Volume 1, Chapter 8

Biodiversity
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8. **BIODIVERSITY**

8.1 **Introduction**

8.1.1 This chapter of the Preliminary Environmental Information Report (PEIR) presents the preliminary results of the assessment of likely significant effects of the DCO Project with respect to biodiversity, including terrestrial ecology, aquatic ecology and ornithology. It should be read in conjunction with the DCO Project description provided in Chapter 6: DCO Project description\(^1\) and the relevant parts of other chapters, namely:

1. **Chapter 7: Air quality and odour** – predictions of the levels of pollutant concentrations and deposition rates which inform the assessment of the effects of nitrogen on sites designated for nature conservation and the species that they support

2. **Chapter 14: Land quality** – predictions of the levels of sediment and pollutants that may be lost to the environment which inform the assessment of effects on sensitive habitats and species

3. **Chapter 17: Noise and vibration** - predictions of the levels of noise and vibration created during construction and operation which inform the assessment of effects on sensitive species

4. **Chapter 21: Water environment** – predictions of the effects on groundwater levels, surface water run-off and river form and function which inform the assessment of effects on sensitive aquatic, riparian and terrestrial habitats and species

5. **Chapter 23: Bibliography**

6. **Glossary of terms and list of abbreviations.**

8.1.2 The Habitats Regulations Assessment (HRA) Screening Report is provided at Appendix 8.5: HRA screening report, Volume 3. This report provides the first stage of the HRA as required by the Conservation of Habitats and Species Regulations 2017. The HRA focuses solely on the designated features of European sites\(^2\) and follows a methodology that is necessarily different to that

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\(^1\) Particularly with regards the green infrastructure shown on the Preferred Masterplan as this is key to the delivery of the environmental measures described in Sections 8.7 and 8.10.

\(^2\) European sites include Special Protection Areas (SPA), Special Areas of Conservation (SAC), candidate SACs and Sites of Community Importance (SCI); these sites are collectively referred to as Natura 2000 sites. Potential SPAs (pSPA), possible SACs (pSACs), Ramsar sites and proposed Ramsar sites are also included in accordance with national planning policy.
presented within this chapter in order to follow due process. European sites are considered both within the Environmental Impact Assessment (EIA) and HRA processes, and although the end conclusions are common, the steps taken to reach these end points and the terms used to describe the outcomes differ.

8.1.3 This technical chapter has a structure that differs from others within this PEIR to reflect Ecological Impact Assessment (EcIA) guidance provided by the Chartered Institute of Ecology and Environmental Management (CIEEM, 2018) and the requirements described within the Airports National Policy Statement (see Section 8.2: Relevant legislation, planning policy and other important and relevant matters). The chapter describes:

1. The legislation, planning policy and other documentation that has informed the assessment (Section 8.2: Relevant legislation, planning policy, and other important and relevant matters)

2. The outcome of consultation and external engagement that has been undertaken to date, including how matters relating to biodiversity within the Scoping Opinion received in July 2018 have been addressed (Section 8.3: Scoping and engagement)

3. The methods used for the baseline data gathering (Section 8.4: Methodology for baseline data collection)

4. The overall baseline (Section 8.5: Overall baseline)

5. The scope of the assessment for biodiversity (Section 8.6: Scope of the assessment)

6. Embedded environmental measures relevant to biodiversity (Section 8.7: Embedded environmental measures)

7. The assessment methods used to inform the PEIR (Section 8.8: Assessment methodology for the PEIR)

8. The assumptions and limitations of the PEIR assessment (Section 8.9: Assumptions and limitations of this assessment)

9. The assessment of effects on biodiversity (Section 8.10: Assessment of biodiversity effects and Section 8.11: Assessment of cumulative effects)

10. Consideration of any additional environmental measures or compensation required (Section 8.12: Consideration of additional environmental measures and compensation)

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3This guidance has been revised since that referred to within the EIA Scoping Report, however the approach described is fundamentally the same between the 2016 and 2018 versions of the guidance.
11. The residual effects for biodiversity (Section 8.13: Preliminary assessment of significance)

8.1.4 In-combination effects are addressed in Chapter 22: In-combination effects.

8.2 Relevant legislation, policy and other important and relevant matters

8.2.1 This section identifies the legislation, policy and other documentation that has informed the assessment of effects on biodiversity. Further information on policies relevant to the EcIA and their status is provided in Chapter 2: Legislative and policy overview of this PEIR.

8.2.2 Table 8.1 lists the legislation relevant to the assessment of the effects on ecological features.

Table 8.1: Legislation relevant to biodiversity

<table>
<thead>
<tr>
<th>Legislation description</th>
<th>Relevance to assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conservation of Habitats and Species Regulations 2017 ('the Habitats Regulations')</td>
<td>The DCO Project will have potential effects on European sites and EPS which requires assessment in line with the Habitats Regulations. Within this chapter the likely significant effects on European sites and EPS are assessed in Section 8.10. Appendix 8.5: HRA screening report provides the HRA Screening Report.</td>
</tr>
<tr>
<td>The Infrastructure Planning (Decisions) Regulations 2010</td>
<td>The UK Post-2010 Biodiversity Framework, through which the UK’s obligations under the Convention are delivered, provides the strategic aims for delivering parts of the Government’s strategy with regards to biodiversity. The strategic aims of Government policy are addressed with regard to biodiversity net gain in Section 8.12.</td>
</tr>
<tr>
<td>Natural Environment and Rural Communities Act 2006 ('the NERC Act')</td>
<td>The DCO Project would have potential effects on HPI and SPI in England. This chapter provides information about, and assessment of HPI and SPI.</td>
</tr>
</tbody>
</table>
purposes of conserving biodiversity in a manner that is consistent with the exercise of their normal functions.

The NERC Act also places a duty on the Secretary of State to maintain lists of species and habitats which are regarded as being of principal importance for the conservation of biodiversity in England. These Habitats of Principal Importance (HPI) and Species of Principal Importance (SPI) are used to guide decision makers in implementing their duties to have regard to the conservation of biodiversity in England when carrying out their normal functions.

Countryside and Rights of Way Act 2000 (‘the CRoW Act’)

This CRoW Act, amongst other elements, details further measures for the management and protection of Sites of Special Scientific Interest (SSSI) and strengthens wildlife enforcement legislation. The DCO Project would have potential effects on SSSIs and protected flora and fauna. The protection conferred to these ecological features through legislation is accounted for within the scope of the assessment (see Section 8.6) and the environmental measures embedded within the DCO Project detailed in Section 8.7.

