels at Hatchford End (HE)[13]:

- HE1: Enclosed field near Hatchford End – 1.2 ha field formed of overgrown meadow with dense hedgerows which will have selective thinning of the overgrown areas, along with some native species woodland planting to create habitat variety and connections to the adjacent Hatchford Wood; and
- HE2: Open field near Hatchford End – 0.5 ha grazing field alongside Old Lane will include areas of native species woodland and hedgerow planting to create glades with a range of habitat types.

SPA Suite of compensatory measures

7.4.11 The Scheme is located partially within part of the Thames Basin Heaths SPA. In order to improve the existing road junction, the Scheme will require the permanent loss of 5.9 ha of SPA land and the temporary loss of 8.6 ha of SPA land, totalling an overall footprint of 14.5 ha of SPA land take. Therefore, a HRA has been carried out in relation to international sites and the Scheme. For further details on the HRA see Section 7.1.1.

7.4.12 The SPA suite of compensatory measures proposed is two-fold:

[12] Appendix B Figure B5 of TR010030/4.1 Statement of Reasons Appendix C: Common land and open space report provides an overview of the Chatley Wood and Farm area.
[13] Appendix B Figure B6 of TR010030/4.1 Statement of Reasons Appendix C: Common land and open space report provides an overview of the Hatchford End area.

- Provision of SPA compensation land; and
- SPA enhancement areas.

7.4.13 An SPA compensation land ratio of 1:1 for the permanent land take, and an SPA enhancement area ratio of 3:1 for the permanent and temporary land take is proposed. This is additional to the restoration of the areas of temporary land take.

7.4.14 The SPA compensation land and enhancement areas are shown on the Scheme layout plans (TR010030/APP/2.8). The full details of the SPA suite of compensatory measures can be found in TR010030 5.3 Annex C: Habitats Regulations Assessment Compensation Annex C: Selection of the Suite of Compensatory Measures.

SPA compensation land

7.4.15 The Scheme will lead to the permanent loss of 5.9 ha of SPA habitat. In order to compensate for this loss in part, two parcels of land immediately adjacent to the Ockham and Wisley Commons Site of Special Scientific Interest (SSSI) component of the SPA have been identified to be included in the SPA boundary. These are:

- C1 Old Lane SPA compensation land (2.0 ha) - an area of field by which is surrounded by woodland edge and is directly adjacent to an area of open heathland habitat within the SPA. The field will be planted with a low density of native tree species to create a wood pasture habitat managed by grazing, to provide a rich invertebrate resource for the SPA. Some of the scrub and young trees in the adjacent edge of the SPA may be thinned to improve habitat connectivity to the heathland beyond; and
- C2 Wisley SPA compensation land (6.1 ha) - a field predominantly consisting of grazed meadow. The field will be planted with a low density of native tree species to create wood pasture habitat managed by grazing, to increase the invertebrate resource that the field contributes to the wider SPA and provide an enhanced linkage to the existing open habitats of the SPA due to enhancement works in the adjacent woodland (see proposals for Pond Farm West SPA enhancement area below).

7.4.16 Proposed species for wood pasture planting is detailed in the SPA Management and Monitoring Plan, Appendix 7.19.

7.4.17 More detail on the SPA compensation land and the design process can be found in the Habitat Regulations Assessment Stages 3-5: Assessment of Alternatives, consideration of the IROPI and compensatory measures (application document TR010030/APP/5.3)

SPA enhancement areas

7.4.18 The SPA enhancement areas will involve habitat management works to include:

- Total clearance of approximately 22.5 ha of wooded areas to create open habitat and enable heathland regeneration.
- Areas of thinning totalling approximately 24.9 ha, where the woodlands will be

thinned to encourage increased woodland diversity and provide more open habitats. The thinning of woodland will create open glades and enable increased diversity (both of species and structure) of the mixed woodland.

7.4.19 The general principles for the SPA enhancement areas include:

- Clearance for heathland restoration: woodland will be cleared in order to allow heathland restoration. However, trees with important features will be retained. These will consist of:
  - Veteran trees and trees with veteran features; and
  - Trees with potential bat roost features (including dead trees).
- Thinning of woodland areas to be divided into two types of thinning:
  - Regeneration thinning: this is the selective felling of parts of a woodland area (retaining all veteran trees or trees with veteran features and trees with bat roost potential). This will include measures such as; creating open patches within the woodland; increasing the size of existing open areas; creating and widening existing glades; and selective felling of some trees and groups of trees, to allow retained trees to flourish, and encourage a more diverse species assemblage to regrow.
- Standard thinning: this is a more typical selective thinning, where the number of trees within a woodland is removed (retaining all veteran trees or trees with veteran features and trees with bat roost potential), allowing the retained trees to flourish and encouraging a more diverse species assemblage to return. This may include some selective planting, where necessary, to increase the species diversity.

7.4.20 The Scheme layout plans (TR010030/APP/2.8) show the proposed SPA enhancement area locations which are located on either side of the A3 at:

- E1 Cockcrow Hill SPA enhancement area (1.9 ha) - woodland clearance to extend the main heathland of Wisley Common southwards and provide connection to the green habitat link across Cockcrow overbridge[14];
- E2 Ockham Common/Sand Hill SPA enhancement area (17.3 ha) - approximately 9.4 ha of woodland clearance to extend the main heathland of Ockham Common northwards and provide connection to the green habitat link across Cockcrow bridge, plus approximately 7.9 ha of woodland thinning to create a more diverse woodland with open rides and a diverse woodland edge;
- E3 Ockham Common/Old Lane SPA enhancement area (4.8 ha) -

[14] The Scheme includes a 'green bridge' extension to Cockcrow bridge. A separate designated funds application is being made by the project team to secure additional funding from Highways England for the provision of a Green Bridge, as a replacement for the demolition of the existing Footpath 17 Cockcrow overbridge. The green bridge is intended to provide an additional enhancement measure to address historic issues relating to the severance of ecological habitats by the existing A3, including habitats that form part of the Ockham and Wisley Commons Site of Special Scientific Interest.
Highways England is confident that there is a reasonable prospect of the designated funds application being approved and has therefore sought authorisation for these works within the scope of the DCO application. However, the inclusion of the green bridge feature within the DCO does not materially affect the overall extent of order land required for the Scheme or the level of funding that may be needed to compensate any affected land interests. In the unlikely event that designated funds are not forthcoming, this enhancement measure can be omitted from the Scheme because it is not essential for the purposes of mitigating the Scheme's environmental effects. Its omission will not have any material consequences for land acquisition matters and therefore any concerns about the certainty of funding for this element of the work need not indicate against the granting of development consent.

approximately 3.8 ha of woodland clearance to extend the main heathland of Ockham Common, plus approximately 1.0 ha of woodland thinning to create a more diverse woodland with open rides and a diverse woodland edge;

- E4 Elm Lane SPA enhancement area (11.3 ha) - approximately 1.8 ha of woodland clearance to open up parts of the southern edge of Bolder Mere and enable heathland to re-establish, plus approximately 9.5 ha of selective thinning of mostly Scots pine and birch to enable a more diverse woodland (in terms of species and structure) to establish;
- E5 Wisley Common SPA enhancement area (4.5 ha) - woodland clearance to extend the main heathland of Wisley Common;
- E6 Hut Hill south SPA enhancement area (1.2 ha) - woodland clearance (mostly young birch) to extend the main heathland of Wisley Common;
- E7 Pond Farm south SPA enhancement area (2.4 ha) - two pockets of woodland either side of a path, that separate two open areas of heathland. One section (to the north) consists of mature trees such as oaks. Selective thinning of some of the younger tree specimens will enhance the diversity of this woodland area. The other section (to the south) contains dense birch growth. This area will be subject to thinning to open the canopy and allow the remaining trees to fill it and to widen the existing path to provide an open linkage between the two areas of heathland; and
- E8 Pond Farm west SPA enhancement area (4.2 ha) - intense selective thinning of mostly young Scots pine, sycamore and birch to create a network of glades and rides in a more open woodland to improve linkage between two areas of open heathland habitat and also the SPA compensation land.

7.4.21 Figure 13 of 5.3 Habitats Regulations Assessment Figures (application document TR010030/APP/5.3), shows the proposed SPA enhancement areas, detailing the target habitats.

7.4.22 These SPA enhancement works will be phased over several years, so that:

- Woodland clearance adjacent to areas of engineering construction does not take place until that work is complete, to ensure a woodland buffer is maintained; and
- Reinstatement of vegetation of areas of temporary possession can take some time to get established before adjacent woodland is removed or opened up.

7.4.23 Details on the clearance timetable, management strategy and funding, and the monitoring of the SPA compensation land and SPA enhancement areas will be determined in the SPA management and monitoring plan (Appendix 7.19), which has been produced in consultation with Natural England, Highways England and SWT. More detail on the SPA enhancement areas and the design process can be found in the Habitat Regulations Assessment Stages 3-5: Assessment of Alternatives, consideration of the IROPI and compensatory measures (application document TR010030/APP/5.3).

Ecological measures for highways land and land used for construction

7.4.24 Specific proposals relevant to biodiversity have been embedded into the Scheme

design in various ways. These proposals are indicated in broad terms on the Scheme layout plans (TR010030/APP/2.8), sheets 1 to 9; these proposals will be refined during detailed design and, if necessary, refined again during construction to accommodate site conditions.

Ecological measures in highways land

7.4.25 The existing M25 and A3 highways land within the Scheme to be reinstated includes native species tree and shrub planting where space allows, creating a visual screen to the movement of traffic and integrating the highway earthworks into the largely wooded context of the adjacent land.

7.4.26 Along the M25, the lower parts of cutting slopes are usually retaining walls or steepened earthworks resulting from previous carriageway widening work; these steep slopes do not have woody vegetation and, therefore, long stretches of the motorway, particularly west of junction 10, have little or no woody vegetation between the carriageway and the environmental barrier fence.

7.4.27 The new highway verges will be seeded to grass; during detailed design, consideration will be given to which of the larger areas of verge could have some wild flower species included within the grass seed mix, where this would be compatible with the sightline requirements and the maintenance regime. In addition, the embankments of Cockcrow bridge will be sown with species-rich acid grassland and heather brash to re-establish heathland on the approaches to the bridge. For further details refer to the Appendix 7.20 Landscape and Ecology Management and Monitoring Plan.

7.4.28 Steepened earthworks slopes will be seeded to grass, plus other wild flower species compatible with the difficult growing conditions presented by the construction method and the aspect.

7.4.29 The drainage balancing ponds and associated facilities that remain within the highway land will have their earthworks grassed and/or planted to integrate with their surroundings, plus aquatic marginal planting as appropriate within the constraints imposed by current maintenance requirements.

Ecological measures in land used for construction

7.4.30 The current expectation is that the existing vegetation within the areas indicated for temporary possession, and temporary possession plus permanent rights, will be cleared of all vegetation, except for locations specifically indicated for retention. Within the SPA (8.6 ha of temporary land take) and SSSI (16.0 ha of temporary land take), this vegetation is mostly plantation woodland. Detailed design and construction planning will aim to reduce the extents of land needed and vegetation clearance where practicable, particularly within the designated habitats and special category land.

7.4.31 Once the engineering construction works are complete, there will be substantial areas of the site that will have their soil conditions restored and will become available for environmental reinstatement, subject to any applicable detailed approvals under DCO requirements. These areas include compounds, soil and materials storage areas, haul roads, temporary slip roads, space for construction activities (including utilities diversions and Public Rights of Way) and sites of demolished overbridges.

7.4.32 Where these areas fall within the extents of special category land and environmental designations, the intention is that these areas will have public access reinstated and will, in due course, become an effective part of the adjacent habitats. To achieve this, the environmental proposals include:

- Native tree and shrub planting (for locations refer to Scheme layout plans (TR010030/APP/2.8)) to create a wooded screen to the highways and traffic beyond; this will be entirely or largely deciduous species, with a high proportion of species that will maintain an effective screen at eye level;
- Larger blocks of tree and shrub planting will also include areas of grassland and species-rich grassland planting with a proportion of native tree and shrub species, to create glades within the woodland and to provide a graduation between woodland and open heathland or grassland areas (refer to Scheme layout plans (TR010030/APP/2.8));
- Species-rich grassland planting as appropriate for the ground conditions, with suitable areas managed to encourage heathland species to establish (refer to Scheme layout plans (TR010030/APP/2.8)); and
- Sandy banks and other open soil areas within the glades and grasslands to provide habitats for reptiles and invertebrate species.

7.4.33 For the private properties beside the A3 that will be affected by temporary possession of land, including Painshill Park, the areas of land to be handed back will have ground conditions reinstated and planting provided, reflecting landowners' wishes and subject to any applicable detailed approvals under DCO requirements.

7.4.34 All land used for compounds will be restored or enhanced after works have been carried out, with the specifics to be determined during detailed design.

Ecological measures for Bolder Mere, part of the Wisley and Ockham Commons SSSI and also within the SPA

7.4.35 The widening works for the A3 southbound carriageway will require construction extending into the north-western edge of Bolder Mere and the removal of the existing wet woodland carr and marginal reed bed habitats along that edge of the mere. As part of the environmental design and to comply with the requirements of the WFD, the following activities are proposed:

- Use of permeable retaining wall along the edge of Bolder Mere to ensure there is no barrier to groundwater flow so that lake hydrology remains unaltered;
- Following construction of the new retaining wall along the north-western edge to the lake, the margin will be reprofiled into the water (to replicate the current slope) and the reedbed re-established (through translocation of the existing reedbed and/or new reedbed planting). In addition, two areas of lily (Nymphaea sp.), noted for their importance to Odonata, will be translocated alongside the reedbed;
- Works along the shoreline of Bolder Mere to improve the condition of the hydrosphere for marginal wetland plant communities and Odonata. These works include the following and should be reviewed in reference to the WFD

report provided as in Water Framework Directive Report TR010030/APP/5.4.

  - Removal of reedbed habitat from selected locations to avoid any significant spread into adjacent land or open water over the long term.
  - Reinstatement of lake shore habitat including reedbed and water lilies along northwest edge of Bolder Mere (adjacent to A3).
  - Regular clearance of any encroaching scrub from within the open areas of acid bog and periodic removal of larger trees (most likely birch and willow) from the edges to maintain a semi-open structure grading into the woodland behind.
  - Regular thinning and removal of trees and scrub (close growing birch and willow with dense understory of *Sphagnum* spp) to encourage a low-growing heath / grassland community to develop. Rhododendron should be removed / treated to avoid further spread.
  - Rotational management of alder, birch and willow to maintain a transitional zone with a varied canopy structure. Excess shading of the lake shore should be targeted, with the aim of maintaining sufficient light to encourage development of marsh and mire habitat, but not the significant detriment of other habitat types.

- Proposal to re-route and treat road drainage which currently discharges to Bolder Mere, to the downstream watercourse;
- The loss of trees and scrub, which at present provide a screen between the margins of Bolder Mere and the existing A3 alignment, will be mitigated through the planting of new trees; and
- Design and implementation of a management programme to reduce/remove the existing carp (*Cyprinus carpio*) population (and potentially bream (*Abramis brama*)) in Bolder Mere. Carp are noted as a potential constraining factor on lake habitat function through their effects on clear water habitat function.

Ecological measures for Sites of Nature Conservation Interest (SNCIs) and ancient woodland

7.4.36 Elm Corner Woods SNCI falls outside the DCO boundary. However, woodland thinning works, by agreement with the Surrey Wildlife Trust, are proposed in order to create a more diverse woodland with open rides and a diverse woodland edge. Tree and shrub planting within Wisley Airfield SNCI will provide a buffer between the Wisley Lane access road and the Elm Corner woods.

Ecological measures for Stratford Brook

7.4.37 A long span bridge crossing of the Stratford Brook will be provided, negating the need for a culvert or works to the channel bed. Abutments will be set back from the watercourse so as to not to significantly influence hydromorphology and connectivity.

7.4.38 Mammal ledges will be installed on the new Stratford Brook underbridge to appropriate Highways England standards to facilitate the movement of mammals during high flows and the riparian zone will be reinstated through appropriate native tree planting to address any losses of riparian habitat within the working

corridor.

7.4.39 There will be enhancement to the riparian zone through localised tree works to improve complexity of riparian zone and selectively remove shading and works to improve channel habitat complexity. The location of these works are shown on Scheme layout plans (TR010030/APP/2.8) with further detail provided below and in Appendix F of the WFD Assessment TR010030/APP/5.4.

7.4.40 Provision of a wide-span structure over the Stratford Brook that retains the existing natural plan and cross-sectional form of the watercourse, negating the need for any in-channel or bankside structures.

7.4.41 Replanting of riparian trees that will be lost because of ground clearance works required for construction of the new crossing structure, reinforcement of Stratford Brook south culvert and access to watercourse/riparian restoration areas.

7.4.42 There will be enhancement to the riparian zone of the Stratford Brook upstream of the existing A3 crossing. The location of these works are shown on Scheme layout plans (TR010030/APP/2.8) with further detail provided below and in Appendix F of the WFD Assessment TR010030/APP/5.4. Measures to include:

- Creation of backwater habitats (3No.) – to provide additional wetted channel habitat, increasing watercourse habitat complexity and provide sites of refuge during high flow for aquatic species e.g. fish;
- Daylighting areas (6No.) – selective tree/shrub works, that will include clearance, felling and/or coppicing (depending on species) to improve the watercourse habitat and generate a more varied age structure along the riparian zone;
- Large wood features (6No.) – to add in-channel habitat complexity and improve local hydromorphological condition in keeping with the character of the watercourse; and
- Addition of coarse gravel to the channel to locally improve flow character and habitat complexity where relevant and in reference to the extent of backwatering from the Stratford Brook Culvert South.

Ecological measures for ephemeral ditches

7.4.43 The following embedded design is included to mitigate for the effects on ephemeral ditch systems and their riparian corridors that are located outside of the SPA boundary. The exact detail of these mitigation works will be confirmed following completion of design feasibility assessments in relation to the following enhancement options:

- Enhancement of ditches within C2 Wisley SPA compensation land and E8 Pond Farm West SPA enhancement area (Pond Farm West ditches) potentially including selective tree thinning, channel realignment and creation of pond features;
- Enhancement of ditches within E7 Pond Farm South SPA enhancement area (Pond Farm South ditch) potentially including tree and scrub removal, channel realignment and introduction of wood features; and
- Enhancement of Chatley Wood pond within the former Chatley Farm

replacement land, to potentially include selective tree thinning and excavation of existing flow path through pond, to increase pond capacity and enhance pond ecology. This habitat although identified as a pond, is considered under ephemeral ditches since the enhancement works relate to changes to the ditch footprint within the ephemeral pond feature.

- An improved drainage system is to be implemented as part of the Scheme, that will, wherever possible keep runoff from highway and non-highway surfaces separate. Within the River Wey catchment, approximately 820 m of ephemeral headwater will be lost or transposed by the Scheme with approximately 420 m being lost or transposed within the River Mole catchment. At the same time around 1440 m of pre-earthwork drain conveying water solely from non-highway surfaces are included in the preliminary design for the River Wey catchment and approximately 720 m within the River Mole catchment.

Measures for the control of traffic noise

7.4.44 To limit the potential for increases in traffic noise arising from the Scheme, most of the new and amended sections of highway will be finished with a Thin Surface Course System (TSCS), to achieve road/tyre noise performance level 3 in accordance with the Manual for the Construction of Highway Works (MCHW), Volume 1: Clause 942.34 and table 9/17; and Volume 2: Clause NG 942.36 and NG 942.37. This means that the noise level emanating from the tyres should be 3.5 dB(A) less than that for a traditional hot-rolled asphalt surface, which is the approach to be used in very noise-sensitive locations.

7.4.45 The road surfaces that will not be finished with a TSCS are:

- The road carriageways on the decks of new Wisley Lane overbridge, replacement Cockcrow overbridge and replacement Clearmount overbridge;
- The A3 carriageways on the M25 junction 10 north and south bridges and the A3 overbridge across the M25;
- The gyratory carriageway on the M25 junction 10 east and west bridges;
- Widening of the M25 existing concrete carriageway for the extended merges and diverges to the east-facing and west-facing slip roads for junction 10; and
- The amended access into RHS Wisley Garden car park.

7.4.46 Environmental barrier fences will be replaced along the M25 and will be extended along the A3, which will reduce the levels of noise within the SPA and SSSI. Environmental barrier fences are shown on Figure 9 of 5.3 Habitats Regulations Assessment Figures (application document TR010030/APP/5.3)

Measures for the control of permanent lighting

7.4.47 New LED lighting will be provided along the new verges of the widened A3 and A245 carriageways and all the amended junction slip roads; the existing central reserve lighting on the A3 across junction 10 and along the M25 will remain. Lighting plans are shown on the Scheme layout plans (TR010030/APP/2.8). The operational lighting on the Scheme will be designed in accordance with best

practice guidelines[15], taking into consideration the presence of commuting and foraging bats and other wildlife, including measures to avoid and minimise light spill onto adjacent vegetation, particularly ancient and secondary woodland. In addition, the lighting along the A3 and M25 within the DCO boundary will be spaced at a distance of 30 m apart, and the lights will be positioned as far away as possible from the NMU bridges. This will provide a shaded corridor along the bridges, increasing the potential for bats and other nocturnal animals to utilise the bridges for commuting.

Proposals for the control of surface water runoff

7.4.48 The increased area of road carriageway will lead to increased rates of surface water runoff, which need to be attenuated to ensure that the existing rates of outfall into the receiving watercourses are not exceeded. Space has been allowed for the provision of drainage attenuation measures (as shown on the Scheme layout plans (TR010030/APP/2.8)), with the aim of minimising the space required during detailed design, as most of these are within the special category land and SPA/SSSI.

Proposals during construction

7.4.49 Construction of the Scheme is planned to commence in winter 2020, with the Scheme planned to be open for traffic in autumn 2023.

7.4.50 During construction there will be strict adherence to Pollution Prevention Guidelines (PPGs)/Guidance on Pollution Prevention (GPPs)[16] and the Construction Industry Research and Information Association (CIRIA)[17] guidance for protection of watercourses from construction related pollution risk.

Contractor compounds

7.4.51 Contractor compounds and storage areas will be located on land that has been selected to avoid ecologically sensitive areas wherever possible. Buffer zones will be implemented around the compound in any sensitive areas to prevent encroachment.

7.4.52 The main compound will be located at the Nutberry Fruit Farm (OSNGR TQ 060 575) and will occupy an area of 5.6 ha of semi improved grass, ruderals and scrub and occasional car boot sale site. It will be set back approximately 10 m from the Stratford Brook which runs along the northern boundary of the compound to avoid detrimental impacts on the watercourse.

7.4.53 At the northern end of the Scheme a second compound will be located on the site of the former San Domenico restaurant. The existing partly derelict building will be demolished to enable the compound to be laid out efficiently but the current Starbucks coffee shop building on this site will be retained and be used

[15] Bat Conservation Trust & Institute of Lighting Professionals (2018) Bats and artificial lighting in the UK: Overview of current evidence and mitigation guidance.
[16] Pollution Prevention Guidelines (PPGs) are out of date and a review process is currently underway to replace them with Guidance for Pollution Prevention (GPPs). These documents are available at http://www.netregs.org.uk/environmental-topics/pollution-prevention-guidelines-ppgs-and-replacement-series/guidance-for-pollution-prevention-gpps-full-list/. GPPs provide environmental good practice guidance for the whole UK, and environmental regulatory guidance directly to Northern Ireland, Scotland and Wales only. For businesses in England, regulatory guidance is available from GOV.UK instead.
[17] The CIRIA documents are a series of publications developed by the Construction Industry Research and Information Association. Each document is targeted at a particular type of business or activity and covers environmental good practice to minimise pollution.

during the works by the contractor. Due to the presence of a bat roost, demolition of the former San Domenico restaurant will be undertaken under licence. For further details see paragraph 7.4.58.

7.4.54 Other compounds will be required for periods during the course of the works where structures are to be built:

- Two compounds at junction 10 – one at Cockcrow overbridge within the SPA and another at Pointers Road. At the end of the works, the Pointers Road compound will be used as part of the replacement land package rather than being returned to its original owners; and
- Five additional compounds will be required - Buxton Wood, on the former Wisley Airfield, on land within the Hilton Hotel site, on the land at New Farm and on land adjacent to the M25 westbound carriageway between the existing Buxton Wood overbridge and the replacement Clearmount overbridge. These compound areas will all be used for storage of soils removed from the site of the works, to enable these soils to be reused for the earthworks.

7.4.55 All land used for compounds will be restored or enhanced after works have been carried out.

Contractor Haul Roads

7.4.56 Haul routes for materials and staff will, as far as possible, use the existing A3 and M25. Where widening will create an extra lane or extended slip road, the contractor will use this area and the adjacent working space included in the DCO boundary as a haul route.

Proposals for protected or notable species

7.4.57 Protected and notable species will benefit from the habitat measures described above. There are also additional species-specific measures built into the design, which are described below.

Bats

7.4.58 A bat mitigation structure will be constructed to compensate for the loss of the former San Domenico restaurant building, which is located adjacent to the A3 and supports a bat roost. Fencing and/or tall hedgerow will be installed/planted to screen the bat mitigation structure from the construction compound, any temporary lighting required will be designed sensitively and five Schwegler bat boxes will be installed outside of the works area at the woodland edge to the north of the existing San Domenico Building. Specific locations for bat boxes will determined by an ecologist on site.

7.4.59 To compensate for the loss of a tree (tree 155 at OSNGR TQ 07006 57882, as shown on Figure 7.11 in Volume 3 (application document TR010030/APP/6.3)), which supports a bat roost, three Schwegler bat boxes and one four seasons bat box will be installed in advance of the removal of this tree.

7.4.60 Additional bat roost boxes will be installed as compensation for all felled trees with moderate or high roost potential.

7.4.61 Any lighting required for construction will be designed sensitively to avoid illuminating adjacent habitats used by commuting and foraging.

Birds

7.4.62 Bird nest boxes will be provided to compensate for the loss of potential nesting opportunities within the DCO boundary. This will include nine open-fronted boxes for spotted flycatchers within the retained woodland areas of Ockham and Wisley Commons to compensate for loss of nesting habitat for this species. In addition, 20 tit boxes will be provided to compensate for the loss of potential nesting cavities.

7.4.63 The exact locations of these nest boxes will be determined during detailed design and recorded in the Construction Environmental Management Plan (CEMP).

Badgers

7.4.64 An artificial badger sett will be created at an undisclosed location to compensate for the temporary closure and permanent partial loss of one main sett that falls within the footprint of the highways proposals.

Great crested newts, reptiles and terrestrial invertebrates

7.4.65 The installation of log piles from some of the felled trees will provide suitable compensatory habitat for some notable terrestrial invertebrates, while providing refugia for great crested newts (*Triturus cristatus*) and common species of reptiles, where present.

7.4.66 Habitat creation will involve the establishment of habitats, including; open, flowery acid grassland and a heath mosaic, south-facing vertical and near-vertical sandy exposures, scrub edge interface, standing deadwood and deadwood, to compensate for permanent loss of terrestrial invertebrate habitats and will also provide some benefit to reptiles, including sand lizards.

7.4.67 The number and exact locations of these log piles and areas of habitat creation will be determined during detailed design and recorded in the CEMP.

7.5 The study area

7.5.1 This biodiversity chapter will consider the impacts of the entire Scheme as described above.

7.5.2 The study area was identified by determining the Ecological Zone of Influence (EZoI) of the Scheme. The EZoI encompasses all the predicted impacts and subsequent effects of the Scheme on nature conservation resources.

7.5.3 The EZoI includes the Scheme area (i.e. the DCO boundary, as shown in Figure 2.1 of Volume 3 Figures in Volume 3 (application document TR010030/APP/6.3)) and extends beyond this area where there are ecological and hydrological links. The EZoI therefore includes land directly adjacent to the Scheme area and nature conservation receptors located further afield due to the potential for indirect effects over a wider area.

7.5.4 Due to the relative importance of some nature conversation resources and the mobility of some species, the desk study and survey areas have been extended for some resources[18]. Based on current best practice guidance, this includes the following:

- Ten kilometres for bats (all species)[19];
- Twenty kilometres for cryptic bat species[20] and bat species listed in the Annex II of the Habitats Directive[21].
- Thirty kilometres for Special Areas of Conservation (SACs) where bats are a qualifying feature for which the SAC was selected[22];
- Two kilometres for statutory designated sites of nature conservation importance:
  - Special Areas of Conservation (SACs) with the exception of those where bats are a qualifying feature [23];
  - SPAs[24];
  - Ramsar sites[25];
  - SSSIs;
  - National Nature Reserves (NNRs); and
  - Local Nature Reserves (LNRs).
- Two kilometres for non-statutory SNCIs and Conservation Verges;
- One kilometre for ancient woodland, notable[26] habitats and notable[27] or legally protected species (with the exception of bats);
- Fifty metres for veteran trees[28];
- Two kilometres for watercourses and hydrologically connected waterbodies[29];
- Fifty metres for standing waterbodies and designated sites not hydrologically connected to a watercourse within the DCO boundary[29];

[18] http://www.standardsforhighways.co.uk/ha/standards/dmrb/vol11/section3/11s3p04.pdf 'The physical scope of an assessment will vary according to the nature of each individual scheme. The area to be considered may need to extend beyond the study area in order to encompass all significant impacts'.
[19] For larger projects, a search distance of up to 10 km for bats is recommended (Collins, J (ed) (2016) Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edn). The Bat Conservation Trust. London).
[20] Alcathoe bats are classed as a cryptic species due to the fact that their presence in Great Britain was first recorded in 2010 and therefore very little is known with regards to their population size or distribution within Great Britain. For further details see: Natural England and other parties (2018). A Review of the Population and Conservation Status of British Mammals: Technical Summary. http://nora.nerc.ac.uk/id/eprint/520322/1/N520322CR.pdf (accessed 14/02/2019)
[21] A full list of Annex II species is available at: http://jncc.defra.gov.uk/page-1523
[22] As recommended in DMRB Volume 11, Section 4: Assessment of implications on European Sites (paragraph 4.10)
[23] Including candidate SACs (cSACs)
[24] Including proposed SPAs (pSPAs)
[25] Including proposed Ramsar sites (pRamsars)
[26] This refers to Habitats of Principal Importance, as listed under Section 41 of the Natural Environment and Rural Communities (NERC) Act (2006).
[27] This refers to Species of Principal Importance, as listed under Section 41 of the Natural Environment and Rural Communities (NERC) Act (2006). For birds it also includes species that are notable for their Amber or Red List Birds of Conservation Concern status, or are protected under Annex I of the Birds Directive (2009/147EC) or Schedule 1 of the Wildlife and Countryside Act 1981 (as amended). For invertebrates, nationally scarce species are also considered to be notable. For plants, nationally rare/scarce and county rare/scare are also considered to be notable.
[28] Veteran trees are defined in Appendix 7.3.
[29] See Appendix 7.6 (aquatic ecology) for further details regarding watercourse EZoI determination.

- Five hundred metres for water bodies[30]; and
- Two hundred metres for sites adjacent to the Affected Road Network (ARN), as described in Chapter 5 (Air Quality) of the Environmental Statement.

7.5.5 The survey area for nature conservation resources is described in detail in Section 7.6.

7.6 Methods of assessment

Desk study

7.6.1 A desk study was undertaken to gather information on designated sites, habitats and species within the study area from the following sources:

- Information on statutory designated sites and their relevant citations, ancient woodlands and Habitats of Principal Importance (HPI) within the desk study area was obtained from the Multi-Agency Geographic Information for the Countryside (MAGIC) website[31] and the relevant citations for those statutory designated sites in February 2019 (results are provided in Appendix 7.2);
- Information on non-statutory designated sites, including SNCI and Conservation Verges within the desk study area was obtained from Surrey Biodiversity Information Centre (SBIC) in April 2017 (results are provided in Appendix 7.2);
- Records of veteran trees from within the desk study area were obtained from the Woodland Trust's Ancient Tree Inventory (ATI)[32] in June 2019 (results are provided in Appendix 7.3);
- Records of notable habitats, and notable and legally protected species (with the exception of bats, badgers, reptiles and amphibians) recorded within the desk study area from 2007-2017 were obtained from SBIC in April 2017[33] (results are provided in Appendix 7.4);
- Environment Agency data related to aquatic ecology, including Thames river basin district River Basin Management Plan (RBMP), freshwater biological survey data for macroinvertebrates, fish, macrophytes and diatoms and River Habitat Surveys;
- Records of all bat species (including roost records and visual observations) within 4 km of a central grid reference (TQ 081 592) were obtained from Surrey Bat Group (SBG) in January 2016, records of all bat species within 10 km of the Scheme were obtained from SBIC in April 2017[33] and records of cryptic[34] and Habitats Directive Annex II species[35] within 20 km were obtained from SBG in December 2017;

[30] Great crested newts can disperse up to 500m from a pond. Therefore, water bodies within 500m of the Scheme have been considered for their great crested newt potential.
[31] http://www.magic.gov.uk/MagicMap.aspx
[32] Woodland Trust Ancient Tree Inventory (https://ati.woodlandtrust.org.uk/; accessed 10/06/2019)
[33] From central OSNGR TQ 080 593.
[34] Alcathoe bats are classed as a cryptic species due to the fact that their presence in Great Britain was first recorded in 2010 and therefore very little is known with regards to their population size or distribution within Great Britain. For further details see: Natural England and other parties (2018). A Review of the Population and Conservation Status of British Mammals: Technical Summary. http://nora.nerc.ac.uk/id/eprint/520322/1/N520322CR.pdf (accessed 14/02/2019)
[35] http://jncc.defra.gov.uk/page-1523

- Ordnance Survey maps and the Where's the Path website[36] were used to identify the presence of water bodies within the desk study area, in order to establish if great crested newts could potentially be present on land within and immediately surrounding the Scheme;
- Records of reptiles and amphibians from within the desk study area from 2007-2017 were obtained from Surrey Amphibian and Reptile Group (SARG) in May 2017;
- Records of qualifying breeding bird species of the Thames Basin Heaths Special Protection Area within Ockham and Wisley Commons from 2J's[37] for the last six years (2013-2018)[38];
- Records of [redacted]
- The Wisley Airfield Environmental Statement (Planning Application reference 15/P/00012) was obtained from the Guildford Borough Planning Portal[39]; and
- Bat data from the Ecological Appraisal and associated documents for the development of San Domenico, Portsmouth Road (Planning Application reference 2017/0524) was obtained from the Elmbridge Borough Council[40].

7.6.2 Figure 7.1 in Volume 3 (application document TR010030/APP/6.3) shows the study area for the desk study.

7.6.3 The desk study records were obtained from the relevant sources from 2016 to 2018. Taking into account the surveys that have been undertaken as detailed in paragraphs 7.6.4 to 7.6.15 and the large volume of data that has been gathered as a result of these, the desk study records provided are considered sufficient.

Ecological surveys

Preliminary ecological appraisal

7.6.4 A series of Preliminary Ecological Appraisal (PEA) surveys were undertaken broadly following the Phase 1 habitat survey methodology as set out in Joint Nature Conservation Committee guidance[41] to record information on the habitats within the survey area, and was 'extended' to include a search for evidence of presence, and an assessment of the potential of each habitat to support, notable and legally protected species, as recommended by CIEEM[42]. In addition, surveyors noted any evidence of the presence of certain invasive plants listed on Schedule 9 of the Wildlife and Countryside Act 1981 (as amended) and subject to strict legal control (Japanese knotweed, giant knotweed, hybrid knotweed,

[36] https://wtp2.appspot.com/wheresthepath.htm.
[37] 2J's is a voluntary group of ornithologists who survey all of the Thames Basin Heaths SPA sites during the breeding bird season each year, to monitor the numbers of SPA qualifying species.
[38] In early 2018, the breeding bird data for Wisley Common and Ockham Common was obtained from 2J's for the five-year period of 2013-2017. The breeding bird data for Wisley Common and Ockham Common for 2018 was also obtained in early 2019.
[39] http://www2.guildford.gov.uk/publicaccess/applicationDetails.do?activeTab=summary&keyVal=_GUILD_DCAPR_157858 (accessed 13/03/2019)
[40] http://emaps.elmbridge.gov.uk/ebc_planning.aspx?requesttype=parseTemplate&template=PlanningPlansAndDocsTab.tmplt&Filter=^APPLICATION_NUMBER^='2017/0524'&appno:PARAM=2017/0524&address:PARAM=San Domenico, Portsmouth Road, Cobham, Surrey, KT11 1EN&northing:PARAM=160291&easting:PARAM=508887 (accessed 13/03/2019)
[41] Joint Nature Conservation Committee (2010) Handbook for Phase 1 habitat survey - a technique for environmental audit.
[42] Chartered Institute of Ecology and Environmental Management (2017). Guidelines for Preliminary Ecological Assessment: Second Addition.

giant hogweed, Himalayan balsam, rhododendron and cotoneaster species). This included surveys of accessible land within the Scheme between February 2016 and February 2019; Thames Basin Heaths SPA/Ockham and Wisley Commons SSSI land within the four quadrants surrounding junction 10[43] in February 2016; Wisley Airfield SNCI, Elm Corner Woods SNCI and Painshill Park in October 2017; and, proposed compound at Nutberry Fruit Farm in February 2018.

7.6.5 A survey was also undertaken of the A3 road verges between the Ockham interchange and Painshill junction in February 2016. In order to avoid the health and safety risks associated with walking on the verge of a major trunk road, this survey was initially conducted from a vehicle and was later supplemented with information gathered from walkover surveys from adjacent land, footpaths and overbridges.

7.6.6 Figure 7.2 in Volume 3 Figures (application document TR010030/APP/6.3) shows the Phase 1 habitat types and the extent of the extended Phase 1 survey area.

National Vegetation Classification

7.6.7 A National Vegetation Classification (NVC) survey of notable habitats, and a search for notable plant species identified during the desk study, was undertaken of land within and immediately adjacent to the Scheme, focussing on terrestrial notable habitats and ancient woodland. Surveys were undertaken in August 2016, September 2017 and May 2018. Methods and results can be found in Appendix 7.5.

7.6.8 The ancient woodland at the Heyswood Girl Guide Camp is split into two compartments. An NVC survey of the south-western compartment was undertaken on 26th September 2017 and of the northern section on 15th May 2018. NVC surveys of the ancient woodlands at Elm Corner and Hatchford Wood were undertaken on 3rd May 2018.

Veteran tree surveys

7.6.9 Ground level walked assessments to record and confirm the presence of veteran trees was undertaken in 2018 and 2019 by an experienced arboriculturist, within and around the Scheme (including replacement, SPA compensation and SPA enhancement areas). Potential veteran specimens and a sample of the standing dead trees recorded were then re-surveyed by an experienced entomologist to ascertain their value for saproxylic invertebrates[44]. Methods and results can be found in Appendix 7.3.

Watercourse and standing waterbody surveys

7.6.10 Walkover surveys were completed in 2017 and 2018 of aquatic habitats (watercourses and standing waterbodies) within the survey area to broadly characterise habitat quality, the range of aquatic species likely to be supported

[43] M25 junction 10 is bound by four areas of land. These are referred to as quadrants in this report, and are located to the north-east, north-west, south-east and south-west of the junction.
[44] Saproxylic invertebrates are dependent on microhabitats associated with the processes of decay and damage in the bark and wood of trees.

(including fish, macroinvertebrates and macrophytes), and identify habitat and species for further survey. Aquatic surveys are detailed in Appendix 7.6. These further surveys consisted of:

- River Corridor Surveys (RCS) were undertaken on the Stratford Brook, the River Wey and River Mole. These are the only rivers for which a WFD status is reported and are within 50 m of the Scheme. Methods and results can be found within Appendix 7.6.
- Aquatic surveys were undertaken on watercourses screened as requiring habitat survey and exhibiting suitable habitat for detailed species survey type. Surveys were undertaken in May 2018, methods and results can be found within Appendix 7.6 and 7.7. Detailed species surveys included:
  - Electric fishing surveys on Stratford Brook; and
  - Aquatic macroinvertebrate surveys on Stratford Brook and the ditch adjacent to the A3.
- Common Standards Monitoring (CSM) was undertaken within Bolder Mere in June 2018. This included a detailed habitat survey alongside aquatic macrophytes and aquatic macroinvertebrates. Methods and results can be found in Appendix 7.8.

Notable and protected species surveys

7.6.11 The requirement for certain notable and protected species surveys was identified based on the results of the Preliminary Ecological Appraisal.