The Hedgerows Regulations 1997

The Hedgerows Regulations facilitate the protection of hedgerows growing in or adjacent to common land, protected land or land used for agriculture, forestry or the breeding and keeping of horses, ponies or donkeys. The DCO Project would potentially have effects on hedgerows deemed important by the Hedgerows Regulations. The likely significant effects on hedgerows are considered in Section 8.10.

Protection of Badgers Act 1992

The Protection of Badgers Act consolidated and improved protection for badgers. It specifically makes it an offence to kill, injure or take a badger, or damage or interfere with a sett unless a licence has been obtained from a statutory authority. The DCO Project would have potential effects on badgers and their setts. The protection conferred to badgers through legislation is accounted for within the scope of the assessment (see Section 8.6) and the environmental measures embedded within the DCO Project detailed in Section 8.7.

Wildlife and Countryside Act 1981 (as amended) (‘the WCA’) 


Amongst other matters it provides protection for wild birds, certain flora and fauna and sets the framework for the protection and management of SSSIs. The DCO Project would have potential effects on SSSIs and protected flora and fauna. The protection conferred to these ecological features through legislation is accounted for within the scope of the assessment (see Section 8.6) and the environmental measures embedded within the DCO Project detailed in Section 8.7.

8.2.3 The Airports National Policy Statement (ANPS) provides the primary basis for decision-making on development consent applications for the North West Runway
at Heathrow, with nationally significant road and rail components of the DCO Project being determined in accordance with both the ANPS and the National Policy Statement for National Networks (NN NPS), as appropriate.

8.2.4 Where other national policy has helped inform the EcIA this is also listed and explained in Table 8.2. All local policies relevant to the assessment of effects on ecological features\(^4\) are located in Appendix 2.1: Regional and Local planning policy and other important and relevant documentation, Volume 3.

<table>
<thead>
<tr>
<th>Policy description</th>
<th>Relevance to assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Airports National Policy Statement (ANPS) (Department for Transport, 2018)</strong></td>
<td>The ANPS establishes a requirement to undertake an assessment of any likely significant biodiversity effects of the DCO Project within the Draft Development Consent Order Limits (herein referred to as ‘the Site’), and the surrounding area.</td>
</tr>
</tbody>
</table>
| Chapter 2: Legislation and policy overview provides an explanation of the relevance of the ANPS to the DCO Project in general terms. The ANPS is the primary basis for decision making on the DCO Project. Paragraphs 5.84 to 5.105 of the ANPS are relevant to the assessment presented in this chapter. Of particular note is paragraph 5.85 which states:

‘The Government’s biodiversity strategy is set out in Biodiversity 2020: A Strategy for England’s wildlife and ecosystem services. Its aim is to halt overall biodiversity loss, support healthy, well-functioning ecosystems, and establish coherent ecological networks, with more and better places for nature for the benefit of wildlife and people.’

Also, of particular note is paragraph 5.89 which states:

‘The applicant should ensure that the environmental statement submitted with its application for development consent clearly sets out any likely significant effects on internationally, nationally and locally designated sites of ecological or geological importance, protected species, and habitats and other species identified as being of principal importance for the conservation of biodiversity’. Finally of note, paragraphs 5.95, 5.96 and 5.97: |
|                                                                                                                                                                                                 | The scope of the assessment and assessment methodology for likely significant biodiversity effects are addressed in Sections 8.6 and 8.8 of this PEIR, with the effects of the assessment presented in Section 8.10. The consideration of environmental measures including how the DCO Project has been designed to reduce biodiversity effects is addressed in Section 8.7. This PEIR accounts for the framework provided by the ANPS by aligning with the UK Government’s overall aim of delivering a net gain to biodiversity through the development of the DCO Project (see Appendix 8.6: Biodiversity offsetting strategy, Volume 3). This is provided through the use of a biodiversity offsetting metric, which allows a measurable and transparent method for assessing the value of compensation associated with the DCO Project. This PEIR assesses the potential effects on internationally, nationally and locally protected sites which may arise, clearly setting out any likely significant effects on the above sites, as well as all protected species and habitats, and other species |

\(^4\) ‘Ecological feature’ is used within CIEEM 2018 in place of the term ‘biodiversity receptor’. The term ecological feature is used throughout this chapter.
### Policy description

‘Compensation ratios relating to the effects of the preferred scheme should be considered in more detail during the design. The application of 2:1 compensation ratio is considered to represent the minimum requirement. However, there are other mechanisms for establishing compensation ratios, such as Defra’s biodiversity offsetting metric.

Equally, it is important to note that habitat ratios form only one part of potential compensation which should be considered, and the location and quality of any compensation land is of key importance. In this regard, habitat creation, where required, should be focused on areas where the most ecological and ecosystems services benefits can be realised.

As a general principle, and subject to the specific policies set out below and the Infrastructure Planning (Decisions) Regulations 2010, development should avoid significant harm to biodiversity and geological conservation interests, including through mitigation and consideration of reasonable alternatives. The applicant may also wish to make use of biodiversity offsetting in devising compensation proposals to counteract any impacts on biodiversity which cannot be avoided or mitigated. Where significant harm cannot be avoided or mitigated, as a last resort appropriate compensation measures should be sought. The development consent order, or any associated planning obligations, will need to make provision for the long term management of such measures.

In taking decisions, the Secretary of State will ensure that appropriate weight is attached to designated sites of international, national and local importance, protected species, habitats and other species of principal importance for the conservation of biodiversity, and to biodiversity and geological interests within the wider environment.

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### Relevance to assessment

and habitats identified as being of principal importance for the conservation of biodiversity (Section 8.10).

This PEIR reflects the principles of the *Biodiversity 2020: A Strategy for England’s wildlife and ecosystem services* in identifying how climate change is likely to affect the future environment (see Chapter 10: Climate Change). It also reflects how ecological networks will be maintained through the use of a biodiversity offsetting metric (Section 8.12) and through studies into connectivity through the study area and wider landscape, for particularly sensitive/valuable species (Section 8.10).

The mitigation hierarchy has been used during the development of the design being assessed within this chapter to avoid or minimise effects where possible. This has included identifying opportunities for green infrastructure (see Chapter 6: DCO Project Description).

The baseline data collection, including desk study and field survey, will enable the Secretary of State to ensure that appropriate weight is attached to all internationally, nationally and locally designated sites of ecological importance, protected species and habitats and other species identified as being of principal importance for the conservation of biodiversity. This information presented in Section 8.5 underpins the assessment provided within this chapter.

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#### National Policy Statement for National Networks, (NN NPS), (Department for Transport, 2014)

**Chapter 2: Legislative and policy overview**

provides an explanation of the relevance of the NN NPS to the DCO Project in general terms.

Paragraphs 5.20 to 5.29 and 5.31 to 5.38 of the NN NPS are relevant to the assessment presented in this chapter.

Of particular note is paragraph [5.25] which states:

‘As a general principle, and subject to the specific policies below, development should avoid significant harm to biodiversity and geological conservation interests, including through mitigation and consideration of reasonable alternatives. The

The NN NPS is generally consistent with the ANPS, above. This is relevant to the assessment as it enables all elements of the proposed infrastructure, with regard to biodiversity, to be approached in a consistent manner.
Policy description | Relevance to assessment
---|---
applicant may also wish to make use of biodiversity offsetting in devising compensation proposals to counteract any impacts on biodiversity which cannot be avoided or mitigated. Where significant harm cannot be avoided or mitigated, as a last resort, appropriate compensation measures should be sought." | The NPPF is largely consistent with the ANPS. This is relevant to the assessment as it enables all elements of the proposed infrastructure, with regard to biodiversity, to be approached in a consistent manner.

National Planning Policy Framework, (NPPF), Department for Communities and Local Government (MHCLG), 2019

Chapter 2: Legislative and policy overview provides an explanation of the relevance of the NPPF to the DCO Project in general terms. Paragraphs 174 to 177 of the NPPF are relevant to the assessment presented in this chapter.

Of particular note is paragraph 174a which states:

‘To protect and enhance biodiversity and geodiversity, plans should:

Identify, map and safeguard components of local wildlife-rich habitats and wider ecological networks, including the hierarchy of international, national and locally designated sites of importance for biodiversity; wildlife corridors and stepping stones that connect them; and areas identified by national and local partnerships for habitat management, enhancement, restoration or creation’

Also of particular note is paragraph 174b which states that plans should:

‘promote the conservation, restoration and enhancement of priority habitats, ecological networks and the protection and recovery of priority species; and identify and pursue opportunities for securing measurable net gains for Biodiversity’.

Regional and local planning policy

8.2.5 Appendix 2.1, Volume 3 presents the list of the regional and local planning policy relevant to the assessment of the effects on ecological features.

8.2.6 The local planning policies from the following local authorities which fall within the biodiversity study area have been considered. See Section 8.4 Methodology for baseline data gathering for an explanation as to how this study area has been established.

1. Greater London Authority
2. London Borough of Hillingdon
3. London Borough of Hounslow
4. Slough Borough Council
5. The Royal Borough of Windsor & Maidenhead
6. South Bucks District Council
7. Spelthorne Borough Council
8. Buckinghamshire County Council

Other important and relevant matters
8.2.7 A summary of other technical documentation that has been used to define survey methods used to inform this assessment, and that is relevant to the assessment undertaken for biodiversity is provided within Appendix 2.1.

8.2.8 In addition to the national policies listed in Table 8.1, the UK Government has a number of plans concerning the protection and enhancement of biodiversity in England. These include A Green Future: Our 25 Year Plan to Improve the Environment (‘the 25 year plan’) published in 2018 by the Department for Environmental, Food and Rural Affairs (Defra). This plan is the government’s vision for biodiversity improvements in England and identifies the need to explore how the principle of net gain is embedded within the planning system.

8.2.9 Biodiversity 2020: A strategy for England’s wildlife and ecosystem services and the UK post-2010 Biodiversity Framework provides further understanding of the government’s strategy for biodiversity improvements and the measures taken to fulfil international commitments secured through convention. The relevant aims described within these plans are being taken in to account throughout the EIA process.

8.2.10 Local Biodiversity Action Plans (LBAPs) outline the plans for conserving fauna, flora and habitats within a defined area. Those relevant to the study area are:

1. Berkshire Biodiversity Action Plan
2. Buckinghamshire and Milton Keynes Biodiversity Action Plan – Forward to 2020
4. London’s Biodiversity Action Plan
These LBAPS have informed the assessment within this chapter and are being used to inform the development of green infrastructure.

Biodiversity Opportunity Area (BOA) plans identify within a local area, where the greatest gains for biodiversity could be delivered. These plans help to inform the progression of projects (including development projects) in delivering biodiversity gains. Those relevant to the DCO Project are:

2. Biodiversity Opportunity Areas in Berkshire (Berkshire Local Nature Partnership)

These BOA plans are being used to inform the development of green infrastructure.

**8.3 Scoping and engagement**

**Introduction**

8.3.1 This section describes the outcome of, and response to, the Scoping Opinion in relation to the biodiversity assessment and also provides details of the ongoing technical engagement that has been undertaken with stakeholders and individuals. An overview of engagement undertaken can be found in Section 1.5 of Chapter 1: Introduction.

8.3.2 Engagement has taken the form of meetings/workshops, correspondence (including provision of technical commentary on draft technical documents) and site visits and is summarised in the following sections. A detailed account of technical engagement is provided in Appendix 8.1: Biodiversity stakeholder engagement, Volume 3.

**Scoping opinion**

8.3.3 A scoping report requesting a Scoping Opinion was submitted to the Secretary of State, administered by the Planning Inspectorate (PINS) on behalf of the Secretary of State, on 21 May 2018. The Scoping Report set out the proposed biodiversity assessment methodologies, outlined the baseline data collected to date and that proposed for the ES.

8.3.4 A Scoping Opinion was adopted by PINS on behalf of the Secretary of State on 2 July 2018. Table 8.3 sets out the comments received in section 4 of the PINS Scoping Opinion (‘Aspect based scoping tables’) for biodiversity (Table 4.2 of the...
Scoping Opinion) and how these have been addressed in this PEIR. A full list of the PINS Scoping Opinion comments and responses is provided in Appendix 5.1: Response to the Scoping Opinion, Volume 3. The information provided in the PEIR is preliminary and therefore it has not been possible to address all Scoping Opinion comments at this stage, however all comments will be addressed within the ES.