7.6.12 The survey effort was proportionate to inform assessment of the EZoI as a result of the Scheme proposals and potential impacts, and focused on the highways proposals (i.e. the temporary and permanent land take areas).

7.6.13 Surveys within the replacement, SPA compensation and SPA enhancement areas were restricted to badgers and breeding birds (breeding bird surveys were undertaken in the SPA enhancement areas to be clear felled to determine whether breeding bird territories may be lost).

7.6.14 It is considered unlikely that there will be impacts on other resources within the replacement, SPA compensation and SPA enhancement areas. This is because works within these areas will be undertaken in a sensitive way to avoid harm to these receptors, and the habitat enhancement measures proposed for these areas will be of benefit to the majority of protected or notable species should they occur, and establishing a baseline was considered unnecessary.

7.6.15 The following detailed surveys for notable and protected species have been undertaken. All surveys were designed to collect the necessary baseline data to assess potential impacts of the Scheme. The survey methodologies for bats, breeding birds, invertebrates and reptiles were agreed with Natural

England[45]/[46]/[47]. The full methods, results and survey area for each resource is provided in the relevant Appendices:

- Bat surveys were undertaken in 2016, 2017 and 2018, according to good practice guidance[48]. Methods and results can be found in Appendices 7.9 and 7.10. Surveys included:
  - Ground level tree assessments;
  - External and internal building and structure inspections;
  - Presence/likely absence surveys, including tree climbing surveys;
  - Activity transect surveys;
  - Crossing point surveys; and
  - Trapping surveys.
- Great crested newt surveys were undertaken in 2016, 2017 and 2018, according to good practice guidance[49,50,51], up to 250 m from the Scheme. Methods and results can be found in Appendix 7.11. Surveys included:
  - Habitat Suitability Index (HSI) assessments;
  - Environmental DNA (eDNA)[52] surveys; and
  - Population size class assessment surveys (conventional methods).
- Presence/likely absence surveys for sand lizards (*Lacerta agilis*)[53] and common species of reptiles (common lizard (*Zootoca vivipara*), grass snake (*Natrix helvetica helvetica*[54]), slow worm (*Anguis fragilis*), and adder (*Vipera berus*)) within and adjacent to the Scheme (excluding replacement, SPA compensation and SPA enhancement areas) areas between August 2017 and October 2017, according to good practice guidance[55]. Additional sand lizard surveys were undertaken in spring 2018. Methods and results can be found in Appendix 7.12;
- Hazel dormouse (*Muscardinus avellanarius*) surveys of wooded areas within and adjacent to the Scheme (excluding replacement, SPA compensation and

[45] Correspondence by email on the 23rd March 2018 from G Steven at Natural England agreeing approach to survey methodology for Aerial Tree-Climbing Approach for Bat Roost Surveys.
[46] Correspondence by email on the 12th June 2017 from G Steven at Natural England agreeing approach to survey methodology for invertebrate and breeding bird surveys.
[47] Correspondence by email on the 27th July 2017 from G Steven at Natural England agreeing approach to survey methodology for bat and reptile surveys.
[48] Collins, J (ed) (2016) Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edn). The Bat Conservation Trust. London.
[49] Oldham R.S., Keeble J., Swan M.J.S. & Jeffcote M. (2000). Evaluating the suitability of habitat for the Great Crested Newt (Triturus cristatus). Herpetological Journal 10 (4), 143-155.
[50] Biggs J, Ewald N, Valentini A, Gaboriaud C, Griffiths RA, Foster J, Wilkinson J, Arnett A, Williams P and Dunn F 2014. Analytical and methodological development for improved surveillance of the Great Crested Newt. Defra Project WC1067. Freshwater Habitats Trust: Oxford.
[51] Great Crested Newt Mitigation Guidelines (English Nature, 2001).
[52] Biggs J, Ewald N, Valentini A, Gaboriaud C, Griffiths RA, Foster J, Wilkinson J, Arnett A, Williams P and Dunn F (2014). Analytical and methodological development for improved surveillance of the Great Crested Newt. Appendix 5. Technical advice note for field and laboratory sampling of great crested newt (*Triturus cristatus*) environmental DNA. Freshwater Habitats Trust, Oxford.
[53] SARG provided advice on appropriate survey areas for sand lizards.
[54] Until 2017, the species of grass snake present within the United Kingdom was thought to be *Natrix natrix* subspecies *helvetica*. This was one of 14 subspecies of *Natrix natrix* within Europe. However, following genetic sequencing studies, the 14 subspecies of *Natrix natrix* was differentiated into two species; *Natrix natrix* and *Natrix helvetica*. There is only one species of grass snake known to occur within the UK and this is now known as *Natrix helvetica helvetica*. https://www.arguk.org/get-involved/news/what-does-the-re-classification-of-european-grass-snakes-mean-for-our-native-grass-snakes
[55] Gent, T., Gibson, S. (2003). Herpetofauna Workers Manual.

SPA enhancement areas) were undertaken in 2016, 2017 and 2018 according to good practice guidance[56]. Methods and results can be found in Appendix 7.13;

- Otter (*Lutra lutra*) and water vole (*Arvicola amphibious*) presence/absence surveys of Stratford Brook, Bolder Mere, Guileshill Brook, Manor Pond, River Mole and River Wey were carried out in April 2018 and July 2018. Methods and results can be found in Appendix 7.14;
- Breeding bird surveys of potentially suitable habitats within the Scheme and the immediate surrounds and the wider footprint of the Ockham and Wisley Commons SSSI (which includes the Ockham and Wisley Commons sections of the Thames Basin Heaths SPA, including the SPA enhancement areas) were carried out in 2016, 2017 and 2018. See Appendix 7.15 for details of methods and results;
- [redacted] surveys were carried out within and up to [redacted]
- White-clawed crayfish (*Austropotamobius pallipes*) survey of Stratford Brook was carried out in October 2018. Methods and results can be found in Appendix 7.17; and,
- Terrestrial invertebrate surveys were undertaken within potential suitable habitats within the Scheme and adjacent to the Scheme, focussing on Ockham and Wisley Commons SSSI during summer 2017. Methods and results can be found in Appendix 7.18.

Non-native invasive species surveys

7.6.16 During the extended Phase 1 habitat survey and NVC survey, a search was made within the Scheme boundary for invasive plants subject to legal control, listed on Schedule 9 of the Wildlife and Countryside Act 1981 (as amended). A summary of relevant legislation is provided in Appendix 7.1.

7.6.17 In addition, during the extended Phase 1 habitat survey and other field surveys for notable and protected species, observations from within the Scheme boundary of invasive animal species listed on Schedule 9 of the Wildlife and Countryside Act 1981 (as amended) were also recorded.

Assessing value (sensitivity) of nature conservation resources

7.6.18 Nature conservation resources have been valued following the framework provided in IAN 130/10 Ecology and Nature Conservation: Criteria for Impact Assessment[57]. This is presented in Table 7.1 below.

7.6.19 The evaluation was based on the information available from the desk study and ecological surveys and used professional judgement, as well as accepted

[56] Bright, P.W., Morris, P.A. and Mitchell-Jones, A. (2006) Dormouse Conservation Handbook 2nd Edition. English Nature, Peterborough.

[57] Interim Advice Note 130/10 (2010) Ecology and Nature Conservation: Criteria for Impact Assessment

criteria[58] (e.g. diversity, rarity and naturalness) for valuing nature conservation.

Table 7.1: Evaluation of nature conservation resources

Examples of resource valuation based on geographical context
International or European value
Natura 2000 sites including: Sites of Community Importance (SCIs); Special Protection Areas (SPAs); potential SPAs (pSPAs); Special Areas of Conservation (SACs); candidate or possible SACs (cSACs or pSACs[59]); and Wetlands of International Importance (Ramsar sites). Biogenetic Reserves, World Heritage Sites and Biosphere Reserves. Areas which meet the published selection criteria for those sites listed above but are not themselves designated as such[60]. Resident, or regularly occurring, populations of species which may be considered at International or European level[61] where: • The loss of these populations would adversely affect the conservation status or distribution of the species at this geographic scale; or • The population forms a critical part[62] of a wider population at this scale; or • The species is at a critical phase[63] of its life cycle at this scale.
UK or National value
Designated sites including: Sites of Special Scientific Interest (SSSIs); Marine Protected Areas (MPAs) including Marine Conservation Zones (MCZs); and National Nature Reserves (NNRs). Areas which meet the published selection criteria e.g. JNCC (1998) for those sites listed above but which are not themselves designated as such[64]. Areas of key/priority habitats identified in the UK Biodiversity Action Plan (BAP); including those published in accordance with Section 41 of the Natural Environment and Rural Communities Act (2006) and those considered to be of principle importance for the conservation of biodiversity[65]. Areas of ancient woodland e.g. woodland listed within the Ancient Woodland Inventory[66]. Resident, or regularly occurring, populations of species which may be considered at International, European, UK or National level[67] where: • The loss of these populations would adversely affect the conservation status or distribution of the species at this scale; or • The population forms a critical part[68] of a wider population at this scale; or

[58] Set out in Ratcliffe (1977) A Nature Conservation Review. Cambridge University Press
[59] pSACs are sites which have been formally advised to the UK government but have not yet been submitted to the European Commission. These sites should be valued at European level on the basis that they meet the relevant selection criteria for a SAC but are not yet designated as such.
[60] Valuation to be made in consultation with SEB.
[61] Valuation to be made in consultation with SEB. Such species include those listed within Council Directive 79/409/EEC on the conservation of wild birds or animal/plant species listed within Council Directive 92/43/EEC.
[62] Valuation to be made in consultation with SEB. Such population include sub-populations that are essential to maintenance of metapopulation dynamics e.g. critical emigration/immigration links between otherwise discrete populations.
[63] Seasonal activity or behaviour upon which survival or reproduction depends.
[64] Valuation to be made in consultation with SEB.
[65] Valuation to be made in consultation with SEB as such listings do not in themselves indicate intrinsic value, but instead indicate a conservation priority.
[66] Valuation to be made in consultation with SEB, and with use of professional judgement as listing does not in itself indicate intrinsic nature conservation value.
[67] Valuation to be made in consultation with SEB as such listings do not in themselves indicate intrinsic value. Such species include those listed within Council Directive 79/409/EEC on the conservation of wild birds or animal/plant species listed within Council Directive 92/43/EEC. Species which may be considered at the UK or National level means: birds, other animals and plants which receive legal protection on the basis of their conservation interest (those listed in the Wildlife and Countryside Act 1981 (as amended), SCH 1, 5 and 8); species listed for their principle importance for biodiversity (in accordance with the Natural Environment and Rural Communities Act 2006 Section 41 [England]; and priority species listed within the UKBAP or species listed within Red Data Books.
[68] Valuation to be made in consultation with the SEB. Such populations include sub-populations that are essential to the maintenance of metapopulation dynamics e.g. critical emigration/immigration links between otherwise discrete populations.

Examples of resource valuation based on geographical context
• The species is at a critical phase[69] of its life-cycle at this scale.
Regional value
Areas of key/priority habitats identified in the Regional BAP (where available); areas of key/priority habitat identified as being of regional value in the appropriate Natural Area Profile (or equivalent); areas that have been identified by regional plans or strategies as areas for restoration or re-creation of priority habitats (for example South-west Nature Map); and areas of key/priority habitat listed within the Highways Agency's[70] BAP. Resident, or regularly occurring, populations of species which may be considered at an International, European, UK or National level[71][72] and key/priority species listed within the HABAP where: • The loss of these populations would adversely affect the conservation status or distribution of the species at this scale; or • The population forms a critical part[73] of a wider population; or • The species is at a critical phase[74] of its life cycle.
County or Unitary Authority Area value
Designated sites including: SNCIs; County Wildlife Sites (CWSs); and LNRs designated in the county or unitary authority area context[75]. Areas which meet the published selection criteria for those sites listed above but which are not themselves designated as such[76]. Areas of key/priority habitats identified in the Local BAP; and areas of habitat identified in the appropriate Natural Area Profile (or equivalent). Resident, or regularly occurring, populations of species which may be considered at an International, European, UK or National level[77][78] where: • The loss of these populations would adversely affect the conservation status or distribution of the species across the County or Unitary Authority Area; or • The population forms a critical part[79] of a wider population; or • The species is at a critical phase[80] of its life cycle.
Local value
Designated sites including Local Nature Reserves (LNRs) designated in the local context[81].

[69] A seasonal activity or behaviour upon which survival or reproduction depends.
[70] This has been taken directly from IAN 130/10. The Highways Agency has now become Highways England.
[71] Valuation to be made in consultation with the SEB. Such species include those listed within Council Directive 79/409/EEC on the conservation of wild birds or animal/plant species listed within Council Directive 92/43/EEC.
[72] Valuation to be made in consultation with the SEB as such listings do not in themselves indicate intrinsic value. Such species include those listed within Council Directive 79/409/EEC on the conservation of wild birds or animal/plant species listed within Council Directive 92/43/EEC. Species which may be considered at the UK or National level means: birds, other animals and plants which receive legal protection on the basis of their conservation interest (those listed in the Wildlife and Countryside Act 1981 (as amended), SCH 1, 5 and 8); species listed for their principle importance for biodiversity (in accordance with the Natural Environment and Rural Communities Act 2006 Section 41 [England]; and priority species listed within the UKBAP or species listed within Red Data Books.
[73] Valuation to be made in consultation with the SEB. Such populations include sub-populations that are essential to the maintenance of metapopulation dynamics e.g. critical emigration/immigration links between otherwise discrete populations.
[74] A seasonal activity or behaviour upon which survival or reproduction depends.
[75] Valuation to be made in consultation with county ecologist or equivalent, with reference made to the criteria for designation.
[76] Valuation to be made in consultation with county ecologist or equivalent.
[77] Valuation to be made in consultation with the SEB. Such species include those listed within Council Directive 79/409/EEC on the conservation of wild birds or animal/plant species listed within Council Directive 92/43/EEC.
[78] Valuation to be made in consultation with the SEB as such listings do not in themselves indicate intrinsic value. Such species include those listed within Council Directive 79/409/EEC on the conservation of wild birds or animal/plant species listed within Council Directive 92/43/EEC. Species which may be considered at the UK or National level means: birds, other animals and plants which receive legal protection on the basis of their conservation interest (those listed in the Wildlife and Countryside Act 1981 (as amended), SCH 1, 5 and 8); species listed for their principle importance for biodiversity (in accordance with the Natural Environment and Rural Communities Act 2006 Section 41 [England]; and priority species listed within the UKBAP or species listed within Red Data Books.
[79] Valuation to be made in consultation with the SEB. Such populations include sub-populations that are essential to the maintenance of metapopulation dynamics e.g. critical emigration/immigration links between otherwise discrete populations.
[80] A seasonal activity or behaviour upon which survival or reproduction depends.
[81] Valuation to be made in consultation with county ecologist or equivalent, with reference made to the criteria for designation.

Examples of resource valuation based on geographical context
Trees that are protected by Tree Preservation Orders (TPOs).
Areas of habitat; or populations/communities of species considered to appreciably enrich the habitat resource within the local context (such as veteran trees), including features of value for migration, dispersal or genetic exchange.

7.6.20 Where ancient woodland is relatively common, as in Surrey, there are often examples that are of SSSI quality (and therefore National value) or of SNCI quality (and therefore county value) that are not covered by a designation. Therefore, inclusion on the Ancient Woodland Inventory does not itself indicate a specific level of value, and the examples present in close proximity to the Scheme area have been valued based on the Joint Nature Conservation Committee (JNCC) SSSI[82] and Surrey SNCI[83] criteria for site selection, ecological survey data, and in consultation with Natural England[84] (as required by IAN 130/10: refer to **Error! Reference source not found.**, footnote 65).

7.6.21 Nevertheless, ancient woodland is an irreplaceable habitat, and whatever nature conservation valuation is placed on an individual ancient woodland, whether an ancient semi-natural woodland (ASNW) or a plantation on an ancient woodland site (PAWS), it has ancient woodland status and the resultant strong policy protection. Section 5.32 of the National Policy Statement for National Networks (2014)[85] states that the:

7.6.22 "Ancient woodland is a valuable biodiversity resource both for its diversity of species and for its longevity as woodland. Once lost it cannot be recreated. The Secretary of State should not grant development consent for any development that would result in the loss or deterioration of irreplaceable habitats including ancient woodland and the loss of aged or veteran trees found outside ancient woodland, unless the national need for and benefits of the development, in that location, clearly outweigh the loss. Aged or veteran trees found outside ancient woodland are also particularly valuable for biodiversity and their loss should be avoided*[86]*. Where such trees would be affected by development proposals, the applicant should set out proposals for their conservation or, where their loss is unavoidable, the reasons for this."

7.6.23 Although veteran trees are implied to be of assumed 'local' value in **Error! Reference source not found.**, an approach to valuing individual veteran trees has been agreed with Natural England[87].

7.6.24 Habitats of Principal Importance present within and in close proximity to the Scheme area have been valued based on their abundance and distribution within Surrey and the South East (i.e. if they are common and widespread). This

[82] JNCC. Guidelines for the selection of biological SSSI's Part 2: Detailed guidelines for habitats and species groups. 2a WOODLANDS. http://jncc.defra.gov.uk/pdf/SSSIs_Chapter02.pdf
[83] SWT (2008). Guidance for the Selection of Sites of Nature Conservation Importance (SNCIs) in Surrey http://surrey-arg.org.uk/SARG/07000-Publications/SWT/Guidance%20for%20Selection%20of%20SNCIs%20-%20May08.pdf
[84] Correspondence by email on the 7th December 2017 from G Steven at Natural England agreeing approach to valuation of ancient woodland, veteran trees and Habitats or Principal Importance
[85] Department for Transport (2014). National Policy Statement for National Networks. Accessed at https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/387222/npsnn-print.pdf
[86] This does not prevent the loss of such trees where the decision-maker is satisfied that their loss is unavoidable
[87] Correspondence by email on the 7th December 2017 from G Steven at Natural England agreeing approach to valuation of ancient woodland, veteran trees and Habitats or Principal Importance

approach has been agreed with Natural England[88].

Impact assessment

7.6.25 The assessment of the potential effects of the Scheme takes into account both on-site effects and those that may occur to adjacent and more distant nature conservation resources. Impacts on nature conservation resources have been characterised, including consideration of the probability, extent, size, duration, reversibility, timing and frequency of the impacts. Impacts can be permanent or temporary and fall broadly into the following categories:

- Direct loss of habitats (permanent or temporary);
- Fragmentation or isolation of habitats;
- Changes to the local hydrology;
- Changes to water quality;
- Changes to air quality;
- Direct mortality or injury to wildlife through construction and/or operation activities;
- Disturbance to species from noise; and
- Disturbance to species from light or other visual stimuli.

7.6.26 This assessment is based on guidance from Design Manual for Roads and Bridges (DMRB) Volume 11: Environmental Assessment, IAN 130/10 and takes account of the CIEEM Guidelines for Ecological Impact Assessment in the UK and Ireland[89] and the Annex to Advice Note 7 by the Planning Inspectorate for England and Wales (PINS)[90].

7.6.27 Effects are unlikely to be significant where features of low value or sensitivity are subject to small or short term impacts. However, where there are a number of small-scale effects that are not significant alone, the assessor may determine that, cumulatively, these may result in an overall significant effect. Significant effects have been determined as being either negative (adverse), positive (beneficial) or neutral.

7.6.28 For designated sites, effects are considered significant when a project and associated activities are likely to either undermine or support the conservation objectives or condition of the site(s) and its features of interest.

7.6.29 When determining the significance of an effect, consideration is given to whether:

- Any processes or key characteristics will be removed or changed;
- There will be an effect on the nature, extent, structure and function of

[88] Correspondence by email on the 7th December 2017 from G Steven at Natural England agreeing approach to valuation of ancient woodland, veteran trees and Habitats or Principal Importance
[89] CIEEM (September 2018). Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine. Chartered Institute of Ecology and Environmental Management, Winchester.
[90] Annex to Advice Note 7: Environmental Impact Assessment: Process, Preliminary Environmental Information and Environmental Statements

component habitats; and/or

- There is an effect on the average population size and viability of component species.

7.6.30 Functions and processes acting outside the formal boundary of a designated site have also been considered, particularly where a site falls within a wider ecosystem e.g. wetland sites.

7.6.31 Some ecosystems can tolerate a degree of minor changes, such as localised or temporary disturbance or changes in physical conditions, without such changes harming their function or value. For this assessment, ecological effects have been considered in the light of any information available about the capacity of ecosystems to accommodate change.

7.6.32 The conservation status of undesignated habitats and species within a defined geographical area has been used in this assessment to determine whether the effects of the proposals are likely to be significant as follows:

- 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

7.6.33 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.

7.6.34 The principles of the mitigation hierarchy have been applied when considering impacts and subsequent effects on nature conservation resources within the EZoI. The principles state that in order of preference, impacts on biodiversity should be avoided, then mitigated. If there are significant residual adverse effects that cannot be mitigated, then compensation will be required. Enhancement measures are also identified to provide benefits for biodiversity above the requirements for avoidance, mitigation or compensation.

7.6.35 As explained in paragraph 7.4.2, the Scheme includes all replacement, SPA compensation and SPA enhancement areas and the environmental proposals within these that are embedded within the design. Potential impacts (positive and negative) of these measures have therefore been included in the impact assessment.

7.6.36 Avoidance and mitigation measures have been incorporated into the Scheme design according to the principles of the mitigation hierarchy and are taken into account in the assessment of the significance of effects. These measures include those required to achieve the minimum standard of established good practice, together with additional measures to further reduce any negative impacts of the Scheme. The avoidance and mitigation measures include those required to reduce or avoid the risk of committing legal offences.

7.6.37 Mitigation measures are designed to reduce and/or minimise impacts within the Scheme. Compensation involves measures, such as habitat creation, that offset the residual impacts after mitigation that have an adverse effect upon the

conservation objectives or condition for a protected site[91].

7.6.38 Taking mitigation measures and replacement, SPA compensation and SPA enhancement areas within the Scheme design into account, the significance of residual effects has been determined using professional judgement and in accordance with CIEEM guidelines. The significance of residual effect categories are listed in **Table** 7.2 below, which has been taken from IAN 130/10.

Table 7.2: Significance of residual effects on nature conservation resource

Significance category	Typical descriptors of effect
Very large	An effect on one or more feature[92](s) of International, European, UK or National Value. NOTE: only adverse effects are normally assigned this level of significance. They should be considered to represent key factors in the decision-making process.
Large	An effect on one or more feature(s) of regional value. NOTE: these effects are considered to be very important considerations and are likely to be material in the decision-making process.
Moderate	An effect on one or more feature(s) of county value. NOTE: These effects may be important but are not likely to be key decision-making factors.
Slight	An effect on one or more feature(s) of local value. NOTE: These effects are unlikely to be critical in the decision-making process but are important in enhancing the subsequent design of the project.
Neutral	No significant effects on important nature conservation resources. NOTE: Absence of effects, or those that are beneath levels of perception.

Consultation

7.6.39 The following environmental organisations have been consulted with regards to aspects of the Scheme such as option selection and design, potential mitigation and compensation features, and species survey methodologies:

- Natural England (option selection and design, Habitats Regulations Assessment, valuations, potential mitigation and compensation features, species survey methodologies and impact assessment);
- Environment Agency (option selection and design, potential mitigation and compensation features, with respect to water);
- Surrey County Council (option selection and design, potential mitigation and compensation features);
- The SWT (option selection and design, Habitats Regulations Assessment, potential mitigation and compensation features);
- The RSPB (option selection and design, Habitats Regulations Assessment,

[91] Definitions adapted from CIEEM guidance on Mitigation, Compensation and Enhancement (https://www.cieem.net/mitigation-compensation-and-enhancement; accessed 24/03/18).
[92] Features are referred to as Nature Conservation Resources in this report

potential mitigation and compensation features);

- Surrey Amphibian and Reptile Group (species survey methodologies[93]); and
- Forestry Commission (option selection and design, potential mitigation and compensation features).

[93] SARG provided advice on appropriate survey areas for sand lizards

7.7 Assumptions and limitations

7.7.1 Survey-specific limitations are provided in the following appendices:

- 7.3 Veteran tree survey;
- 7.5 Vegetation and notable plants;
- 7.6 Aquatic ecology;
- 7.9 Bat survey report;
- 7.10 Bat baseline desk study, bat trapping and radiotracking survey;
- 7.11 Great crested newt survey report;
- 7.12 Reptile surveys;
- 7.13 Hazel dormouse surveys;
- 7.14 Otter and water vole surveys;
- 7.15 Breeding bird surveys;
- 7.16 Badger surveys;
- 7.17 White-clawed crayfish surveys; and
- 7.18 Invertebrate assessment.

7.7.2 Ecological surveys are limited by factors that affect the presence of plants and animals such as the time of year, migration patterns and behaviour. Therefore, absence of evidence of any particular species should not be taken as conclusive proof that the species is not present (although, in accordance with survey guidelines, “likely absence” has been determined for some species) or that it will not be present in the future.

7.7.3 The PEA included a scoping survey of the A3 verge undertaken from a vehicle of the A3 between the A3 Ockham interchange and A3/A245 Painshill junction. This involved a high-level assessment of broad habitat types present with their potential to support legally protected and notable fauna. This was conducted instead of an Extended Phase 1 habitat survey due to the health and safety risks associated with surveying the verge of a major trunk road on foot. As the surveys were supplemented with knowledge gathered from surveys of the surrounding areas, including adjacent land that extends up to the highways boundary, footpaths and overbridges, it is considered that the data collected is sufficient to establish the broad habitat types present along the verges and has enabled the potential for protected species that may occur within the road verges to be identified.

7.7.4 The list of invasive plant species included on Schedule 9 of the Wildlife and Countryside Act 1981 (as amended) is extensive and these plants are found in a range of different habitats, including aquatic habitats. The walkover survey checked for the presence of Japanese knotweed (*Fallopia japonica*), giant knotweed (*Fallopia sachalinensis*), hybrid knotweed (*Fallopia x bohemica*), giant hogweed (*Heracleum mantegazzianum*), rhododendron, cotoneaster species (*Cotoneaster spp*), Indian balsam (*Impatiens glandulifera*), New Zealand pygmy weed (*Crassula helmsii*) and Nuttall’s waterweed (*Elodea nuttallii*). Other

invasive species may not have been recorded, but it is considered that this survey is sufficient to identify any constraints posed by invasive species.

7.7.5 The survey effort is considered proportionate to the Scheme proposals, and focused on the highways proposals (i.e. the temporary and permanent land take areas) for the most part, rather than the replacement, SPA compensation and SPA enhancement areas. Badger and breeding bird surveys have been undertaken within the SPA enhancement and compensation areas. For habitats within the replacement, SPA compensation and SPA enhancement areas the precautionary principle[94] has been applied, whereby mitigation/compensation measures are provided to avoid/minimise the risk of any potentially adverse impacts.

7.7.6 Natural England have been consulted on the survey methodologies for bats, breeding birds, invertebrates and reptiles used where these deviated from standard guidance[95/96/97]. It is considered that a thorough series of ecological surveys have been conducted for the Scheme, and therefore a sufficient baseline dataset has been established in order to inform the impact assessment.

7.8 Baseline conditions (including value/sensitivity of resources and receptors)

7.8.1 Baseline conditions for each nature conservation resource are described below. Table 7.5 at the end of this section provides information about the nature conservation value of the resources in relation to the Scheme.

Designated sites

Statutory designated sites

7.8.2 The Scheme falls partially within the Thames Basin Heaths SPA, Ockham and Wisley Commons SSSI and Ockham and Wisley LNR. There are a further three statutory designated sites within 2 km of the Scheme, all of which are SSSIs (refer to Appendix 7.1 and section 7.3 for relevant legislation). Full details on the designated sites can be found in Appendix 7.2.

7.8.3

[94] United Nations Educational, Scientific and Cultural Organisation (2005). The Precautionary Principle. World Commission on the Ethics of Scientific Knowledge and Technology (COMEST).
[95] Correspondence by email on the 23rd March 2018 from G Steven at Natural England agreeing approach to survey methodology for Aerial Tree-Climbing Approach for Bat Roost Surveys.
[96] Correspondence by email on the 12th June 2017 from G Steven at Natural England agreeing approach to survey methodology for invertebrate and breeding bird surveys.
[97] Correspondence by email on the 27th July 2017 from G Steven at Natural England agreeing approach to survey methodology for bat and reptile surveys.

7.8.4 Table 7.3 summaries the designated sites within 2 km of the Scheme, and the location of the designated sites can be found on Figure 7.3 in Volume 3 (application document TR010030/APP/6.3).

Table 7.3: Summary of statutory designated sites within 2 km of the Scheme

Designated Site	Approximate distance from the Scheme
Thames Basin Heaths SPA	The Scheme falls partially within the SPA, which is located directly adjacent to the south-east and south-west of M25 junction 10.
Ockham and Wisley Commons SSSI	The Scheme falls partially within the SSSI which is located Directly adjacent to the south-east, south-west, north-east and north-west of M25 junction 10.
Ockham and Wisley LNR	The Scheme falls partially within the LNR, which is located directly adjacent to the south-east, south-west and north-west of M25 junction 10. 85 m to the north-east of M25 junction 10.
Bookham Commons SSSI	960 m south-east of the western extent of the Scheme.
Papercourt SSSI	1.5 km west of the southern extent of the Scheme.
Esher Commons SSSI	1.8 km northeast of the northern extent of the Scheme.

7.8.5 Two SACs where bats are listed as one of the qualifying features of the designation were identified within 30 km of the Scheme. Mole Gap to Reigate Escarpment SAC is 4.7 km to the south-east of the Scheme and Ebernoe Common SAC is 29.1 km to the south of the Scheme.

7.8.6 For air quality assessment the designated sites up to 200 m from the ARN consist of Ockham and Wisley Commons SSSI, Colony Bog and Bagshot Heath SSSI, Chobham Common SSSI, Esher Commons SSSI, Sheepleas SSSI and Mole Gap to Reigate Escarpment SSSI.

Non-statutory designated sites

Sites of Nature Conservation Importance

7.8.7 Twenty-one SNCIs were identified within 2 km of the Scheme. Information on these sites has been taken from the SBIC data search and is provided in Appendix 7.2 and Figure 7.4 in Volume 3 (application document TR010030/APP/6.3).

7.8.8 The Scheme falls partially within two SNCIs: Elm Corner Woods SNCI and Wisley Airfield SNCI[98]. In addition, Hunts Copse SNCI is immediately adjacent to the Scheme at Elm Lane.

Conservation Verges

7.8.9 There are four Conservation Verges within 2 km of the Scheme. Details of these are provided in Appendix 7.2.

7.8.10 One of these Conservation Verges falls within the Scheme – Bolder Mere conservation verge is located on both verges of Old Lane. The verge is a crossing site for common toad (*Bufo bufo*) at a 'county population of

[98] The area covered by the Wisley Airfield SNCI has been amended since the publication of the Regional Investment Programme M25 Junction 10/A3 Wisley Interchange Preliminary Environmental Information Report in February 2018. The Wisley Airfield SNCI boundary as shown on Figure 7.4 in Volume 3 (application document TR010030/APP/6.3) which covers 28.2 ha is that which was adopted by Guildford Borough Council in August 2018.

significance'[99].

Ancient woodland and veteran trees (outside of ancient woodland)

Ancient woodland

7.8.11 There are 33 parcels of ancient woodland within 1 km of the Scheme. A summary of these is provided in Appendix 7.2.

7.8.12 Five parcels of ancient woodland fall partially within the Scheme. Two parcels are located partially within the highways proposals (the temporary and permanent land take of the Scheme): the woodland within Heyswood Girl Guide Camp (OSNGR TQ 089 602 and OSNGR TQ 092 604) and Elm Corner Wood (OSNGR TQ 065 577).

7.8.13 The woodland at the Heyswood Girl Guide Camp is split into two compartments, with a gas compound between. The south-western compartment is 1.6 ha in size, and the northern compartment 0.4 ha in size. There are trees within the gas compound that give some continuity of the woodland canopy, but substantial gaps are present. The woodland ground flora in the gas compound area is sparse.

7.8.14 The vegetation survey of the south western compartment of the woodland at Heyswood Girl Guide Camp confirmed that the woodland is deciduous, containing sweet chestnut (*Castanea sativa*), beech (*Fagus sylvatica*), pedunculate oak (*Quercus robur),* turkey oak (*Quercus cerris*), red oak (*Quercus rubra*), hornbeam (*Carpinus betulus*) and silver birch (*Betula pendula*), including several pedunculate oaks that appear to be c200 years in age. The understorey includes a dense distribution of sycamore (*Acer pseudoplatanus*) saplings, with patches of cherry laurel (*Prunus laurocerasus*), holly (*Ilex aquifolium*) and rhododendron. The ground flora is shaded by the mature trees and sparse. Bramble (*Rubus fruticosus*), bracken (*Pteridium aquilinum*) and bluebell (*Hyacinthoides non-scripta*), are scattered throughout, and there are patches of tall ruderals, ferns and mosses.

7.8.15 The woodland in the northern section is in private ownership and situated on the boundary of pasture and is grazed under by horses and cattle. The vegetation survey of this section of woodland determined that the woodland has frequent hornbeam and sycamore, with occasional sweet chestnut and silver birch. There is no shrub layer to the woodland and the ground flora has a prominent grass component, with Yorkshire-fog (*Holcus lanatus*), rough meadow-grass (*Poa trivialis*), and creeping soft-grass common (*Holcus mollis*). Also, frequently occurring throughout the woodland are bluebell, ground ivy (*Glechoma hederacea*), common nettle (*Urtica dioica*) and bracken. Foxglove (*Digitalis purpurea*) and the ancient woodland indicator species hairy wood-rush (*Luzula pilosa*), three-nerved sandwort (*Moehringia trinervia*), and pignut (*Conopodium majus*) were occasionally recorded.

7.8.16 Elm Corner Wood is present on the southern extreme of Ockham Common and separated from the common by a prominent ditch. The NVC survey of this woodland confirmed that the woodland has a dominant shrub layer, composed of

[99] Taken from the desk study provided by SBIC which detailed the Biodiversity Interest for Bolder Mere Conservation Verge (CV005).

hazel (*Corylus avellana*), holly and hawthorn (*Crataegus monogyna*) and relatively open, high canopy of pedunculate oak and ash. The ground flora is heavily shaded in places but relatively diverse close to the boundary with Wisley Airfield. The ground flora consists of common species including; moschatel (*Adoxa moschatellina*), germander speedwell (*Veronica chamaedrys*), broad buckler-fern (*Dryopteris dilatata*), bramble, rough meadow-grass, ground ivy and common nettle. Elm Corner Wood appears to have had little management in recent years, and has been used by unauthorised motorcyclists, although SWT have taken steps to prevent this.

7.8.17 Two parcels of ancient woodland are located within the replacement land: The Bogs located within Pointers Road North replacement land (OSNGR TQ 090 588) and Queen Anne's Hills East woodland within Park Barn Farm replacement land (TQ 075 602).

7.8.18 The Bogs is a heavily shaded mature woodland, dominated by the invasive non-native species rhododendron. The canopy is predominantly oak and sweet chestnut with other trees including silver birch, downy birch (*Betula pubescens*), wild cherry (*Prunus avium*), rowan (*Sorbus aucuparia*) and alder (*Alnus glutinosa*). The dense shrub layer is dominated by rhododendron and rowan with dense bracken in places, limiting the ground flora beneath. The ground flora present within small glades, was dominated by remote sedge (*Carex remota*), creeping soft grass, enchanter's nightshade (*Circaea lutetiana*) and greater stichwort (*Stellaria holostea*). Some coppicing of alder and dense bracken was present beneath local communication pylons, otherwise there was little in the way of management. Only one rarity was identified, common spotted orchid (*Dactylorhiza fuchsia*). Wetland features were present within the woodland, including a heavily shaded pond and a ditch around the northern perimeter of the woodland.

7.8.19 In addition, two parcels of ancient woodland are located immediately adjacent to the highways proposals: Brickfield Copse north of M25 (OSNGR TQ 100 581) and Brickfield Copse south of M25 (TQ 100 579). While Park Wood north of the A3 (TQ 056 567) is 15 m from the Scheme. Following standard practices there is no risk to these woodlands, therefore they have not been subject to survey or valuation.

7.8.20 An additional parcels of ancient woodland, Hatchford Wood (OSNGR TQ 088 583), is located 4 m from the Scheme. Hatchford Wood is 15 ha in size, and is situated to the south of the M25, east of the junction. The NVC survey of this confirmed that the woodland has an open canopy of silver birch and pedunculate oak, with sweet chestnut and Scots pine (*Pinus sylvestris*) frequently found. Sycamore is abundant in the north of the woodland adjacent to the M25, and aspen (*Populus tremula*) and grey willow (*Salix cinerea*) are locally abundant. Some old planted specimen trees and shrubs are present, including wellingtonia (*Sequoiadendron giganteum*), coast redwood (*Sequoia sempervirens*), holm oak (*Quercus ilex*) and yellow azalea (*Rhododendron luteum*). There are few shrub species and the shrub layer is relatively open. Bramble is abundant throughout the woodland, forming a dense but low tangle. Herb species are occasional or rare in the ground flora.

Veteran trees

7.8.21 Details of the veteran tree methods and results can be found in Appendix 7.3.

7.8.22 The Woodland Trust website did not include any records of veteran trees within 50 m of the Scheme.

7.8.23 The arboricultural assessment carried out in 2018 and 2019 identified 41 individual trees as veteran trees and two veteran tree groups within the survey area (see Figure 9.31 Tree protection plan for tree locations). The main species recorded that had attained veteran status was oak. These being sporadically located within the Scheme, with a concentration being within the land to the north-west of the junction specifically around Fox Warren Park and Feltonfleet School.

7.8.24 Of the 41 trees identified as veteran trees, 14 are located outside of the Scheme, including any associated Root Protection Areas (RPAs). Of the remaining 27 veteran trees:

- Fifteen are located within the Scheme: two within the highways proposals, four within the Nutberry Fruit Farm compound and nine within Park Barn Farm replacement land.
- Twelve trees have RPAs that overlap the Scheme: nine RPAs that overlap the highways proposals, two RPAs overlap the Scheme in areas of no construction works, and one RPA that overlaps the Scheme at Park Barn Farm replacement land.

7.8.25 Of the two veteran tree groups, one is located within the Scheme at Park Barn Farm replacement land and the second is located outside of the Scheme Boundary.

Habitats

7.8.26 The Phase 1 Habitat Survey Plan (Figure 7.2 in Volume 3 (application document TR010030/APP/6.3)) shows the habitats within and adjacent to the Scheme, and the HPI Plan (Figure 7.8 in Volume 3 (application document TR010030/APP/6.3)) shows the HPIs within 1 km of the Scheme.

7.8.27 The desk study, using the MAGIC website[31] identified five potential HPIs within or immediately adjacent to the Scheme:

- Lowland heathland – all parcels of lowland heathland within the Scheme are located within a designated site;
- Lowland mixed deciduous woodland – there are several parcels located within the Scheme, outside of any designated sites;
- Wood pasture and Parkland – there are several parcels located within the Scheme, outside of any designated sites;
- Ponds – There are several ponds located within and immediately adjacent to the Scheme, which are located within a designated site; and
- Rivers – the River Wey and the River Mole are located immediately adjacent to the Scheme boundary, outside of any designated sites.

7.8.28 One further HPI located within 1 km of the Scheme was identified on the MAGIC website:

- Traditional orchards - the closest parcel is located approximately 220 m south of the Scheme close to the Old Lane/Ockham Lane cross roads; and

7.8.29 In addition, potential HPI habitats were identified during surveys within the Scheme, including eutrophic standing waters/mesotrophic lakes and reedbeds.

7.8.30 A number of ponds are identified as being potentially affected by the Scheme. These include Chatley Wood pond (0.2 ha in size) and Manor pond (1.0 ha in size). Neither of these ponds meet the criteria for definition as a priority habitat/HPI.

7.8.31 Twelve watercourses have been identified as having an impact pathway from the Scheme. Nine are ephemeral ditches that are dry for most of the year, the remaining three; Stratford Brook, River Wey and River Mole are classed as main rivers. The River Wey and Mole do not meet any of the listed criteria for definition as a priority habitat. Fish surveys on the Stratford Brook identified good numbers of the Habitats Directive Annex II species Bullhead (*Cottus gobio*) which is one of seven priority habitat qualifying features (for rivers), however, it does not exhibit any other qualifying feature i.e. high ecological status, supporting an Annex I habitat, a chalk river or a headwater, an active shingle river, or a SSSI designated for river species. Therefore, Stratford Brook is not considered to be a priority habitat.

7.8.32 Stands of reedbed are present around the perimeter of Bolder Mere, including the north western margin adjacent to the A3 and along the eastern margin. The reedbeds are dominated by stands of common reed (*Phragmites australis*), however, breeding bird surveys in April to July 2017 (see Appendix 7.15) and invertebrate surveys in June 2018 (see Appendix 7.8), show they do not support nationally rare birds or invertebrates. Therefore, the reedbeds do not meet the criteria for definition as a priority habitat.

7.8.33 Bolder Mere is a shallow (<1 m in depth), large, degraded mesotrophic lake (8.1 ha in size). Mesotrophic status is driven by the local geology (nutrient poor Bagshot beds)[100]. Many of the plant species typical of mesotrophic lakes once present within Bolder Mere are now missing (likely due to impacts such as eutrophication, disturbance and introduction of non-native invasive species) however, Bolder Mere does not fit within the description of a eutrophic lake either. The flora of the lake currently contains a number of species more typically found in eutrophic lakes (i.e. tolerant of eutrophic conditions) but the lake does not have the balance of species expected to be seen in a natural eutrophic lake. Therefore, Bolder Mere does not meet the criteria of either priority habitat type currently.

7.8.34 Lowland heathland is adjacent to the Scheme to the south of junction 10, on both sides of the A3. The heathland lies adjacent to the SPA enhancement areas, however, it is separated from the construction footprint of the Scheme by a belt

[100] Natural England, Ockham and Wisley Commons SSSI citation https://designatedsites.naturalengland.org.uk/PDFsForWeb/Citation/1001052.pdf accessed September 2018

of trees.

7.8.35 There are no hedgerows within the Scheme.

7.8.36 The habitats within the highway soft estate include semi-improved neutral grassland and semi-improved species-poor grassland, often forming a mosaic with tall ruderal and scrub vegetation.

Watercourses and standing waterbodies

7.8.37 In total, 12 watercourse and three waterbodies identified through the screening process were taken forward for impact assessment. Information relating to watercourse and waterbody assessment and survey screening is provided in Appendix 7.6. The location of these watercourses and standing waterbodies are shown in Figure 7.9. Surveys of these watercourses and standing waterbodies were undertaken between September 2017 and November 2018.

Watercourses

- Stratford Brook – a narrow watercourse (approximately 1.5 m wide), which is hydro-morphologically modified due to the presence of culverts associated with the current A3 and slip road crossings. These crossings create notable habitat severance and implications for mammal and fish passage. Upstream of the existing A3 and slip road crossings the watercourse exhibits a generally sinuous planform supporting a range of instream habitats. Downstream of the existing A3 crossing the channel is predominantly straightened. Aquatic macroinvertebrate surveys indicate that the watercourse bed is moderately sedimented and that biological water quality is not significantly constraining the range of species supported. The macroinvertebrate assemblage is assessed as being of low conservation value comprising of only commonly occurring species. Fish surveys indicate the brook is a limited fishery dominated by minor species. WFD assessments indicate that aquatic macroinvertebrates are at moderate status and macrophytes/phytobenthos are at good status while the hydromorphology of the watercourse is identified as supporting good status.
- River Wey - a wide watercourse (approximately 20 m wide), deep, slow flowing river hydrologically connected to the floodplain. Aquatic macroinvertebrate surveys indicate the watercourse has very good water quality with moderate sedimentation. The species assemblage identified during aquatic macrophyte surveys are indicative of high nutrient conditions while fish surveys indicate the watercourse supports a mixed coarse fishery. WFD assessments indicate that both aquatic macroinvertebrates and macrophytes/phytobenthos are at moderate or better status while the hydromorpholgy of the watercourse is identified as supporting good status.
- River Mole - a wide (approximately 13 m wide), meandering watercourse with moderate flow and a mix of marginal and bankside vegetation. River Habitat Survey information indicate the watercourse is severely modified, driven by artificial structures and channel re-sectioning. WFD assessments indicate that aquatic macroinvertebrates and macrophytes/phytobenthos are at moderate or better status while the hydromorpholgy of the watercourse is identified as supporting good status.

- Pointers Road ditch – ephemeral ditch system with limited in-channel habitat complexity likely to support opportunistic aquatic species during part of the hydrological year.
- Chatley Wood ditch – ephemeral ditch system with limited in-channel habitat complexity likely to support opportunistic aquatic species during part of the hydrological year.
- Ockham Common ditch – ephemeral ditch system, overgrown with scrub, with limited in-channel habitat complexity likely to support opportunistic aquatic species during part of the hydrological year.
- Cockcrow Hill ditches – ephemeral ditch system, heavily shaded by trees with limited in-channel habitat complexity likely to support opportunistic aquatic species during part of the hydrological year.
- Pond Farm south ditch – ephemeral ditch system, heavily shaded by trees and heavily sedimented with large amounts of leaf litter. Limited in-channel habitat complexity likely to support opportunistic aquatic species during part of the hydrological year.
- Hut Hill ditch – ephemeral ditch system, overgrown with scrub, with limited in-channel habitat complexity likely to support opportunistic aquatic species during part of the hydrological year.
- Ditch adjacent to A3 – ephemeral ditch, receiving flow from Bolder Mere. Aquatic macroinvertebrate data show that the biological water quality is poor, although it is likely that scores are influenced by the limited range of habitats supported by the ditch. The macroinvertebrate assemblage is of low conservation value containing commonly occurring species. The species present also show the flow is slack or sluggish and is the ditch bed is highly sedimented.
- Ditch system within A3 central reservation – ephemeral drainage ditch system within central highway reservation, with mixed saplings and scrub. Limited in-channel habitat complexity likely to support opportunistic aquatic species during part of the hydrological year.
- Elm Lane ditch – ephemeral ditch system, heavily shaded by trees with limited in-channel habitat complexity likely to support opportunistic aquatic species during part of the hydrological year.

Standing waterbodies

- Bolder Mere - a shallow lake (approximately 1 m deep and 8.1 ha in size) supporting a mix of habitats including reedbed, mixed emergent vegetation, wetland acid bog and open water. WFD assessments indicate that the waterbody is heavily modified, aquatic phytoplankton is at moderate status while the hydromorpholgy of the watercourse is identified as supporting good status. Five distinct habitats were identified within Bolder Mere and sampled for aquatic macroinvertebrates, including areas of reed bed, shallow marginal areas and open water habitats. A total of 43 taxa were recorded from 31 families with the marginal areas on the south short returning the highest number of taxa. Only one species of high conservation status was recorded (the riffle beetle *Stenelmis canaliculata*) and none of the Odonata species recorded were rare species. A total of 41 aquatic macrophyte species were

identified during the surveys. Within the open water areas, dominant plants include the invasive non-native species Nuttall's waterweed (*Elodea nuttallii*) and alternate water-milfoil (*Myriophyllum alterniflorum*). Marginal wetland habitat showed considerable variation with stands of common reed (*Phragmites australis*) common spikerush (*Eleocharis palustris*) and branched bur-reed (*Sparganium erectum).* The invasive non-native species New Zealand pigmyweed (*Crassula helmsii*) is abundant throughout the site, forming dense mats limiting the growth of other low-growing marginal vegetation. Other invasive non-native species found during survey include Turkish crayfish (*Astacus leptodactylus*) and carp. Overall the surveys undertaken as part of the CSM indicate Bolder Mere fails to meet the majority of qualifying targets required for favourable condition. These targets include macrophyte community composition (none of the qualifying species were identified), the modified/artificial hydrological regime and the presence of invasive species. Despite being assessed as unfavourable, many of the aquatic habitats in and around the lake remain important, particularly for invertebrates and birds.

- Chatley Wood pond – a small ephemeral pond (0.2 ha in size) situated within mature Scots pine (*Pinus sylvestris*) dominated woodland. A distinct narrow channel is present within the pond which was dry during survey but contained a large amount of water pepper (*Persicaria hydropiper*) and marsh pennywort (*Hydrocotyle vulgaris*). Hydrologically connected to Chatley Wood ditch.
- Manor pond – a medium sized fishing pond (1.0 ha in size) surrounded by mature woodland with limited marginal aquatic macrophytes and large numbers of coarse fish, including carp. As a result, turbidity is generally high, which is assumed to be limiting the range of submerged and marginally emergent macrophyte species.

Notable and protected species

7.8.38 All desk study records pertaining to notable and protected species stated below are all within 10 years of the data search (between 2007 and 2017).

7.8.39 Records of notable plants, bats, great crested newt, birds, otter and water voles were provided by SBIC as a four-figure grid reference, giving an indication of the presence of a species within a grid square, but with no confirmed location.

7.8.40 Additional records were requested from SBG, SARG and WSBG provided more accurate grid references (at least six figure) for bats, amphibians, reptiles and badgers.

Notable plants

7.8.41 Details of the notable flora survey methodology and results can be found in Appendix 7.5. A complete list of the notable plant species records provided by SBIC since 2007 can be found in Appendix 7.4.

7.8.42 The SBIC data search returned 71 records within the 1 km OS grid squares that the Scheme boundary occupies. This comprised of 35 notable plant species. Of these 35 species, three are Species of Principal Importance (SPI): annual knawel (*Scleranthus annuus*), copse-bindweed (*Fallopia dumetorum*) and corn buttercup (*Ranunculus arvensis*).

7.8.43 Two additional notable species were recorded during the surveys: royal fern (*Osmundia regalis*) and cross-leaved heath (*Erica tetralix*). Royal fern was recorded at OSNGR TQ 06870 58956, within the C2 Wisley SPA compensation land. Cross-leaved heath was recorded at OSNGR TQ 07572 58947, and within the wet heath communities in Wisley Common. Royal fern is scarce in Surrey, and cross-leaved heath is near threatened in England.

7.8.44 The notable plant species bog hair grass (*Dechampsia setacea*), lesser water plantain (*Baldellia ranunculoides*) and multi-stemmed spike-rush (*Eleocharis multicaulis*) were not found during the surveys, although records of these plants are known for Ockham and Wisley Commons SSSI.

Bats

7.8.45 The full details of the bat survey methodology and results are provided in Appendix 7.9 and 7.10.

7.8.46 Surrey Bat Group (SBG) returned 85 records of bats within a 4 km square from the Scheme[101], which comprised the following eight species; common pipistrelle (*Pipistrellus pipistrellus*), soprano pipistrelle (*Pipistrellus pygmaeus*), Nathusius' pipistrelle (*Pipistrellus nathusii*), Natterer's bat (*Myotis nattereri*), brown long-eared bat (*Plecotus auritus*), noctule bat (*Nyctalus noctula*), serotine bat (*Eptesicus serotinus*) and Daubenton's bat (*Myotis daubentonii*).

7.8.47 Records were also provided for Myotis bat sp., pipistrelle bat (*Pipistrellus sp.*), and long-eared bat (*Plecotus sp.*).

7.8.48 The SBG records provided confirmed roosts for noctule bat and soprano pipistrelle bat within the Scheme within the Elm Lane SPA enhancement area adjacent to Bolder Mere.

7.8.49 Surrey Biological Information Centre (SBIC) returned 195 recent[102] records of bats within a 10 km square from the Scheme. Records were provided as 1 km OS grid squares and comprised the following 11 species; common pipistrelle, soprano pipistrelle, Nathusius' pipistrelle, Natterer's bat, brown long-eared, noctule bat, serotine bat, Daubenton's bat, Leisler's bat, whiskered bat (*Myotis mystacinus*) and Barbastelle bat (Barbastella barbastellus).

7.8.50 Records were also provided for long-eared bat and whiskered/Brandt's bat (*Myotis brandti*).

7.8.51 In addition to the data provided above, SBG provided bat records from within a 20 km square surrounding the Scheme[103] for the following cryptic[104] and Habitats Directive Annex II species[105]; Alcathoe bat (*Myotis alcathoe*), Barbastelle bat (Annex II species) and Bechstein's bat (*Myotis bechsteinii*) (Annex II species).

7.8.52 The closest record for one of the three cryptic or Annex II species identified

[101] The central OSNG reference provided was TQ 081 592.
[102] From within the past 10 years only.
[103] The central OSNG reference provided was TQ096607.
[104] Alcathoe bats are classed as a cryptic species due to the fact that their presence in Great Britain was first recorded in 2010 and therefore very little is known with regards to their population size or distribution within Great Britain. For further details see: Natural England and other parties (2018). A Review of the Population and Conservation Status of British Mammals: Technical Summary. http://nora.nerc.ac.uk/id/eprint/520322/1/N520322CR.pdf (accessed 14/02/2019)
[105] http://jncc.defra.gov.uk/page-1523

above is an Alcathoe bat, recorded approximately 2.9 km south from the centre of the Scheme.

7.8.53 Alcathoe bat is a more recently discovered species in the UK, which were first discovered in Greece in 2001 and confirmed present in the UK in 2010 after DNA testing allowed them to be separated from whiskered and Brandt's bats. The species has been found to be locally common in Surrey and Sussex, and largely absent from the rest of the UK. The species is classed as 'data deficient' and the UK status is unknown but considered rare due to the limited known geographic distribution[106]. Surveys conducted for research purposes independent to the Scheme are identifying that this species is a woodland specialist, that appears to prefer old broadleaved woodland, but habitat preferences are largely unconfirmed for this species.

7.8.54 There are no confirmed maternity colonies of barbastelle bats in Surrey, where they are considered to be locally rare and encountered infrequently. The nearest is a record for a number of barbastelle bats roosting within a barn approximately 8 km south-west from the centre of the Scheme in 2009. The barn has since been converted and the bats are no longer present. The only other record for barbastelle bat is 12.4 km south-east from the centre of the Scheme.

7.8.55 Bechstein's bats are comparatively more common and widespread throughout wooded areas in southern Surrey. There are a number of known maternity roosts in Surrey. However, the species is nationally rare. The closest record of a Bechstein's bat is from Bookham Commons, approximately 5.4 km south-east from the centre of the Scheme.

7.8.56 Mole Gap to Reigate Escarpment SAC is located approximately 4.7 km south-east of the Scheme and Ebernoe Common SAC is located approximately 29.3 km south of the Scheme. Both of these SACs include Bechstein's bat as a qualifying species and Ebernoe Common SAC also includes barbastelle bat as a qualifying species.

7.8.57 Bat surveys of buildings and structures within the survey area identified four confirmed bat roosts. The location of these structures are shown on Figure 7.10 in Volume 3 (application document TR010030/APP/6.3). These are referenced as San Domenico Building (brown long-eared bat maternity roost, day roost and feeding perches, noctule, common pipistrelle and soprano pipistrelle day roost)[107], Hut Hill Cottage (brown long-eared bat maternity and hibernation roost), Pond Farm SWT Office (pipistrelle bat species hibernation roost[108]), and Buildings at Wisley Scout Camp (brown long-eared bat and soprano pipistrelle day roost).

7.8.58 No other buildings/structures were confirmed to contain a bat roost. These comprised one building with high potential, six buildings/structures with low potential, and five buildings/structures with negligible potential.

7.8.59 Bat surveys of trees within the survey area identified five confirmed bat roosts.

[106] Jan, C.M.I., Frith, K., Glover, A.M., Butlin, R.K., Scott, C.D., Greenway, F., Reudi, M., Dawson, D.A. & Altringham, J.D. (2010). *Myotis alcathoe* confirmed in the UK from mitochondrial and microsatellite DNA. Acta Chiropterologica, 12(2): 471–483, 2010.
[107] Aspect Ecology (2017). Project: Former San Domenico Restaurant, Portsmouth Road, Cobham. Bat, Great Crested Newt and Reptile Survey Results and Evaluation
[108] Information received from the SWT.

The location of these trees are shown on Figure 7.11 in Volume 3 (application document TR010030/APP/6.3). These are referenced as trees; 27 (noctule transitional/occasional roost), 35 (Natterer's bat day roost), 98 (soprano pipistrelle day roost), 106 (soprano pipistrelle transitional/occasional roost), and 155 (Natterer's and noctule transitional/occasional roost and noctule hibernation roost).

7.8.60 No other trees within the GLTA survey area were confirmed to contain a bat roost. Other trees included 42 trees with high potential, 32 with moderate potential, 15 with low potential. A total of six trees with bat roosting potential were found to have either been felled during felling operations undertaken by SWT or had fallen upon a return survey visit.

7.8.61 Bat activity surveys recorded the following species of bat within the survey area; common pipistrelle, soprano pipistrelle, common/Nathusius' pipistrelle[109], serotine, Leisler's, noctule, brown long-eared, Natterer's, Myotis bat sp.. Transect routes are shown on Figure 7.13 in Volume 3 (application document TR010030/APP/6.3).

7.8.62 Overall, common/Nathusius' pipistrelle activity was concentrated in the south-west and north-west transects, serotine bat activity was concentrated in the south-east transect and relatively high in the north-west transect, noctule bat activity was concentrated in the south-east transect and was at a relatively high level in the Nutberry Fruit Farm transect. Leisler's bat activity was concentrated in the south-east transect and absent from the Wisley, Nutberry Fruit Farm and south-west transects. Brown long-eared bat activity was concentrated in the Wisley and south-west transects, which is consistent with the confirmed roost location at Hut Hill Cottage. Myotis bat species activity was concentrated in the south-west transect, particularly around the lake, which indicates that the recordings are likely to be Daubenton's bats. Potential soprano pipistrelle swarming activity was recorded in the north-west transect.

7.8.63 Static monitoring provided results that are relatively consistent with the transect survey data. However, noctule bat activity was significantly higher within Nutberry Fruit Farm when compared to all other locations within the survey area. Soprano pipistrelle and Myotis bat species activity was also highest at Nutberry Fruit Farm, and brown long-eared activity was highest in the north-west transect and Nutberry Fruit Farm.

7.8.64 Bat crossing point surveys identified a regular bat crossing point at Clearmount overbridge (which is to be replaced as part of the Scheme), where the most frequently recorded species was common pipistrelle, with low numbers of soprano pipistrelle and two Myotis bats. No bat crossings were recorded at Cockcrow overbridge or Wisley Lane footbridge. The location of the bat crossing point surveys are shown on Figure 7.13 in Volume 3 (application document TR010030/APP/6.3).

7.8.65 Advanced bat surveys comprising trapping and radiotracking involved the tagging of four bats of three species (one Daubenton's bat, two Natterer's bats and one brown long-eared bat), which enabled the identification of four

[109] Nathusius' pipistrelle bat can be confused with common pipistrelle bat flying in the open, as repetition rate and frequency rate can be similar. Russ, J. (2012). British Bat Calls: A guide to species identification.

confirmed bat tree roosts. These are referenced as Bat1 (brown long-eared bat possible maternity roost), Bat2 (Natterer's bat maternity roost) and Bat4 (2 x Natterer's bat maternity roost). Trapping locations and confirmed roosts identified during these surveys are shown on Figure 7.15 in Volume 3 (application document TR010030/APP/6.3).

7.8.66 A total of 189 bats of eight species were trapped during the surveys: soprano pipistrelle (68 individuals), common pipistrelle (37 individuals), serotine (27 individuals), noctule (16 individuals), Natterer's bat (15 individuals), brown long-eared bat (12 individuals), Daubenton's bat (11 individuals), and whiskered bat (3 individuals). Notably, the majority of bats trapped in the south-west quadrant (Wisley Common) occurred close to the pond (OSNGR TQ 07523 59030). A relatively high proportion of serotine bats were trapped in the north-east quadrant, and also the south-east quadrant, which included lactating females and juveniles, indicating the likely presence of a maternity roost in the local area. A Natterer's bat identified as having recently given birth was recorded in the north-west quadrant, as was a high proportion of noctule bats. A breeding female Daubenton's bat was recorded in the south-east quadrant, near Bolder Mere.

7.8.67 No barbastelle bats, Bechstein's bats or Alcathoe bats were recorded during any of the bat surveys.

Great crested newt

7.8.68 Details of the great crested newt survey methodology and results can be found in Appendix 7.11. Figure 7.16 in Volume 3 (application document TR010030/APP/6.3) provides a plan of waterbodies subject to survey. Waterbody numbers referred to in the paragraphs below are shown on this figure.

7.8.69 The SBIC data search returned four records of great crested newts within 1 km of the Scheme, of which three were recorded after 2007, with the most recent records being from 2016. The closest records to the Scheme fall within the 1 km OS grid squares for Bolder Mere, and Ockham and Wisley Commons (the exact locations of these records were not provided).

7.8.70 The SARG data search returned one record of great crested newt within 1 km of the Scheme, located at OSNGR TQ 06969 59565. This record was provided as a positive eDNA result and falls within the Scheme on the edge of Buxton Wood. No waterbody was located at this grid reference or nearby following a review of Ordnance Survey maps and aerial imagery, with the closest waterbody located 130 m to the west. Furthermore, no waterbody was located within the vicinity of this grid reference during the HSI surveys.

7.8.71 SWT confirmed a water sample taken from the wetland edge features of Bolder Mere (shown at W9a) in 2016 tested positive for great crested newt eDNA. This location is partially located within the E4 Elm Lane SPA enhancement area.

7.8.72 Suitable terrestrial habitat for great crested newts, particularly woodland habitat, is present in abundance both within the Scheme and in the surrounding habitats. The terrestrial habitats provide habitat connectivity to nearby ponds and offer suitable foraging, sheltering and hibernation opportunities for great crested newt. A review of aerial imagery and Ordnance Survey maps identified aquatic habitat

that could potentially be used by breeding great crested newt, including 84 ponds and 59 ditches within 500 m of the Scheme.

7.8.73 Great crested newt typically use suitable terrestrial habitat up to 500 m from a breeding pond[110]. However, there is a notable decrease in great crested newt abundance beyond a distance of 250 m from a breeding pond[111]. Therefore, taking into account the localised nature and potential impacts of the Scheme and the abundance of suitable terrestrial habitat surrounding the ponds, 25 ponds and 11 were scoped out from further survey. An additional four ponds and four ditches were scoped out as they were separated from the Scheme by physical barriers that would prevent great crested newt movement (such as rivers, major roads etc). While six ponds and four ditches are located in areas where proposed works are limited to cabling and gantries within the existing highways boundary, and have therefore been scoped out from surveys.

7.8.74 The remaining waterbodies (49 ponds and 40 ditches) were subject to further surveys as follows (further information is provided in Appendix 7.11):

- A total of 18 ponds and 24 ditches were classed as unsuitable as great crested newt breeding ponds and therefore scoped out from further survey during either HSI or eDNA survey visits;
- Five ponds and one ditch were subject to presence/likely absence surveys using conventional survey methods, as described in Appendix 7.11. Of these, four ponds were subject to a population size class assessment survey; and
- 25 ponds and 12 ditches were subject to presence/likely absence surveys using eDNA survey methods.

7.8.75 Great crested newts were confirmed as present in the following four waterbodies:

- W9a located within the Scheme at E4 Elm Lane SPA enhancement area. Presence confirmed by eDNA (SWT survey);
- W10 located 8 m away from the Scheme at E3 Ockham Common/Old Lane SPA enhancement area. A small population was recorded using conventional survey methods;
- W11 located 2 m away from the Scheme at C1 Old Lane SPA compensation land. A small population was recorded using conventional survey methods; and
- W32 located within the heathland area in the south-west quadrant, approximately 145 m west of the Scheme. Presence confirmed by eDNA.

7.8.76 Great crested newt were confirmed to be present at waterbody W9a in 2016 eDNA surveys by SWT. The 2017 conventional presence/absence and population estimate surveys carried out did not record great crested newt. In 2018 an eDNA survey was carried out at W9a and this was returned as negative indicating great crested newt were absent. Although surveys in 2017 and 2018 found no evidence of great crested newt in W9a, due to the 2016 positive eDNA result for W9a provided by SWT, it is assumed that a very small breeding

[110] English Nature (2001). Great Crested Newt Mitigation Guidelines.
[111] Cresswell, W. & Whitworth, R. (2004) English Nature Research Reports Number 576: *An assessment of the efficiency of capture techniques and the value of different habitats for the great crested newt* Triturus cristatus. English Nature, Peterborough.

population of great crested newt makes use of W9a when conditions are suitable for breeding. In September 2017, a male great crested newt was recorded at the northern edge of Bolder Mere during reptile surveys, confirming that great crested newt make use of the terrestrial habitat around W9 and W9a.

7.8.77 Taking into account the distances between W9a, W10 and W11[112], it is assumed that these waterbodies form a metapopulation of great crested newt. Taking into account the results of the surveys and peak counts (only available for W10 and W11), it is assumed that the size of the metapopulation is small[113].

7.8.78 Presence of great crested newts in W32 was confirmed using eDNA. In the absence of population size class assessment, it is assumed that a medium population of great crested newt is present. No other positive great crested newt eDNA results were returned for any other waterbodies within Wisley Common. W32 is located approximately 145 m west of E8 Pond Farm west SPA enhancement area and just over 300 m from the construction works area at the closest point.

Reptiles

7.8.79 Details of the reptile survey methodology and results can be found in Appendix 7.12. The reptile survey areas are shown on Figure 7.17 in Volume 3 (application document TR010030/APP/6.3).

7.8.80 The SARG and SBIC data search combined identified 470 records within 1 km of the Scheme which comprised of common lizard, grass snake, slow worm, adder and sand lizard. Grass snake, slow worm and sand lizard were most recently recorded in 2016, while adder and common lizard were most recently recorded in 2017. No desk study records were within the highways proposals. However, adder, slow worm, grass snake and common lizard were recorded within the SPA enhancement areas, whilst sand lizards were recorded approximately 11 m south of the E2 Ockham Common/Sand Hill SPA enhancement area, with the closest record in relation to the highways proposals being approximately 26 m south-west of the Scheme. These records are predominantly associated with heathland areas at Ockham and Wisley Commons. Adder records were provided within or in close proximity to Survey Areas G, I and J, as shown on Figure 7.17 in Volume 3 (application document TR010030/APP/6.3). In addition, grass snake, slow worm and common lizard have all been recorded within the eastern section of the Wisley Airfield SNCI[114].

7.8.81 The Phase 1 Habitat Survey identified the areas of open lowland heathland at Ockham and Wisley Commons as having high suitability for reptiles, considered likely to support common reptile species as well as sand lizard. Records of sand lizard from Chatley Heath at Ockham Common were identified in the desk study and it has been confirmed by SWT and SARG that the species has become established following a successful re-introduction at the site in 1991 in the mature heathland that is part of the SWT nature reserve. Sand lizards were only reintroduced to Ockham Common, and are considered to be absent from the

[112] W10 is located approximately 140 m south-east of W9a, and W11 which is approximately 610 m south-east of W9a but located only 330 m south-east of W11 and connected by a ditch.
[113] English Nature, 2001. Great crested newt mitigation guidelines
[114] Savills (2015) Wisley Airfield: Environmental Statement: Appendix 8.8 Reptile survey results

habitats within the south-west, north-east and north-west quadrants surrounding M25 junction 10, due to the A3 and M25 forming physical barriers to dispersal. All desk study records of sand lizard provided by SARG fall within the heathland (Chatley Heath) at Ockham Common.

7.8.82 The woodland habitat within the Scheme has low suitability for reptiles, due to the heavy shading and reduced opportunities for basking and foraging. However, log piles and gaps around tree roots could potentially be used as reptile hibernating sites, particularly where they are on located on the edge of a woodland.

7.8.83 Reptile presence/likely absence surveys of common species (adder, grass snake, common lizard and slow worm) were undertaken between August 2017 and early October 2017. A plan of the reptile survey areas is shown in Figure 7.17 in Volume 3 (application document TR010030/APP/6.3) and a summary of the reptile survey results can be found in Table 7.4.

7.8.84 Sand lizard surveys were undertaken at Ockham Common between August to October 2017 and April to June 2018. The sand lizard survey area is shown on Figure 7.17 in Volume 3 (application document TR010030/APP/6.3). The 2018 sand lizard surveys confirmed that a breeding population of sand lizards is present within Chatley Heath at Ockham Common, located outside of the Scheme with the nearest record approximately 40 m south of the E2 Ockham Common/Sand Hill SPA enhancement area. This included records of adult male and female sand lizards along with juveniles.

7.8.85 Sand lizards live on sandy heathland and coastal sand dunes and require sandy ground in sunny spots in which to dig burrows for egg-laying and shelter. They are dependent on well-managed heathland or sand dune habitats and bask in sunny spots close to mature vegetation. Colonies across Surrey are restricted solely to dry heathland habitats that are situated on a sandy or gravel substrate. Surrey populations of sand lizard are strongly associated with large areas of dry heath with mature heather that has a deep moss structure underpinning the heather with an associated slope, undulating ground or a small plateau. There must be a mosaic structure of undergrowth and exposed sand, for egg laying[115].

7.8.86 Two male juvenile sand lizards were recorded within the woodland area of the south-east quadrant, which lies adjacent to and within the Scheme. One of these records was from an incidental record[116] and the other was a single record during the 2018 surveys. The woodland habitat in which these individuals were observed is outside of the area of heathland habitat at Ockham Common, which provides the optimum habitat for sand lizards. This woodland habitat is unsuitable for feeding, basking or breeding sand lizards. Therefore, it is considered likely that these individual males are exploring individuals attempting to find their own territory.

Table 7.4: Summary of reptile survey results, including sand lizard surveys

Location	Reptile species recorded

[115] SARG (2019). Sand Lizard. http://surrey-arg.org.uk/SARGWEB.php?app=SpeciesData&Species=sand_lizard [Accessed 20.03.2019]
[116] A single sand lizard (a juvenile male) was recorded within an open glade of the open wooded area near the Ockham Bites café (TQ 07890 58748) during an invertebrate survey on the 19th June 2017.

Location	Reptile species recorded
North-west quadrant of junction 10	Slow worm, grass snake, common lizard
North-east quadrant of junction 10	No reptiles recorded
South-west quadrant of junction 10 (including Wisley Common and Wisley Lane)	Slow worm, grass snake, common lizard
South-east quadrant of junction 10 (Ockham Common), including sand lizard survey area.	**Sand lizard**, slow worm, grass snake, common lizard, adder.
A3 verge south of the M25 junction 10	Grass snake, slow worm
Elm Lane (Snakes Field)	Slow worm, grass snake, common lizard
Bolder Mere	Grass snake, common lizard
Wisley Airfield (disused)	Slow worm, grass snake, common lizard
A3 verge north of the M25 junction 10, Painshill Park and associated areas	Slow worm, grass snake, common lizard
Properties adjacent to the west of the A3 (Hilton Hotel)	No reptiles recorded

Hazel dormouse

7.8.87 Details of the hazel dormouse survey methodology and results can be found in Appendix 7.13.

7.8.88 The SBIC data search returned no records of hazel dormice within 1 km of the Scheme.

7.8.89 The extended Phase 1 Habitat Survey identified mixed woodland, with abundant Scots pine and only occasional broadleaved species, as the main habitat present immediately surrounding junction 10. Much of the woodland is considered to be sub-optimal for dormice due to the dominance of conifers and absence of a scrub layer. However, there are patches of more diverse habitat, such as adjacent to the M25 to the south-east of junction 10, where species such as bramble, honeysuckle (*Lonicera periclymenum*), holly, birch, gorse (*Ulex europaeus*) and sweet chestnut are present.

7.8.90 Dormouse surveys were undertaken in 2016, 2017 and 2018. All areas of potentially suitable habitat within or adjacent to the highways proposals (i.e. the temporary and permanent land take areas) were surveyed. The survey areas are shown on Figure 7.19 in Volume 3 (application document TR010030/APP/6.3).

7.8.91 No dormice were recorded during any of the surveys and they are considered likely to be absent from the Scheme.

Otter and water vole

7.8.92 Details of the otter and water vole survey methodology and results can be found in Appendix 7.14.

7.8.93 The SBIC data search returned no records of otters or water voles within 1 km of the M25 junction 10 within the past 10 years. The data search did return a single historic record of otter from 2005 (at OSNGR TQ 06 59 approximately 940 m southwest of the Scheme Boundary), and a single historic record of water vole

from 1986 (at OSNGR TQ 06 58 in 1986 approximately 500 m northwest of the Scheme near Stratford Brook).

7.8.94 The River Wey-Woking SNCI (including Pryford Place Lake) is identified in the SBIC desk study as supporting a population of water vole. The SNCI is located 450 m north-west of the site compound proposed at Nutberry Fruit Farm.

7.8.95 Otter and water vole surveys were completed in April and June 2018 for Bolder Mere, Guileshill Brook, Manor Pond, the River Mole, the River Wey and Stratford Brook.

7.8.96 Habitat suitability assessments for otter and water vole were undertaken for Pond Farm south ditch and the ditch adjacent to the A3, which were ruled out for further surveys due to unsuitable habitat. In addition, Guileshill Brook was considered to contain unsuitable habitat for water voles, and further surveys were undertaken for only otter.

7.8.97 No water vole evidence was recorded during the surveys. A number of American mink (*Neovison vison*) prints were recorded within bankside substrate of the River Wey, and an American mink was recorded in Stratford Brook during an aquatic ecology survey in 2017. Water voles are susceptible to American mink predation due to the American mink's ability to hunt on both land and water. Female and juvenile American mink are also small enough to predate water voles inside their burrows. Therefore, the presence of American mink reduces the suitability of these watercourses for water voles.

7.8.98 The only confirmed evidence of otter presence recorded during the surveys was a regularly used territorial spraint site on the River Wey located approximately 180 m east from the Scheme at Park Barn Farm replacement land. No breeding sites or resting places were confirmed for otter, but the presence of this regularly used territorial spraint site indicates that this stretch of the River Wey is used by otters regularly for commuting purposes. The River Wey runs adjacent to the Scheme at the replacement land at Park Barn farm, and flows under the M25 in an area where the Scheme will involve the provision of new gantries which will be suitable for future work to upgrade to smart motorway between junctions 10 and 16.

Birds

7.8.99 Details of the breeding bird survey methodology and results can be found in Appendix 7.15.

7.8.100 The SBIC data search identified recent records of 83 bird species within 1 km OS grid squares in which the Scheme boundary falls. Of these, 60 species are notable[117] for their protected or conservation concern status.

7.8.101 The extended Phase 1 habitat survey identified that the habitats within the survey area offer suitable nesting opportunities for birds.

7.8.102 Detailed breeding bird surveys were carried out in 2016, 2017 and 2018, including species-specific surveys for Dartford warbler, nightjar and woodlark.

[117] notable birds have been taken as those listed on; Schedule 1 of the Wildlife and Countryside Act 1981 (as amended); Annex 1 of the Birds Directive; the red or amber lists of Birds of Conservation Concern (BoCC); and Species of Principal Importance (SPI).

Survey transect were varied between 2017 and 2018, to ensure that all potentially suitable habitats within the overall survey area (i.e. the Scheme boundary) were covered (although the heathland habitats within Ockham and Wisley Commons were surveyed in all three years). The survey transects can be seen in Figures 7.21, 7.22 and 7.23 in Volume 3 (application document TR010030/APP/6.3).

7.8.103 A total of 77 species were recorded during the breeding bird surveys, of which 33 are notable.

7.8.104 Of the 33 notable species, 22 species were either confirmed to have bred, or thought to have bred within the survey area: bullfinch (*Pyrrhula pyrrhula*), common tern (*Sterna hirundo*), cuckoo (*Cuculus canorus*), Dartford warbler, dunnock (*Prunella modularis*), firecrest (*Regulus ignicapillus*), grey wagtail (*Motacilla cinerea*), hobby (*Falco subbuteo*), kingfisher (*Alcedo atthis*), linnet (*Carduelis cannabina*), mallard (*Anus platyrhynchos*), mistle thrush (*Turdus viscivorus*), mute swan (*Cygnus olor*), nightjar, reed bunting (*Emberiza schoeniclus*), song thrush (*Turdus philomelos*), spotted flycatcher (*Muscicapa striata*), stock dove (*Columba oenas*), tawny owl (*Strix aluco*), willow warbler (*Phylloscopus trochilus*), woodcock (*Scolopax rusticola*) and woodlark. See Figures 7.24, 7.25 and 7.26 in Volume 3 (application document TR010030/APP/6.3) for a plan of approximate territory locations of notable breeding birds in 2016, 2017 and 2018.

7.8.105 Of the 22 species that were confirmed to have bred, or thought to have bred within the survey area, seven of these were recorded within the footprint of the highways proposals: bullfinch, dunnock, linnet, mistle thrush, song thrush, stock dove and willow warbler.

7.8.106 All three Thames Basin Heaths SPA qualifying bird species were recorded as breeding within the south-east and south-west quadrants. The greatest numbers of all three species were recorded in 2017:

- South-west quadrant (Wisley Common): three nightjar territories, two Dartford warbler territories, one woodlark territory; and
- South-east quadrant (Ockham Common): four nightjar territories, four Dartford warbler territories, one woodlark territory.

7.8.107 In addition, a barn owl (*Tyto alba*) (a notable bird species) was observed hunting over the eastern edge of Ockham Common during a bat survey on the 25th July 2017. The habitats within the survey area are not considered optimal for barn owls (woodland and heathland, rather than rough grassland habitats that would support food prey, such as field voles *Microtus agrestis*) and there were no records of barn owl within the SBIC records, so barn-owl specific surveys were not undertaken. However, due to the large number of dusk and dawn nightjar and bat surveys undertaken, during which no other barn owls were observed, it is considered that this isolated sighting on a single occasion does not indicate that barn owls breed within or adjacent to the Scheme, and this barn owl is likely to have travelled from further afield.

Badger

7.8.108 Details of the badger survey methodology and results can be found in Appendix

7.16. Due to the vulnerability of badgers to persecution, Appendix 7.16 and Figure 7.28 in Volume 3 (application document TR010030/APP/6.3) are confidential, but are available on request where required.

7.8.109 The WSBG desk study returned [redacted]

7.8.110 [redacted] all areas apart from hard standing as potentially suitable badger habitat. Badger surveys were undertaken for all areas of the Scheme in winters of 2017, 2018 and 2019.

7.8.111 [redacted] Badgers are mobile animals and may dig new setts at any time.

White-clawed crayfish

7.8.112 Details on the white-clawed crayfish survey methodology and results can be found in Appendix 7.17. The white-clawed crayfish survey area is shown on Figure 7.29 and 7.30 in Volume 3 (application document TR010030/APP/6.3).

7.8.113 The SBIC data search returned no records of white-clawed crayfish within 1 km of the Scheme since 2007.

7.8.114 The Environment Agency has confirmed that signal crayfish (*Pacifastacus leniusculus*) are known to occur within the River Wey, which is located downstream of Stratford Brook. As part of the Scheme, a feasibility study will be undertaken to assess the removal/modification of the sill within the Stratford Brook North and South Culvert. This will create a potential passage way for signal crayfish upstream into Stratford Brook, which in turn may result in the loss of white-clawed crayfish from Stratford Brook, should they be present[118]. Therefore, a white-clawed crayfish survey was undertaken at Stratford Brook[119].

7.8.115 Surveys were undertaken in October 2018. Stratford Brook was identified as unsuitable to support white-clawed crayfish due to a lack of suitable refuges and severe pollution at the time of survey. White-clawed crayfish are sensitive to pollutants, and sewage fungus was recorded throughout Stratford Brook. No evidence of white-clawed crayfish or invasive non-native crayfish species were observed during these surveys.

7.8.116 Based on the desk study data, the condition of the Stratford Brook and the absence of evidence of white-clawed crayfish recorded during the surveys, white-clawed crayfish are considered to be likely absent from Stratford Brook.

Terrestrial invertebrates

[118] The non-native North American signal crayfish is an invasive species and carries a disease to which the white-clawed crayfish has no natural resistance.
[119] Team meeting minutes from a meeting with the Environment Agency on the 15th August 2018.

7.8.117 Details of the terrestrial invertebrate survey methodology and results can be found in Appendix 7.18. The terrestrial invertebrate survey area is shown on Figure 7.31 in Volume 3 (application document TR010030/APP/6.3).

7.8.118 The SBIC desk study identified recent records of 84 notable invertebrate species[120] within 1 km OS grid squares in which the Scheme boundary falls. This includes 20 SPI (refer to Appendix 7.4 for a full list of invertebrate species returned from the data search).