Table 8.3: Scoping Opinion consultation

<table>
<thead>
<tr>
<th>PINS ID number</th>
<th>Scoping Opinion comment</th>
<th>How is this addressed?</th>
</tr>
</thead>
<tbody>
<tr>
<td>23</td>
<td>‘The Scoping Report does not provide sufficient justification as to why it intends to deviate from the CIEEM industry standard guidance for ecological impact assessment by not considering effects on ecological features of local importance. It also does not contain specific information on the types of habitats and species which would be considered to be of local or negligible value. In the absence of specific information on the likely ecological features of local and negligible importance, including cumulative effects on such features both within the Proposed Development and from other projects or plans, together with the scale of the Proposed Development which could result in effects such as local extinctions of a species/habitats, the Inspectorate does not agree to scope this matter from the assessment. Accordingly the ES should include an assessment of effects on ecological features of local importance arising from the Proposed Development, including cumulative effects, or provide adequate justification in the ES as to why effects on any ecological features of local importance subsequently identified would not be considered to be significant. The ES and/or accompanying appendices should identify the species and habitats to be included in the biodiversity offsetting metric, including those considered to be of local/negligible importance.’</td>
<td>Section 8.6 provides the method for the scoping of the assessment. In line with the Scoping Opinion a technical justification, is provided for all ecological features scoped out of the assessment. This approach is consistent with CIEEM (2018) guidance and does not deviate from it. The scope of the assessment methodology outlined in Section 8.6 ensures that those ecological features deemed to be of local value, when considered alone or with respect to cumulative effects, are scoped out only if a technical justification is available for their exclusion. When an ecological feature is scoped out of the assessment it is on the basis of ‘an effect that is not sufficiently important to require assessment and reporting so that a decision maker is adequately informed of the environmental consequences of permitting a project’ (CIEEM, 2018) being identified. Appendix 8.2: Biodiversity scoping tables, Volume 3 provides the justification (irrespective of the level of importance) for the scoping in or out of each identified ecological feature. Irrespective of the scoping in / out of ecological features all habitats lost to development will be accounted for through the use of the biodiversity offsetting metric (Appendix 8.6: Biodiversity offsetting strategy, Volume 3). Therefore, residual effects on all areas of habitat (other than hard-standing and existing buildings) will be compensated for. No species are directly accounted for in the biodiversity offsetting metric. This conforms</td>
</tr>
<tr>
<td>PINS ID number</td>
<td>Scoping Opinion comment</td>
<td>How is this addressed?</td>
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<td></td>
<td>with Defra guidance on biodiversity offsetting, as habitats are used as a proxy to account for species losses. However, Natural England’s guidance ‘The Mosaic Approach – Managing Habitats for Species’ is being used to inform the design of green infrastructure to ensure the opportunities for a variety of species is maintained or enhanced (see Appendix 8.4: Habitat creation – summary description, Volume 3).</td>
</tr>
<tr>
<td>24</td>
<td>‘The Inspectorate welcomes the Applicant’s intention to use an evidence plan process to seek agreements with relevant stakeholders with regards to the biodiversity assessment. The Applicant should seek to agree the type and level of evidence to be collected to inform the assessment in respect of biodiversity, together with approaches to the assessment methodology. Evidence of agreements reached in respect of the ecological impact assessment should also be provided with the ES, where possible.’</td>
<td>Where agreements have been reached with stakeholders they are detailed within this PEIR chapter (see Section 8.3 and Appendix 8.1: Biodiversity stakeholder engagement, Volume 3).</td>
</tr>
<tr>
<td>25</td>
<td>‘The Inspectorate notes that the biodiversity study area presented in Figure 6.1 and Baseline Data Collection Area presented on Figure 6.2 do not include the waterbodies identified as part of the survey area for wintering birds, in particular the Wraysbury complex of waterbodies, Kingsbury, and South Horton, as presented on Figure 6.10. The ES should present the final biodiversity study area on clear figures consistent with the biodiversity scope of assessment. The assessment study area should be applicable to the likely zone of influence (ZOI) of the Proposed Development, the potential for likely significant effects and the relevant ecological feature concerned. The Inspectorate acknowledges that the ZOI may vary by ecological feature and type of effect. The ES should consider all ecological features of importance that could be significantly affected by the Proposed Development within the ZOI, including, but not limited to, species and habitats that could be affected as a result of hydrological-links to the Proposed Development, species and habitats sensitive to</td>
<td>The study area presented in this PEIR has been updated to reflect the latest design information and respond to corresponding updates in the ZOI for each ecological feature. This includes the inclusion of all waterbodies within the ‘Wraysbury Complex’ of the South West London Waterbodies SPA (including functional habitat) and those hydrologically linked to the areas proposed for development. The study area is described in Section 8.4 and shown on Figure 8.1, Volume 2. ZOIs for each ecological feature scoped into the assessment are provided in Table 8.13. With justification of each ZOI provided in Appendix 8.2. Wherever appropriate, the ZOIs have been determined through the outputs of other technical disciplines (for example the traffic modelling output, groundwater modelling output etc.). Wherever this has occurred a cross reference has been provided. The desk study has been updated to ensure the latest available data is reflected within the assessment. The desk study and baseline survey data gathered encompasses the whole</td>
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<td><em>The Inspectorate notes that all SSSIs within 2km of the biodiversity study area have been identified in the Scoping Report. This 2km search area is stated to have been determined through precautionary professional judgement. In respect of European sites, footnote 19 explains that a search area of 20km has been applied on the basis of road traffic modelling accompanying the Airports Commission Final Report (July 2015) as nitrogen deposition associated with road traffic accessing/egressing the Airport will need to be addressed within the HRA</em>. The Scoping Report does not make clear why a 2km buffer is appropriate for SSSIs and other ecological features of importance potentially sensitive to air quality effects. The ES should consider all SSSIs beyond 2km where likely significant effects could occur on SSSI features sensitive to changes in air quality which could arise from the Proposed Development (i.e. within the ZOI for the Proposed Development). This should include an assessment of all sources of air quality changes from the Proposed Development and also cumulatively, as appropriate. The ZOI should be identified in conjunction with the air quality aspect chapter to determine the distance of search. The Applicant should</td>
<td>Following discussions with Natural England the area within which SSSIs and European sites have been identified now coincides with the area within which traffic modelling is to occur (see Figure 3.2 of Appendix 8.5: HRA screening report). This area is much greater in extent than the previously used 2km search area. This area has been determined to be appropriate as it represents the road network across which changes in traffic may occur and therefore where increases in nitrogen deposition may be realised. It is noted that any changes in air quality associated with aircraft or airport operation are all predicted to occur inside this area (see Chapter 7: Air quality and odour). The potential for cumulative effects is to be included within the road traffic modelling (Chapter 19: Transport network users) and associated air quality modelling (Chapter 7). The potential for cumulative effects to ecological features arising from traffic and associated air quality is accounted for by the fact that the air quality and traffic modelling includes cumulative developments. Within this chapter the assessment of effects on SSSIs is detailed in Sections 8.10 and 8.11.</td>
</tr>
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The Applicant should review and amend the ZOI, as necessary, as the design of the Proposed Development evolves prior to any application for development consent to ensure that all ecological features of importance that could be significantly affected by the Proposed Development have been identified and assessed in the ES. The Applicant should ensure the desk study information used to inform the assessment is also informed by the ZOI and updated accordingly. The biodiversity aspect chapter should include appropriate and specific cross-references to any studies presented elsewhere in the ES (for example to any hydrology or air quality modelling) that have been used to determine the ZOI for ecological features. 