7.8.119 The Ockham and Wisley Commons SSSI citation[121] indicates that open water surrounded by heathland presents an ideal habitat for many dragonflies and damselflies (*Odonata*). The SSSI is considered to be of national importance for Odonata and over 20 species have been recorded within the SSSI. The site also supports many other local and rare invertebrates. It is of national importance for true flies (*Diptera*). A large number of locally scarce beetles (*Coleoptera*) are also found[122].

7.8.120 The terrestrial invertebrate surveys in 2017 identified 37 notable species. Ten of these species were nationally scarce bees and wasps (*Hymenoptera*), beetles, flies and ants (*Formicidae*). Only one SPI invertebrate species was recorded: cinnabar moth (*Tyria jacobaeae*).

7.8.121 Invertebrates recorded within the survey area are not limited to the survey area and are assumed to be found in adjacent suitable habitats.

Non-native invasive plant species

7.8.122 The desk study did not identify any records of non-native invasive plant species listed on Schedule 9 of the Wildlife and Countryside Act 1981 (as amended)[123]. However, the following species listed on Schedule 9 were recorded during the extended Phase 1 Habitat Survey:

- Rhododendron was noted as present in several of the woodlands;
- Japanese knotweed was noted present at the replacement land at Park Barn Farm (TQ 073 596) and within the wooded area of Wisley Common (TQ 074 585) approximately 40 m from the Scheme;
- Indian balsam was noted as present at a number of locations including; to the east end of the Scheme (near the Semaphore Tower), both to the north (TQ 092 585) and south (TQ 091 584) of the M25, immediately adjacent to the Scheme, along Stratford Brook both east and west (TQ 059 576) of the A3, along the River Wey (TQ 071 600) adjacent to the Scheme, within the wooded area immediately surrounding Ockham Bites café (TQ 079 586) and within Heyswood (TQ 088 601); and
- Four ponds (W9, W10, W11 and W28 as shown on Figure 7.16 in Volume 3 (application document TR010030/APP/6.3)) were all noted as supporting the

[120] Notable invertebrates are taken to be species of importance that are defined as those with a national designation as either Endangered, Nationally Threatened, Nationally Scarce, Red Data Book or Section 41 status. For further details of these different statuses, see Annex B and C of Appendix 7.18.
[121] https://designatedsites.naturalengland.org.uk/PDFsForWeb/Citation/1001052.pdf (accessed: 19/04/18)
[122] Natural England (1986). Ockham and Wisley Commons Citation. https://designatedsites.naturalengland.org.uk/PDFsForWeb/Citation/1001052.pdf [Accessed: 20/03/19]
[123] It is illegal to plant or otherwise cause these species to grow in the wild

non-native invasive New Zealand pigmyweed (*Crassula helmsii*).

Nature conservation evaluation

7.8.123 The nature conservation value for each resource is described below in Table 7.5.

7.8.124 White-clawed crayfish, water vole and dormice have not been recorded within the study area for the Scheme, therefore, these species are likely to be absent and are not considered further in this assessment.

7.8.125 The Thames Basin Heaths SPA qualifying species (Dartford warbler, woodlark and nightjar) are not included within the nature conservation value in this assessment as individual species as these are valued as part of the SPA.

7.8.126 The nature conservation value is only provided below for only those HPI that fall outside of designated sites. Therefore, lowland heathland which falls entirely within the Wisley and Ockham Commons SSSI has been valued as part of the designated site.

7.8.127 Habitats, species and species groups that are not subject to legislative protection and have a nature conservation value in the context of the Scheme area only are not considered important ecological receptors. Impacts on these receptors are unlikely to have a significant effect on the conservation status of these habitats or species outside of the footprint of the Scheme. These receptors have therefore been scoped out of further assessment.

Table 7.5: Nature conservation value of resources in relation to the Scheme

Receptor/resources	Value (in the context of the Scheme)	Justification
Thames Basin Heaths SPA	European	Designated at European level due to the bird species it supports; Dartford warbler, nightjar and woodlark.
Ockham and Wisley Commons SSSI	National	Designated at a National level due to the species/habitats it supports.
Ockham and Wisley LNR	County	Designated at a County level due to its status as a SSSI. The LNR covers land within the Thames Basin Heaths SPA and Ockham and Wisley Commons SSSI, along with additional land parcels outside of the SSSI boundary including Wisley Airfield SNCI/Hunts Copse SNCI/Elm Corner Woods SNCI and Hatchford Wood Ancient Woodland.
Elm Corner Woods SNCI	County	Elm Corner Woods SNCI was selected as an SNCI in 2007 due to its contiguous connection with Ockham and Wisley Commons SSSI and Wisley Airfield SNCI. It provides an important connective corridor of woodland, and contributes to the wider value of these adjacent sites and is considered to be of county value.
Wisley Airfield SNCI	County	The site is selected for its importance for reptiles, plants and birds. The site is important for a number of notable plant and bird species. The citation for the site supports an exceptional population of grass snakes and a good population of slow worms, commons lizards and common frogs. Based on the designation and the species it supports it is considered to be of county value.
Bolder Mere Conservation Verge (CV005)	County	The site is selected for its County population of significance for common toad and is a registered toad crossing site; therefore, this site is considered to be of county value.
Elm Corner Wood ancient woodland (part of the Elm Corner Woods SNCI)	County	The parcel of ancient woodland (Elm Corner Wood) itself is approximately 1.3 ha in size, consisting of a dominant shrub layer, composed of hazel, holly and hawthorn, and relatively open high canopy of pedunculate oak and ash. Ancient woodland indicator species present include town-hall clock (*Adoxa moschatellina*), alder buckthorn (*Frangulus alnus*), bluebell, holly and three-nerved sandwort (*Moeringia trinervia*). The section of ancient woodland alone does not meet the national SSSI or Surrey SNCI selection criteria, only forms a small part of the SNCI, and is not integral to the connectivity between Ockham and Wisley Commons SSSI and Wisley Airfield SNCI. In terms of its intrinsic ecological value, it is considered to be of local value. However, it is recognised that ancient woodland does have additional value as an example of irreplaceable habitat, and also this example contributes to the wider value of the SNCI. Considering the ecological value of these habitats in the context of the wider countryside the Elm Corner Woods section of ancient woodland is considered to be of county value.

Receptor/resources	Value (in the context of the Scheme)	Justification
		This valuation has been discussed and agreed with Natural England.
Ancient woodland within Heyswood Girl Guide Camp	County	The woodland at Heyswood Girl Guide Camp (central OS grid reference TQ 089 602) is split into two sections, separated by a gas compound. The southern section is approximately 1.6 ha in area and consist of deciduous woodland, containing several mature specimens of trees (sweet chestnut, beech, pedunculate oak, turkey oak, red oak, hornbeam and silver birch), including several pedunculate oaks that appear to be c200 years in age. The woodland at Heyswood has not been subject to recent management, and the understorey includes a dense distribution of sycamore saplings. The northern section of woodland is approximately 0.4 ha in size and is grazed under by horses and cattle, so has an open understorey with grasses bluebell, bracken and foxglove. The woodland at Heyswood Girl Guide Camp is not designated as an SNCI and does not meet the national SSSI or Surrey SNCI selection criteria. In terms of its intrinsic ecological value, it is considered to be of local value. However, it is recognised that ancient woodland does have additional value as an example of irreplaceable habitat. Therefore, the two sections of ancient woodland at Heyswood Girl Guide Camp are considered to be of county value. This valuation has been discussed and agreed with Natural England.
Hatchford Wood Ancient Woodland	County	The woodland at Hatchford Wood (central OS grid reference TQ 088 583) is deciduous, containing silver birch, pedunculate oak, sweet chestnut and Scots pine. Some mature ornamental specimens are present, including wellingtonia (*Sequoiadendron giganteum*), coast redwood (*Sequoia sempervirens*), holm oak (*Quercus ilex*) and yellow azalea (*Rhododendron luteum*). This woodland is approximately 14.8 ha in area. This woodland forms part of Ockham and Wisley Commons LNR. Ancient woodland indicator species present include aspen, pendulous sedge (*Carex pendula*), wood sedge *(Carex sylvatica),* Tutsan (*Hypericum androsaemum*) In terms of its intrinsic ecological value, it is considered to be of local value. However, it is recognised that ancient woodland does have additional value as an example of irreplaceable habitat. Therefore, Hatchford Wood is considered to be of county value. This valuation has been discussed and agreed with Natural England.
The Bogs ancient woodland at Pointers Road (within the former Chatley Farm	County	The ancient woodland at The Bogs (central OS grid reference TQ 090 587) is deciduous and is dominated by rhododendron. The canopy predominantly contains oak and sweet chestnut with

Receptor/resources	Value (in the context of the Scheme)	Justification
replacement land)		other trees including silver birch, downy birch, wild cherry, rowan and alder. Ancient woodland indicator species present include pendulous sedge, remote sedge, creeping soft-grass, bluebell, holly, three-nerved sandwort, aspen, wild cherry, small leaved lime (*Tilia cordata*) In terms of its intrinsic ecological value, it is considered to be of local value. However, it is recognised that ancient woodland does have additional value as an example of irreplaceable habitat. Therefore, The Bogs ancient woodland is considered to be of county value.
Queen Anne's Hills East Ancient Woodland at Fox warren park (within Park Barn Farm replacement land)	National	Ancient woodland is an irreplaceable habitat which provides a valuable biodiversity resource both for its diversity of species and for its longevity as woodland. Due to access restrictions, this area of ancient woodland has not been surveyed. Therefore, a precautionary approach has been taken and this plot of ancient woodland has been assessed as being of national value.
Queen Anne's Hills West Ancient Woodland at Fox warren park (immediately adjacent to Park Barn Farm replacement land)	National	Ancient woodland is an irreplaceable habitat which provides a valuable biodiversity resource both for its diversity of species and for its longevity as woodland. Due to access restrictions, this area of ancient woodland has not been surveyed. Therefore, a precautionary approach has been taken and this plot of ancient woodland has been assessed as being of national value.
Veteran Trees	Regional[124]	The NPPF (2019) considers veteran trees to be 'irreplaceable habitat.' However, the ecological value of these habitats in the context of the wider countryside needs to be considered. The veteran trees identified within or adjacent to the Scheme have features suitable for specialised invertebrates of decaying wood, epiphytic bryophytes and lichens, however, they are situated in an area where a wealth of similar resources occur (and will occur for years to come as other trees decay and age). All occur at the edge of woodlands and not in an independent setting or in large aggregations which would increase their associated value for invertebrates or bats (bats generally favour large aggregations of veteran trees and veteran trees set in a context of surrounding high-quality woodland).
Habitats of Principal Importance (HPI) – including lowland mixed deciduous	Local	These habitat types are common and widespread within the county. Therefore, where these HPIs are not within designated sites and/ or ancient woodland, they are considered to be of

[124] Only T165 is assessed as being of regional value. All other individual veteran trees are of county or local value.

Receptor/resources	Value (in the context of the Scheme)	Justification
woodland, wood pasture and parkland priority habitat (outside of designated sites and ancient woodland),		local value. Where HPIs fall within designated sites, these have not been valued separately as the contribute to the value of the designated sites.
Bolder Mere (part of the Ockham and Wisley Commons SSSI)	National	Surveys have identified Bolder Mere as a shallow lake comprised of a good range of aquatic macrophyte and macroinvertebrate species although constrained by the presence of invasive non-native species. It is an important feature within the Ockham and Wisley Commons SSSI and is a valuable habitat for the maintenance of the interest features of the site.
Stratford Brook	Local	Stratford Brook is a modified watercourse with heavy shading limiting aquatic macrophytes. Aquatic surveys indicate moderate water quality and limited minor fish species. Despite this, the watercourse exhibits good geomorphological variety and a range of in-channel habitats upstream of the existing A3 crossing.
River Wey	County	The River Wey is a modified river with varied marginal and bankside aquatic vegetation. Surveys indicate the river has very good water quality and supports a mix of coarse fishery.
River Mole	County	The River Mole is a wide, highly modified, meandering watercourse with moderate flow and a mix of marginal and bankside vegetation.
Ephemeral ditches – Pointers Road, Chatley Wood, Ockham Common, Cockcrow Hill, Pond Farm south, Hut Hill, Elm Lane, adjacent to A3 and within A3 carriageway	Local	A series of heavily modified/managed ephemeral drainage ditches situated in woodland or adjacent to carriageways with heavy shading from trees and dense scrub. Although these watercourses are not identified as exhibiting habitat or ecological complexity they provide some value as aquatic resources for part of the year (when wet) and form a series of wildlife corridors linked to other watercourses and habitats within the Ockham and Wisley Commons SSSI.
Chatley Wood pond	Local	This is a small ephemeral pond situated within mature Scots pine (*Pinus sylvestris*) dominated woodland. It is situated within the Ockham and Wisley Commons SSSI; however, it does not exhibit habitat or ecological complexity due to its ephemeral nature but will provide some value as an aquatic resource for part of the year.
Manor pond	Local	Manor pond is a medium sized pond surrounded by mature woodland. It is constrained by its use as a carp fishery with limited marginal aquatic vegetation. However, is it part of a larger wetland area, with ponds upstream supporting a range of aquatic macrophytes and a wet woodland area downstream towards the River Mole.

Receptor/resources	Value (in the context of the Scheme)	Justification
Bats	County	The majority of bats recorded within the survey area, particularly all confirmed roosts, are of species that are widespread in the UK and/or England. In Surrey, common pipistrelle, soprano pipistrelle and brown long-eared bat are common; serotine, Daubenton's bat, and Natterer's bat are locally common; and whiskered and noctule have local status, while only Nathusius' pipistrelle and Leisler's bat are listed as rare[125]. Noctule, soprano pipistrelle and brown long-eared bat are SPI. None are on the IUCN European Red List[126]. Taking this into account, the assemblage of bats associated with the Scheme is of county value.
Great crested newt	Local	Great crested newt is a SPI and European Protected Species. This species is found throughout Surrey where aquatic and terrestrial conditions are suitable. Based on desk study data and the assessments undertaken, it is considered that the habitats within the EZoI support a small metapopulation around Bolder Mere and Ockham Common, and a medium[127] population within a single pond (W32) on Wisley Common. Therefore, this species is valued at the Local scale.
Sand lizard	Regional	Sand lizard are a SPI and also a European Protected Species. In Surrey there are approximately seven isolated colonies of sand lizard and five broad meta-populations covering multiple sites[128]. These are all located in the west of the county. Elsewhere in the south east they are found in Dorset, Hampshire, and West Sussex. The population in Ockham Common (reintroduced in 1991) is isolated. However, it is a breeding population and it is potentially increasing in size. Considering the restricted range of the species in the south east the population of sand lizard (associated with Ockham Common) is valued at the regional scale.
Common Species of Reptiles (adder, common lizard, grass snake, slow worm)	Local	All reptile species recorded are SPI. Five areas (Wisley Airfield, Elm Lane: Snakes Field, Wisley Common, NW Quadrant, Ockham Common Wood) are considered to be 'important reptile sites' according to the criteria of the Key Reptile Site Register (Froglife 1999).
Otter	Local	No natal holts have been found. A regularly used spraint site was found on the River Wey (close to Park Barn Farm replacement land) and it is likely that otter may forage along this watercourse. This location is not within the Scheme and there are no works planned on the

[125] Surrey Nature Partnership (2017). The State of Surrey's Nature.
[126] https://www.iucnredlist.org/
[127] This is a precautionary assumption, based on a single positive great crested newt eDNA result at pond W32.
[128] SARG Atlas - Lacerta agilis. http://surrey-arg.org.uk/SARGWEB.php?app=HeatMap; accessed 17/05/2019

Receptor/resources	Value (in the context of the Scheme)	Justification
		River Wey. Otters have a large range and will continue to have access to the river.
Breeding birds, not including SPA qualifying species (bullfinch, dunnock, linnet, mistle thrush, song thrush, stock dove, willow warbler woodcock)	Local	These are all common breeding species in Surrey and it is considered that the habitats within the Scheme will only support populations of these species of local value in the context of the Scheme.
Spotted flycatcher	County	The British population of spotted flycatchers has declined by 50% between 1995 and 2010. Despite these declines, they remain a widespread breeding summer visitor, with an estimated 33,000 breeding territories in Britain[129]. However, spotted flycatchers are scarce breeders in Surrey, with estimates of less than 50 breeding territories[130]. Three spotted flycatcher territories were identified within the SPA enhancement area, representing more than 1% of the county population. Therefore, in the context of the Scheme, spotted flycatcher are of county value.
Badger	Local	Badgers are widespread in Surrey and the UK. They are not listed as a SPI in the UK or Surrey however they are afforded legal protection through the Protection of Badgers Act 1992 which protects them from persecution. There is a well-established main sett and other setts. Therefore, in the context of the Scheme, badgers are of local value.
Terrestrial invertebrate assemblage	Local	The terrestrial invertebrate surveys recorded 37 notable species within Ockham and Wisley Commons SSSI. The key areas for invertebrates such as the heathland within Wisley Common, the ancient Tumulus monument and its deadwood resources and also the mature trees along Pointers Lane in the north-east quadrant, fall outside the Scheme. These key locations are potential nuclei for scarce species, and as such, if retained, any impacts to the site should not negatively affect species at a wide geographical level, particularly as a similar habitat will be retained outside the Scheme footprint. Scheme land take (temporary and permanent) is only a small proportion of the available habitat, what will remain is of similar quality, or in the case of the north-west quadrant, significantly greater quality, and these areas will support a similar range of species. While the invertebrate community contributes to the national value of the SSSI, the Local valuation

[129] Balmer, D., Gillings, S., Caffrey, B., Swann, B., Downie, I. and Fuller, R. (2013) Bird Atlas 2007-11 The distribution of breeding and wintering birds in Britain and Ireland. British Trust for Ornithology; Thetford.
[130] The 2015 Surrey Bird Report (produced by the Surrey Bird Club) recorded potential breeding records of spotted flycatchers from 46 locations in 2015, 43 locations in 2014 and 39 locations in 2013).

Receptor/resources	Value (in the context of the Scheme)	Justification
		applies to the smaller survey area and follows referenced valuation standards[131].

[131] Plant, C. (2009). Invertebrates and ecological assessment.

7.9 Impact assessment

Ecological Zone of Influence (EZoI)

7.9.1 Nature conservation resources that were not recorded in the initial desk study and surveys have been scoped out of further assessment, as they will not be affected by any activities or processes involved in the Scheme. Therefore, hazel dormouse, water vole and white-clawed crayfish have been scoped out from further assessment.

7.9.2 No breeding sites or resting places were confirmed for otter, but the presence of a regularly used territorial spraint site 180 m from the Scheme at Park Barn Farm replacement land indicates that this stretch of the River Wey is used by otters regularly for commuting purposes. None of the construction activities relating to the highways proposals have the potential to affect otters or habitats used by otters. Park Barn Farm replacement land is adjacent to the River Wey, but will only be subject to enhancement measures, which will not affect the river. In addition, it has been taken into account that the PPGs/GPPs[132] and the CIRIA[133] guidance on the control of water pollution from construction sites will be implemented to prevent any impacts on water courses or notable aquatic habitats. It is therefore anticipated that there will be no potential impacts to otters and they are not considered further in the assessment.

7.9.3 Once the data gathering exercises from both the desk study and field surveys were completed and all Scheme details were available, the EZoI was finalised for both the construction and operational phases of the Scheme, as detailed below.

Designated sites, ancient woodland and veteran trees

7.9.4 In setting the EZoI for designated sites, it has been taken into account that the PPGs/GPPs and the CIRIA guidance on the control of water pollution from construction sites will be implemented to prevent any impacts on water courses or notable aquatic habitats. With suitable pollution measures in place, direct impacts will only result where any in-channel works are required. Any in-channel works will be confined within the Scheme.

7.9.5 With the exception of air quality, which is discussed in paragraphs 7.9.20 to 7.9.27, it is expected that the EZoI will include designated sites, ancient woodland and veteran trees within or adjacent to the Scheme with impacts considered unlikely to extend further.

7.9.6 For air quality assessment the EZoI includes designated sites and habitats up to 200 m from the ARN. This consists of Ockham and Wisley Commons SSSI, Colony Bog and Bagshot Heath SSSI, Chobham Common SSSI, Esher Commons SSSI, Sheepleas SSSI and Mole Gap to Reigate Escarpment SSSI. Impacts on the SSSI's within the ARN are assessed in Chapter 5 of the

[132] Pollution Prevention Guidelines (PPGs) are out of date and a review process is currently underway to replace them with Guidance for Pollution Prevention (GPPs). These documents are available at http://www.netregs.org.uk/environmental-topics/pollution-prevention-guidelines-ppgs-and-replacement-series/guidance-for-pollution-prevention-gpps-full-list/. GPPs provide environmental good practice guidance for the whole UK, and environmental regulatory guidance directly to Northern Ireland, Scotland and Wales only. For businesses in England, regulatory guidance is available from GOV.UK instead.
[133] The CIRIA documents are a series of publications developed by the Construction Industry Research and Information Association. Each document is targeted at a particular type of business or activity and covers environmental good practice to minimise pollution.

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7.9.7 With regard to SACs with bats as a qualifying feature, the HRA Screening concluded that there will be no potential impacts to the bat species that are the qualifying species for these designated sites due the absence of Bechstein's or barbastelle bat during the surveys and due to the fact that the Scheme is considered not to create any additional barriers to the movement of bats. Therefore, the Mole Gap to Reigate Escarpment SAC and Ebernoe Common SAC have been scoped out and will not be considered further in this Assessment (for further details see TR010030 5.3 Habitats Regulations Assessment Annex A: Stage 1 Screening, Annex A).

Habitats

7.9.8 Due to the generally localised nature and level of the impact of the construction and operational works, it is considered that potential impacts from the Scheme on habitats will be restricted to within or directly adjacent to the Scheme. Therefore, it is considered for the EZoI for habitats be confined to those within or directly adjacent to the Scheme.

7.9.9 With the exception of air quality, which is discussed in paragraph 7.9.6, it is expected that the EZoI will include habitats within or adjacent to the Scheme with direct impacts considered unlikely to extend further.

Protected and notable species

7.9.10 The EZoI for protected and notable species has been defined on a species-specific basis based on the likely effects of the Scheme as detailed in Table 7.6 below (distances are taken from the Scheme).

Table 7.6: Ecological Zone of Influence for Impact Assessment on protected and notable species

Species	Distance from the Scheme (including replacement, SPA compensation and SPA enhancement areas)		Justification
	Construction	Operation	
Notable plants	Within the Scheme	Within/adjacent to the Scheme	Due to the generally localised nature and level of the impact of the construction and operational works, it is considered appropriate to only assess impacts on notable plants within the Scheme. Air quality calculations have determined that increases in nitrogen deposition will be confined to within 10 m of the Scheme.
Bats	100 m	100 m	Although bats are known to commute large distances between roosts and foraging habitat, direct construction and operational impacts are likely to be restricted to commuting, foraging and roosting habitat within 30 m of the Scheme. However, due to the

Species	Distance from the Scheme (including replacement, SPA compensation and SPA enhancement areas)		Justification
	Construction	Operation	
			potential for indirect impacts such as noise and lighting during construction on known roosts in the local area, the EZoI has been extended to 100 m.
Great crested newt	250 m	Within the Scheme	Impacts on great crested newt could occur through habitat damage and loss, with potential for killing and injury during construction. Although great crested newts can use suitable terrestrial habitat within 500 m of a breeding pond, there is usually a decrease in newt abundance beyond 250 m from a breeding pond[134]. It is therefore considered that the Scheme has the potential to impact on populations or metapopulations of great crested newts using ponds located within 250 m of the Scheme only. During operation, impacts will be limited to small scale maintenance works affecting habitat and individual great crested newts within the Scheme Boundary.
Reptiles	Within and adjacent to the Scheme	Within the Scheme	Impacts on reptiles will occur through habitat loss and potential for killing and injury of reptiles within the Scheme and through potential disturbance to individuals adjacent to the Scheme during construction.
Breeding birds	200 m	Within/adjacent to the Scheme	Construction works could potentially disturb breeding birds. A distance of 200 m has been allowed, although where an existing visual screen is present the distance at which disturbance will occur will be lower. Once operational, disturbance will be limited to within the Scheme itself.
Schedule 1 breeding birds	200 m	Within/adjacent to the Scheme	Construction works could potentially disturb Schedule 1 breeding birds. A distance of 200 m has been allowed, although where an existing visual screen is present the distance at which disturbance will occur will be lower. Once operational, disturbance will be limited to within the Scheme itself.

[134] English Nature (2004). An assessment of the efficiency of capture techniques and the value of different habitats for the great crested newt (ENRR576) http://publications.naturalengland.org.uk/publication/134002

Species	Distance from the Scheme (including replacement, SPA compensation and SPA enhancement areas)		Justification
	Construction	Operation	
Badger	30 m	Within the Scheme	Badgers sett tunnels extend from the sett entrance[135]. Vibrations from heavy machinery and excavation of soils may cause the collapse of tunnels. Significant impacts from the proposed works on a sett beyond 30 m from the Scheme are not anticipated.
Terrestrial invertebrates	Within the Scheme	Within the Scheme	Impacts on invertebrates will occur through habitat loss and potential for killing of invertebrates within the Scheme and through potential disturbance to populations adjacent to the Scheme during construction.
Non-native invasive plant species	Within the Scheme	Within the Scheme	Construction works will be confined to the Scheme, and therefore the risk of spreading non-native invasive plant species will also be confined to the Scheme.

Potential impacts

7.9.11 This section describes the potential impacts (positive and negative) on nature conservation resources within the EZoI. Potential impacts can persist over different periods of time and for the purposes of this assessment these have been categorised as:

- Construction short term impacts – those that are expected to occur during construction (including enabling works). These are likely to be temporary impacts, such as noise generated during construction of the Scheme;
- Construction long term impacts – those that will result from construction activities, but the effects will not be evident until the operational phase (such as tree planting to create wood pasture habitats in compensation areas), or the effects will be permanent; and
- Operational impacts – those that occur as a result of the operation of the Scheme.

7.9.12 As well as the highways proposals, all biodiversity mitigation measures (including extensive areas identified and secured for habitat creation and management) are embedded into the Scheme design and fall within the DCO boundary of the Scheme, and as such are included in the assessment of potential impacts for the Scheme. Although these measures have the potential result in long term positive impacts, some activities (such as tree felling or selective thinning) may also result in short term negative impacts and are discussed below.

[135] English Nature (2002). Badgers and development. http://www.badgerland.co.uk/help/en_badgers_development.pdf

7.9.13 It is anticipated that construction will take three years and will commence in winter 2020 with the enabling works, which are expected to take place between winter 2020 and summer 2021. Habitat creation and planting works within the common land, open space and open public access replacement land parcels and the SPA compensation land parcels will take place during the first suitable season for these works within this period. Therefore, any potential impacts resulting from the preparation of the areas targeted for habitat creation and enhancement as part of the Scheme (such as those resulting from selected tree felling and thinning) are considered to be short term (negative) impacts taking place during construction.

7.9.14 Potential impacts on designated sites, ancient woodland, veteran trees, sensitive habitats and areas likely to contain protected or notable species have been avoided in the design where possible. As the design incorporates measures to prevent light spill, no disturbance impacts are anticipated as a result of increased light during construction or operation of the Scheme. No potential impacts are anticipated as a result of changes to local hydrology. In areas targeted for enhancement, enhancement measures will avoid all trees that contain veteran features or features with the potential to support roosting bats and all badger setts. Measures to protect other notable species such as great crested newt, reptiles and nesting birds will be included in the appropriate method statement for the enhancement works.

7.9.15 Further information regarding potential impacts on Thames Basin Heaths SPA and its qualifying species (Dartford warbler, nightjar and woodlark) are provided in the M25 junction 10/A3 interchange HRA[136].

7.9.16 The potential impacts on nature conservation resources as a result of changes in air quality, changes in water quality, increased dust and disturbance to species from noise (operation only) are discussed in paragraphs 7.9.18 to 7.9.27 below, while the remaining potential impacts for each nature conservation resource are discussed in turn in Table 7.7.

7.9.17 Without mitigation, construction activities could also result in the accidental spread of invasive plant species.

Dust and water quality

7.9.18 Without mitigation, the highways proposals have the potential to cause indirect impacts (i.e. habitat degradation) to habitats within statutory and non-statutory designated sites, ancient woodland and HPI from increased dust during construction and through ground and surface water pollution (i.e. change in soil quality through contamination) during construction and operation. The potential degradation of habitats could lead to a reduction in their suitability for the species they support. Further information regarding road drainage and the water environment can be found in Chapter 8.

[136] For further details of the HRA refer to the following documents; TR010030 5.3 Habitats Regulations Assessment Stage 2: Statement to inform appropriate assessment; TR10030 HRA Stages 3-5: Assessment of Alternatives; TR010030 5.3 Habitats Regulations Assessment Annex A: Stage 1 Screening; TR010030 5.3 Habitats Regulations Assessment Annex B: Habitats Regulations Assessment Consultation Report; and TR010030 5.3 Annex C: HRA compensation Annex C: Habitats Regulations Assessment Selection of the Suite of Compensatory Measures.

Noise (operation)

7.9.19 During operation, noise levels are predicted to typically increase by 1 dB or less as a result of the Scheme and will decrease along the A3 due to improved noise barriers which have been embedded into the Scheme design. There will be some minor adverse changes in noise close to the M25 and the new slip roads at M25 junction 10. However, these will be very localised and will tend to be increases of less than 5 dB. In these locations, the existing noise levels already exceed 70 dB. Overall, due to the extremely localised and minor increases in noise predicted, and the existing levels of 70 dB or greater in those locations, it is considered that the changes in noise levels due to operation will be negligible. See Chapter 6 of the Environmental Statement for further details.

Air quality

7.9.20 Out of the five SSSI's within 200 m of the ARN, the air quality assessment in Chapter 5 of the Environmental Statement identified two designated sites within 200 m of the ARN that could potentially be adversely affected by changes resulting from vehicle emissions as a result of the Scheme: Esher Commons SSSI; and Ockham and Wisley Commons SSSI (part of which is within the Thames Basin Heaths SPA). See Chapter 5 of the Environmental Statement for further details.

Esher Commons SSSI

7.1.4 According to the Air Pollution Information Systems (APIS) website[137], the average nitrogen deposition rate for Esher Common SSSI is 11.48 kg N/ha/yr for the whole site.

7.1.5 Table 21 of the Natural England Commissioned Report NECR210[138] shows that for lowland heath habitats with a background nitrogen deposition rate of 10 kg N/ha/yr, an increase of 0.8 kg N/ha/yr is required to reduce the measured species-richness of a habitat by one species.

7.9.21 The greatest change in nutrient nitrogen deposition as a result of the Scheme at Esher Commons SSSI was estimated to be a maximum of 0.04 kg/ha/yr at a distance of 17 m from the road edge, well below the increase of 0.8 kg N/ha/yr required to see a reduction in species-richness. In addition, even at this location, the predicted nitrogen deposition rate of 11.32 kg N/ha/yr in the opening year (2022) is below the existing (2015) baseline of 13.22 kg N/ha/yr.

7.9.22 Due to the changes in nitrogen deposition resulting from the operational Scheme falling below the Natural England thresholds for a reduction in species-richness, and below existing baseline levels, the Scheme will not result in any perceivable changes in habitat structure or function within the Esher Commons SSSI.

Ockham and Wisley Commons SSSI

[137] APIS website (http://www.apis.ac.uk/srcl/select-a-feature?site=1000780&SiteType=SSSI&submit=Next; accessed 27/01/2019)
[138] Caporn, S., Field, C., Payne, R., Dise, N., Britton, A., Emmett, B., Jones, L., Phoenix, G., S Power, S., Sheppard, L. & Stevens, C. (2016). Assessing the effects of small increments of atmospheric nitrogen deposition (above the critical load) on seminatural habitats of conservation importance. Natural England Commissioned Reports, Number 210.

7.9.23 According to the Air Pollution Information Systems (APIS) website[139], the average nitrogen deposition rate for Ockham and Wisley Commons SSSI is 13.9 kg N/ha/yr for the habitat features it supports.

7.9.24 Table 21 of the Natural England Commissioned Report NECR210 shows that for lowland heath habitats with a background nitrogen deposition rate of 10[140] kg N/ha/yr, an increase of 0.8 kg N/ha/yr is required to reduce the measured species-richness of a habitat by one species.

7.9.25 Of the ten transects at Ockham and Wisley Commons SSSI, the only transect that exceeds 0.8 kg N/ha/yr was to the north of the M25 (west of the A3). At this location, the greatest increase was estimated to be 0.87 kg N/ha/yr at 5 m from the edge of the road, dropping to 0.57 kg N/ha/yr at 10 m from the edge of the road. However, even at this location (5 m from the edge of the road), the predicted nitrogen deposition rate of 16.11 kg N/ha/yr is below the existing (2015) baseline of 17.51 kg N/ha/yr.

7.9.26 Due to the changes in nitrogen deposition resulting from the operational Scheme being below the Natural England thresholds for a reduction in species-richness (with the exception of up to 5 m from the road in a single location), and also below existing baseline levels, it can be concluded with confidence that the Scheme will not result in any perceivable changes in habitat structure or function within the Ockham and Wisley Commons SSSI.

Other habitats within the EZoI

7.9.27 These transects are likely to be representative of the wider Scheme footprint. Therefore, it is considered that any increases in nitrogen deposition as a result of the Scheme will be restricted to the edge of the road and will be lower than existing (2015) baseline levels, thus ensuring that changes in air quality resulting from the Scheme will cause no perceivable changes to the habitats that occur adjacent to the Scheme.

[139] APIS website (http://www.apis.ac.uk/srcl/select-a-feature?site=1001052&SiteType=SSSI&submit=Next; accessed 27/01/2019)
[140] Although a nitrogen deposition rate of 13.9 kg N/ha/yr has been given for Ockham and Wisley Commons SSSI, this is likely to reduce by 2022 due to improvements in emissions and has been rounded down to 10 as a precautionary measure (the higher the value, the larger the increase required to cause a reduction in species-richness)

Table 7.7: Potential impacts of the Scheme on nature conservation resources

Nature conservation resource	Potential impacts	Description
Thames Basin Heaths SPA[141]	Direct loss/creation of habitats	Construction Short term: The construction of the highways proposals will lead to the temporary loss of 8.6 ha of habitat within the SPA (0.1 % of the total SPA area of 8,274.7 ha). These losses fall within the Ockham and Wisley Commons SSSI component of the SPA, which is 222.2 ha in size. Therefore, this represents a temporary loss of 3.9 % of habitat within this component. This habitat loss will be confined to the woodland edge of the SPA and will not directly affect the heathland habitats nor the qualifying species that they support (Dartford warbler, nightjar and woodlark), but could lead to a reduction in the invertebrate resource available for the SPA qualifying species. Woodland clearance or thinning in the SPA enhancement areas could also lead to a reduction in the invertebrate resource available for the SPA qualifying species in the short term. Long term: The 8.6 ha of temporary land take will be reinstated with a mixture of woodland edge and shrub habitats. The construction of the highways proposals will lead to the permanent loss of 5.9 ha of habitat that is designated as Thames Basin Heaths SPA. This equates to 0.1 % of the total SPA area. These losses fall within the Ockham and Wisley Commons SSSI component of the SPA. Therefore, the 7.3 ha represents a permanent loss of 2.7 % of habitat within this component. Habitat loss will be confined to the woodland edge of the SPA and will not directly affect the heathland habitats nor the qualifying species that they support (Dartford warbler, nightjar and woodlark), but could lead to a reduction in the invertebrate resource available for the SPA qualifying species. The Scheme has the potential to result in long term beneficial impacts for the qualifying species of the SPA as a result of habitat creation and enhancement to be carried out to 47.4 ha (this equates to 21.3 %) of the Wisley and Ockham Commons SSSI component of the SPA during the construction phase. These measures form part of the SPA suite of compensatory measures and include; 22.5 ha woodland clearance to allow for heathland regeneration; 24.9 ha of enhanced woodland from woodland thinning creating open rides and increasing woodland diversity. In addition, the SPA compensatory measures will also include the creation of 8.1 ha of wood pasture adjacent to the

[141] For further details on the impacts of the Scheme on the Thames Basin Heaths SPA, refer to the HRA documents: TR010030 5.3 Habitats Regulations Assessment Stage 2: Statement to inform appropriate assessment, TR10030 HRA Stages 3-5: Assessment of Alternatives, TR010030 5.3 Habitats Regulations Assessment Annex A: Stage 1 Screening, TR010030 5.3 Habitats Regulations Assessment Annex B: Habitats Regulations Assessment Consultation Report and TR010030 5.3 Annex C: HRA compensation Annex C: Habitats Regulations Assessment Selection of the Suite of Compensatory Measures.

Nature conservation resource	Potential impacts	Description
		SPA.
	Direct mortality of qualifying species (Dartford warbler, nightjar and woodlark).	None anticipated. The qualifying species only occur in the heathland habitats within the SPA which fall outside the Scheme.
	Fragmentation or isolation of habitats	None anticipated. The Scheme will result in the expansion of the existing highway boundary around M25 junction 10 with no potential for fragmentation or isolation of habitats within the SPA. The byway section of Elm Lane will be upgraded across Ockham Common to provide access suitable for all vehicles between Old Lane and Elm Corner. Elm Lane falls outside the heathland areas where the qualifying species occur, and these minor changes in usage will not lead to any increased fragmentation.
	Disturbance to qualifying species from noise, light or other visual stimuli	Construction Short term: Potential disturbance of the qualifying species as a result of minor increases in noise (up to 3 dB) as a result of continuous construction noises and from louder activities such as bridge demolition. Potential for disturbance of the qualifying species by loud irregular noises (such as dropping objects at heights). As recreational use of the SPA will not be possible in areas under construction, no potential disturbance impacts on the qualifying species are anticipated as a result of recreational usage of the SPA during construction. Operation The operation of the Scheme is not expected to result in changes to the numbers of visitors to the Thames Basin Heaths SPA, or the way in which visitors gain access to the SPA, therefore no potential impacts to the qualifying species are anticipated as a result of recreational disturbance.
Ockham and Wisley Commons SSSI	Direct loss of habitats	Construction Short term: The construction of the highways proposals will lead to a temporary loss of 16.0 ha of habitat within the SSSI (5.9 % of the total SSSI area of 269.6 ha). The woodland habitat being cleared (or thinned) for the construction of the highways proposals and the creation of the SPA enhancement areas may support a number of rare and local insects (noted in the citation for the SSSI). Therefore, in the short term during construction, the clearance and thinning of woodland may result in some reductions in the populations of notable invertebrates within the SSSI. Long term:

Nature conservation resource	Potential impacts	Description
		The 16.0 ha of temporary land take will be reinstated with a range of habitats including native tree and shrub planting, species rich grassland and sandy banks (see paragraph 7.4.32 for further details). The construction of the highways proposals will lead to the permanent loss of 11.5 ha of habitat within the SSSI. This equates to 4.3 % of the total area of the SSSI. The Scheme has the potential to result in long term beneficial impacts as a result of habitat creation and enhancement to be carried out during the construction phase within and adjacent to the SSSI (22.5 ha of woodland clearance within the SSSI to allow for heathland regeneration; 45.1 ha of woodland enhancement through woodland thinning and creation of open rides and increasing woodland diversity; creation of 10.4 ha of wood pasture; creation of 5.8 ha of acid grassland/heathland; and enhancement of Bolder Mere). The 47.4 ha of habitat enhancements within the SSSI equates to an enhancement of 17.6 % of the SSSI.
	Direct mortality of qualifying species	Construction Short term: Vegetation clearance during construction of the highways proposals and selected clearance/thinning of woodland within SPA enhancement areas has the potential to result in the mortality of individual rare and local insects (noted in the citation for the SSSI).
	Fragmentation or isolation of habitats	None anticipated. The Scheme will result in the expansion of the existing highway boundary around M25 junction 10 with no potential for fragmentation or isolation of habitats within the SSSI. The byway section of Elm Lane will be upgraded across Ockham Common to provide access suitable for all vehicles between Old Lane and Elm Corner. However, this is a minor access road, servicing 16 properties and will not provide parking opportunities for visitors. Therefore, these minor changes in usage will not lead to any increased fragmentation.
	Disturbance to species from noise, light or other visual stimuli	None anticipated.
Ockham and Wisley Commons LNR	Direct loss/creation of habitats	Construction Short term: The construction of the highways proposals will lead to the temporary loss of 19.3 ha of habitat within the LNR (5.8 % of the total LNR area of 332 ha). Long term: The 19.3 ha of temporary land take will be reinstated with a range of habitats including native tree and shrub planting, species rich grassland and sandy banks (see paragraph 7.4.32 for further details).