of the study area described in Section 8.4.
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<tr>
<td>27</td>
<td>‘The Inspectorates notes the following statement in the Scoping Report ‘Areas where survey has not been possible pre-application, or planned activities have been curtailed, will be highlighted at later stages of the DCO Project, with suitable mitigation measures dealing with this issue suggested and discussed with consultees.’ The Applicant must ensure that sufficient baseline information has been obtained to inform the assessment of effects and mitigation within the ES.’</td>
<td>Details of the surveys undertaken to date (including percentage coverage of the study area) and the periods of further proposed survey are provided in Table 8.6. Issues relating to land access are described in more detail in Section 8.9. Conclusions regarding the full extent of data gathering cannot yet be determined as survey is ongoing. The extent of survey coverage has been discussed frequently with Natural England and the Environment Agency (see Appendix 8.1: Biodiversity stakeholder engagement, Volume 3).</td>
</tr>
<tr>
<td>28</td>
<td>‘Any open water assessed in the ES should be clearly identified and classified by type (for example Main River, ordinary watercourse, lake, ditch) and the applicable survey methodology clearly stated (for example River Corridor Survey, Ditch Habitat Survey). The ES should also clearly identify where a river/stream becomes a ditch with regards to Main River and ordinary watercourse classification. The ES should be supported by clear figures in respect of water bodies.’</td>
<td>The classifications of each water body described in this chapter are provided within the baseline survey text (see Section 8.5).</td>
</tr>
<tr>
<td>29</td>
<td>‘The ES should clearly identify any ancient woodland (including Ancient Semi-Natural Woodland (ASNW) and Plantation on Ancient Woodland Sites (PAWS)) and veteran/aged trees that could be affected by the Proposed Development and ensure they are valued and assessed in the ES, where significant effects could occur. The ES should also clearly identify and assess any ancient woodland and/or veteran trees that do not already form part of a designated site, together with any veteran/aged trees that do not already form part of ancient woodland. The Applicant’s attention is also directed to the additional guidance documents identified on ancient woodland described on the Ancient Woodland Inventory (AWI) was identified within the desk study report released alongside the EIA Scoping Report. Baseline survey information for areas of ancient woodland is described in Section 8.5. Table 8.12 identifies that all woodland listed on the Ancient Woodland Inventory and ancient and veteran trees therein will be classed of national importance within the assessment. In line with Forestry Commission and the Planning Inspectorate advice, surveys of woodland being undertaken for the DCO Project have collected relevant information to...’</td>
<td>ANCIENT WOODLAND INV A5...WOODLAND (ASNW) AND PLANTATION ON ANCIENT WOODLAND SITES AND PLANTATION ON ANCIENT WOODLAND SITES (PAWS)</td>
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<td>30</td>
<td>Paragraph 6.6.18 of the Scoping Report states that no plant species listed in Schedule 8 of the Wildlife and Countryside Act have been identified during the desk study or surveys undertaken in 2017; however, Appendix 6.2 identifies the presence of Bluebell in the study area. The Inspectorate acknowledges that Bluebell is identified in Schedule 8 as protected from sale only; however, the ES should be clear with regards to the protected status of the species assessed. The Applicant’s attention is also directed to the comments of Spelthorne BC with regards to the presence of Brown Galingale in a seedbank on Shortwood Common, which is listed in Schedule 8 of the Wildlife and Countryside Act. The ES should include an assessment of effects on any notable plant species arising from the Proposed Development, where significant effects are likely to occur.</td>
<td>The protected status of plant species identified during the desk study and field surveys are listed in Section 8.5 and in greater detail in the desk study and field survey reports. These include plants where the protected status refers to sale only. The record of a seed bank of brown galingale at Shortwood Common has been noted, however this location is outside of the study area. Bluebell distribution and abundance will be described within the desk study and the field survey reports that will be available at the time of application. All notable plant species scoped into the assessment are considered in Sections 8.10 and 8.11 in this PEIR and will be assessed in the ES.</td>
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<tr>
<td>31</td>
<td>‘The ES should also consider any likely significant effects on riparian habitat and lateral connectivity as a result of activities associated with the realignment/diversion/modification of river/stream channels during construction.’</td>
<td>Habitat connectivity (including riparian habitat) is considered qualitatively within Section 8.10 and 8.11 based on information gathered from field survey and professional judgement. A detailed assessment of effects based on a quantification of connectivity will be provided in the ES. This will be based on the evolving design (particularly with regards green infrastructure) which is insufficiently developed at this stage.</td>
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<tr>
<td>32</td>
<td>‘The ES should consider effects on ecological features arising from changes to surface water</td>
<td>The potential effects on ecological features associated with surface water run-off are</td>
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### Scoping Opinion comment

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<td>33</td>
<td>Environmental measures and biodiversity offsetting are discussed in Sections 8.7 and 8.12, including the delivery risks associated with the provision of habitats. Lessons learnt (positive and negative) from the Heathrow Biodiversity Sites created following the development of Terminal 5 (T5) will be described in an appendix to the ES at the time of application; these lessons are being used to inform the evolving green infrastructure design. The biodiversity offsetting metric described in Appendix 8.6: Biodiversity offsetting strategy, Volume 3 uses Defra’s approach to quantifying delivery risk, whilst Appendix 8.4: Habitat creation – summary descriptions, Volume 3 describes how certain types of habitat can be created.</td>
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<tr>
<td>34</td>
<td>'The ES should consider any likely significant effects associated with increased recreational pressure on ecological features/sites of importance as a result of displaced users of existing green space to be lost to/affected by the Proposed Development. The ES should include appropriate cross-reference to other relevant aspect chapter assessments in this regard, including the Community chapter and the proposed Open Space Assessment. The Applicant’s attention is also drawn to the comments of South Bucks DC with regards to a mitigation strategy currently under development in respect of recreational pressure at Burnham Beeches Special Area of Conservation (SAC).'</td>
<td>Steps to understand the potential displacement of recreational users from the areas within or adjacent to the construction area are ongoing. This includes understanding the number of residents likely to be displaced by the DCO Project, the strategy and schedule for the re-provision of public open space, the other areas currently visited regularly by those living close to Heathrow (for example Langley Park and Black Park) and the current usage of affected areas (for example Harmondsworth Moor). The potential effects of recreational displacement are discussed in the PEIR (Sections 8.10 and 8.11), with a detailed assessment to be provided in the ES. Engagement with City of London Corporation (as owners of Burnham Beeches) with regard the management activities at, and pressures on, this SAC has been undertaken (see Appendix 8.1: Biodiversity stakeholder engagement, Volume 3). Likely significant</td>
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**Table Note:**

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- **Scoping Opinion comment**
- **How is this addressed?**
### PINS ID number | Scoping Opinion comment | How is this addressed?
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35 | ‘The creation of new flood storage areas and wetland habitats identified within the Scoping Report to the north of Heathrow Airport has potential to increase bird-strike risk. Design of new wetland habitats should minimise their attractiveness to species of birds hazardous to air traffic.’ | The development of green infrastructure, including flood storage areas, has considered wildlife strike risk\(^6\) at each stage of its evolution. The aim is to design green infrastructure that manages wildlife strike risk effectively minimising the need for active measures (for example netting of ponds). Further detailed information will be developed after the submission of PEIR and provided in the ES. The principles associated with habitat creation (including consideration of wildlife strike risk) are provided in Appendices 8.4: Habitat Creation – summary descriptions, and 8.6: Biodiversity offsetting strategy, Volume 3.

36 | ‘The Inspectorate notes the intention to assess a worst-case for the ‘majority of features’ during construction. The ES should clearly state the assumptions used for the biodiversity assessment for each receptor/likely significant effect.’ | Section 8.10 and 8.11 provide the assessment of each ecological feature, including the assumptions made. The biodiversity assessment in the ES will fully detail such assumptions.

37 | ‘The ES should ensure that ecological connectivity is adequately considered and assessed, including effects on the existing connectivity (including hydrological links) and connectivity to and from any proposed offsetting/compensatory habitat to be provided. The Applicant should consider how value associated with connectivity could be taken into account in the biodiversity offsetting metric approach.’ | Quantification and assessment of habitat connectivity will take place between the submission of PEIR and application and will be provided in the ES (see comments to the Planning Inspectorate ID number 31). A qualitative assessment is provided within Sections 8.10 and 8.11 for relevant ecological features. The biodiversity offsetting metric published at the EIA scoping stage (see Appendix 8.6: Biodiversity offsetting strategy, Volume 3) has been agreed formally with Natural England and Environment Agency. Connectivity is not addressed specifically within the metric (in keeping with the current approach of Defra (Defra, 2012)). This approach has been agreed as appropriate with Natural England following the issuing of the Scoping Opinion.

38 | ‘The Inspectorate notes the intention to include the detailed design of mitigation’ | The detailed design of the environmental measures and biodiversity offset have not yet

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\(^6\) Wildlife strike risk is a term used to encompass the potential for species other than birds to be struck by aircraft.
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<td>39</td>
<td>‘Where monitoring of habitats and species is identified for the purposes of mitigation/compensation/enhancement, the ES and/or associated appendices should clearly set out the monitoring proposals, including: methods to be used; appropriate timings; criteria for determining success/failure; mechanisms for implementation; and frequency and duration of monitoring, feedback and reporting. The Applicant should ensure that monitoring measures to be included for the purposes of the EIA are appropriately secured in the draft DCO.’</td>
<td>Detailed information on monitoring of habitats and species has not yet been defined as the survey programme is ongoing. This information will be provided within the ES.</td>
</tr>
<tr>
<td>40</td>
<td>‘The Applicant’s attention is drawn to the comments of the Environment Agency in Appendix 2 of this Opinion confirming that more than three electro-fishing runs may be necessary to obtain worthwhile analysis.’</td>
<td>The electro-fishing surveys have been undertaken in line with UK TAG which provides the standard guidance for assessment against the Water Framework Directive. The Environment Agency have been contacted specifically with regards to the comment raised to clarify the issue, although a response has not been received. In lieu of a response, three runs have been used as standard (as this conforms with guidance) with a fourth run being used if the predicted reach depletion on the first three runs was not sufficient.</td>
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<td>41</td>
<td>‘The ES and/or accompanying appendices should describe in detail the survey methodology/technique used to inform the ES, particularly where new or novel techniques have been applied (for example eDNA Method statements for all survey techniques inclusive of the survey guidance used (both common and novel) are provided in the Biodiversity Method Statements. These have been agreed as appropriate with Natural</td>
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7 Biodiversity Method Statements will be available at the time of application tailored to reflect the surveys undertaken. Interim versions accompanied the EIA Scoping Report.
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<td>42</td>
<td>‘The River Crane (Priority Habitat) and River Colne (Priority for Restoration) should also be included within Table 6.2.8 and assessed in the ES.’</td>
<td>This comment relates to Table 6.2.8 of Appendix 6.2 of the EIA Scoping Report. This table shows identification of habitats listed on the priority habitat inventory (MAGIC Website, Natural England). Neither the River Colne nor River Crane are shown on the priority habitat inventory. However, field survey marks these out as Habitats of Principal Importance for Conservation in England due to the presence of otter and European bullhead and these habitats are considered as such within this chapter and accompanying appendices. These rivers are considered within the assessment in Section 8.10 and 8.11.</td>
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| 43            | ‘The Inspectorate notes at Paragraph 6.9.11 and Table 6.11 of the main body of the Scoping Report that the Applicant intends to consider any negative residual effects on ecological features of local/negligible importance in the Biodiversity Offsetting Metric.  
As stated at point 1 above, the ES should clearly identify all species and habitats that are to be accounted for in the biodiversity offsetting metric. The information regarding features of local/negligible importance will also need to be presented in the ES and/or accompanying appendices, where such features are to be included in the biodiversity offsetting metric to ensure they have been adequately considered.’ | Section 8.12 provides a calculation of the losses to biodiversity associated with the DCO Project. The gains associated with the DCO Project (in other words those delivered around the built infrastructure, within the areas identified for green infrastructure and other additions) cannot be calculated at this stage as the design is not yet detailed enough – this will be provided in the ES. The calculations of both losses and gains will include habitat features of local/negligible importance. The biodiversity offsetting metric is separate from the assessment undertaken within this chapter, with regards the EIA Regulations, and in it, there is no differentiation between ecological features scoped in and those scoped out. This ensures that the losses being accounted for are all residual effects on biodiversity (for example the loss of improved grassland), not just those associated with significant effects identified in this assessment. This calculation will be presented in an Appendix to accompany the ES. |
| 44            | ‘The ES should include sufficient detail with                                                                                                                                                                               | The progression of the green infrastructure is                                                                                                                                                                          |