Nature conservation resource	Potential impacts	Description
		The construction of the highways proposals will lead to the permanent loss of 12.7 ha of habitat that is designated as Ockham and Wisley Commons LNR. This equates to 3.8 % of the total area of the LNR. The Scheme has the potential to result in long term beneficial impacts as a result of habitat creation and enhancement to be carried out during the construction phase within and adjacent to the LNR (22.5 ha of woodland clearance to allow for heathland regeneration; 45.1 ha of woodland enhancement through woodland thinning and creation of open rides and increasing woodland diversity; creation of 10.4 ha of wood pasture; creation of 5.8 ha of acid grassland/heathland; and enhancement of Bolder Mere). The 49.4 ha of habitat enhancements within the LNR (47.4 ha of SPA enhancement and the creation of 2.0 ha of wood pasture at C1) equates to an enhancement of 14.3 % of the LNR.
	Fragmentation or isolation of habitats	None anticipated as the Scheme will result in the expansion of the existing highway boundary around M25 junction 10 with no potential for fragmentation or isolation of habitats within the LNR.
Elm Corner Woods SNCI	Direct loss/creation of habitats	Construction Short term: The construction of the highways proposals will lead to the temporary loss of 1.2 ha of habitat within the SNCI (11.8 % of the total SNCI area, 10.2 ha). Long term: The 1.2 ha of temporary land take will be reinstated with native tree and shrub planting (see paragraph 7.4.32 for further details). The construction of the highways proposals will lead to the permanent loss of 1.7 ha of habitat that is within Elm Corner Woods SNCI. This equates to 16.7 % of the total area of the SNCI. The remaining 7.3 ha of Elm Corner Woods SNCI will be subject to woodland thinning to create a more diverse woodland with open rides and a diverse woodland edge.[142]
	Fragmentation or isolation of habitats	Construction Long term: The creation of a permanent side access road at Wisley Airfield will fragment habitats between Elm Corner Woods SNCI and Wisley Airfield SNCI that are currently connected. The proposed permanent access road at Wisley Airfield will separate an area of ancient woodland from the adjacent scrub and ruderal habitats within Wisley Airfield SNCI and will cross a short section of woodland (not ancient woodland).

[142] Although areas of Elm Corner Woods SNCI fall outside the DCO boundary, woodland thinning works will be undertaken, as agreed by SWT.

Nature conservation resource	Potential impacts	Description
Wisley Airfield SNCI	Direct loss/creation of habitats	Construction Short term: The construction of the highways proposals will lead to the temporary loss of 1.6 ha of habitat within the SNCI, 5.7 % of the total SNCI area, 28.2 ha). Long term: The 1.6 ha of temporary land take will be reinstated with a range of habitats including native tree and shrub planting, species rich grassland and sandy banks (see paragraph 7.4.32 for further details). The construction of the highways proposals will lead to the permanent loss of 2.9 ha of habitat that is within Wisley Airfield SNCI. This equates to 10.3 % of the total area of the SNCI. Tree and shrub planting within Wisley Airfield SNCI will provide a buffer between the Wisley Lane access road and the Elm Corner woods.
	Direct mortality of qualifying species	Construction Short term: The populations of reptiles and amphibians are reasons for the selection of Wisley Airfield as an SNCI. In the absence of mitigation, reptiles and amphibians could be killed or injured during construction.
	Fragmentation or isolation of habitats	Construction Long term: The creation of a permanent side access road at Wisley Airfield will fragment habitats between Elm Corner Woods SNCI and Wisley Airfield SNCI that are currently connected. The proposed permanent access road at Wisley Airfield will separate an area of ancient woodland from the adjacent scrub and ruderal habitats within Wisley Airfield SNCI and will cross a short section of woodland (not ancient woodland). Fragmentation could potentially lead to the splitting of local populations of species such as reptiles and amphibians, or prevent individuals of these species from moving between habitats required for different stages of their lifecycle.
	Disturbance to qualifying species from noise, light or other visual stimuli	Construction Short term: The populations of reptiles and amphibians are reasons for the selection of Wisley Airfield as an SNCI. Construction of the highways proposals could cause disturbance of reptiles and amphibians within Wisley Airfield SNCI.

Nature conservation resource	Potential impacts	Description
Bolder Mere Conservation Verge (CV005)	Direct loss/creation of habitats	Construction Short term: There will be no temporary loss of habitats from within Bolder Mere Conservation Verge CV005 as a result of the Scheme. The habitat enhancement measures in SPA enhancement area E3 involve woodland thinning and clearance of woodland to allow for the extension of heathland habitat. This will result in the temporary disturbance of existing habitats during the woodland thinning habitat enhancement works to approximately 105 m of the verge to the east of Old Lane within the CV005. The habitat enhancement measures in SPA enhancement area E4 involve woodland thinning of mostly Scots pine and birch to enable a more diverse woodland. This will result in the temporary disturbance of existing habitats during the woodland thinning habitat enhancement works to approximately 250 m of the verge to the west of Old Lane within the CV005.
	Direct mortality of qualifying species	Construction Short term: CV005 is designated for the common toad population that uses Old Lane in this location as a toad crossing site. In the absence of mitigation, common toads could be could be killed or injured during implementation of enhancement measures at E3 and E4.
	Fragmentation or isolation of habitats	None anticipated. There will be no fragmentation or isolation of habitats within Bolder Mere Conservation Verge CV005 as a result of construction or operation. Old Lane and Elm Lane (byway 525) will be resurfaced with tarmac where the two meet but will not include raised kerbs. Therefore, the resurfaced roads will not be a barrier to movement and dispersal of common toad movement for which Bolder Mere Conservation Verge CV005 is designated.
	Disturbance to qualifying species from noise, light or other visual stimuli	Construction Short term: Construction activities have the potential to increase levels of temporary disturbance to common toads that occur within or adjacent to the Scheme boundary, such as: • Visual disturbance from movement of vehicles, machinery and members of the workforce; • Noise disturbance; and • Light disturbance during night-time construction works. Operation None anticipated as no significant change in lighting, noise and visual stimuli is anticipated to occur as a result of

Nature conservation resource	Potential impacts	Description
		the Scheme.
Ancient woodland (Elm Corner and Heyswood)	Direct loss of habitats	Construction Long term: Due to the irreplaceable nature of ancient woodland habitat all habitat loss within the permanent and temporary land take areas within ancient woodland is considered as permanent loss of ancient woodland. The land take area required for the construction of the highways proposals includes the permanent loss of 0.4 ha of ancient woodland. During construction of the Scheme there will be the removal of rhododendron from within 6.1 ha of ancient woodland habitat at Chatley Farm, enabling a more diverse woodland to establish in the long term.
	Fragmentation or isolation of habitats	Construction Long term: No fragmentation is anticipated.
Veteran trees	Direct loss of habitats	Construction Long term: The construction of the highways proposals will lead to the permanent loss of up to eleven veteran trees. Two trees are confirmed to be lost as there are no feasible design changes available to retain the trees. Nine additional veteran trees require further assessment during the design process in order assess the potential to retain the trees.
Habitats of Principal Importance (HPIs)	Direct loss/creation of habitats	Construction Short term: The construction of the highways proposals will lead to the temporary loss of wood pasture and parkland. Creation of heathland habitat within the SPA enhancement areas will involve the selective clearance of woodland. As a result, 22.5 ha of mixed deciduous woodland will be cleared during construction. Long term: The SPA suite of compensatory measures and replacement land measures has the potential to result in long term beneficial impacts as part of the Scheme as it will lead to the creation of 10.4 ha of wood pasture, 22.5 ha of heathland, 27.4 ha of woodland planting and 45.1 ha of woodland enhancement (as a result of thinning to improve the diversity of the woodland in terms of structure, species assemblage and age). The replacement land outside the SPA will lead to the planting of 8.1 ha of woodland at Park Barn Farm, with the provision of a woodland corridor linking to existing parcels of woodland. It will also lead to the planting of 1.7 ha of woodland at Hatchford End and the enhancement of 20.2 ha of woodland at Chatley Woods and Park Barn Farm,

Nature conservation resource	Potential impacts	Description
		and enhancement of the ancient woodland at Elm Corner by thinning some of the trees to enable a diverse understory to develop.
	Fragmentation or isolation of habitats	Construction Long term: The creation of a side access road at Wisley Airfield will fragment areas of lowland mixed deciduous woodland that is currently connected.
Stratford Brook	Direct loss of aquatic/riparian habitat	Construction Construction works associated with the Stratford Brook include: • New river crossing c. 27.5m wide, c. 5m high overbridge to accommodate new road access to Wisley Lane. The new crossing structure will include a mammal pass. • Strengthening of existing culvert under A3 SW bound slip road. • Provision of four outfalls to the Stratford Brook, all of which are attenuated either by attenuation pond or attenuation ditch. • Watercourse and riparian restoration/enhancement works and works to existing Stratford Brook Culvert North and Culvert South structures following the outcome of feasibility assessments. Should works to Stratford Brook Culvert North and Culvert South be deemed technically unfeasible and/or not of “reasonable cost” then a commuted sum will be provided to the Environment Agency to undertake compensatory restoration works on watercourse extent/s elsewhere in the River Wey catchment (see WFD Assessment Technical Appendix F TR010030/APP/5.4 for definitions of reasonable cost and further information in relation to the commuted sum). Short term: During construction of the new crossing and strengthening of the existing culvert, required vegetation clearance and earthworks will result in the direct loss of riparian habitat from along both banks of Stratford Brook. The riparian zone is currently characterised by the presence of mixed woodland and scrub. This loss will be temporary outside of the direct footprint of the crossing and its embankments, as riparian trees will be reinstated following the construction works. There will be no direct loss of in-channel or bank habitat since the new crossing is a single span bridge, thus negating the need for any abutments in or immediately adjacent to the watercourse. Due to current shading at the location of the new bridge crossing by riparian trees, changes to in-channel habitat that may arise from the effects of shading by the new crossing on aquatic macrophytes, is not anticipated. There will be temporary disturbance to the watercourse banks and riparian zone associated with the construction of four surface water outfalls. There will be localised habitat losses (riparian tree clearance) associated with the proposed

Nature conservation resource	Potential impacts	Description
		restoration/enhancement works along the Stratford Brook, but the overall result will be an improvement in watercourse habitat condition and resource availability for aquatic species. Long Term: Loss of riparian habitat and reduced habitat connectivity beneath the new Stratford Brook crossing, plus a reduction in aquatic habitat quality and availability for aquatic species due to shading from the 27 m wide deck. There will be permanent localised losses of the watercourse banks and riparian zone associated with the construction of four surface water outfalls. <u>Operation</u> None anticipated during operation of the Scheme.
	Fragmentation or isolation of habitats	<u>Construction</u> Short term The single span bridge design negates the need for any in-channel structures that could cause barriers to aquatic species movement. The new crossing structure will include a mammal pass to mitigate for potential impacts associated with mammal passage at high flows. Strengthening works to the existing culvert under A3 SW bound slip road is not anticipated to cause additional habitat fragmentation since the footprint of the structure will remain unchanged. Despite localised habitat losses (riparian tree clearance) associated with the proposed restoration/enhancement works along the Stratford Brook, it is not anticipated that these will affect riparian connectivity and the overall result will be an improvement in riparian habitat complexity. Improved connectivity within the watercourse may arise if it is feasible to address the current severance for fish and mammal passage created by the Stratford Brook North and South Culverts. Long term: The new crossing of the Stratford Brook will result in habitat fragmentation through the loss of riparian connectivity created by shading beneath the bridge deck. <u>Operation</u> None anticipated during operation of the Scheme.
	Loss of and/or physical disturbance to aquatic species (aquatic invertebrates, macrophytes and fish)	<u>Construction</u> Short term: As there will be no in-channel structures associated with the new crossing structure, fish passage is unlikely to be affected although it is recognised that resource availability and habitat quality beneath the bridge deck will be

Nature conservation resource	Potential impacts	Description
		reduced permanently for fish populations. There may be localised losses of, and temporary physical disturbance to, aquatic macroinvertebrates resulting from the potential requirement to coffer/de-water and over pump the Stratford Brook in relation to the refurbishment works at the A3 SW bound slip road south culvert. Physical disturbance to fish may also occur should dewatering be required. Appropriate measures will be implemented through the CEMP that acts to limit potential effects on fish. These will likely include measures to exclude fish from the area to reduce the risk of entrainment and/or a fish rescue and translocation procedures under an ecological watching brief. There may localised losses of, and temporary physical disturbance to aquatic species associated with the construction of four outfalls to the Stratford Brook. There will be temporary localised disturbance to aquatic species and potentially localised losses of aquatic macroinvertebrates associated with the proposed restoration/enhancement works along the Stratford Brook, mainly in relation to creation of backwater habitats and the placement of large wood and gravel. However, the overall result will be an improvement in watercourse habitat condition for aquatic species. Long term: Shading beneath the 27 m wide deck of the new crossing will affect in-channel primary and secondary productivity which will likely remove the potential for aquatic macrophyte and diatom growth immediately beneath the bridge deck. By association, the aquatic macroinvertebrate community will be altered permanently with the likely trajectory of change within the community towards a more species poor assemblage immediately below the bridge deck. <u>Operation</u> None anticipated during operation of the Scheme.
	Changes to hydromorphology/ water quality	<u>Construction</u> Short term: The new crossing is a single span bridge, negating the need for any abutments in, or immediately adjacent to the watercourse. Therefore, gross changes in watercourse planform and hydrological processes beneath the new bridge deck are not anticipated. Temporary changes to hydromorphology may arise should there be the need to coffer/de-water and over pump the Stratford Brook in relation to the refurbishment works at the A3 SW bound slip road culvert. The potential for temporary changes to water quality arising from general construction activities associated with the placement of the new bridge structure and the strengthening of the existing culvert under A3 SW bound slip road will be managed through measures to control run-off and the risk of accidental pollution within the CEMP. Long term: It is recognised that shading can affect watercourse hydromorphology through the removal of in-channel

Nature conservation resource	Potential impacts	Description
		macrophyte assemblages. The new crossing structure will negatively affect watercourse hydromorphology through the effects of shading to in-channel habitats (reducing potential for macrophyte and algal growth) and permanent loss of riparian vegetation, including trees, that add habitat complexity to the banks and channel through provision of organic matter and tree root structure within the channel. There will be long term improvements to watercourse hydromorphology arising from the proposed restoration/enhancement works along Stratford Brook. Further improvements to watercourse hydromorphology may arise if feasibility of addressing the current flow impoundment created by the culvert SW bound slip road are implemented. Operation Provision of flow attenuation and subsequent treatment of road run-off as part of the drainage strategy will ensure no changes to watercourse hydromorphology or water quality.
	Disturbance to species from noise, light or other visual stimuli	Construction Short term: Temporary acoustic and visual disturbance to fish will arise during construction of the new crossing, culvert refurbishment works and outfall construction. Measures will be implemented within the CEMP to address potential effects in relation to acoustic disturbance that may arise from any piling activities. Avoidance of the use of percussive (hammer) piling in favour of softer alternatives (e.g. silent sheet piling, vibratory sheet piling) where ground conditions allow. Where not possible, soft start piling procedures should be utilised. The soft-start duration should be a period of not less than 20 minutes and should piling cease for a period greater than 20 minutes, the soft start procedure must be repeated. Temporary disturbance (visual and acoustic) to fish will also result from the activities required to implement the embedded design mitigation to restore/enhance the Stratford Brook. During construction, use of directional lighting away from the Stratford Brook will be implemented as to not induce altered behavioural responses within the fish population. Operation In operation, the use of directional lighting associated with the new crossing structure will not result in additional light spill to the channel. Fish populations are not considered to be sensitive to the increase in traffic flow associated with the new crossing.
River Wey and River Mole	Direct loss of aquatic/riparian habitats	The River Wey is the receiving watercourse for the Stratford Brook and ephemeral ditches within the Scheme area. It is within 10m of the Park Barn Farm replacement land. The River Mole is the receiving watercourse for ephemeral ditches within the Scheme area. It is directly adjacent to the former Chatley Farm replacement land.

Nature conservation resource	Potential impacts	Description
		Construction There will be no direct works within or adjacent to the River Wey or the River Mole associated with the Scheme. Therefore, no direct loss of aquatic/riparian habitats are anticipated during construction. Operation None anticipated during operation of the Scheme.
	Fragmentation or isolation of habitats	Construction There will be no direct works within or adjacent to the River Wey or the River Mole that could result in fragmentation or isolation of habitats. Operation None anticipated during operation of the Scheme.
	Loss of and/or physical disturbance to aquatic species (aquatic invertebrates, macrophytes and fish)	Construction There will be no direct works within or adjacent to the River Wey or the River Mole that could result in losses of, or physical disturbance to aquatic species. Operation None anticipated during operation of the Scheme.
	Changes to hydromorphology/ water quality	The River Wey is the receiving watercourse for the Stratford Brook and eight ephemeral ditches within the Scheme area. It is within 10m of the Park Barn Farm replacement land. The River Mole is the receiving watercourse for three ephemeral ditches within the Scheme area. It is directly adjacent to the former Chatley Farm replacement land. Construction Measures will be implemented through the CEMP that act to manage the potential for pollution to watercourses (e.g. through fine sediment run-off and accidental spills) to occur through general construction activities, such as adherence to appropriate pollution prevention (PPG/GPP's) and CIRIA guidance. Operation Provision of flow attenuation and subsequent treatment of road run-off as part of the drainage strategy will ensure no changes to watercourse hydromorphology and/or water quality that could otherwise arise from changes in discharge to the River Wey and River Mole.
	Disturbance to aquatic species from noise, light or other visual	Construction There will be no direct works within or adjacent to the River Wey or the River Mole that could act to disturb aquatic species.

Nature conservation resource	Potential impacts	Description
	stimuli	Operation None anticipated during operation of the Scheme.
Ephemeral ditches	Direct loss of aquatic/riparian habitats	Construction Construction works associated with the ephemeral ditches include: • Culvert extension (5 m) and displacement of channel (25 m) of the ditch within the A3 central reservation. • Culvert extension (10 m) and displacement of channel (57 0m) of the ditch adjacent to the A3. • Culvert replacement on Elm Lane ditch. • New extension (10 m) and new culvert (10m to accommodate the NMU) on Pond Farm South ditch. • Loss of ephemeral ditch extents: Hut Hill ditch (170 m), Cockcrow Hill ditches (15 m), Ockham common ditch, Chatley Wood ditch, Pointers Road ditch. • Enhancement works to Pond Farm West ditches, Pond Farm South ditch and Chatley Wood pond. Short term: There will be localised habitat losses (riparian tree clearance and in-channel works) associated with the proposed restoration/enhancement works within E2 Wisley SPA compensation land, E8 Pond Farm West SPA enhancement area and E7 Pond Farm South SPA enhancement area, but the overall result will be an improvement in watercourse habitat condition and resource availability for aquatic species. Long term: Construction works to the above ditch systems which include culvert extensions, culvert replacements, ditch displacements outside of the footprint of the works and open channel habitat losses will result in the direct permanent loss of aquatic and riparian habitat. In total, 820 m of ephemeral headwater will be lost or transposed by the Scheme within the River Wey catchment, and 720 m within the River Mole catchment. However, the Scheme will implement an improved drainage system that will wherever possible keep runoff from highways and no-highway surfaces separate. In total approximately 1440 m of new drain conveying water solely form non highway surfaces are included in the design within the River Wey catchment, and approximately 720 m within the River Mole catchment. Operation None anticipated during operation of the Scheme.
	Fragmentation or isolation of habitats	Construction Short term: There will be permanent habitat fragmentation and loss of connectivity resulting from the placement of new culverts,

Nature conservation resource	Potential impacts	Description
		extension of existing culverts, loss of ditch extents and the requirement to clear vegetation adjacent to the ditch systems to facilitate construction works. Operation None anticipated during operation of the Scheme.
	Loss of and/or physical disturbance to aquatic species (aquatic invertebrates, macrophytes and fish)	Construction Long term: There is the potential to be permanent localised loss of, and physical disturbance to, aquatic macroinvertebrates and macrophytes resulting from the construction of new culverts, culvert extensions, culvert replacements, displacement of channels and loss of ditch extents. These ephemeral watercourses are not considered to provide viable habitat for fish, but could provide suitable habitat for macroinvertebrates and macrophytes during periods in which they contain water. Operation None anticipated during operation of the Scheme.
	Changes to hydromorphology/ water quality	Construction Short term: Temporary changes to hydromorphology and water quality will arise due to the enhancement works within Pond Farm West ditches and Pond Farm South ditch, including channel realignments and introduction of wood features. However, there will be long term improvements to watercourse hydromorphology arising from the proposed enhancement works. Measures will be implemented through the Construction Environmental Management Plan that act to manage and reduce the risk of pollution to ditch systems (e.g. through fine sediment run-off and accidental spills), and by association downstream receiving watercourses/water bodies, that may occur through general construction activities, such as adherence to appropriate pollution prevention (PPG/GPP's) and CIRIA guidance. Long term: Culvert works will result in localised changes to ditch morphological character through further physical modification of the ditch systems. It is considered likely that where ditch displacements are required, replacement drainage infrastructure will be of a similarly modified nature. Operation Provision of flow attenuation and subsequent treatment of road run-off as part of the drainage strategy will ensure no changes to watercourse hydromorphology or water quality that could otherwise arise from changes in discharge to the ephemeral ditches.

Nature conservation resource	Potential impacts	Description
		Implementation of an improved drainage system that will, wherever possible keep runoff from highways and non-highway surfaces separate will improve water quality within the ephemeral ditches.
	Disturbance to aquatic species from noise, light or other visual stimuli	Construction Due to the ephemeral nature of the ditches, disturbance to aquatic species from noise, light or other visual stimuli is not anticipated. Operation None anticipated during operation of the Scheme.
Bolder Mere (part of Ockham and Wisley Commons SSSI)	Direct loss of aquatic/marginal pond habitat	Construction Shor term: There will be a loss of terrestrial lake margin habitat associated with the requirement to clear the existing trees and shrubs along the northwest shore to facilitate construction of the new retaining wall. This will be a temporary loss, since the screen provided will be reinstated through replacement tree and shrub planting following completion of the construction works. The new retaining wall (approx. 180m in length), to be constructed c. 4-8 m into the lake margins along the northwest shoreline of the lake to accommodate widening of the A3, will result in a permeant loss of c. 1,440 m2 of lake area (conservative estimate) available to aquatic flora and fauna. The translocation of the existing reedbed and lily pads alongside the retaining wall will ensure maintenance of valuable marginal habitats within the lake environment in the long term. It is noted that by physically advancing the lake margin along the northwest shore there will be a permanent loss of open water habitat as it is replaced by the retaining wall and translocated reed bed margin. However, the submerged macrophyte community that will be replaced has been assessed as having relatively low ecological value within the wider context of the lake, it being dominated by the submerged plant Nuttall's waterweed, which is an invasive non-native species. Direct loss of trees and scrub will result from the embedded design mitigation measures included to enhance the marginal habitats of the lake shore. These works, agreed in consultation with Natural England and the SWT, are deemed necessary for the long term improvement of the lake margin habitats and will have beneficial effects for the local Odonata assemblages. Refer to Appendix F of WFD Assessment TR010030/APP/5.4 for full details. Operation There will be no direct or indirect loss of lake habitat during operation of the Scheme.
	Fragmentation or isolation of habitats	Construction Short term: There will be temporary habitat fragmentation along the northwest margin of the lake resulting from tree and shrub

Nature conservation resource	Potential impacts	Description
		clearance required to facilitate the construction of the new retaining wall. Whilst this will not directly affect the aquatic habitat itself, it is noted that there may be implications for terrestrial species in terms of resource value and movement along the lake margin, until the planting matures and full connectivity along the shoreline re-established. Operation There will be no fragmentation or isolation of habitats within or adjacent to the lake habitat during operation of the Scheme.
	Loss of and/or physical disturbance to aquatic species (aquatic invertebrates, macrophytes and fish)	Construction Short term: There will be localised losses of, and temporary physical disturbance to, benthic aquatic macroinvertebrates and lake macrophytes resulting from the advancement of the retaining wall into the lake and the associated translocation of the reedbed habitat. Physical disturbance to fish may also occur should dewatering be required. Appropriate measures will be implemented through the CEMP that act to limit potential effects on fish. These will likely include measures to exclude fish from the area to reduce the risk of entrainment and/or a fish rescue and translocation procedures under an ecological watching brief. Temporary physical disturbance to fish will also result from the activities required to implement the carp and bream removal programme. Long term: Fish removal works, agreed in consultation with Natural England and the SWT, are deemed necessary for the long term improvement of the lake habitats and will have beneficial effects in the long term. Operation Aquatic species are not considered to be sensitive to disturbance arising from the Scheme in operation.
	Changes to hydromorphology/ water quality	Construction Short term: Temporary changes to water quality are likely to occur during works associated with the installation of the new retaining wall and removal and reinstatement of the reedbed as a result of the mobilisation of fine sediment. The CEMP shall include measures to limit the generation of suspended sediment and its propagation within the lake, through for example, the use of silt curtains. The potential for temporary changes to water quality arising from general construction activities will also be managed through measures to control run-off and the risk of accidental pollution within the CEMP. Long term:

Nature conservation resource	Potential impacts	Description
		Permanent changes to the lake morphology will result from the reduction in lake area and reprofiling of the bed along the north-western edge of the lake. The morphological condition of the north-western shoreline will, however, remain unaltered as this location is already heavily modified due to the presence of the existing retaining structure. Ground and surface water hydrological interactions along the north-western shoreline are not expected to be affected due to the use of a permeable structure in the construction of the new retaining wall. An assessment of the loss of lake area (and concomitantly water volume) on water quality has been undertaken in support of the WFD assessment (TR010030/APP/5.4). This assessment focused on Total P concentrations since changes in nutrient status are considered the mechanism most likely to cause deterioration in ecological condition within the water body. The assessment identified on minor changes in Total P based on historical data, which would not result in deterioration of this element as reported under the WFD. Operation Long term improvements in water quality are anticipated in operation since runoff from the A3, which currently outfalls into Bolder Mere, will be captured in pipe and mechanically treated before being discharged to the watercourse downstream of Bolder Mere. It is noted that this may result in a reduction in volume of water entering the lake due to the removal off this discharge pathway. However, the beneficial effects of removing road runoff as a source of chemical pollutant and fine sediment ingress to the lake is considered to outweigh the effects of any temporary reduction in the volume of water entering the lake.
	Disturbance to aquatic species from noise, light or other visual stimuli	Construction Short term: Temporary acoustic and visual disturbance to fish will arise during construction of the retaining wall. Measures will be implemented within the CEMP to address potential effects in relation to acoustic disturbance that may arise from any piling activities. Temporary disturbance (visual and acoustic) to fish will also result from the activities required to implement the embedded design mitigation to enhance the lake margin. These works, agreed in consultation with Natural England and the SWT, are deemed necessary for the enhancement of the lake habitats in the long term. During construction use of directional lighting away from the lake as to not induce altered behavioural responses within the fish population. Operation: Directional lighting has been embedded into the design of the Scheme. Therefore, during operation there will be no disturbance to fish species or adult flying Odonata.
Chatley Wood pond	Direct loss of	Construction

Nature conservation resource	Potential impacts	Description
	aquatic/marginal pond habitats	Long term: There will be localised habitat losses associated with the proposed enhancement works around Chatley Wood pond including selective tree thinning and excavation of the existing flow path through the pond to increase pond capacity and enhance pond ecology. However, the overall result will be an improvement in water body habitat condition and resource availability for aquatic species. Operation None anticipated during operation of the Scheme.
	Fragmentation or isolation of habitats	Construction Long term: Despite localised habitat losses associated with the proposed enhancement works around Chatley Wood pond, it is not anticipated that these will affect connectivity and the overall result will be an improvement in riparian habitat complexity. Operation None anticipated during operation of the Scheme.
	Loss of and/or physical disturbance to aquatic species (aquatic invertebrates, macrophytes and fish)	Construction Long term: There may be localised losses of, and temporary physical disturbance to aquatic macrophytes and macroinvertebrates resulting from the enhancement works, including excavation works of the existing flow path through the pond. However, the overall result will result in an improved watercourse habitat condition for aquatic species. Operation None anticipated during operation of the Scheme.
	Changes to hydromorphology/ water quality	Construction Short term: Temporary changes to hydromorphology and water quality will arise as a result of the enhancement works, including excavation of the flow path within the pond. The potential for temporary changes to water quality within the pond and that within the downstream watercourse, arising from general construction activities, will be managed through measures to control run-off and the risk of accidental pollution within the CEMP. Long term:

Nature conservation resource	Potential impacts	Description
		The overall result will be an improvement in hydromorphology. Operation None anticipated during operation of the Scheme since there are no discharges to the water body.
	Disturbance to aquatic species from noise, light or other visual stimuli	Construction Disturbance to aquatic species from noise, light or other visual stimuli is not anticipated. Due to the ephemeral nature of the pond, it is not anticipated to support a viable fish population. Operation None anticipated during operation of the Scheme.
Manor Pond	Direct loss of aquatic/marginal pond habitats	Construction Long term: Construction works associated with Manor Pond are the: Installation of a new retaining wall along the A245, approx. 120m in length will encroach into the riparian zone and potentially up to the edge of Manor Pond. During construction of the retaining wall, required vegetation clearance and earthworks will result in the direct permanent loss of marginal habitat from along the southern edge of the pond. The margin of the pond is characterised by the presence of mixed woodland and scrub, including the invasive non-native species bamboo (species of bamboo unconfirmed). There will be no loss of open water habitat associated with construction of the retaining wall. Operation There will be no direct or indirect loss of lake habitat during operation of the Scheme.
	Fragmentation or isolation of habitats	Construction Long term: The construction of the retaining wall will result in permanent habitat fragmentation along the southern edge of the pond, through the loss of marginal habitat and the footprint of the wall. Operation There will be no direct or indirect loss of lake habitat during operation of the Scheme.
	Loss of and/or physical disturbance to aquatic species (aquatic invertebrates,	Construction Shor term: There will be localised losses of, and temporary physical disturbance to, benthic aquatic macroinvertebrates and

Nature conservation resource	Potential impacts	Description
	macrophytes and fish)	pond macrophytes resulting from the construction of the retaining wall along the southern edge of the pond. Physical disturbance to fish may also occur should dewatering be required. Appropriate measures will be implemented through the CEMP that act to limit potential effects on fish. These will likely include measures to exclude fish from the area to reduce the risk of entrainment and/or a fish rescue and translocation procedures under an ecological watching brief. Operation Aquatic species are not considered to be sensitive to disturbance arising from the Scheme in operation.
	Changes to hydromorphology/ water quality	Construction Short term: There will be a permanent change to the morphological character of the pond along the southern edge resulting from the construction of the retaining wall. Temporary changes to water quality are likely to occur during works associated with the installation of the new retaining wall as a result of the mobilisation of fine sediment. The CEMP shall include measures to limit the generation of suspended sediment and its propagation within the pond, through for example, the use of silt curtains. Although it should be noted that the pond is turbid due to the presence of large number of benthic feeding fish (the pond is operated as a commercial fishery) and as such aquatic species are not likely to be sensitive to temporary changes in fine sediment load. The potential for temporary changes to water quality arising from general construction activities will also be managed through measures to control run-off and the risk of accidental pollution within the CEMP. Long term: There will be a permanent change to the morphological character of the pond along the southern edge resulting from the construction of the retaining wall. Operation The drainage strategy does not act to alter the rate, quality or pathway of water that discharges to the pond and as such no impacts on pond hydrology or water quality are anticipated.
	Disturbance to aquatic species from noise, light or other visual stimuli	Construction Short term: Temporary acoustic and visual disturbance to fish will arise during construction of the retaining wall. Measures will be implemented within the Code of Construction Practice to address potential effects in relation to acoustic disturbance that may arise from any piling activities. Avoidance of the use of percussive (hammer) piling in favour of softer alternatives (e.g. silent sheet piling, vibratory sheet piling) where ground conditions allow. Where not possible, soft start piling procedures should be utilised. The soft-start duration should be a period of not less than 20 minutes

Nature conservation resource	Potential impacts	Description
		and should piling cease for a period greater than 20 minutes, the soft start procedure must be repeated. During construction use of directional lighting away from Manor Pond as to not induce altered behavioural responses within the fish population. Operation Directional lighting has been embedded into the design of the Scheme. Therefore, during operation there will be no disturbance to fish.
Bats	Direct loss/creation of habitats	Construction Short term: The Scheme will result in the permanent loss of the former San Domenico building that supports a brown long-eared maternity roost, day roost and feeding perches, and common pipistrelle, soprano pipistrelle and noctule bat day roost. As part of the embedded mitigation, to compensate for this loss, a bat mitigation structure and five Schwegler bat boxes will be installed in close proximity to the existing roost. A single tree roost (tree 155, see Figure 7.11 in Volume 3 (application document TR010030/APP/6.3)) will also be permanently lost, which supports a transitional/occasional roost of Natterers bats and noctule bats, as well as a hibernation roost of noctule bats. To compensate for this loss, the embedded mitigation includes the provision of three Schwegler bat boxes and one four seasons bat box to be installed. The selective thinning/clearance of woodland will avoid the removal of trees that have potential to support roosting bats and selective thinning surrounding trees with bat roosts will also be avoided to minimise the potential for impacts resulting from any changes to the conditions surrounding roosts (e.g. changes to flight-lines, increased predation risk, removed protection from wind, altered ambient temperature, etc.). Construction of the highways proposals will result in the localised temporary loss of habitat and the permanent loss of habitat currently used by commuting and foraging bats. This will reduce the foraging/commuting resource available to bats that are associated with the Scheme area until replacement habitats become established (anticipated by year 15 post-construction). Bat boxes will be installed as compensation for the loss of any trees with moderate or high roost potential. Long term: Replacement planting included as part of the Scheme has the potential to result in long term beneficial impacts for bats as it will include native trees and shrubs, hedgerow planting, species rich grassland, open grassland, and attenuation ponds with marginal and emergent vegetation adjacent to the road network. Low density tree planting (i.e. wood pasture) will be created on SPA compensation land. Existing SPA land will be enhanced by selective woodland thinning and clearance to restore heathland, which will introduce woodland edge habitats of value for foraging bats. Replacement land (non-SPA) will also be established with native woodland planting, and the creation of woodland glades, which is anticipated to result in a more diverse habitat for

Nature conservation resource	Potential impacts	Description
		invertebrates and improve the food resource for foraging bats in the long term.
	Direct mortality or injury to wildlife	Construction Short term: Without mitigation, the demolition of the San Domenic building and removal of tree 155 could lead to the direct mortality or injury of roosting bats.
	Fragmentation or isolation of habitats	None anticipated.
	Disturbance to species from noise, light or other visual stimuli	Construction Short term: Construction activities have the potential to increase levels of temporary disturbance to roosting, foraging and commuting bats that occur within or adjacent to the Scheme boundary, such as: • Visual disturbance from movement of vehicles, machinery and members of the workforce; • Noise disturbance from particularly loud irregular noises; and • Light disturbance during night-time construction works. Operation None anticipated as no significant change in lighting or and visual stimuli is anticipated to occur as a result of the Scheme.
Great crested newt	Direct loss/creation of habitats	Construction Short term: There will be no direct loss of aquatic breeding habitat for great crested newt as a result of the Scheme. The construction of the highways proposals will result in the permanent loss of approximately 0.1 ha of suitable terrestrial habitat within 250 m of great crested newt breeding waterbodies. This represents 0.1 % of the terrestrial habitat within 250 m of these waterbodies. The construction of the highways proposals will result in the temporary loss of approximately 0.4 ha of great crested newt terrestrial habitat within 250 m of breeding ponds. The temporary working area will be replanted with trees and shrubs following completion of construction. The habitat enhancement measures in SPA enhancement area E3 involve clearance of woodland to allow for the extension of heathland habitat. This will result in the temporary disturbance to approximately 3.8 ha of terrestrial habitat within 250 m of breeding waterbodies during the removal of tree stumps and surface layer to expose the mineral soil layer beneath. Once the heathland has established, this will provide suitable terrestrial habitat for

Nature conservation resource	Potential impacts	Description
		foraging and sheltering great crested newts. The temporary loss of habitat associated with the construction of the highways proposals and the modification of habitat from woodland to heathland represents approximately 9 % of suitable terrestrial habitat within 250 m of great crested newt breeding waterbodies. The new drainage system along the A3 includes removal of direct discharges from the A2 into Bolder Mere (W9). This will result is an improvement in water quality within Bolder Mere (W9). Embedded design mitigation at Bolder Mere (W9) include improvement of marginal habitats and implementation of a programme of carp removal. These measures may result in improvements to the suitability of Bolder Mere (W9) for great crested newts, and may provide potential breeding and foraging options not currently available to this species (great crested newts currently absent from Bolder Mere (W9)). Operation There will be no direct or indirect loss of great crested newt terrestrial or aquatic habitat during operation of the Scheme.
	Direct mortality or injury to wildlife	Construction Short term: Without mitigation, the construction of the highways proposals and heathland creation measures at SPA enhancement area E3 could kill or injure individual great crested newts. Without mitigation, the clearance/selected thinning of woodland within SPA enhancement area E3 and E4 has the potential to kill and injure great crested newts where these works take place within 250 m of breeding waterbodies. Where habitats around breeding waterbodies provides good opportunities, it is unlikely that individual great crested newts will be found far from their aquatic breeding habitat[143]. The habitat within the construction footprint does not provide better quality habitat than that available close to the breeding waterbodies. Taking into account the size of the metapopulation (small), the distance between the waterbodies and the highways construction areas and the wide availability of good quality habitat close to the waterbodies, the potential for to encounter and kill or injure individual great crested newts within the highways construction areas is considered to be low. SPA enhancement area E4 (woodland thinning) includes the wet area adjacent to Bolder Mere (W9a) where is assumed great crested newts breed when conditions are suitable to do so. Whilst the tree thinning and clearance works are taking place close to the waterbody, taking into account the localised nature of the works, the potential to encounter and to kill or injure great crested newts is considered to be low.

[143] Cresswell, W. & Winkworth, R. 2004. English Nature Research Report (ENRR) 576 An assessment of the efficiency of capture techniques and the value of different habitats for the great crested newt Triturus cristatus

Nature conservation resource	Potential impacts	Description
		SPA enhancement area E3 (woodland management and heathland creation) lies 8 m from waterbody W10. The heathland creation works are taking place approximately 50 m from the waterbody at its closest point. The existing habitat within the coniferous woodland which will be cleared provides some suitable habitat for great crested newts to shelter and forage. However, the closed canopy of the trees provides little light for any understory or ground vegetation layer. The deciduous woodland habitat close to the waterbody, including the large extent immediately west of the waterbody provide better quality terrestrial habitat for great crested newt. The dead wood, leaf litter and understory layers in this habitat provide more foraging and sheltering opportunities than the coniferous woodland in E3. Therefore, the risk of encountering great crested newts within SPA enhancement area E3 works is considered to be low. Operation The road layout will not significantly change within the south-east quadrant, where great crested newt are known to occur. Therefore, no increase in mortality or injury of great crested newt is anticipated as a result of the operation of the Scheme.
	Fragmentation or isolation of habitats	There will be no fragmentation or isolation of habitats as a result of construction or operation in the south-east quadrant, where great crested newt are known to occur. Elm Lane (byway 525) will be resurfaced with tarmac but will not include raised kerbs. Therefore, the narrow resurfaced road will not be a barrier to movement and dispersal of great crested newt movement.
	Disturbance to species from noise, light or other visual stimuli	Construction Short term: • Construction activities have the potential to increase levels of temporary disturbance to great crested newt that occur within or adjacent to the Scheme boundary, such as: Visual disturbance from movement of vehicles, machinery and members of the workforce; • Noise disturbance; and • Light disturbance during night-time construction works. Operation None anticipated as no significant change in lighting, noise and visual stimuli is anticipated to occur as a result of the operation of the Scheme.
Reptiles	Direct loss/creation of habitats	Construction Short term: The construction of the highways proposals will result in the direct temporary loss of 101.4 ha of land and the permanent loss of 139.2 ha of land. Much of which is currently used by common species of reptile. The loss of habitat could cause a reduction in the population sizes of common species of reptile, but it is not considered likely

Nature conservation resource	Potential impacts	Description
		that there will be a reduction in population size of sand lizards as these occur within the heathland areas outside the Scheme footprint. It is possible that individual foraging/basking sand lizards could be using the woodland habitats surrounding the heathland (Chatley Heath) in which the breeding population of sand lizards was found. However, sand lizards typically live on sandy heathland and coastal sand dunes and require sandy ground in sunny spots in which to dig burrows for egg-laying, shelter and hibernation. It is therefore considered that whilst the woodland habitat within the Scheme surrounding Chatley Heath could occasionally be used by individual foraging/basking sand lizard, it is unlikely that this woodland is used for hibernating or breeding by the sand lizard population. Clearance/selected thinning of woodland may result in habitat of reduced suitability for low numbers of common species of reptile in the short term until vegetation has re-established. Long term: The compensation and enhancement measures proposed within the Scheme have the potential to result in long term beneficial impacts for reptiles by creating 22.5 ha of open heathland (of which 13.2 ha are connected to Chatley Heath) and will provide open glades within retained areas of woodland, resulting in habitats of higher suitability for reptiles (including sand lizards) over a larger area.
	Direct mortality or injury to wildlife	Construction Short term: Without mitigation, the construction of the highways proposals and clearance/selected thinning of woodland in areas targeted for enhancement could potentially lead to the killing or injury of individual reptiles, including sand lizards.
	Fragmentation or isolation of habitats	Construction Long term: The individual male sand lizards recorded in the woodland within the highways proposals are likely to have been attempting to find their own territory. Although these were exploring within habitats to be affected by the Scheme, the expansion of the existing highway boundary around M25 junction 10 will not cause an increase in fragmentation or isolation of habitats suitable for reptiles, including habitats suitable sand lizards any more than the existing situation. During construction, the creation of side access roads at Wisley Airfield, Ockham Common and Painshill could potentially provide a barrier to movement of reptiles of common species between habitats, leading to isolation of discrete populations.
	Disturbance to species from noise, light or other visual stimuli	Construction Short term:

Nature conservation resource	Potential impacts	Description
		Construction activities have the potential to increase levels of temporary disturbance to reptiles that occur within or adjacent to the Scheme boundary, such as: • Visual disturbance from movement of vehicles, machinery and members of the workforce; • Noise disturbance; and • Light disturbance during night-time construction works. Operation None anticipated as no significant change in lighting, noise and visual stimuli is anticipated to occur as a result of the Scheme.
Breeding birds (not including SPA qualifying species)	Direct loss of habitats	Construction Short term: During construction of the highways proposals, there is the potential for the territories of seven notable bird species (bullfinch, dunnock, linnet, mistle thrush, song thrush, stock dove and willow warbler) to be permanently lost or displaced to outside of the works area as their territories partially fall within the temporary and permanent land take areas of the highways proposals. Even after taking into account the embedded construction measures, the noise assessment in chapter 6 has identified a number of loud construction activities, such as site clearance, earthworks and road surfacing. As can be seen in figures 7 and 8 of 5.3 Habitats Regulations Assessment Figures (application document TR010030/APP/5.3), the existing noise levels are typically greater than 55 dB for several hundred metres from the Scheme construction areas. The majority of the loud construction noises will fall below 55 dB after a distance of 200m, with the exception of bridge demolition. These loud construction activities will still be audible against the existing ambient sound levels at a distance of greater than 200m from the source, but will be more easily masked by other closer noise sources. There is potential for some of these construction activities to cause temporary disturbance of breeding birds, particularly within 200m of the construction works. In addition, a hobby nest has been recorded approximately 100 m from the DCO boundary. Although there will be a visual barrier, it is possible that some of the louder construction activities will cause temporary disturbance of this Schedule 1 species. During the clearance/selected thinning of woodland areas targeted for enhancement, breeding territories of six notable bird species (bullfinch, dunnock, song thrush, spotted flycatcher, woodcock and willow warbler) will be lost or displaced. Long term: The habitat creation measures to be provided as part of the Scheme have the potential to result in long term beneficial impacts for breeding birds within the SPA enhancement areas. These will provide areas of open

Nature conservation resource	Potential impacts	Description
		heathland and diverse woodland within the SPA/SSSI. In addition, the woodland creation and enhancement measures within the replacement land at the former Chatley Farm, Park Barn Farm and Hatchford End will also provide enhanced bird nesting opportunities, and the wood pasture being created within the SPA compensation areas will provide potential nesting habitat for birds such as spotted flycatchers once the trees start to mature.
	Direct mortality or injury to wildlife	Construction Short term: Without mitigation, the construction of the highways proposals and the clearance/selected thinning of woodland areas targeted for enhancement could potentially lead to the damage or destruction of active nests and killing or injury of birds.
	Fragmentation or isolation of habitats	Due to their mobility, the fragmentation of habitats as a result of the creation of minor access roads will not have an impact on breeding birds.
	Disturbance to species from noise, vibrations, light or other visual stimuli	Construction Short term: Construction activities have the potential to increase levels of temporary disturbance to breeding birds that occur within or adjacent to the Scheme boundary, such as: • Visual disturbance from movement of vehicles, machinery and members of the workforce; • Noise disturbance (up to 100m from the Scheme boundary); and • Light disturbance during night-time construction works. Operation None anticipated as no significant change in lighting, noise and visual stimuli is anticipated to occur as a result of the Scheme.
Badgers	Direct loss of habitats	Construction Short term: The construction of the highways proposals will result in the permanent partial loss and temporary closure of one main badger sett and the permanent loss of one subsidiary sett and four outlier setts. Four badger setts (one subsidiary sett and three outlier setts) will be temporarily closed as a result of the construction of the highways proposals. A further 11 badger setts (two main, two subsidiary and seven outlier setts) are at risk of damage from the proposed works and require further assessment during the design process in order assess the potential to retain/avoid the badger setts.

Nature conservation resource	Potential impacts	Description
		The construction of the highways proposals will also result in the temporary and permanent loss of habitat currently used by commuting and foraging badgers.
	Direct mortality or injury to wildlife	Construction Short term: It is anticipated that construction will take place at all times of the day and night, and therefore there will be construction activities, such as traffic movement during night time hours when badgers are more active. This could potentially lead to mortality or injury of badgers as a result of collision with construction traffic or machinery. Without mitigation, the construction of the highways proposals could kill or injure any badgers that are present within the sett. Operation Once operational, traffic movements on the new side roads could have the potential to result in direct mortality or injury to badgers due to traffic collisions with badgers.
	Fragmentation or isolation of habitats	Due to their mobility, the fragmentation of habitats as a result of the creation of minor access roads will not have an impact on badgers.
	Disturbance to species from noise, light or other visual stimuli	Construction Short term: Construction of the highways proposals may lead to increased disturbance of badgers occupying setts within the Scheme, as result of: • Visual disturbance from movement of vehicles, machinery and members of the workforce; • Noise disturbance, particularly loud irregular noises; and • Light disturbance during night-time construction works. Operation None anticipated as no significant change in lighting, noise and visual stimuli is anticipated to occur as a result of the Scheme.
Notable invertebrates (terrestrial)	Direct loss/creation of habitats	Construction Short term: Vegetation clearance during construction of the highways proposals and selected clearance/thinning of woodland within SPA enhancement areas will result in temporary and permanent loss of habitats supporting notable invertebrates.

Nature conservation resource	Potential impacts	Description
		Long term: The habitat creation measures to be provided as part of the Scheme have the potential to result in long term beneficial impacts for notable invertebrates as the clearance of wooded areas will create open habitat and enable heathland regeneration providing a much more diverse habitat for invertebrates. The thinning of woodland areas will create open glades and result in increased species and structural diversity of the mixed woodland, also resulting in a more diverse habitat for invertebrates. This will include the habitat enhancement measures within the SPA compensation land parcels and the SPA enhancement areas and the woodland enhancement proposals within the adjacent areas at Chatley Farm, Park Barn Farm and Hatchford End.
	Direct mortality or injury to wildlife	Construction Short term: Vegetation clearance during construction of the highways proposals and selected clearance/thinning of woodland within SPA enhancement areas could result in the mortality of individual notable invertebrates.
	Fragmentation or isolation of habitats	The Scheme will result in the expansion of the existing highway boundary around M25 junction 10 and therefore will not cause an increase in fragmentation or isolation of habitats for notable invertebrates.
	Disturbance to species from noise, light or other visual stimuli	Construction Short term: Changes in lighting during construction could potentially disturb or even displace notable invertebrates. The selected clearance/thinning of woodland within SPA enhancement areas could result in disturbance of notable invertebrates. Operation None anticipated as no significant change in lighting, noise and visual stimuli is anticipated to occur as a result of the Scheme.

7.10 Mitigation and enhancement measures

7.10.1 The DCO contains land acquisition powers, including the power to take temporary possession of land and to acquire permanent rights in land, in order to secure the mitigation, compensation and enhancement measures.

7.10.2 The land within the DCO boundary includes replacement land, SPA compensation land and SPA enhancement areas which are required to compensate for the loss of land designated as common land, open space/open public access and for its ecological value as a SPA, which will be lost as a result of the highways proposals. Therefore, the creation and enhancement measures for habitats within these areas are embedded within the Scheme design and form part of the Scheme and have been taken into consideration in the assessment. These embedded mitigation and compensation measures are described in Section 7.4.

7.10.3 This section describes additional mitigation measures that will be undertaken to avoid or reduce potential adverse ecological impacts that could arise from the Scheme. As habitat creation and enhancement measures are embedded within the Scheme design, the remaining mitigation measures fall into the following categories:

- Avoidance of adverse impacts (spatial and temporal) through the sensitive timing or moving of works; and
- Reduction of impacts lessening the scale of the impact.

7.10.4 In addition, a number of enhancement measures have been considered and are proposed at the end of this section.

Mitigation Measures

7.10.5 The mitigation measures outlined below will be implemented to avoid and reduce the significance of any adverse impacts on valued nature conservation resources.

Provision of a Construction Environmental Management Plan (CEMP)

7.10.6 A CEMP will be adopted for all construction operations. The CEMP will include the measures detailed below.

7.10.7 Protection (of designated sites, ancient woodland, retained veteran trees and other notable retained habitats as far as possible outside the working area) from accidental incursion by the use of construction exclusion fencing.

7.10.8 Protection (of designated sites, ancient woodland, retained veteran trees and notable habitats, and notable and legally protected species outside the working area) from pollution during clearance and construction works by adherence to the PPGs/GPPs[Error! Bookmark not defined.] and the CIRIA guidance on the control of water pollution from construction sites[Error! Bookmark not defined.]. These detail good practice advice for undertaking works that may have the potential to cause pollution.

7.10.9 Protection of retained trees following standard practice (i.e. BS 5837:2012 Trees in relation to design, demolition and construction. – Recommendations);

7.10.10 Use of mitigation measures under licence if habitats or features afforded legal protection due to their use by protected species (such as badger setts or bat roosts) will be affected during the works.

7.10.11 Use of Precautionary Methods of Working (PMW) during construction to minimise risks to individual animals of protected species where licences will not be required; such as ensuring species such as great crested newts and reptiles (sand lizards and common species of reptiles) are not harmed and timing of works will avoid sensitive seasons (e.g. breeding bird season)[144].

7.10.12 Construction works will be timed in locations to minimise impacts on certain species, for example, avoiding disturbance of breeding birds that have been recorded nesting near to the Scheme, such as Dartford warbler, woodlark and hobby (which are protected against disturbance during breeding under Schedule 1 of the Wildlife and Countryside Act 1981 (as amended)).

7.10.13 Mitigation measures will be implemented as set out in Chapter's 5 (Air Quality) and 8 (Water and Drainage) to avoid and/or reduce the significance of any potential effects caused by air and/or water pollution both during construction and operation.

7.10.14 Provision of an Ecological Clerk of Works to advise on the above measures during construction.

Specific measures to protect designated sites, ancient woodland and retained veteran trees

7.10.15 Wherever possible, the location of access tracks, haul roads and site compound and material storage areas will be sited outside designated sites and ancient woodland, away from retained veteran trees (and outside of notable habitats), and a buffer zone[145] will be implemented around these receptors where works are not limited by the existing carriageway.

7.10.16 The retained veteran trees shall be assessed by an arboriculturist prior to construction to inform on any potential remedial works that maybe required to manage any structural or physiological defect(s) that increase the likelihood of full or partial failure of the tree or tree part within falling distance of the works. This forms part of a duty of care to both people and property laid down in the Occupiers Liability Acts 1957 and 1984, the Highways Act 1980 and Health and Safety at Work Act 1974. Veteran habitat features are often defects, meaning

[144] For European Protected Species subject to the Conservation of Habitats and Species Regulations 2010 (as amended), Natural England's view is that: "*If the consultant ecologist, on the basis of survey information and specialist knowledge of the species concerned, considers that on balance the proposed activity is reasonably unlikely to result in an offence under Regulation 41 or 45 then no licence is required".*
N.B. Regulation 41 or 45 in the 2010 (as amended) Conservation of Habitats and Species Regulations, refer regulations 43 and 47 in the 2017 Conservation of Habitats and Species Regulations.
In cases where a licence is not required, Natural England urge that reasonable precautions be taken to avoid affecting European Protected Species during works and that an audit trail is kept on the decision-making process.
WML-G12 – EPS Mitigation Licensing – How to get a licence – Version December 2013, Natural England 2013.

[145] For designated sites and ancient woodland, a buffer zone of at least 15 m will be used where practicable. For retained veteran trees, a buffer zone of at least 15 times larger than the diameter of the tree or 5m from the edge of its canopy, if that's greater, will be used where practicable.

any potential works will be sympathetic, whilst being reasonable in order to manage the risk of harm to people or property.

Specific measures to protect common toads within/adjacent to Bolder Mere Conservation Verge CV005

7.10.17 To minimise risks of killing and injury to common toads, highways construction and habitat enhancements areas in the vicinity of CV005 will be carried out sensitively under a written PMW. This will detail measures and steps to be taken and will involve the careful planning and timing of works to avoid sensitive periods such as hibernation (where mortality is more likely) and hand searching for individual common toads, along with other amphibians and common reptiles, during site preparation and habitat clearance. Furthermore, during active periods, all excavations will be covered or closed overnight to prevent any toads becoming trapped. Alternatively, a 'ramp' or graded edge will be provided as a means of escape, with excavations being checked first thing each morning for toads. This PMW will cover works within the vicinity of CV005 along with works to be undertaken within other areas of suitable common toad habitat.

Specific measures to compensate for loss of ancient woodland

7.10.18 The current standing advice has been reviewed to help inform the approach to mitigation and compensation[146]. Ancient woodland soils will be translocated from proposed donor sites (Elm Corner and Heyswood) to the receptor site (Park Barn Farm). A desk study assessment of the broad soil types at the proposed ancient woodland soil donor sites and receptor site has identified similar soil types with acid, free-draining profiles. Therefore, Park Barn Farm is an appropriate receptor site for the ancient woodland soil. The top soil of the receptor site will be stripped to reduce soil fertility levels prior to the translocation of the donor soil.

Specific measures to compensate for loss of veteran trees

7.10.19 Up to eleven veteran trees will be lost due to the construction of the Scheme. Confirmation on tree removals will be undertaken prior to construction and detailed within an Arboricultural Method Statement (AMS), that shall also confirm protection measures for the retained trees. Any trees which have not been previously surveyed (or areas where design changes occur during detailed design) will be assessed following the methodology detailed in British Standard 5837: 2012 'Trees in relation to Design, Demolition & Construction – Recommendations' and this information will feed into the AMS. All other veteran trees within or adjacent to the working area will be protected in accordance with BS5837:2012.

7.10.20 Felling activities, be it woodland clearance or thinning, will avoid the loss of all trees that have veteran features.

7.10.21 Standing and fallen deadwood have ecological benefits and the approach selected for each individual veteran tree that cannot be retained will be tailored to maximise the value of any features that can be salvaged through translocation

[146] Forestry Commission and Natural England (2018). Guidance. Ancient woodland, ancient trees and veteran trees: protecting them from development. https://www.gov.uk/guidance/ancient-woodland-and-veteran-trees-protection-surveys-licences. Accessed: 12/06/2019.

or other means. Arboricultural assessment during detailed design will determine the appropriate approach on an individual tree-by-tree basis from the following alternatives, which are listed in order of priority. All work will be determined jointly by a suitably qualified arboriculturist and a suitably qualified ecologist, and then supervised on site by a suitably qualified arboriculturist. Receptor site preparation and translocation will take account of current guidance (including 'Habitat translocation – a best practice guide' (CIRIA C600), 'Veteran Trees: A guide to good management' (Natural England IN13, 2000), and 'Principles of tree hazard assessment and management (Research for amenity trees)' (Lonsdale, D., 2013). The current standing advice has been reviewed to help inform the approach to mitigation and compensation[147]. In order of priority the options are:

- During detailed design the works around the locations of veteran trees will be kept under review. If the tree can be retained in situ with reduced crown rather than being lost, then this approach will be taken;
- If retention is not possible then the tree will be translocated to the receptor site (to be identified at detailed design) using a tree spade. Some crown reduction may be undertaken to increase chances of potential survival. If required, additional support will be placed to maintain the translocated tree as standing living or dead wood; or
- If none of the above options are possible, the tree will be cut down to a stump and this will be translocated, allowing for either potential regrowth to occur or, at least, the decaying stump to provide deadwood habitat.

7.10.22 The wood pasture compensation land areas C1 and C2 have been identified as possible receptor sites for translocated veteran trees and dead wood.

7.10.23 In addition, dead wood habitat will be provided from retained tree sections to be selected from the trunks and major branches of the other trees to be felled onsite as a mixture of standing and fallen deadwood. Deadwood habitats will form a key component of the wood pasture creation and woodland enhancement, and will be attempted wherever feasible along throughout the Scheme areas (as detailed in the SPA Management and Monitoring Plan, Appendix 7.19 and Appendix 7.20 Landscape and Ecology Management and Monitoring Plan).

7.10.24 For every veteran tree lost, three trees of the same native species will be planted with space around them to develop into an open crown. These will be of local origin. The locations of the new trees to be planted will be determined during detailed design.

7.10.25 The SPA Management and Monitoring Plan (Appendix 7.19) and Landscape and Ecology Management and Monitoring Plan (Appendix 7.20) will be implemented to ensure the successful establishment of newly created habitats.

Specific measures to protect bats/potential bat roosts:

7.10.26 Construction works involving demolition of the San Domenico Restaurant (B1) and felling of tree 155 will be carried out under a Natural England bat mitigation

[147] Forestry Commission and Natural England (2018). Guidance. Ancient woodland, ancient trees and veteran trees: protecting them from development. https://www.gov.uk/guidance/ancient-woodland-and-veteran-trees-protection-surveys-licences. Accessed: 12/06/2019.

licence and accompanying method statement detailing the mitigation and compensation measures that will be put in place to maintain the favourable conservation status of the species affected. The mitigation proposals summarised below have been approved in principle by Natural England, based on the draft bat licence application, and as confirmed by a Letter of No Impediment (LONI) received from Natural England on 26th March 2019.

7.10.27 For B1, the measures will include:

- Construction of a bat mitigation structure to be complete by 1st March 2021 in advance of B1 demolition, outside of the works area and to the north of B1, to provide a compensatory maternity roost for brown long-eared bats. The structure will also contain day roosting opportunities for brown long-eared bats, common pipistrelle, soprano pipistrelle and noctule bats;
- The bat mitigation structure will be checked during the construction period (2021-2023) to determine its level of use by roosting bats. Modifications to the external structure or internal environment may be required to ensure its continued functionality or improve its suitability for roosting bats, as advised by the Named Ecologist/Accredited Agent;
- Establishment of fencing prior to 1st March 2021 to screen the bat mitigation structure from the construction compound. Fencing and/or tall hedgerow planting for the long term screening from future development of the site will be determined during detailed design;
- Establishment of five Schwegler bat boxes outside of the works area at the woodland edge and to the north of B1, in order to provide alternative day roosting opportunities for the above bat species, and an enhancement in the long term;
- Demolition of B1 will be undertaken in the presence of the Named Ecologist/Accredited Agent during the period September-November 2021, to avoid the sensitive periods of maternity and hibernation. The Named Ecologist/Accredited Agent will be present during a destructive search of B1 by soft demolition to advise on the careful removal of roosting features to avoid any harm to individual bats; and
- If any bats are found during the works, they will be carefully removed to the bat mitigation structure or one of the pre-established bat boxes.

7.10.28 For tree 155, the measures will include:

- Establishment of three Schwegler bat boxes and one four seasons' bat box outside of the works area near tree 155 in advance of tree felling, to provide alternative roosting opportunities for Natterer's bats and noctule bats, and to contribute to an enhancement in the long term;
- An endoscope inspection of tree 155 will be undertaken by the Named Ecologist/Accredited Agent during the period September-November 2020 (or other suitable season, depending on project timetable), to avoid the sensitive periods of maternity and hibernation. Immediately after the inspection of tree 155, if bats are present the roost may be excluded using standard methods and then blocked prior to felling if/once bats are absent. Tree 155 will then be

felled; and

- During felling, tree roost feature will be carefully lowered to the ground and if practicable, fixed to an existing tree outside of the works area near tree 155 for future bat use.

7.10.29 All trees (excluding tree 155) with potential to support roosting bats[148] will be felled under a PMW in relation to bats. This will involve a climbed inspection by a bat licensed ecologist to confirm bats are absent immediately prior to felling. If the tree cannot be felled on the same day, and bats are absent, the feature will be blocked to prevent use in the interim period prior to felling. If bats or evidence of a roost is found at any point then measures to protect individual bats and maintain roosting opportunities will be put in place including, if required, an amendment to the mitigation licence.

7.10.30 Felling activities for the SPA enhancement areas and replacement land, be it woodland clearance or thinning, will avoid the loss of all trees that have features that may be suitable for roosting bats where appropriate, as determined by a ground level tree assessment prior to clearance.

7.10.31 One Schwegler bat box suitable to support bat species found within the Scheme area will be provided for each felled tree with moderate or high roosting potential. The replacement boxes will offer a combination of summer (i.e. 2F, 1FD and 2FN) and winter (i.e. 1FW) roosting opportunities and be fixed to retained trees outside of the works area in adjacent woodland habitat.

7.10.32 A replacement overbridge will be constructed adjacent to Clearmount overbridge, prior to demolition of the existing structure, to maintain an existing bat crossing point over the M25 during and post-construction.

7.10.33 Night working will be avoided where possible, and any lighting required for construction will be designed sensitively to avoid illuminating adjacent habitats used by commuting and foraging bats such as woodland and scrub edge, and Clearmount overbridge.

7.10.34 A Landscape and Ecology Management and Monitoring Plan, as detailed in Appendix 7.20, will also be implemented for the maintenance and appropriate management of newly created semi-natural habitats (particularly new woodland) for use by foraging and commuting bats.

7.10.35 New road lighting will be designed in accordance with best practice guidelines[149], taking into consideration the presence of commuting and foraging bats and other wildlife, including measures to avoid and minimise light spill onto adjacent vegetation, particularly ancient and secondary woodland.

7.10.36 Measures will be taken during detailed design to reduce light spill on to NMU overbridges (i.e. possible use of solid sides on NMU bridges) to maintain dark corridors across the NMU to allow bats and other nocturnal animals to utilise these bridges for commuting.

[148] i.e. low/moderate/high potential.
[149] Institute of Lighting Professionals (2018). Guidance Note 08/18. Bats and artificial lighting in the UK. Bats and the Built Environment Series.

Specific measures to protect great crested newt

7.10.37 To avoid killing and injury to great crested newt, all works within 250 m of known breeding waterbodies (including highways construction and habitat enhancements) will be carried out sensitively under a written PMW. This will detail measures and steps to be taken to will involve the careful planning and timing of works to avoid sensitive periods such as hibernation (where mortality is more likely) and hand searching for individual great crested newts during site preparation and habitat clearance. These measures will be incorporated into method statements associated with SPA enhancement areas E3 and E4.

7.10.38 In SPA enhancement area E3, removal of trees and soil from the woodland area for heathland creation will be carried out in stages to deter great crested newts from the working area and reduce the risk of incidental killing and injury. Prior to removal of trees over winter, ground level debris, small areas of ground vegetation and litter will be removed when newts are active. This will reduce the risk of individual great crested newts hibernating in the working area, but also reduce the risk of mortality of individual great crested newts if they are found during clearance.

7.10.39 Where appropriate to do so (such as in SPA enhancement area E4), log piles will be created from arisings generated during tree thinning. These will provide sheltering and potential hibernation and foraging opportunities for great crested newt.

7.10.40 Measures to protect great crested newt will be included in the SPA Management and Monitoring Plan (Appendix 7.19) for works within SPA enhancement area E3. Implementation of the Landscape and Ecology Management and Monitoring Plan (Appendix 7.20) will ensure that this species is protected during regular maintenance and management activities of the highways estate during operation of the Scheme.

Specific measures to protect breeding birds

7.10.41 Vegetation clearance will take place from September to February as far as possible to prevent risk of harm to breeding birds and their nests during the works. If vegetation clearance is required during the core breeding season (1st March-31st August inclusive), the area to be cleared will be inspected by an ecologist for the presence of nesting birds, within 24 hours prior to it being cleared to minimise opportunities for nest building between the survey and the start of works. Any nest in use or being built during inspection will need to be left undamaged, with an appropriate buffer of surrounding vegetation for the entire nesting period and alternative approaches to the works will be proposed.

Specific measures to protect reptiles (sand lizards and common species of reptiles)

7.10.42 To avoid killing and injury to reptiles, highways construction and habitat enhancements will be carried out sensitively under a written PMW. This will detail measures and steps to be taken to will involve the careful planning and timing of works to avoid sensitive periods such as hibernation (where mortality is more likely) and hand searching for individual reptiles during site preparation and

habitat clearance.

7.10.43 The permeability of Wisley Lane will be maintained for amphibians and reptiles. This may include the use of fencing, kerbs and wildlife friendly underpasses. However, the specifics will be subject to detailed design, and will be based on current good practice.

7.10.44 Construction exclusion fencing will be used to demarcate the working area and prevent encroachment onto adjacent habitats.

7.10.45 There is a risk that the construction of the highways proposals at Ockham Common (southeast quadrant) in the areas adjacent to Chatley Heath could result in the potential killing and/or injury of individual sand lizards, depending on whether any working areas could become temporarily suitable for egg-laying by sand lizards. Therefore, in addition to the implementation of the general reptile PMW in this area, the use of reptile fencing may be required to ensure sand lizards do not move into the working area. The use of reptile fencing will be determined through detailed design.

Specific measures to protect badgers.

7.10.46 As part of the embedded mitigation, an artificial badger sett will be created at an undisclosed location to compensate for the temporary closure and permanent partial loss of one main sett that falls within the footprint of the highways proposals. The closure of all active badgers setts will be carried out under licence and the proposed mitigation has been approved in principle by Natural England after submission of a draft licence and as confirmed in a LONI received from Natural England on 3rd April 2019.

7.10.47 As a final precaution, a pre-construction badger survey will be undertaken to determine the level of activity at badger setts that have potential to be directly or indirectly affected by construction.

7.10.48 Inactive badger setts requiring closure will be destroyed under a PMW (to be advised by the Ecological Clerk of Works (ECoW)).

7.10.49 Badger setts [redacted]

7.10.50 Works within replacement land and the SPA enhancement/compensation land will be carried out [redacted]

7.10.51 All excavations will be covered or closed overnight to prevent any animals [redacted] becoming trapped. Alternatively, a ‘ramp’ or graded edge will be provided as a means of escape.

7.10.52 Felling activities, be it woodland clearance or thinning, will [redacted].

Specific measures to protect wildlife commuting routes

7.10.53 Habitat connectivity and commuting routes for notable and protected species and other wildlife will be maintained around the construction area and where practicable, enhanced.

Specific measures to mitigate habitat loss

7.10.54 Installation of log piles from felled trees, bird and bat boxes, which will provide suitable compensatory habitat for notable terrestrial invertebrates, common species of reptiles, great crested newts, birds and bats.

7.10.55 Habitat creation will involve the establishment of habitats, including; open, flowery acid grassland and a heath mosaic (on Cockcrow embankments), areas of bare ground scrapes and/or mounds to be included (within temporary land take areas), scrub edge interface, standing deadwood[150] and deadwood (within wood pasture creation/woodland enhancement areas), to compensate for permanent loss of terrestrial invertebrate habitats. For more details refer to the SPA Management and Monitoring Plan (Appendix 7.19).

7.10.56 A Landscape and Ecology Management and Monitoring Plan (Appendix 7.20) will be implemented for the maintenance and appropriate management of newly created semi-natural habitats (particularly new heathland and woodland) to ensure their successful establishment[151].

Specific measures to avoid spread of invasive plants

7.10.57 A contractor who specialises in the removal of invasive non-native plant species will be appointed by the Principal Contractor to oversee the removal of Japanese knotweed under a method statement.

Enhancement Measures

7.10.58 During design and consultation, some additional potential enhancement measures have been identified that may provide further biodiversity enhancements over and above those required to mitigate or compensate for the potential impacts of the Scheme. Where appropriate, applications have been or will be made for funding under Highways England's national designated funds. These include a series of measures to enhance terrestrial and aquatic habitats, some of which will be subject to feasibility studies.

7.10.59 As these measures will subject to funding through separate designated funds, the potential beneficial effects are not included in the impact assessment. However, the potential for the replacement to Cockcrow Bridge to include a wide green margin as habitat linkage has been considered within the HRA, to ensure that it will not result in any additional or cumulative negative impacts on the SPA.

7.11 Assessment of effects

7.11.1 This section provides an assessment of the construction and operational impacts

[150] Trees are typically felled at ground level. Where possible, felling should try to replicate natural standing deadwood (approximately 2–4 m in height). This feature encourages bracket fungus and associated fungus beetles and will significantly enhance the value of the local woodlands.
[151] SPA Management and Monitoring Plan (Appendix 7.19).

and subsequent effects (both positive and negative) of the Scheme on important ecological receptors within the EZoI of the Scheme. The assessment takes account of all embedded and additional mitigation measures to be included in the Scheme. Each receptor is discussed in turn in the following paragraphs followed by a summary table (Table 7.8).

Designated sites

Thames Basin Heaths SPA

7.11.2 Further information regarding impacts on Thames Basin Heaths SPA and its qualifying species (Dartford warbler, nightjar and woodlark) are provided in the M25 junction 10 Habitats Regulations Assessment Report (TR010030/APP/5.3). A summary is provided below.

Construction

7.11.3 The construction of the highways proposals will lead to the permanent loss of 5.9 ha of habitat that is designated as Thames Basin Heaths SPA. This equates to 0.1 % of the total area of the SPA (8,274.7 ha). In addition, there will be the temporary loss of 8.6 ha of habitat within the SPA (0.1 % of the total SPA area).

7.11.4 The qualifying species of the Thames Basin Heaths SPA all breed within the open heathland areas outside the Scheme and are not found within the mixed woodland areas which will be lost as a result of the construction of the highways proposals. The permanent and temporary habitat losses during construction will be confined to the woodland edge of the SPA and therefore will not directly affect the heathland habitats nor the qualifying species that they support. Therefore, the populations of the SPA qualifying species will not be directly lost as a result of the Scheme.

7.11.5 The areas of mixed woodland within the Scheme provide a buffer habitat for the heathland, and contribute to the invertebrate food resource for the qualifying species of the SPA. The 8.6 ha of temporary habitat loss will be reinstated after construction and will be replanted with trees and shrubs to create a diverse invertebrate rich habitat. However, this will take several years to establish. The loss of this buffering habitat (both permanent and temporary) within the SPA could lead to a permanent reduction in the invertebrate resource available, which could result in declines of the qualifying species, resulting in an indirect negative impact on the qualifying species in the long -term. Although 14.5 ha of woodland within the SPA is being lost, this is 10.2 % of the total wooded area within the SPA (142.8 ha). Therefore, it is considered unlikely that the reduction in invertebrates will be sufficient to result in a negative impact on the qualifying species due to the large amount of woodland to be retained within the SPA, which will continue to contribute to the invertebrate resource for these species. Furthermore, although invertebrates will reduce in number as a direct result of woodland loss, this may not directly reduce the invertebrate resource utilised by the qualifying species. The clearance of woodland should be of immediate benefit to woodlarks (a qualifying species).

7.11.6 According to the noise assessment (see Chapter 6), construction activities will generally be at lower noise levels than the existing background noise levels

within the heathland areas where the qualifying species occur. During construction there will be minor increases in noise (up to 3 dB) as a result of continuous construction noises. Although this noise will still be audible against the ambient noise levels where the territories of the qualifying species are present, they will be masked by other closer noise sources.

7.11.7 Louder activities such as bridge demolition will be extremely short term and localised and the potential for disturbance (e.g. startling) of the qualifying species as a result of loud, irregular noises (such as dropping objects at heights) is unlikely because of their distance from the construction works. Therefore, no adverse effects on the integrity of the SPA, in respect of the qualifying species, is anticipated as a result of construction noise.

7.11.8 To compensate for the loss of land within the SPA, a suite of compensatory measures has been designed in consultation with Natural England, Forestry Commission, SWT, RSPB and Surrey County Council. The SPA compensatory measures include the provision of 8.1 ha of compensation land and 47.4 ha of enhancement land within the Scheme resulting in 22.5 ha of heathland creation, 24.9 ha of woodland enhancement and 8.1 ha of wood pasture creation.

7.11.9 At C1 Old Lane and C2 Wisley the SPA compensation land will be planted with trees to create 8.1 ha of wood pasture. These measures will increase the invertebrate resource contributed by these areas to the wider SPA. These measures will be undertaken and provided to the SPA before construction works commence, and will be managed for a period of 20 years to ensure that they establish, as described within Appendix 7.19 SPA Management and Monitoring Plan. These wood pasture areas will continue to increase their invertebrate resource as the trees mature.

7.11.10 In the long term, the clearance of 22.5 ha of Scots pine dominated woodland within the SPA enhancement areas will create open habitat and enable heathland regeneration. Once established, these measures will provide more nesting and foraging habitat for the qualifying species and increase the carrying capacity of these areas. The resulting heathland will provide a diverse habitat for invertebrates[152], increasing the food resource available by creating habitats that support the invertebrate species most appropriate for the qualifying species. The thinning of 24.9 ha of woodland areas within the SPA enhancement areas will create open glades to support the qualifying species (particularly nightjar) and result in increased species and structural diversity of the mixed woodland, also resulting in a more diverse habitat for invertebrates, increasing the food resource of the qualifying species[153/154].

7.11.11 The temporary land take areas required for construction of the highways proposals will be replanted with trees and scrub, and re-instatement of these areas will include features such as bare patches and sandy mounds to improve their ability to support a diverse range of invertebrate species.

[152] Buglife (2013) Promoting habitat mosaics for invertebrates: lowland heathland (https://www.buglife.org.uk/sites/default/files/HM%20Heathland%20mosaic%20proof%20FINAL_1.pdf; accessed 04/10/18)
[153] Alexander, K., Butler, J. and Green, T. (2006) The value of different tree and shrub species to wildlife. British Wildlife 18(1): 18-28.
[154] Humphrey, J., Ferris, R. and Quine, C. (2003) Biodiversity in Britain's planted forests: Results for the Forestry Commission's Biodiversity Assessment Project. Forestry Commission; Edinburgh.

7.11.12 Overall, the area of heathland, which supports the qualifying species within the SPA, will not reduce and it is considered unlikely that the numbers of breeding qualifying species will decrease as a result of construction of the Scheme. In the short term, during construction the Scheme there will be a reduction in woodland habitat within the SPA and a reduction in the invertebrate resource as a result. Although it is considered unlikely that this will be sufficient to result in a negative impact on the qualifying species, the potential for there to be indirect impacts on the qualifying species, which may result in reducing their breeding success, cannot be ruled out. Therefore, a precautionary approach has been adopted and it is concluded that in the short term the Scheme will have a temporary adverse effect of very large significance on the SPA, which is of European value.

7.11.13 In the long term however, the provision of the SPA suite of compensation measures will involve the provision of 8.1 ha of wood pasture within the compensation land, and the enhancement of 47.4 ha of habitats within the SPA. Thus, increasing their value for invertebrates and providing an additional 22.5 ha of heathland habitat within SPA enhancement areas for the qualifying species to nest and forage within. It is considered likely that these measures will lead to increased numbers of all three qualifying species, and therefore, overall the Scheme will have a permanent positive effect on the SPA of large significance.

Ockham and Wisley Commons SSSI

Construction

7.11.14 The construction of the highways proposals will lead to the permanent loss of 11.5 ha (11.4 ha of woodland and 0.1 ha of Bolder Mere) of Ockham and Wisley Commons SSSI of which 5.9 ha fall within the Thames Basin Heaths SPA. This loss of 11.5 ha equates to 4.3 % of the total area of the SSSI (269.6 ha). In addition, there will be the temporary loss of 16.0 ha of woodland habitat within the SSSI (5.9 % of the total SSSI area), of which 8.6 ha fall within the SPA.

7.11.15 Bolder Mere lies within the SSSI, however, the assessment of effects are reported under the Watercourses and standing water bodies section, paragraphs 7.11.51 to 7.11.55.

7.11.16 The enhancement of habitat within the SPA suite of compensatory measures will involve the selective thinning/clearance of woodland within the SSSI. Both will result in the short term loss of habitats and notable invertebrates for which the SSSI is designated. However, once established, these enhancement areas will consist of diverse heathland and woodland, leading to increased numbers of invertebrates.

7.11.17 The SPA suite of compensation measures within the Scheme includes 8.1 ha of compensation land and 47.4 ha of enhancement area. These areas will compensate for the losses of habitat within the Ockham and Wisley Commons SSSI. These areas will be subject to enhancement measures during construction. However, even after the provision of these measures and the reinstatement of habitats temporarily lost due to construction of the highways proposals, the area of the SSSI will be reduced permanently by 11.5 ha. Therefore, the construction of the Scheme will have a direct permanent adverse effect of very large significance on the SSSI, which is of national value.

7.11.18 Land at Park Barn Farm will be planted with woodland and managed to provide acid grassland (which may even establish heathland vegetation over time). Chatley Wood and Breach Hill Wood will be managed to enhance the diversity of the existing Scots pine plantation.

7.11.19 In the long term, once habitats are established, enhancement of 47.4 ha of land within SPA enhancement areas and 8.1 ha of land within SPA compensation areas will result in a more diverse range of habitats of higher quality for invertebrates within the SSSI, resulting in a higher diversity of invertebrates in the long term. In addition, 38.5 ha of land adjacent to the SSSI at Park Barn Farm, Chatley Farm and Hatchford End will be managed to improve habitat quality and species and structural diversity, also resulting in additional habitat suitable for a range of invertebrate species.

7.11.20 In the longer term, although the SSSI will be 11.5 ha smaller in size, the retained areas within the SSSI will be in a better condition as a result of the measures implemented within the SPA enhancement areas, including the creation of 22.5 ha of heathland. In addition, 8.1 ha of wood pasture habitat will be created immediately adjacent to the SSSI to compensate for losses within the SPA/SSSI. The SSSI is designated for its heathland habitats, and these increases in heathland will benefit the SSSI. Therefore, overall, the Scheme including the compensation and enhancement measures provided will lead to a permanent positive effect on the SSSI of large significance.

Ockham and Wisley Commons LNR

7.11.21 The Ockham and Wisley Commons is designated as an LNR due to its designation as a SPA and SSSI.

Construction

7.11.22 The construction of the highways proposals will lead to the permanent loss of 12.7 ha of habitat that is designated as Ockham and Wisley Commons LNR. This equates to 3.8 % of the total area of the LNR (332 ha). In addition, there will be the temporary loss of 19.3 ha of habitat within the LNR (5.8 % of the total LNR area).

7.11.23 In the longer term, although the LNR will be 12.7 ha smaller in size, the Scheme will include 49.4 ha of habitat creation and enhancement to be carried out within the LNR as part of the SPA suite of compensatory measures (creation of 22.5 ha of heathland from woodland clearance to allow for heathland regeneration; 24.9 ha of woodland enhancement through woodland thinning and creation of open rides and increasing woodland diversity; creation of 2.0 ha of wood pasture at C1) along with enhancements to Bolder Mere. Therefore, the retained areas within the LNR will be in a better condition as a result of the measures implemented as part of the Scheme.