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8 For a river to qualify as a Habitat of Principal Importance it must meet at least one of seven criteria (BRIG 2008). The Colne and Crane within the study area qualify by supporting at least one Species of Principal Importance.
8.19

Technical engagement

8.3.5 Technical engagement has been ongoing with a number of prescribed and non-prescribed consultation bodies in relation to biodiversity. A summary of engagement undertaken is outlined below with further detail provided in Appendix 8.1.

Natural England

8.3.6 Engagement with Natural England, with regards to biodiversity, has been ongoing since 11 November 2016 in the form of technical meetings/workshops (30 in total), site visits (three in total) and the sharing of draft technical documentation. In addition to the engagement described below with regard to biodiversity, Natural England have provided advice on other aspects of the DCO Project including Landscape and visual amenity (Chapter 15), Water environment (Chapter 21) and Land quality (Chapter 14). A further 20 strategic meetings have been held with Natural England. These meetings ensure that clarification on current positions can be provided, the correct information is being shared between the parties and a prioritisation of issues can be understood and acted upon.

8.3.7 Natural England have provided advice on a wide range of subjects relevant to the assessment of biodiversity. These can be categorised as follows:

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<td>regard to the proposed compensation areas, including clear figures, together with the detailed calculations that have been used for the biodiversity offsetting metric. Any mitigation/compensation measures relied upon in the ES should be appropriately secured through the draft DCO.'</td>
<td>not sufficiently advanced at this stage to provide this within the PEIR. This will be detailed and provided in the ES alongside secured measures to support that strategy.</td>
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<tr>
<td>‘The ES should clearly identify where any of the existing habitat that would be affected by the Proposed Development has previously been allocated as mitigation/compensation land for other development and consider what influence this would have on the assessment of likely significant effects and the proposed biodiversity offsetting metric approach. The Applicant’s attention is drawn to the comments of e.g. Surrey CC and London Borough of Hillingdon with regards to land within the Scoping Report study area that has been restored or used as mitigation for other development.’</td>
<td>Appendix 8.6: Biodiversity offsetting strategy, Volume 3 identifies and describes how future secured proposals for other plans or projects are incorporated within the biodiversity offsetting metric. Where another development has a secured restoration plan in place (for example a currently operational quarry) it is the end state that will be valued within the metric. This ensures that any environmental measures agreed for previous projects will be sufficiently accounted for even if it is yet to be realised. The ES and Appendices will present complete details of such habitat areas and consider them in the assessment and offsetting calculations.</td>
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1. Advice on, and review of technical documentation associated with the field survey programme
2. Advice on, and review of technical documentation associated with biodiversity offsetting
3. Advice on, and review of technical documentation associated with the HRA\(^9\) and the associated SSSIs
4. Advice on green infrastructure design with focus on habitat connectivity and provision of opportunities for flora and fauna
5. Advice on protected species licensing with regard to bats, otters, great crested newts and badgers
6. Advice on, and review of data collected with regard to terrestrial invertebrates
7. Advice regarding the identification of potential effects and the approach to the assessment.

Natural England have agreed that:

1. The approach to the assessment detailed in Sections 8.4, 8.6 and 8.8 is appropriate for determining significant effects on ecological features (discussions relate to ID23, ID24, ID26 and ID36 of the PINS Scoping Opinion)
2. The Biodiversity Survey Method Statements are suitable for the provision of a robust baseline on which to base an EcIA (discussions relate to ID24, ID40 and ID41 of the Planning Inspectorate Scoping Opinion)
3. The Biodiversity Baseline Survey Reports provide evidence that the data gathering undertaken to date has been carried out in accordance with the Biodiversity Survey Method Statements, thereby providing robust data for consideration within the preliminary assessment in Sections 8.10 and 8.11 (discussions relate to ID24, ID27, ID29 and ID30 of the Planning Inspectorate Scoping Opinion)
4. The approach to HRA screening and the conclusions of the screening process (detailed in Appendix 8.5) are suitable at this preliminary stage, based on current information and guidance (discussions relate to ID25 of the Planning Inspectorate Scoping Opinion)
5. The biodiversity offsetting metric for the DCO Project provides a robust basis for the calculation of losses and gains to biodiversity associated with the DCO

\(^9\) HRA Screening Report is provided in Appendix 8.5
Environment Agency

8.3.9 Engagement with the Environment Agency, with regards to biodiversity, has been ongoing since 5 December 2016 in the form of meetings/workshops (16 in total) and the sharing of draft technical documentation. In addition to the engagement described below with regard to biodiversity the Environment Agency have provided advice on other aspects of the DCO Project including Water environment (Chapter 21), Water Framework Directive Assessment (Chapter 21), Waste (Chapter 20) and Land quality (Chapter 14). A further 23 strategic meetings have been held with the Environment Agency. These meetings ensure that clarification on current positions can be provided, the correct information is being shared between the parties and a prioritisation of issues can be understood and acted upon.

8.3.10 The Environment Agency have provided advice on a range of subjects relevant to the assessment of biodiversity. These can be categorised as follows:

1. Advice on, and review of technical documentation associated with the field survey programme
2. Advice on, and review of technical documentation associated with biodiversity offsetting
3. Advice on green infrastructure (especially with regard to freshwater habitats) design with focus on habitat connectivity and provision of opportunities for flora and fauna.