7.11.24 A further 41.9 ha of habitats adjacent to the LNR will be subject to habitat enhancements to increase species and structural diversity of the habitats present. This consists of 19.6 ha of woodland planting, woodland enhancement and acid grassland/heathland creation at Park Barn Farm, 14.5 ha of woodland enhancement at Chatley Wood, 1.7 ha of woodland planting at Hatchford End

and 6.1 ha of wood pasture creation at C2 Wisley SPA compensation land.

7.11.25 Therefore, taking into account the compensation and enhancement measures provided, overall the construction of the Scheme will lead to a permanent positive effect on the LNR of moderate significance.

Elm Corner Woods SNCI

Construction

7.11.26 The construction of the highways proposals will lead to the permanent loss of 1.7 ha of habitat that is designated as Elm Corner Woods SNCI. This equates to 16.7 % of the total area of the SNCI (10.2 ha). In addition, there will be the temporary loss of 1.2 ha of habitat within the SNCI (11.8 % of the total SNCI area).

7.11.27 The creation of a permanent side access road at Wisley Airfield will fragment habitats between Elm Corner Woods SNCI and Wisley Airfield SNCI that are currently connected. However, this will be a minor single carriageway access road and will be unlit. Therefore, this access road will not cause a barrier to movement between the habitats.

7.11.28 The temporary land take areas will be replanted with trees and shrubs to create a diverse habitat. To compensate for the permanent loss of 1.7 ha of woodland, the remaining 8.5 ha of SNCI (including areas outside the Scheme boundary) will be managed to improve habitat quality and species and structural diversity[155]. Therefore, the Scheme will result in a permanent, positive effect of neutral significance on Elm Corner Woods SNCI, which is of county value.

Wisley Airfield SNCI

Construction

7.11.29 The construction of the highways proposals will lead to the permanent loss of 2.9 ha of habitat that is designated as Wisley Corner SNCI. This equates to 10.3 % of the total area of the SNCI (28.2 ha)[156]. In addition, there will be the temporary loss of 1.6 ha of habitat within the SNCI (5.7 % of the total SNCI area).

7.11.30 The temporary land take areas will be replanted with trees and shrubs to create a diverse habitat. Tree and shrub planting within Wisley Airfield SNCI will provide a buffer between the Wisley Lane access road and the Elm Corner woods.

7.11.31 The populations of reptiles and amphibians are reasons for the designation of Wisley Airfield SNCI. During vegetation clearance required for construction of the highways proposals and during clearance and selective thinning in areas targeted for enhancement, clearance will be carried out under a PMW for reptiles to minimise the risk of killing or injury.

[155] Although areas of Elm Corner Woods SNCI fall outside the DCO boundary, woodland thinning works will be undertaken, as agreed by SWT.
[156] The area covered by the Wisley Airfield SNCI has been amended since the publication of the Regional Investment Programme M25 Junction 10/A3 Wisley Interchange Preliminary Environmental Information Report in February 2018. The Wisley Airfield SNCI boundary as shown on Figure 7.4 in Volume 3 (application document TR010030/APP/6.3) which covers 28.2 ha is that which was adopted by Guildford Borough Council in August 2018.

7.11.32 To prevent fragmentation between Elm Corner Woods SNCI and Wisley Airfield SNCI as a result of the creation of a permanent side access road (Wisley Lane) at Wisley Airfield, the permeability of Wisley Lane will be maintained for amphibians and reptiles through the use of measures such as fencing, kerbs and wildlife friendly underpasses.

7.11.33 Due to the loss of habitat, the Scheme will result in a permanent, direct, adverse effect of slight significance on Wisley Airfield SNCI, which is of county value.

Bolder Mere Conservation Verge (CV005)

Construction

7.11.34 There will be no permanent or temporary land take within CV005 as a result of the Scheme. The habitat enhancement measures in SPA enhancement area E3 involve woodland thinning and clearance of woodland to allow for the extension of heathland habitat. This will result in the temporary disturbance to approximately 105 m of the verge to the east of Old Lane within the CV005. While the habitat enhancement measures in SPA enhancement area E4 involve woodland thinning of mostly Scots pine and birch to enable a more diverse woodland, which will result in the temporary disturbance to approximately 250 m of the verge to the west of Old Lane within the CV005.

7.11.35 During the construction of the highways proposals (including vegetation clearance) and habitat enhancements such as woodland thinning/clearing, works will be carried out under a PMW for common toads to minimise the risk of killing or injury. Therefore, there will be no significant residual effect as a result of the construction of the Scheme. The Scheme will have a neutral effect on Bolder Mere Conservation Verge and the population of common toads for which it is designated.

Ancient woodland

Construction

7.11.36 Due to the irreplaceable nature of ancient woodland habitat, all habitat loss within the permanent and temporary land take areas within ancient woodland is considered as permanent loss of ancient woodland. Therefore, a total of 0.4 ha of ancient woodland at Elm Corner and Heyswood will be permanently lost as a result of the construction of the highways proposals. These losses will be from the outer edge of the ancient woodland where it meets the A3 and therefore will not result in fragmentation.

7.11.37 The Scheme will result in the planting of 27.4 ha of woodland and 10.4 ha of wood pasture, including woodland creation at Park Barn Farm that will provide linkages between the ancient woods at Queen Anne's Hills and Buxton woods. In addition, soils from the ancient woodlands will be translocated and used for woodland creation within the Park Barn Farm replacement area, thus providing suitable soils and a seed bank for ancient woodland ground flora to establish within the newly planted woodland areas. In addition, 4.2 ha of ancient woodland habitat at the former Chatley Farm replacement land will be enhanced by the removal of rhododendron, enabling a more diverse woodland to establish in the long term.

7.11.38 Although these measures will result in an overall increased area of woodland, as ancient woodlands are irreplaceable habitats the loss of these woodlands is irreversible. Therefore, overall the Scheme will result in a direct, permanent, irreversible, adverse effect of moderate significance on ancient woodlands at Elm Corner and Heyswood, which are of county value.

Veteran trees

Construction

7.11.39 The construction of the highways proposals will result in the permanent loss of, or works within the RPA of up to eleven veteran trees. Ten of these trees are of county value and one (T165 as shown on Figure 9.31 Tree protection plan) is of regional value. Of these eleven trees, two are confirmed as being removed (both of county value) as they are located directly within the footprint of the highways proposals and there are no feasible design changes to avoid this loss. Nine trees (including T165 which is of regional value) require further assessment during the detailed design process to ascertain whether work within their RPAs can be avoided, or reduced. However, T165 is located adjacent to an existing hardstanding access track which is regularly used by heavy vehicles such as buses. Therefore, it is considered likely that it will be possible to retain this tree, although this will be confirmed during detailed design.

7.11.40 Four veteran trees are located within the Nutberry Fruit Farm compound. Further assessment is required during the detailed design process in order to ensure that the compound avoids the veteran trees and their RPAs.

7.11.41 Ten veteran trees are located within Park Barn Farm replacement land. Prior to any work occurring in the replacement land, an Arboricultural Method Statement (AMS) will be produced that will confirm protection measures for the remained trees.

7.11.42 For every veteran tree lost, three trees of the same native species will be planted with space around them to develop into an open crown. These will be of local provenance. The locations of the new trees to be planted will be determined during detailed design

7.11.43 Veteran trees are irreplaceable the loss of these trees is irreversible. Therefore, overall the Scheme will result in a direct, permanent, irreversible, adverse effect of moderate significance on veteran trees which are of regional[157] value.

Habitats

Habitats of Principal Importance (HPI) (outside of designated sites):

7.11.44 An assessment of the effects on HPI falling outside of designated sites is provided below. HPIs falling within designated sites have been assessed above as part of their respective designated sites.

Construction

[157] Only T165 is assessed as being of regional value. All other individual veteran trees are of county or local value.

7.11.45 The construction of the highways proposals will lead to the loss of 41.7 ha of wood pasture and parkland, of which 19.3 ha is also classified as lowland mixed deciduous woodland. This includes 19.8 ha of habitat to be temporarily lost, but re-planted with a mixture of grassland, scrub and trees.

7.11.46 Works within the SPA compensation areas, replacement land and the reinstatement of temporary land take will result in the planting of an additional 27.4 ha of mixed deciduous woodland and 10.4 ha of wood pasture.

7.11.47 The creation of a permanent side access road at Wisley Airfield will fragment areas of lowland mixed deciduous woodland that are currently connected.

7.11.48 Therefore, the construction of the Scheme will have a direct temporary adverse effect on HPIs outside of designated sites, which are of local value.

7.11.49 In the long term however, the replacement land provides a number of measures to compensate for the loss of wood pasture and parkland and lowland mixed deciduous woodland. This includes 8.1 ha of woodland creation at Park Barn Farm, new woodland linkages will be created between Buxton wood and Queen Anne's Hills East ancient woodland at Park Barn Farm and the Scots pine plantations within the former Chatley Farm replacement area will be managed to improve their diversity and ecological value.

7.11.50 Therefore, overall in the long term the Scheme will result in a neutral permanent positive effect on HPIs outside of designated sites, which are of local value.

Watercourses and standing water bodies

Bolder Mere (part of Ockham and Wisley Commons SSSI)

Construction

7.11.51 The encroachment of the new retaining wall into Bolder Mere will result in the loss of open water habitat and temporary losses/disturbance (including acoustic and visual) of aquatic species.

7.11.52 There will be a temporary loss of terrestrial lake margin habitat and temporary habitat fragmentation related to the clearance and reinstatement of existing trees and shrub/scrub.

7.11.53 Embedded design mitigation will result in the temporary loss/disturbance to aquatic species and direct loss of trees and scrub. However, the reinstatement of valuable marginal reedbed habitats and lily pads within/adjacent to the lake environment along with works to improve marginal habitats along the shore of the lake (including a programme of carp and bream removal) will enhance the water body's suitability for dragonflies, a designation feature of the SSSI and act to support the maintenance of a clear water habitat.

7.11.54 The environmental measures proposed for Bolder Mere will enhance the waterbody's suitability for dragonflies, a designation feature of the SSSI.

7.11.55 While there will be a loss of open water habitat, due to the improvements as part of the embedded design, the Scheme will result in a permanent, positive effect of slight significance on Bolder Mere, which is of national value.

Operation

7.11.56 During operation there will be an improvement in water quality within Bolder Mere related to the new drainage system which includes removal of direct discharges from the A3 into the lake and the programme of carp and bream removal which will support the maintenance of a clear water habitat. Therefore, the operation of the Scheme will result in a permanent positive effect of slight significance on Bolder Mere.

Stratford Brook

Construction

7.11.57 Construction of the new crossing, strengthening of the existing culvert and construction of new outfalls, requires temporary loss of riparian habitat.

7.11.58 It is anticipated there will be direct, permanent loss of riparian habitat and habitat connectivity beneath the bridge deck, plus a reduction in aquatic habitat quality and availability for aquatic species due to shading from the new bridge deck.

7.11.59 There will be temporary losses and/or temporary disturbance to aquatic species associated with construction activities and the potential requirement for dewatering.

7.11.60 The embedded design mitigation (implementation of the enhancement measures along the Stratford Brook) will result in temporary losses and/or temporary disturbance to aquatic species. However, in the long term this will result in improvements to in-channel and riparian habitat complexity.

7.11.61 While there will be a permanent loss of riparian habitat and a reduction in aquatic habitat availability beneath the bridge deck, the implementation of the enhancement measures as part of the Scheme, will result in a permanent, positive effect of slight significance on Stratford Brook, which is of county value.

Operation

7.11.62 During the operation of the Scheme, no negative effects are anticipated on the watercourse.

River Wey & River Mole

Construction

7.11.63 The River Wey and River Mole are receiving watercourses for rivers and ephemeral ditches within the Scheme area. The implementation of the CEMP will result in no direct impacts to these watercourses.

7.11.64 The drainage strategy for the Scheme includes the provision of flow attenuation and treatment of run-off which will potentially improve water quality and habitat conditions.

7.11.65 As no direct works are occurring within or adjacent to these watercourses, the Scheme will result in a permanent, neutral effect of no significance on the River Wey and River Mole, which are of county value.

Operation

7.11.66 During the operation of the Scheme, no negative effects are anticipated on the watercourse.

Ephemeral ditches

Construction

7.11.67 The Scheme requires construction works associated with culvert extensions, culvert replacements and ditch displacements on ephemeral ditches within the Scheme area. This will result in permanent open channel habitat losses, localised loss of riparian habitat and fragmentation of habitat.

7.11.68 Enhancement and improvements of watercourses and water bodies within the Scheme area (namely Pond Farm south and Pond Farm west ditches, and Chatley Wood pond) will create improved habitat conditions for a variety of aquatic species including Odonata.

7.11.69 The habitat loss associated with the Scheme will result in a permanent negative effect, however the embedded design improvements including enhancements of watercourses/waterbodies and provision of flow attenuation will result in permanent positive effect. Overall, the Scheme will result in a permanent, neutral effect of no significance on the ephemeral ditches, which are of local value.

Operation

7.11.70 The provision of flow attenuation and subsequent treatment of run-off as part of the drainage strategy will improve water quality and habitat conditions.

7.11.71 An improved drainage system is to be implemented as part of the Scheme, that will, wherever possible keep runoff from highway and non-highway surfaces separate. Within the River Wey catchment, approximately 820 m of ephemeral headwater will be lost or transposed by the Scheme with approximately 420 m being lost or transposed within the River Mole catchment. At the same time around 1440 m of pre-earthwork drain conveying water solely from non-highway surfaces are included in the preliminary design for the River Wey catchment and approximately 720 m within the River Mole catchment. Therefore, the operation of the Scheme will have a permanent neutral effect on ephemeral ditches.

Chatley Wood Pond

Construction

7.11.72 There will be localised habitat losses associated with the proposed enhancement works around Chatley Wood pond including selective tree thinning and excavation of the existing flow path through the pond to increase pond capacity and enhance pond ecology. However, the overall result will be an improvement in water body habitat condition and resource availability for aquatic species.

7.11.73 There may be localised losses of, and temporary physical disturbance to aquatic macrophytes and macroinvertebrates resulting from the enhancement works, including excavation works of the existing flow path through the pond. However, the overall result will result in an improved watercourse habitat condition for

aquatic species.

7.11.74 Due to the improvements to the water body habitat condition and resource availability for aquatic species, the Scheme will result in a permanent positive effect of slight significance on Chatley Wood pond, which is of local value.

Operation

7.11.75 During the operation of the Scheme, no negative effects are anticipated on the water body.

Manor Pond

Construction

7.11.76 There will be a direct permanent loss of terrestrial lake margin habitat and temporary habitat fragmentation associated with the requirement to clear trees and shrubs adjacent to the retaining wall.

7.11.77 There will be localised losses and disturbance to benthic aquatic macroinvertebrates and macrophytes resulting from construction of the wall.

7.11.78 Due to the loss of terrestrial lake margin habitat and minor fragmentation, the Scheme will result in a permanent, adverse effect of slight significance on Manor Pond, which is of local value.

Operation

7.11.79 During the operation of the Scheme, no negative effects are anticipated on the water body.

Notable and protected species

7.11.80 An assessment of the effects on notable and protected species is provided below. This excludes the qualifying features of the Thames Basin Heaths SPA and Ockham and Wisley Commons SSSI, which are assessed above as part of their respective designated sites.

Bats

Construction

7.11.81 The Scheme will result in the permanent loss of the San Domenic Building that supports a maternity roost, day roost and feeding perches for brown long-eared bats, and day roosts of common pipistrelle, soprano pipistrelle and noctule bats. A single tree roost (tree 155, See Figure 7.11 in Volume 3 (application document TR010030/APP/6.3)) will also be permanently lost, which supports a transitional/occasional roost of Natterers bats and noctule bats, as well as a hibernation roost of noctule bats. These will be mitigated for with bat boxes and a mitigation structure (as described in paragraph 7.4.58) and removed under licence once the replacement roosts have been installed.

7.11.82 Although the positioning of lighting should improve the crossing of bats across the A3 and M25, the construction of new access side roads could potentially

provide a barrier to commuting and foraging bats. However, these side roads are mainly for access to local housing, the SWT Pond Farm and Wisley RHS. Therefore, the majority of access will be during daylight hours, and these unlit minor roads should not pose a constraint to bat movements. There may be some minor disturbance of foraging and commuting bats during construction.

7.11.83 Due to the protection, or replacement, of bat roosts within the Scheme, it is anticipated that the Scheme will not lead to the overall loss of bat roosts, and with the provision of additional bat roost boxes for all felled trees with moderate or high roost potential even though a bat roost was not recorded, the number of roosting opportunities within the Scheme surrounds may actually increase.

7.11.84 The suite of compensation measures will include woodland creation, enhancement of existing woodland, and the restoration of diverse heathland areas. These measures should benefit invertebrates, and in turn, benefit foraging bats.

7.11.85 During construction there may be a temporary adverse effect on foraging and commuting bats of slight significance. However, overall the permanent residual effect on the conservation status of the county value bat population present is anticipated to be positive and of neutral significance.

Operation

7.11.86 Due to the Scheme involving changes to an existing junction, it is considered that bat commuting and/or foraging should not significantly change as a result of the Scheme. The operational lighting for the Scheme will be positioned to provide a shaded corridor along all of the NMU bridges within the Scheme[158]. It is considered that these dark corridors may enable bats and other nocturnal to utilise these bridges for commuting. For example, of the three existing bridges that were surveyed, only Clearmount overbridge is regularly used by commuting bats. Clearmount overbridge is shaded, whereas the other bridges that were surveyed are currently well lit. It is anticipated that the provision of shaded crossing points between all four quadrants will enable a new level of connectivity for foraging and commuting bats, where a barrier to movement currently exists. Therefore, the residual effect of the Scheme lighting will be permanent positive effect of slight significant to the existing bat populations.

Great crested newt

Construction

7.11.87 A small metapopulation of great crested newts occurs around Ockham Common and Bolder Mere. There will be no loss of aquatic breeding habitat for great crested newts as a result of the Scheme. Construction of the highways proposals will result in the permanent loss of approximately 0.05 ha of terrestrial habitat within 250 m of a breeding pond. This loss lies outside the core habitat area of the great crested newt metapopulation and represents approximately 0.1 % of available habitat within 250 m of the breeding waterbodies.

[158] This barrier is required to enable safe passage by equestrian users

7.11.88 A medium population of great crested newts is assumed at pond W32[159] on Wisley Common. No other positive great crested newt eDNA results were returned for any other waterbodies within Wisley Common. W32 is located approximately 170 m from E8 Pond Farm west SPA enhancement area, where selective thinning will take place and over 300 m from the Scheme construction works areas.

7.11.89 Construction of the highways proposals and heathland creation at E3 Ockham Common/Old Lane SPA enhancement area will result in the temporary loss of approximately 4.2 ha of terrestrial habitat within 250 m of a breeding pond. This loss lies outside the core habitat area of the great crested newt metapopulation and represents approximately 9 % of available habitat within 250 m of the breeding waterbodies. Habitat within the highways proposals areas will be reinstated on completion of construction with trees and shrubs. Habitat within the heathland creation area will provide foraging and sheltering opportunities for great crested newt as the heathland habitat establishes.

7.11.90 The low risk of killing and injury to individual great crested newts within the Scheme (both highways proposals and SPA enhancement areas) will be reduced through the implementation of appropriate site clearance and habitat enhancement measures under a PMW to be described in the CEMP.

7.11.91 Although the permanent and temporary loss of terrestrial habitat will cause a minor reduction in the terrestrial habitat available to great crested newts, these losses lie outside the core habitat area of the great crested newt metapopulation, and represent only a small proportion of the terrestrial habitat available to this species (approximately 0.1 % permanent and 9 % temporary). This small-scale loss of terrestrial habitat is not considered to affect the favourable conservation status of this metapopulation of great crested newt due to abundant availability of good quality habitat within 250 m of the breeding waterbodies.

7.11.92 Overall, no significant residual adverse effects on the favourable conservation status of great crested newt is anticipated as a result of the construction of the Scheme. The Scheme will have a neutral effect on this species which is of local value.

Operation

7.11.93 Measures to protect great crested newts will be included in management plans for SPA enhancement areas and maintenance plans for the highways estate to ensure this species is protected during regular maintenance and management activities during operation of the Scheme. Therefore, a neutral effect on the favourable conservation status of great crested newt is anticipated as a result of the operation of the Scheme.

Reptiles

Sand Lizards

Construction

[159] This is a precautionary assumption, based on a positive eDNA result.

7.11.94 A breeding population of sand lizards is present within the open heathland habitats (Chatley Heath) of Ockham Common located outside of the Scheme.

7.11.95 It is possible that occasional individuals may occur in the woodland habitats within the Scheme, but the woodland habitat within the Scheme is outside of the area of optimum heathland habitat and is unsuitable for breeding or hibernating sand lizards.

7.11.96 During vegetation clearance required for construction of the highways proposals and during clearance and selective thinning in areas targeted for enhancement, clearance will be carried out under a PMW for reptiles to minimise the risk of killing or injury. Therefore, the construction of the Scheme will result in a neutral effect on the sand lizard population at Chatley Heath.

7.11.97 In the long term however, the compensation and enhancement measures will result in the creation of 22.5 ha of open heathland of which 13.2 ha are within Ockham Common and adjacent to the existing sand lizard habitat, which will result in an increase in habitat of optimum suitability for sand lizards.

7.11.98 Therefore, overall the compensation and enhancement measures provided as part of the construction of the Scheme will lead to a permanent positive effect on sand lizards of moderate significance, which are of regional value.

Operation

7.11.99 Measures to protect sand lizards will be included in management plans for SPA enhancement areas and maintenance plans for the highways estate to ensure this species is protected during regular maintenance and management activities during operation of the Scheme. Therefore, the operation of the Scheme will have a neutral effect on the conservation status of sand lizards.

Common species of reptile

Construction

7.11.100 The construction of the highways proposals will result in the direct temporary loss and the permanent loss of habitat currently used by common species of reptile.

7.11.101 During construction, the creation of side access roads at Wisley Airfield, Ockham Common and Painshill could potentially provide a barrier to movement of reptiles of common species between habitats, leading to isolation of discrete populations.

7.11.102 While it is possible that this loss and fragmentation of habitat could cause a reduction in the population sizes of common species of reptile, there are abundant suitable habitats available adjacent to the Scheme that are considered to be sufficient to support the local populations of reptiles, including any displaced individuals.

7.11.103 During vegetation clearance required for construction of the highways proposals and during clearance and selective thinning in areas targeted for enhancement, clearance will be carried out under a PMW for reptiles to minimise the risk of killing or injury.

7.11.104 In the long term however, the compensation and enhancement measures will result in the creation of 22.5 ha of open heathland and will provide open glades within retained areas of woodland, resulting in habitats of higher suitability for reptiles over a larger area.

7.11.105 Therefore, overall the compensation and enhancement measures provided as part of the construction of the Scheme will lead to a permanent positive effect of slight significance on the conservation status of common reptiles, which are of local value.

Operation

7.11.106 The permeability of Wisley Lane will be maintained for amphibians and reptiles during operation. Furthermore, measures to protect common species of reptiles will be included in management plans for SPA enhancement areas and maintenance plans for the highways estate to ensure this species is protected during regular maintenance and management activities during operation of the Scheme. Therefore, the operation of the Scheme will have a neutral effect on the conservation status of common reptiles.

Breeding bird assemblage (not including SPA qualifying species)

Construction

7.11.107 An assessment of the effects on breeding birds, not including the SPA qualifying species, is provided below. An assessment of effects on the SPA qualifying species has been provided above.

7.11.108 During construction of the highways proposals and the clearance and selected thinning of woodland in areas targeted for enhancement, the breeding bird assemblage within the temporary and permanent land take areas will be displaced.

7.11.109 According to the noise assessment (see Chapter 6), construction activities will generally be at lower noise levels than the existing background noise levels at distances greater than 200 m from the Scheme. These loud construction activities will still be audible against the existing ambient sound levels, but will be more easily masked by other closer noise sources.

7.11.110 There is potential for some of these construction activities to cause temporary disturbance of breeding birds, particularly within 200 m of the construction works. However, these loud construction activities will be short term and are unlikely to lead to displacement of those breeding birds.

7.11.111 In addition, a hobby nest has been recorded approximately 100 m from the DCO boundary. Although there will be a visual barrier, it is possible that some of the louder construction activities will cause temporary disturbance of this Schedule 1 species. However, these works will be ongoing prior to the arrival of this migratory bird, and it is likely that this pair will select a nest site (typically a disused crow's nest) at a suitable distance to avoid disturbance from the ongoing construction activities.

7.11.112 The proposed SPA enhancement measures include the clearance of 22.5 ha of

Scots pine dominated woodland to allow heathland restoration. Although this will be of benefit to heathland specialists, it is likely to displace three spotted flycatcher territories (although these may relocate to the retained woodland areas within the SPA).

7.11.113 Therefore, the construction of the Scheme will have a direct, temporary adverse effect on breeding birds, including spotted flycatcher.

7.11.114 In the long term the Scheme will result in the creation of 37.8 ha of woodland (27.4 ha of woodland planting and 10.4 ha of wood pasture planting) and 22.5 ha of diverse heathland habitat, and the enhancement of 45.1 ha of existing woodland areas. In addition, nine open nest boxes will be provided for spotted flycatcher. Although it is considered likely that the populations of spotted flycatcher will remain stable and that this species will continue to breed within the retained woodland areas (and eventually within the woodland and wood pasture creation areas) it cannot be ruled out that the SPA enhancement measures could lead to a temporary reduction in the populations of this or other species.

7.11.115 Therefore, a precautionary approach has been adopted and it is concluded that the in the long term the Scheme will have a direct, permanent positive effect of neutral significance on breeding birds outside of the SPA qualifying species, which are of local value and a direct, permanent neutral effect of moderate significance on spotted flycatcher, which is of county value.

Operation

7.11.116 Measures to protect breeding birds be included in management plans for SPA enhancement areas and maintenance plans for the highways estate to ensure that nesting birds are protected during regular maintenance and management activities during operation of the Scheme. Therefore, the operation of the Scheme will have a permanent neutral effect on breeding birds, which is not significant.

Badgers

Construction

7.11.117 The construction of the highways proposals will result in the permanent partial loss of one main badger sett and the permanent loss of one subsidiary sett and four outlier setts. During construction there will also be the temporary damage of four badger setts (one subsidiary sett and three outlier setts). An artificial sett will be created to compensate for the temporary closure and partial loss of the main sett. The four remaining active badger setts to be permanently destroyed will be permanently closed under licence and an additional four active setts will be temporarily closed under licence. Measures will be put in place to avoid badger setts present in areas targeted and to avoid disturbance of badgers in these areas.

7.11.118 A further 11 badger setts (two main, two subsidiary and seven outlier setts) are at risk of damage from the proposed works and require further assessment during the design process in order assess the potential to retain/avoid the badger setts

7.11.119 The construction of the highways proposals will also result in the permanent and temporary loss of habitat currently used by commuting and foraging badgers.

7.11.120 Therefore, the construction of the Scheme will have a direct, temporary adverse effect of slight significance on badgers, which are of local value.

7.11.121 The compensation and enhancement measures included within the Scheme will include woodland creation, enhancement of existing woodlands and restoration of diverse heathland habitat. All of these habitat types should be suitable for foraging badgers. Therefore, in the long term the construction of the Scheme is likely to have a direct, permanent adverse neutral effect which is not significant on badgers, which are of local value.

Operation

7.11.122 During operation it is possible that the movement of cars on new permanent access roads may result in badger road casualties. However, this is already a risk as a result of the existing roads. Therefore, the operation of the Scheme is considered to have a neutral effect (not significant) on badgers.

Terrestrial invertebrates

7.11.123 An assessment of the effects on notable terrestrial invertebrates is provided below.

Construction

7.11.124 During construction, the clearance of vegetation for the highways proposals and the felling and selective thinning of woodland in areas targeted for enhancement will lead to the loss of invertebrates.

7.11.125 Therefore, the construction of the Scheme will have a direct temporary adverse effect of slight significance on notable invertebrates, which are of local value.

7.11.126 In the long term, once habitats are established, enhancement of 47.4 ha of land within SPA enhancement areas, 8.1 ha of land within SPA compensation areas and the environmental measures proposed for Bolder Mere will result in a more diverse range of habitats, supporting a more diverse range of invertebrates within the retained areas of the SSSI, which will be of benefit to notable invertebrates which are the designated features of the SSSI and those present outside of the SSSI. In addition, 38.5 ha of land at Park Barn Farm, Chatley Farm and Hatchford End will be managed to improve habitat quality and species and structural diversity, also resulting in additional habitat suitable for a range of invertebrate species.

7.11.127 Temporary land take areas will be replanted with trees and scrub, and will contain features such as bare patches and sandy mounds. These areas will be designed to provide a variety of suitable habitats for invertebrates.

7.11.128 Therefore, in the longer term, the compensation and enhancement measures provided as part of the Scheme will lead to a permanent positive neutral effect (not significant) on terrestrial invertebrate species.

Non-native invasive plant species

7.11.129 Rhododendron removal will be undertaken within SPA enhancement areas and replacement land during the works and measures set out within the CEMP will ensure that non-native invasive plant species are not spread during construction resulting in a neutral impact.

7.12 Residual effects

7.12.1 Due to the positioning of the highways proposals, the Scheme leads to the loss of 240.6 ha of land (139.2 ha permanent land take, 101.4 ha temporary land take), including land from an SPA, SSSI, LNR and two SNCIs.

7.12.2 In order to ensure that all required biodiversity mitigation, compensation and enhancement proposals are secured as part of the DCO process, the Scheme encompasses all land within the DCO boundary. Therefore, as well as the highways proposals and any associated development, all biodiversity mitigation, compensation and enhancement proposals to be implemented within the DCO boundary are also included as part of the design of the Scheme. As these are requirements of the Scheme and fall within the DCO boundary, all necessary mitigation, compensation and enhancement measures are embedded into the design.

7.12.3 Overall, it is considered that the mitigation, compensation and enhancement measures proposed will allow the residual effects of the Scheme to be minimised as much as possible.

7.12.4 **Table** 7.8 provides a summary of residual effects that will occur as a result of the Scheme.

7.12.5 Based on the valuation of nature conservation resources, the potential impacts identified, and the mitigation measures proposed, it is considered that in the short term, during construction of the Scheme there will be a significant adverse effect on spotted flycatcher.

7.12.6 Overall, once habitats created during construction have become established there will be:

- Significant neutral effects on spotted flycatcher.
- Significant positive effects on: Thames Basin Heaths SPA; Ockham and Wisley Commons SSSI; Ockham and Wisley LNR; Bolder Mere; and reptiles including sand lizard and common species.

7.12.7 However, there will be permanent residual significant adverse effects of moderate significance on:

- Ancient woodland; and
- Veteran trees.

7.12.8 In addition, there will be permanent residual significant adverse effects of slight significance on:

- Wisley Airfield SNCI; and
- Manor Pond.

7.12.9 The Scheme will have a neutral effect on:

- The conservation status of the following species/species groups/habitats: HPI; Stratford Brook; River Wey and River Mole; ephemeral ditches; Chatley Wood Pond; bats; great crested newt; breeding bird assemblage (not including SPA qualifying species); badger; terrestrial invertebrates; and
- The conservation objectives of Elm Corner Woods SNCI.

7.12.10 During operation, it is considered that the Scheme will result in a permanent positive effect of slight significance on Bolder Mere.

7.12.11 During design and consultation, some additional potential enhancement measures have been identified that have the potential to provide additional biodiversity enhancements over and above those required to mitigate or compensate for the potential impacts of the Scheme. As these measures will subject to funding through separate designated funds, the potential beneficial effects are not included in the impact assessment.

Table 7.8: Summary of assessment of impacts and effects from construction and operation of the Scheme

Nature conservation resource	Value	Summary of impacts	Impact characterisation	Summary of mitigation	Residual effect	Significance category
Thames Basin Heaths SPA	European	Construction Short term: Temporary loss of 8.6 ha within SPA (3.9 % of the Ockham and Wisley Commons SSSI component of the SPA). Potential temporary reduction in invertebrate resource for qualifying species due to loss of woodland buffering habitat. Potential temporary disturbance to qualifying species (noise).	Habitat loss: negative, certain, direct, reversible, temporary. Reduction in invertebrate resource: negative, unlikely, indirect, reversible, temporary. Potential disturbance to species: negative, probable, reversible, temporary.	Habitat reinstatement of 8.6 ha of in temporary clearance areas/woodland buffer area. The site will be subject to protection from incursion and pollution prevention measures will be implemented during construction of the Scheme.	Permanent positive effect	Large
		Long term: Permanent loss of 5.9 ha within SPA (2.7 % of this component of the SPA). SPA suite of compensatory measures will lead to enhancement of 47.4 ha of the SPA (21.3 % of this component of the SPA) to include 22.5 ha of newly created heathland habitat and 24.9 ha of enhanced woodland habitats. Along with the	Habitat loss: negative, certain, direct, irreversible, permanent. SPA suite of compensatory measures: positive, certain, direct and indirect, permanent.	Embedded ecological design (listed in impacts)		

Nature conservation resource	Value	Summary of impacts	Impact characterisation	Summary of mitigation	Residual effect	Significance category
		permanent provision of 8.1 ha of wood pasture within the SPA compensation land. These measures will enhance the habitats present for invertebrates and nesting habitat for the qualifying species.				
		Operation No impacts identified.	n/a	n/a	n/a	n/a
Ockham and Wisley Commons SSSI	National	Construction Short term: Temporary loss of 16.0 ha within SSSI (5.9 % of SSSI) Loss of notable invertebrates (reason for SSSI designation) within the Scheme during clearance.	Negative, certain, direct, reversible, temporary	Habitat reinstatement of 16.0 ha in temporary clearance areas (trees, shrub, grassland and sandy banks). The site will be subject to protection from incursion and pollution prevention measures will be implemented during construction of the Scheme.	Permanent positive effect	Large
		Long term: Permanent loss of 11.5 ha within SSSI (4.3 % of SSSI). The SPA suite of compensatory measures will lead to 22.5 ha of newly created heathland habitat and 24.9 ha of woodland enhancement	Habitat loss: negative, certain, direct, irreversible, permanent. Compensatory measures: positive, certain, direct and indirect, permanent.	Embedded ecological design (listed in impacts)		

Nature conservation resource	Value	Summary of impacts	Impact characterisation	Summary of mitigation	Residual effect	Significance category
		and enhancement of Bolder Mere within the SSSI. With further measures adjacent to the SSSI to include creation of 2.3 ha of wood pasture; planting of 9.8 ha of woodland and enhancement of 20.2 ha of woodland at Chatley Wood, Park Barn Farm and Hatchford End; creation of 5.8 ha of acid grassland/heathland. Although the SSSI will be reduced by 11.5 ha, the suite of compensatory measures provided will result in the retained habitats being in better condition to compensate for this loss, with an increase of 22.5 ha of heathland which is the main habitat for which the SSSI is designated.				
		Operation No impacts identified.	n/a	n/a	n/a	n/a
Ockham and Wisley LNR	County	Construction Short term: Temporary loss of 19.3 ha within LNR (5.8 % of	Negative, certain, direct, reversible, temporary	Habitat reinstatement of 19.3 ha in temporary clearance areas (trees, shrub, grassland and	Permanent positive effect	Moderate

Nature conservation resource	Value	Summary of impacts	Impact characterisation	Summary of mitigation	Residual effect	Significance category
		LNR).		sandy banks) The site will be subject to protection from incursion and pollution prevention measures will be implemented during construction of the Scheme.		
		Long term: Permanent loss of 12.7 ha within LNR (3.8 % of LNR). Resultant overall loss of land within LNR will be 12.7 ha, but embedded compensation measures provided as part of the Scheme will result in habitats of better condition to compensate for this loss.	Habitat loss: negative, certain, direct, irreversible, permanent. Compensatory measures: positive, certain, direct and indirect, permanent.	Embedded ecological design (listed in impacts)		
		Operation No impacts identified.	n/a	n/a	n/a	n/a
Elm Corner Woods SNCI	County	Construction Short term: Temporary loss of 1.2 ha within SNCI (11.8 % of SNCI).	Negative, certain, direct, reversible, temporary.	Habitat reinstatement of 1.2 ha. The site will be subject to protection from incursion and pollution prevention measures will be implemented during construction of the Scheme.	Permanent positive effect	Neutral

Nature conservation resource	Value	Summary of impacts	Impact characterisation	Summary of mitigation	Residual effect	Significance category
		Long term: Permanent loss of 1.7 ha within SNCI (16.7 % of SNCI). Minor habitat fragmentation between Elm Corner Woods SNCI and Wisley Airfield SNCI due to new permanent access road. Enhancement of remaining 7.3 ha of SNCI to create a more diverse woodland with open rides and a diverse woodland edge.[160]	Habitat loss and fragmentation: negative, certain, direct, irreversible, permanent. Habitat reinstatement and enhancement: positive, certain, direct and indirect, permanent.	Embedded ecological design (enhancement measures listed in impacts)		
		Operation No impacts identified.	n/a	n/a	n/a	n/a
Wisley Airfield SNCI	County	Construction Short term: Temporary loss of 1.6 ha within SNCI (5.7 % of SNCI). Potential to kill and injure reptiles and amphibians (see species sections below).	Negative, certain, direct, reversible, temporary.	Habitat reinstatement of 1.6 ha with tree and shrub planting. The site will be subject to protection from incursion and pollution prevention measures will be implemented during construction of the Scheme.	Permanent negative effect	Slight
		Long term: Permanent loss of 2.9	Negative, certain, direct, irreversible, permanent.	Embedded ecological design (measures listed in		

[160] Although areas of Elm Corner Woods SNCI fall outside the DCO boundary, woodland thinning works will be undertaken, as agreed by SWT.

Nature conservation resource	Value	Summary of impacts	Impact characterisation	Summary of mitigation	Residual effect	Significance category
		ha within SNCI (10.3 % of SNCI). Embedded measures include tree and shrub planting within Wisley Airfield SNCI to provide a buffer between Wisley Lane access road and the Elm Corner woods.	Habitat loss and fragmentation: negative, certain, direct, irreversible, permanent. Habitat reinstatement/ enhancement: neutral, certain, direct and indirect, permanent.	impacts)		
		Operation No impacts identified.	n/a	n/a	n/a	n/a
Bolder Mere Conservation Verge (CV005)	County	There will be no permanent or temporary land take within CV005 as a result of the Scheme. The SPA enhancement measures will result in the temporary disturbance to approximately 105 m of the verge to the east of Old Lane and 250 m of the verge to the west.	Potential disturbance to species: negative, probable, reversible, temporary.	Construction works, vegetation clearance and habitat enhancement measures within suitable toad habitats to be carried out under a PMW.	Neutral	Neutral
		Operation No impacts identified.	n/a	n/a	n/a	n/a
Ancient woodland (Elm Corner and Heyswood)	County	Construction Long term: Permanent loss of 0.4 ha of ancient woodland at Elm Corner and Heyswood. 9.8 ha of woodland	Negative, certain, direct, irreversible, permanent	Embedded ecological design (enhancement measures). The site will be subject to protection from incursion and pollution prevention measures will be implemented during	Permanent negative effect	Moderate

Nature conservation resource	Value	Summary of impacts	Impact characterisation	Summary of mitigation	Residual effect	Significance category
		planting and improved woodland linkages, soil translocation from ancient woodlands lost to provide seed bank for ancient woodland ground flora to establish in newly created areas. Enhancement of ancient woodland at Chatley Farm. Due to irreplaceable nature of ancient woodland, despite the increases in woodland area and enhancement of retained ancient woodland, there still remains a permanent loss of 0.4 ha of ancient woodland at Elm Corner and Heyswood.		construction of the Scheme.		
		Operation No impacts identified.	n/a	n/a	n/a	n/a
Veteran Trees	Regional[161]	Construction Long term: Permanent loss of up to 11 veteran trees: two confirmed losses with the loss/retention of the nine veteran trees to be	Negative, certain, direct, irreversible, permanent	Confirmation of tree to be lost/managed will be undertaken prior to construction and detailed within an Arboricultural Method Statement (AMS), that shall also confirm protection measures for	Permanent negative effect	Moderate

[161] Only T165 is assessed as being of regional value. All other individual veteran trees are of county or local value.

Nature conservation resource	Value	Summary of impacts	Impact characterisation	Summary of mitigation	Residual effect	Significance category
		determined during detailed design For every veteran tree loss, three trees of the same native species will be planted with space around them to develop into an open crown. Due to irreplaceable nature of veteran trees, despite the increase of trees planted there will still be a permanent negative effect as a result of the Scheme.		the retained trees. Any trees which have not been previously surveyed (or areas where design changes occur during detailed design) will be assessed following the methodology detailed in British Standard 5837: 2012 'Trees in relation to Design, Demolition & Construction – Recommendations' and this information will feed into the AMS.		
		Operation No impacts identified.	n/a	n/a	n/a	n/a
Habitats of Principal Importance (HPI) (outside of designated sites)	Local	Construction Short term: Temporary loss of 19.8 ha of wood pasture and parkland, of which 9.0 ha is also classified as lowland mixed deciduous woodland. Minor habitat fragmentation caused by construction of new access roads.	Negative, certain, direct, reversible, temporary.	Habitat reinstatement of 16.6 ha with a mixture of grassland, scrub and some trees. HPI's will be subject to protection from incursion and pollution prevention measures will be implemented during construction of the Scheme.	Permanent positive effect	Neutral
		Long term: Permanent loss of 21.9 ha of wood pasture and	Habitat loss and fragmentation: negative, certain, direct, irreversible,	Embedded ecological design (habitat creation and enhancement measures listed in		

Nature conservation resource	Value	Summary of impacts	Impact characterisation	Summary of mitigation	Residual effect	Significance category
		parkland, of which 10.3 ha is also classified as lowland mixed deciduous woodland. Minor habitat fragmentation caused by construction of new access roads. Embedded mitigation measures will create 22.5 ha of new heathland, 27.4 ha of woodland, 10.4 ha of wood pasture and enhancement of 45.1 ha of woodland.	permanent. Habitat reinstatement/ enhancement: positive, probable, direct and indirect, permanent.	impacts).		
		Operation No impacts identified.	n/a	n/a	n/a	n/a
Bolder Mere (part of Ockham and Wisley Commons SSSI)	National	Construction Short term: Temporary losses/disturbance of aquatic species associated with encroachment of the new retaining wall structure into the lake and potential for generation of suspended sediment. Temporary loss of terrestrial lake margin habitat and temporary	Negative, certain, direct, reversible, temporary.	Reinstatement of the trees and shrubs adjacent to the retaining wall. Translocation of valuable marginal reedbed habitat and lily pads from the footprint of the works to in front of the new retaining wall structure and measures to prevent fish entrainment within the working area. Measures will be implemented within the CEMP to address potential effects in relation	Permanent positive effect	Slight

Nature conservation resource	Value	Summary of impacts	Impact characterisation	Summary of mitigation	Residual effect	Significance category
		habitat fragmentation associated with vegetation clearance works. Temporary losses/disturbance of aquatic species and direct loss of trees and scrub to enhance the aquatic and marginal habitats of the lake. Temporary acoustic and visual disturbance to fish during construction of the retaining wall.		to acoustic disturbance that may arise from any piling activities. Avoidance of the use of percussive (hammer) piling in favour of softer alternatives (e.g. silent sheet piling, vibratory sheet piling) where ground conditions allow. Where not possible, soft start piling procedures should be utilised. The soft-start duration should be a period of not less than 20 minutes and should piling cease for a period greater than 20 minutes, the soft start procedure must be repeated. Bolder Mere will be subject to protection from incursion and pollution prevention measures will be implemented during construction of the Scheme including sediment control.		
		Long term: Direct permanent loss of open water associated with the encroachment of the new retaining wall structure into the lake and changes to the	Negative, certain, direct, reversible, permanent.	Habitat improvements on the shores of Bolder Mere and a programme of carp and bream removal. These measures will in-part enhance the waterbody's suitability for	Permanent positive effect	Slight

Nature conservation resource	Value	Summary of impacts	Impact characterisation	Summary of mitigation	Residual effect	Significance category
		marginal structure of the lake associated with enhancement works.		dragonflies, a designation feature of the SSSI and act to support the maintenance of a clear water habitat. A feasibility assessment will be undertaken to assess the potential for further improvements to the waterbody to be realised through the control of invasive species (Nuttall's waterweed and Turkish crayfish).		
		Operation Changes to current drainage system into Bolder Mere.	Positive, certain, direct and indirect, permanent.	The upgrade to the road drainage system includes the replacement of the existing direct untreated discharge to Bolder Mere with a treated discharge to a ditch downstream of the lake.	Permanent positive effect	Slight
Stratford Brook	County	Construction Short term: Temporary loss of riparian habitat due to vegetation clearance to construct new crossing and undertake strengthening of the existing culvert and to construct outfalls. Temporary losses and/or temporary disturbance to	Negative, certain, direct, reversible, temporary.	Reinstatement of vegetation and enhancement of the Stratford Brook which in the long term will result in improvements to in-channel and riparian habitat complexity at the locations of the enhancement works. Stratford Brook will be subject to protection from	Permanent positive effect	Slight

Nature conservation resource	Value	Summary of impacts	Impact characterisation	Summary of mitigation	Residual effect	Significance category
		aquatic species associated with construction activities and the potential requirement for dewatering, and the implementation of the restoration/enhancement measures along the Stratford Brook.		incursion and pollution prevention measures will be implemented during construction of the Scheme.		
		Long term: Loss of riparian habitat and reduced habitat connectivity beneath the bridge deck, plus a reduction in aquatic habitat quality and availability for aquatic species because of shading from the 27 m wide deck.	Negative, certain, direct and indirect, irreversible, permanent (at the site of the new crossing).	Watercourse and riparian enhancement works will be undertaken upstream of the new crossing structure. These works are not considered to fully mitigate for the effects of the new crossing on watercourse form and function. Residual negative effects will be addressed through undertaking compensatory works to the existing Stratford Brook South Culvert, to remove its impounding effects on 100-200 m of watercourse (thus improving flow and habitat conditions within, and upstream, of the new crossing footprint). In addition, the current barriers to fish and mammal passage at the	Permanent positive effect Depending on outcomes of the feasibility assessments these positive effects may be either related to the Stratford Brook within the redline boundary or elsewhere within the wider river catchment.	Slight

Nature conservation resource	Value	Summary of impacts	Impact characterisation	Summary of mitigation	Residual effect	Significance category
				Stratford Brook North and South Culverts will be mitigated through the provision of fish and mammal pass solutions. These compensatory and mitigation measures will only be undertaken following the outcome of a feasibility assessment should they prove to be both technically feasible and of "reasonable cost". Due to the uncertainty surrounding the outcome of the feasibility assessment a provision has been made to provide a commuted sum to the Environment Agency to undertake watercourse restoration works outside of the redline boundary within the River Wey catchment. The inclusion of a mammal pass on the new crossing structure will mitigate for potential effects on mammal passage at high flows.		
		Operation No impacts anticipated for the Scheme	n/a	n/a	n/a	n/a

Nature conservation resource	Value	Summary of impacts	Impact characterisation	Summary of mitigation	Residual effect	Significance category
River Wey and River Mole	County	Construction No direct works are occurring within, or adjacent to the River Wey and the River Mole, however, they are receiving watercourses for rivers and ephemeral ditches within the Scheme area. No impacts from the Scheme are anticipated.	Neutral, probable, direct, permanent	The site will be subject to protection from incursion and pollution prevention measures will be implemented during construction of the Scheme.	Permanent neutral effect	Neutral
		Operation Provision of flow attenuation and treatment of run-off as part of the drainage strategy has the potential to improve water quality and habitat conditions.	Neutral, probable, direct, permanent	n/a	Permanent neutral effect	Neutral
Ephemeral ditches	Local	Construction Short term: Temporary loss of riparian habitat due to vegetation clearance associated with construction works for culvert extensions, culvert replacements and ditch displacements. Temporary losses and/or temporary disturbance to	Negative, certain, direct and indirect, temporary.	The site will be subject to protection from incursion and pollution prevention measures will be implemented during construction of the Scheme.	Temporary negative effect	Neutral

Nature conservation resource	Value	Summary of impacts	Impact characterisation	Summary of mitigation	Residual effect	Significance category
		aquatic macrophytes and macroinvertebrates associated with construction activities. Temporary losses and/or temporary disturbance to aquatic species associated with implementation of the enhancement measures along Pond Farm South ditch and Pond Farm West ditches and the ditch associated with Chatley Wood pond.				
		Long Term: There will be permanent habitat fragmentation and loss of connectivity resulting from the placement of new culverts, extension of existing culverts and loss of ditch extents. In summary around 820 m of ephemeral headwater ditches will be lost or transposed by the Scheme in the Wey catchment. At the same time around 2260 m of pre-embankment drain will be created. Approximately 820 m of	Negative, certain, direct and indirect, permanent.	Where practicable the pre-embankment drains will be designed in accordance with the generic guidance on the principles of WFD compliant design set out in Chapter 5 of WFD Assessment report TR010030/APP/5.4. In addition, compensatory habitat will be provided through the creation of improved habitat within Chatley Wood Pond, Pond Farm South and Pond Farm West ditches. This will create improved habitat conditions for a variety of aquatic species including Odonata.	Permanent positive effect	Slight

Nature conservation resource	Value	Summary of impacts	Impact characterisation	Summary of mitigation	Residual effect	Significance category
		ephemeral headwater ditch will be lost or transposed by the Scheme within the River Wey catchment, and approximately 420 m within the River Mole catchment.		An improved drainage system is to be implemented as part of the Scheme, that will, wherever possible keep runoff from highway and non-highway surfaces separate. While approximately 1240 m of ephemeral headwater ditch will be lost or transposed as part of the Scheme (within both the River Mole and River Wey catchments), overall 2160 m of pre-earthwork drain conveying water solely from non-highway surfaces are included in the Scheme design for both the River Wey and River Mole catchments.		
		Operation Provision of flow attenuation and subsequent treatment of run-off as part of the drainage strategy will improve water quality and habitat conditions.	Neutral, certain, direct and indirect, permanent	n/a	Permanent neutral effect	Neutral
Chatley Wood Pond	Local	Construction Short term: Localised habitat losses associated with	Neutral, probable, direct, permanent.	None required.	Permanent positive effect	Slight

Nature conservation resource	Value	Summary of impacts	Impact characterisation	Summary of mitigation	Residual effect	Significance category
		proposed habitat enhancement works. This includes tree thinning and excavation of existing flow path to increase pond capacity and enhance pond ecology.				
		Operation No impacts anticipated for the Scheme	n/a	n/a	n/a	n/a
Manor Pond	Local	Construction Short term: There will be localised losses and disturbance to benthic aquatic macroinvertebrates and macrophytes resulting from construction of the wall.	Negative, certain, direct and indirect, reversible, temporary.	The site will be subject to protection from incursion and pollution prevention measures will be implemented during construction of the Scheme.	Temporary negative effect	Slight
		Long term: Direct permanent loss of terrestrial lake margin habitat and temporary habitat fragmentation associated with the requirement to clear trees and shrubs adjacent to the retaining wall.	Negative, certain, direct and indirect, irreversible, permanent.	None	Permanent negative effect	Slight
		Operation No impacts anticipated	n/a	n/a	n/a	n/a

Nature conservation resource	Value	Summary of impacts	Impact characterisation	Summary of mitigation	Residual effect	Significance category
		for the Scheme				
Bats	County	Construction Short term: Loss of two roost sites, loss of foraging habitat. Loss of trees with roosting potential. Temporary reduction in foraging resource. Temporary disturbance (noise/light) during construction	Negative, certain, direct, reversible, temporary.	Habitat reinstatement. Embedded ecological design (replacement roosts, replacement potential roost features, habitat enhancement and creation). Trees with potential to support roosting bats will be felled under PMW. Felling activities within enhancement/replacement land will avoid loss of trees with roosting potential where appropriate. One Schwegler bat box will be provided for each felled tree with moderate/high roosting potential. The existing Clearmount overbridge will not be demolished until the replacement bridge is constructed. Night working will be avoided where possible. Any lighting required for construction will be designed sensitively. New road lighting will be	Temporary negative effect Permanent positive effect	Neutral

Nature conservation resource	Value	Summary of impacts	Impact characterisation	Summary of mitigation	Residual effect	Significance category
				designed sensitively.		
		Long term: Provision of mitigation roost sites. Enhancement of habitats as a result of compensation measures, leading to increased food resource.	Positive, probable, direct, permanent.	Implementation of a Landscape and Ecology Management and Monitoring Plan (Appendix 7.20) for the maintenance/ management of newly created habitats for use by foraging and commuting bats.		
		Operation Creation of dark corridors adjacent to NMU bridges as a result of lighting design. These dark corridors will allow bats and other nocturnal animals to utilise these bridges for commuting.	Positive, probable, direct, permanent.	n/a	Permanent positive effect	Slight
Great crested newt	Local	Construction Short term: Minor temporary loss of terrestrial habitat (approximately 9 % of available terrestrial habitat within 250 m of breeding waterbodies) Low risk of killing and injury to individual great crested newt during construction and habitat enhancement works	Neutral, certain, direct, temporary	Habitat reinstatement. Clearance of habitat under a PMW for great crested newt. Creation of log piles where appropriate.	Neutral effect	Neutral

Nature conservation resource	Value	Summary of impacts	Impact characterisation	Summary of mitigation	Residual effect	Significance category
		Long term: Minor permanent loss of habitat (approximately 0.1 % of available terrestrial habitat within 250 m of breeding waterbodies). Embedded design including the improvement of water quality at Bolder Mere (W9) and improvement of marginal habitat and removal of carp may provide increased opportunities for breeding and foraging.	Neutral, certain (habitat loss), probable (improvement to water quality, risk to individual newts), direct, permanent.	Embedded ecological design (measures listed in impacts).		
		Operation Low risk of killing and injury of individual great crested newts during maintenance and management activities	Negative, unlikely, direct, temporary	Protection of species to be included in management and maintenance plans.	Neutral effect	Neutral
Reptiles: sand lizards	Regional	Construction Short term: It is considered unlikely that the sand lizard population will be affected during construction.	Neutral, likely, direct, permanent.	Clearance of habitat under PMW for reptiles. Construction exclusion fencing will be used to prevent encroachment onto adjacent habitats. Potential use of reptile fencing (to be determined at detailed design) to ensure sand lizards do not	Permanent positive effect	Moderate

Nature conservation resource	Value	Summary of impacts	Impact characterisation	Summary of mitigation	Residual effect	Significance category
				move into the working area.		
		Long term: Creation of 22.5 ha of heathland habitat suitable for sand lizards, of which 13.2 ha are located adjacent to Chatley Heath.	Positive, probable, direct, permanent.	Embedded ecological design (habitat creation).		
		Operation Low risk of killing and injury of individual reptiles during maintenance and management activities	Negative, unlikely, direct, temporary	Protection of species to be included in management and maintenance plans.	Neutral effect	Neutral
Reptiles: common species of reptile	Local	Short term: Permanent loss of habitat of low suitability for reptiles. Extensive areas of retained habitat suitable for reptiles. Minor habitat fragmentation caused by construction of new access roads with potential to lead to isolation of discrete populations. Potential killing and injury to reptiles during construction and habitat enhancement works.	Negative, certain, direct and indirect reversible, temporary.	Clearance of habitat under PMW for reptiles. Construction exclusion fencing will be used to prevent encroachment onto adjacent habitats. Creation of log piles where appropriate.	Permanent positive effect	Slight

Nature conservation resource	Value	Summary of impacts	Impact characterisation	Summary of mitigation	Residual effect	Significance category
		Long term: Creation of 22.5 ha of heathland habitat and open glades within woodland areas suitable for common species of reptile.	Positive, probable, direct, permanent	Embedded ecological design (habitat creation).		
		Operation Low risk of killing and injury of reptiles during maintenance and management activities	Negative, unlikely, direct, temporary	Protection of species to be included in management and maintenance plans.	Neutral effect	Neutral
Breeding bird assemblage (notable bird species not including SPA qualifying species)	Local	Construction Short term: Breeding bird assemblage will be displaced and there is the potential for loss of nest sites. Damage or destruction of nests during clearance. Temporary disturbance during construction.	Negative, likely, direct and indirect reversible, temporary	Clearance of habitat under a PMW for nesting birds.	Temporary negative effect Permanent positive effect	Neutral
		Long term: Creation and enhancement of habitats provided as part of the Scheme including the provision of nest boxes.	Negative, likely, direct and indirect, permanent	Habitat enhancement works carried out under a PMW for nesting birds.		
		Operation	Negative, unlikely, direct,	Protection of species to be included in management	Neutral effect	Neutral

Nature conservation resource	Value	Summary of impacts	Impact characterisation	Summary of mitigation	Residual effect	Significance category
		Potential to damage individual nests during on-going management activities in habitats.	permanent	and maintenance plans.		
Spotted flycatcher	County	Construction Short term: Vegetation clearance of 24.9 ha of Scots pine plantation is likely to result in the loss of up to three spotted flycatcher territories.	Negative, likely, direct and indirect reversible, temporary	Habitat clearance and enhancement works carried out under a PMW for nesting birds. Embedded environmental design (habitat enhancement)/	Temporary negative effect Permanent neutral effect	Neutral
		Long term: Creation and enhancement of habitats provided as part of the Scheme including enhancement of retained woodland and planting of new woodland and open nest boxes to be provided for spotted flycatcher.	Positive, likely, direct and indirect, permanent.			
		Operation Potential to damage individual nests during on-going management activities in habitats.	Negative, unlikely, direct, permanent	Protection of species to be included in management and maintenance plans.	Permanent neutral effect	Neutral
Badgers	Local	Construction Short term: Permanent partial loss and temporary closure of	Negative, certain, direct and indirect reversible, temporary	Creation of artificial setts. Habitat clearance and construction carried out under PMW or licence	Temporary negative effect Permanent negative effect	Neutral

Nature conservation resource	Value	Summary of impacts	Impact characterisation	Summary of mitigation	Residual effect	Significance category
		one main badger sett and permanent loss of one subsidiary sett and four outlier setts. Artificial sett to be created to compensate for the temporary closure and partial loss of the main sett. Temporary damage of one subsidiary sett and three outlier setts. Additional 11 setts (two main, two subsidiary and seven outlier) as risk of damage. Permanent and temporary loss of habitat used by commuting and foraging badgers. Temporary disturbance during construction.		(where necessary). Embedded environmental design to reinstate and enhance habitat. [redacted] sing buffer zones and fencing. Excavations will be covered/closed or provided with a ramp overnight to prevent any animals becoming trapped. Felling activities will avoid active badger setts.		
		Long term: Woodland creation and enhancement, creation and restoration of heathland habitat suitable for badgers.	Neutral, probable, direct, permanent.	Felling activities will avoid active badger setts.		
		<u>Operation</u> Movement of cars on new/improved access roads may lead to badger road deaths. Already a risk on	Neutral (incidental only), unlikely, but remains a possibility, direct, irreversible, permanent.	None	Neutral	Neutral

Nature conservation resource	Value	Summary of impacts	Impact characterisation	Summary of mitigation	Residual effect	Significance category
		existing access roads.				
Terrestrial invertebrates	Local	Construction Short term: Loss of notable invertebrates due to clearance of vegetation for the highways proposals and in areas targeted for enhancement.	Negative, probable, direct, reversible, temporary.	Embedded ecological design measures (habitat enhancement).	Temporary adverse effect but overall a permanent positive effect	Neutral
		Long term: Creation and enhancement of habitats provided as part of the Scheme	Positive, probable, direct, permanent.	Embedded ecological design measures (habitat creation and enhancement).		
		Operation No impacts anticipated.	n/a	n/a	n/a	n/a

7.13 Cumulative effects

7.13.1 Chapter 15: Assessment of cumulative effects identifies the potential plans and projects that could have cumulative effects with the M25 junction 10/A3 Wisley interchange Scheme. This assessment takes a number of plans and projects through to Stage 2 for further consideration. All plans and projects taken to Stage 2 and within 2 km of the Scheme have been assessed for cumulative ecological effects in Table 7.12 below.

Table 7.9: Cumulative effects

Development	Distance from site (closest point)	Description	Potential cumulative impact (Yes/No)	Justification
M25 junction 10 - 16 Smart Motorway Programme (SMP)	Within the Scheme	M25 junction 10 to junction 16 includes upgrading the M25 between junction 10 (A3) and junction 16 (M40) through a mixture of enhancements, including hard shoulder running between junctions 15 and 16. The scope also includes gantry works at junction 10.	No	The SMP has been taken into account for the traffic modelling and therefore in combination effects on air quality and noise have been considered. This project will not lead to increased land take as all requirements have been allowed for within the Scheme, and will not alter access to the SPA/SSSI/LNR.
The former Wisley Airfield	Partly within the Scheme	Residential led mixed use development, allocated for: Approximately 2000 homes (C3), including some specialist housing and self-build plots, and approximately 100 sheltered/Extra Care homes (C3 use), and 8 Traveller pitches, and approximately 1,800 m^2 of employment floor space (B1a), and approximately 2,500 m^2 of employment floor space (B2/B8), and approximately 500 m^2 of comparison retail (A1), and approximately 600 m^2 of convenience retail (A1), and approximately 550 m^2 services in a new Local Centre (A2 -A5), and approximately 500 m^2 of community uses in a new Local Centre (D1), and two form entry primary school (D1), and a secondary school (D1) (four form entry, of which two forms are needed for the housing on the site and two for the wider area).	No	An appeal on a planning application was dismissed by the inspector on 13 June 2018: App No. 15/P/00012. The footprint of the former Wisley Airfield project overlaps with the temporary land take area of the Scheme. This consists of a large area of hardstanding that will be used to store spoil throughout the duration of the construction period. The two projects cannot take place at the same time as they share the same space. Therefore, there will be no in combination impacts resulting from construction works or combined land take loss (i.e. the temporary land take of the Scheme will be reinstated prior to the Wisley Airfield project commencing). The formal Wisley Airfield proposals will bring an extra 2000 homes to the local areas. The project will not receive planning consent unless it can be demonstrated that it will not cause any increase in recreational pressure on the SPA. The Wisley Airfield project proposes to do this by providing a Suitable Alternative Natural Greenspace (SANG). The Scheme will not improve user access to the SPA/SSSI/LNR and will provide new NMU routes and replacement land outside the

Development	Distance from site (closest point)	Description	Potential cumulative impact (Yes/No)	Justification
				designated areas. Therefore, both projects will not increase, and possibly even reduce recreational pressure, and there will be no in combination impact. This project has been included in the traffic model for the Scheme and therefore, air quality and noise impacts have already been accounted for. In conclusion, should the Wisley Airfield project receive planning permission, it will not have in combination effects with the Scheme.
Land to the East of South Cottage, White Horse Lane, Ripley, GU23 6BB	Approximately 0.62 km from the Scheme.	Outline planning application for the demolition of existing petrol filling station, car sales buildings and dilapidated workshops and the construction of up to 26 residential units to the rear and 2 retail/commercial units on the High Street frontage (for flexible A1, A2, A3 or A4 use) and associated car parking and landscaping all matters reserved except access.	No	This a small development of an existing site, providing up to 26 residential units. There will be no overlap or adjacent land take, and there will be no in combination land take effects. The small number of properties will not lead to increased recreational pressure on the designated sites that fall within the Scheme. This small development will not have in combination impacts with the Scheme on biodiversity.
Royal Horticultural Society (RHS) Garden, Wisley Lane, Wisley, Woking, GU23 6QS	Parts of the RHS site are within the Scheme	Erection of new part single-storey part two-storey building accommodating retail, entrance and visitor facilities and alterations to the car parking and hard and soft landscaping and following the demolition of the existing plant centre, the extensions to the Laboratory building, toilet blocks, Aberconway Cottage and part of Aberconway House.	No	This development is contained within the existing RHS Wisley site, and the impacts of the development will be confined to within the boundary of the RHS Wisley Site. Therefore, this development will not have in combination effects with the Scheme.
Royal Horticultural Society Garden, Wisley	Part of the RHS site are within the	Demolition of existing buildings and erection of a two-storey building	No	This development is contained within the existing RHS Wisley site, and the impacts of the

Development	Distance from site (closest point)	Description	Potential cumulative impact (Yes/No)	Justification
Lane, Wisley, Woking, GU23 6QS	Scheme	accommodating science, education, research and restaurant facilities, associated landscaping including a landscape bund and other works associated with the development.		development will be confined to within the boundary of the RHS Wisley site. Therefore, this development will not have in combination effects with the Scheme.
Land at Garlick's Arch, Send Marsh Burnt Common and Ripley Site Allocation Policy A4	Approximately 1.7 km from the Scheme	The site is allocated for approximately 400 homes (C3), including some self-build and custom house building plots, and 6 Travelling Show people plots (sui generis).	No	This is allocated land within the Guildford Borough Proposed Submission Local Plan: strategy and sites 2017. This development has been included in the traffic model for the Scheme and therefore, any potential air quality and noise impacts have already been accounted for. It is possible that the development could lead to increased visitors to the SPA/SSSI/LNR. However, the Scheme will not improve user access to the SPA/SSSI/LNR and will provide new NMU routes and replacement land outside the designated areas. Therefore, the Scheme will not increase, and may possibly even reduce recreational pressure, and there will be no in combination impact with this allocated development. This Site Allocation is included within the Local Plan HRA162 and will also be assessed and designed to avoid impacts on the SPA.
Former San Domenico Restaurant 2017/0524	Within the Scheme	Demolition of existing main building and the construction of the new petrol filling station (Sui Generis) with ancillary convenience store (Use A1) and food to go outlet (Use Class A5), 4 no. pump islands, canopy, underground tanks, revisions to vehicular	No	This proposal falls within the DCO boundary of the Scheme, and will be used as a site compound throughout construction. The Scheme will also require the demolition of the existing main building. Therefore, at the end of construction, the site will be returned to Euro

[162] Habitats Regulations Assessment for Guildford Borough Proposed Submission Local Plan: Strategy and Sites (2018 update)

Development	Distance from site (closest point)	Description	Potential cumulative impact (Yes/No)	Justification
		access, parking and circulation arrangements, landscaping and associated works.		Garages Limited without the main building and ready for development (subject to planning permission). Both projects share the same footprint and require the removal of the main building, so there will be no in combination impact as a result of the Scheme.
Enfin, Painshill Farm, Portsmouth Road, Cobham Surrey KT11 1DN	Abutting the Scheme	A revised application to provide a 70 bed care home with integrated communal and support facilities, landscaped residents' gardens, staff areas, refuse storage, parking and landscaping following demolition of existing houses.	No	This site consists of an island of land bound by the A3, A245 and Convent Lane. Due to these surrounding roads, the only land take resulting from the Scheme that this site is directly connected to is some minor verge clearance on the slips of the A3/A245 junction. Any reptiles that were displaced from the verge in this location during the construction of the Scheme would be expected to relocate into the land within the Enfin site. However, the verge clearance for the Scheme will on be temporary, and reptiles will be able to return once works have completed, and the Enfin project will need to assess and mitigate the impacts of the loss of this island of land on protected species, including reptiles. It is possible that the development could lead to increased visitors to the SPA/SSSI/LNR. However, the Scheme will not improve user access to the SPA/SSSI/LNR and will provide new NMU routes and replacement land outside the designated areas. Therefore, the Scheme will not increase, and may possibly even reduce recreational pressure, and there will be no in combination impact with this allocated development.
Feltonfleet School	Adjacent to and	Two-storey detached building (Music	No	This project will mainly consist of the

Development	Distance from site (closest point)	Description	Potential cumulative impact (Yes/No)	Justification
Byfleet Road Cobham Surrey KT11 1DR	within the Scheme	Facility) with single storey glazed link and new pedestrian access, conversion of Leighton House to ancillary staff accommodation, internal refurbishment of David Rutherford Centre, two-storey detached building (Digital Technology & Art Hub), single storey building and 4 m high brick wall enclosure to provide rifle range, single storey maintenance shed, rearrangement of maintenance yard, single storey detached building to provide new Head's House, cricket nets and replacement boundary wall along Byfleet Road following the demolition of part two/part single storey detached building (Keith Leighton Memorial Hall), single storey store and toilet, attached garage to Leighton House and existing rifle range and open store building.		refurbishment or replacement of existing buildings. However, it will require the removal of a number of trees adjacent to the area of proposed tree removal for the access road being created as part of the Scheme. At a site scale, these projects will have an in combination impact on the loss of trees. However, this impact is extremely localised and will not cause an in combination effect on any veteran trees, HPIs or notable species.
Land surrounding West Hall, Parvis Road, West Byfleet Site allocation GB15	Approximately 1.1 km from the Scheme	Allocated use is residential including affordable house. 592 dwellings proposed. The site is 29.3 ha.	No	This is allocated land within the Woking Borough Council Site Allocations Development Plan Document (June 2015). This development has been included in the traffic model for the Scheme and therefore, any potential air quality and noise impacts have already been accounted for. It is possible that the development could lead to increased visitors to the SPA/SSSI/LNR. However, the Scheme will not improve user access to the SPA/SSSI/LNR and will provide new NMU routes and replacement land outside the designated areas. Therefore, the Scheme will not increase, and may possibly even reduce recreational pressure,

Development	Distance from site (closest point)	Description	Potential cumulative impact (Yes/No)	Justification
				and there will be no in combination impact with this allocated development. This Site Allocation is included within the Woking Borough Local Plan HRA[163] and will also be assessed and designed to avoid impacts on the SPA.
Broadoaks, Parvis Road, West Byfleet PLAN/2016/1003	Approximately 1.4 km from the Scheme	The site is 14.7 ha. Allocated for Quality offices and research premises, residential including Affordable Housing and housing to meet the accommodation needs of the elderly. Proposed land use B1a, 16722 proposed GFA m^2 and 1323.8 proposed jobs FTE. Full planning application for the change of use of vacant class B1 business building [Sherwood House] to Class D1 secondary school with playing field and Multi Use Games Area (MUGA), floodlighting, landscaping, internal roads, car, mini bus and cycle parking areas, restoration and change of use of Model Dairy to a shop/office [ancillary to the use of the school]; demolition and removal of all former MOD and other buildings, hardstanding and structures across the site apart from the part demolition, restoration and conversion of Broadoaks House to create two dwellings and erection of two new garages, part demolition, restoration and extension to the Coach House to create six dwellings and restoration and reuse of the two Lodge Houses as	No	This is allocated land within the Woking Borough Council Site Allocations Development Plan Document (June 2015). This development has been included in the traffic model for the Scheme and therefore, any potential air quality and noise impacts have already been accounted for. It is possible that the development could lead to increased visitors to the SPA/SSSI/LNR. However, the Scheme will not improve user access to the SPA/SSSI/LNR and will provide new NMU routes and replacement land outside the designated areas. Therefore, the Scheme will not increase, and may possibly even reduce recreational pressure, and there will be no in combination impact with this allocated development. This Site Allocation is included within the Woking Borough Local Plan HRA and will also be assessed and designed to avoid impacts on the SPA.

[163] Woking Borough Council Site Allocations DPD: habitats Regulations Assessment (2018)

Development	Distance from site (closest point)	Description	Potential cumulative impact (Yes/No)	Justification
		independent dwellings and erection of 2 new garages, erection of 151 new dwellings including 36 affordable dwellings and associated garages, together with new altered access points to Parvis Road and Hobbs Close and separate pedestrian/cycle link from Parvis Road, associated internal roads, fencing including acoustic fencing to Parvis Road frontage and hard and soft landscaping throughout the site and off site highway works.		
Library, 71 High Road, Byfleet Site Allocation UA1	Approximately 1.3 km from the Scheme.	0.1 ha site allocated for mixed use development to comprise residential and replacement library and community uses. Estimated yield of 12 dwellings.	No	This is a small development of 12 dwellings. Therefore, it will not lead to increased visitor pressure on the SPA/SSSI/LNR, nor will it lead to changes in the ARN that would have in combination impacts on air quality or noise. The development is not connected to the Scheme and will not have any in combination land take impacts as a result of the Scheme.
Byfleet Road, New Haw IE1 Site 51 / HO6/7	Approximately 0.65 km from the Scheme	Allocated for employment use. This site of 7.9 ha will deliver a high-quality employment development that will: • Provide a minimum of 20,000 net additional m^2 of B1c/B8 floorspace in units of no greater than 1000 m^2 • Include measures to mitigate the impact of development on the local road network Provide or contribute to any other infrastructure identified at application stage which is necessary to make the site acceptable in planning terms.	No	This is allocated land within the Runnymede Borough Council Draft Local Plan 2015-2030. The development is not connected to the Scheme and will not have any in combination land take impacts as a result of the Scheme. It is possible that the development could lead to increased visitors to the SPA/SSSI/LNR. However, the Scheme will not improve user access to the SPA/SSSI/LNR and will provide new NMU routes and replacement land outside the designated areas. Therefore, the Scheme will not increase, and may possibly even reduce recreational pressure, and there will be no in combination impact with

Development	Distance from site (closest point)	Description	Potential cumulative impact (Yes/No)	Justification
				this allocated development. This Site Allocation is included within the Runnymede Borough Local Plan HRA[164] and will also be assessed and designed to avoid impacts on the SPA.

[164] Appropriate Assessment Report Pursuant to the Conservation of Habitats and Species Regulations 2017 on the Likely Significant Effects and Adverse Effects on Integrity of Runnymede Borough Council's Local Plan: HRA Screening and Appropriate Assessment Report (2018)

7.14 NPSNN compliance

7.14.1 The assessment for this Scheme has considered potential impacts relevant to the Biodiversity and Ecological Conservation section (paragraphs 5.20 – 5.38) of the National Policy Statement for National Networks (NPSNN), as set out below.

7.14.2 This report provides an assessment of the significance of effects of the Scheme on European, nationally and locally designated sites of ecological conservation importance, protected species and notable habitats and other species identified as being of principal importance for the conservation of biodiversity.

7.14.3 It is considered that the potential mitigation and compensation options being proposed for this Scheme demonstrate a positive effort to take opportunities to conserve and advance biodiversity (for example, the creation of habitat linkages between heathland areas and the creation of new areas of connected habitats, including heathland and woodland). This is in line with the Government's biodiversity strategy, as set out in Biodiversity Strategy 2020: A Strategy for England's Wildlife and Ecosystem Services, and referenced in the NPSNN.

7.14.4 In addition, it is considered that the potential mitigation and compensation options being proposed for this Scheme comply with the bullet points listed in paragraph 5.36 of the NPS:

- During construction, they will seek to ensure that activities will be confined to the minimum areas required for the works;
- During construction and operation, best practice will be followed to ensure that risk of disturbance or damage to species or habitats is minimised (including as a consequence of transport access arrangements);
- Habitats will, where practicable, be restored after construction works have finished;
- Developments will be designed and landscaped to provide green corridors and minimise habitat fragmentation where reasonable; and
- Opportunities will be taken to enhance existing habitats and, where practicable, to create new habitats of value within the site landscaping proposals.

7.14.5 In accordance with the NPSNN (paragraph 5.32), any loss of ancient woodland and veteran trees has been avoided or minimised as far as possible. However, the Scheme will result in the unavoidable loss of 0.4 ha of ancient woodland and potential loss of 11 veteran trees; two confirmed losses with the loss/retention of the nine veteran trees to be determined during detailed design.

7.15 Monitoring

7.15.1 The monitoring of the SPA compensatory measures varies between land parcel types.

7.15.2 As part of the 20 year management of the SPA compensation land, the development of the planted trees will be monitored and actions will be taken to rectify any issues, such as failed trees or damaged tree guards. Botanical monitoring will be undertaken every five years of the 20 year management period

to record any changes in NVC habitat types.

7.15.3 The heathland creation within the SPA enhancement areas will undergo botanical monitoring every five years of the 15 year management period to record any changes in NVC habitat types.

7.15.4 The woodland enhancement within the SPA enhancement areas will undergo botanical monitoring every year for the first five years, and then in years 10 and 15 of the 15 year management period to record any changes in vegetation structure.

7.15.5 Habitat creation areas throughout the Scheme will also be monitored. Monitoring of species-rich grassland and marginal/emergent plants to be carried out through annual botanical monitoring during the five year management period. The requirement is that biodiversity is being optimised by this management plan, if not, remedial actions are required. Tree and shrub planting will be monitored in years one, three and five to assess the condition and identify if any remedial actions are required. For further details refer to Appendix 7.19 SPA Management and Monitoring Plan and Appendix 7.20 Landscape and Ecology Management and Monitoring Plan.

7.15.6 Monitoring will be required as part of the licence conditions for EPS (i.e. bats). A five-year aftercare period is proposed post-construction during which time the bat mitigation structure will be structurally amended as instructed by a bat licensed ecologist (should it be required), based on the results of the monitoring surveys to ensure its continued functionality. During the five-year period, the structure will be inspected by a bat licensed ecologist and any damage to the mitigation structure or damaged or lost bat boxes will be mended or replaced. Monitoring of the mitigation structure will be conducted for two years once it is in place (in 2024 and 2025) and will comprise of one dusk emergence/ dawn-re-entry survey in the period May-August, in each year.

7.15.7 The bat boxes associated with tree 155 to compensate for the loss of the noctule hibernation roost will also be monitored in two years post-construction (in 2024 and 2025) by undertaking an inspection of the boxes during the winter period (January-February), once in each year.

7.15.8 No monitoring is proposed for the other bat boxes near B1 that will be established as part of the mitigation/compensation and enhancement measures for the Scheme. All bat boxes will be inspected yearly for the first five years post-construction and mended/replaced where necessary. Future monitoring of the bat boxes for conservation purposes will be explored with the Surrey Bat Group.

7.15.9 Monitoring of Stratford Brook to include:

- Aquatic macroinvertebrate surveys to be undertaken downstream of the new road bridge to assess any changes in species assemblages during and following construction. Surveys to be undertaken:
  - Pre construction – spring 2020;
  - During construction – spring 2021; and
  - Post construction – spring 2022.

- River Corridor Surveys following completion of the new road bridge and enhancement works, including fixed point photography before works and on completion of works, to document changes and improvements from the Scheme.

7.15.10 Monitoring of Bolder Mere to include:

- Reed bed re-establishment survey, following the translocation of the reed bed. Twice yearly surveys will be required to understand the recovery of the reed bed and any remedial works required. Surveys will be undertaken in May and September.
- Fixed point photography, supplemented with detailed field notes to document the changes within the reed bed at the northern shore, and the enhancement works along the southern shore

7.16 Summary

7.16.1 The potential ecological impacts of the Scheme have been assessed following appropriate methodologies. Impacts to designated sites, habitats and species within the study area have been characterised and significant residual effects have been identified.

7.16.2 Potential cumulative effects have been assessed with the conclusion that there will be no cumulative effects as a result of the Scheme.

7.16.3 It can also be confirmed that the Scheme is in compliance with NPSNN.

7.16.4 Due to the positioning of the highways proposals, the Scheme leads to loss of 240.6 ha of land (139.2 ha permanent land take and 101.4 ha temporary land take), including land from an SPA, SSSI, LNR and two SNCIs.

7.16.5 In order to ensure that all required biodiversity mitigation, compensation and enhancement proposals are secured as part of the DCO process, the Scheme encompasses all land within the DCO boundary. Therefore, as well as the highways proposals and any associated development, all biodiversity mitigation, compensation and enhancement proposals to be implemented within the DCO boundary are also included as part of the design of the Scheme. As these are requirements of the Scheme and fall within the DCO boundary, all necessary mitigation, compensation and enhancement measures are embedded into the design.

7.16.6 In the short term during construction of the Scheme, there will be a significant adverse effect on spotted flycatcher. However, in the long term, once habitats created during construction have become established there will be neutral effects on spotted flycatcher.

7.16.7 In the long term there will be a significant residual positive impact on the qualifying species of the Thames Basin Heaths SPA as a result of the measures to be implemented as part of the SPA compensation package. Further details regarding the potential impacts in relation to the Thames Basin Heaths SPA and the suite of compensatory measures are described fully in TR010030 5.3 Annex C: Habitats Regulations Assessment Compensation Annex C: Selection of the Suite of Compensatory Measures.

7.16.8 As well as significant positive residual effects on Thames Basin Heaths SPA, in the long term there will also be positive effects on Ockham and Wisley Commons SSSI; Ockham and Wisley LNR; Bolder Mere; and reptiles including sand lizard and common species.

7.16.9 However, there will be permanent residual adverse effects of moderate significance on ancient woodland and veteran trees.

7.16.10 In addition, there will be permanent residual adverse effects of slight significance on Wisley Airfield SNCI and Manor Pond.

7.16.11 During design and consultation, some additional potential enhancement measures have been identified that have the potential to provide additional biodiversity enhancements over and above those required to mitigate or compensate for the potential impacts of the Scheme. As these measures will subject to funding through separate designated funds, the potential beneficial effects are not included in the impact assessment.

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