8.3.11 The Environment Agency have agreed that:

1. The biodiversity offsetting metric for the DCO Project provides a robust basis for the calculation of losses and gains to biodiversity associated with the DCO Project (discussions relate to ID33, ID35, ID38, ID43, ID44 and ID45 of the Planning Inspectorate Scoping Opinion).

Colne Valley Park Community Interest Company (CVP CIC)

8.3.12 Engagement with CVP CIC, with regards to biodiversity, has been ongoing since 26 May 2017 in the form of meetings/workshops (11 in total) and the sharing of draft technical documentation. In addition to the engagement described below with regard to biodiversity CVP CIC have provided advice on other aspects of the DCO Project including Landscape and visual amenity (Chapter 15) and Recreation (Chapter 11: Community). A further 14 strategic meetings have been held with CVP CIC. These meetings ensure that clarification on current positions can be
provided, the correct information is being shared between the parties and a prioritisation of issues can be understood and acted upon.

8.3.13 CVP CIC have provided advice on a wide range of subjects relevant to the assessment of biodiversity. These can be categorised as follows:

1. Advice on local biodiversity priorities and the objectives of the Colne Valley Regional Park
2. Advice on green infrastructure design with focus on habitat connectivity and provision of opportunities for flora and fauna
3. Advice regarding the identification of potential effects and the approach to the assessment.

Heathrow Strategic Planning Group (HSPG)

8.3.14 Engagement with HSPG, with regards to biodiversity, has been ongoing since 29 November 2017 in the form of meetings (10 in total) and the sharing of draft technical documentation. The HSPG meetings, where biodiversity was discussed, were also attended by Natural England, the Environment Agency and CVP CIC.

8.3.15 In addition to the engagement described below, the HSPG have been consulted on all other aspects of the EIA.

8.3.16 The HSPG have provided views on a wide range of subjects relevant to the assessment of biodiversity. These can be categorised as follows:

1. Advice on local biodiversity priorities, including how these relate to current and emerging local plans
2. Advice on green infrastructure design with focus on habitat connectivity and provision of opportunities for flora and fauna
3. Advice regarding the identification of potential effects and the approach to the assessment.

Other Engagement

8.3.17 Engagement with regard to biodiversity has been undertaken with a wide range of other stakeholders including national and local non-governmental organisations (NGOs) and voluntary interest groups (for example local amphibian and reptile groups) that have a focus on biodiversity and the delivery of effective green infrastructure. The stakeholders who have taken the opportunity to engage are:

1. Berks, Bucks and Oxon Wildlife Trust
2. Berkshire and South Buckinghamshire Bat Group
3. Berkshire Ornithological Club
4. Department for Transport
5. City of London Corporation (as owners and managers of Burnham Beeches SAC)
6. Crane Valley Partnership
7. Friends of the River Crane Environment (FORCE)
8. Greenspace Information for Greater London
9. Groundworks (managing agents for Colne Valley CIC)
10. Herts and Middlesex Wildlife Trust
11. Highways England
12. Historic Royal Palaces
13. London Wildlife Trust
14. Plantlife
15. Surrey Biodiversity Information Centre
16. Surrey Wildlife Trust
17. The Royal Parks.

8.3.18 In total 33 organisations have been invited to participate in technical engagement with regard to biodiversity (one government department, two regulators, one grouping of local planning authorities\(^\text{10}\), 15 NGOs and 14 voluntary groups); with 21 so far having engaged. As the DCO Project progresses further opportunities to engage will be sought.

8.3.19 Each technical engagement (not including strategic meetings) with all prescribed and non-prescribed consultation bodies is detailed in Appendix 8.1.

8.4 Methodology for baseline data gathering

Study area

8.4.1 The study area comprises the land within the Draft Development Consent Order Limits (herein referred to as ‘the Site’), plus an additional buffer zone of 500m around proposed built infrastructure and the South West London Waterbodies (SWLW) SPA / Ramsar site and associated functional habitat within the

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\(^{10}\) Chapter 1 lists the authorities who participate as full members of HSPG.
Wraysbury complex (as per Scoping Opinion response ID25) – see Figure 8.1, Volume 2. The study area is defined as the area over which field survey data has been collected to inform the assessment of the DCO Project. Additional areas of search for data (see Table 8.4 for definitions) have also been defined to provide the basis for gathering the desk study information necessary to inform the assessment. The study area and additional areas of search were determined based on best practice guidance, advice from Natural England (including with regard to European sites and SSSIs), responses within the Scoping Opinion and a high level overview of the types of ecological features present and the potential for effects that could occur. The study area and additional areas of search were defined on a precautionary basis to ensure that the ZOI$^{[1]}$ relevant to each ecological feature (see Section 8.4) was covered during baseline data gathering activities.

8.4.2 As the design process is iterative, the study area and areas of search have been regularly reviewed to ensure that their extent is adequate to enable the assessment of likely significant effects on the ecological features identified. The individual elements of the DCO Project have all been reviewed in light of the ecological features present (which was informed by the early data gathering exercise) and the potential effects that could occur. At each stage of design evolution the extent of the study area and additional areas of search were tested using the methodology described in Section 8.6 to ensure adequate information was available on which to base an assessment of the DCO Project.

**Desk study**

8.4.3 A data-gathering exercise was undertaken to obtain existing information relating to relevant statutory and non-statutory biodiversity sites, habitats and species of principal importance$^{[1]}$, legally protected and controlled species and other conservation notable species$^{[2]}$ that have been recorded over the previous 10 years (2008 to 2018). Table 8.4 lists the data compiled within the study area and additional areas of search.

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$^{[1]}$ The ZOI in this context is the area over which an individual ecological feature may be subject to a likely significant effect as a result of the DCO Project.

$^{[1]}$ Habitats of Principal Importance and Species of Principal Importance are referred to in this chapter as HPI and SPI respectively

$^{[2]}$ A conservation notable species is one that has some form of conservation designation (for example it is present on a red list) but has no specific legal protection.
### Table 8.4: Information relevant to the biodiversity desk study

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<th>Ecological Feature</th>
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<tbody>
<tr>
<td><strong>Statutory sites designated under international conventions or European Directives</strong></td>
<td>Wetlands of International Importance (also known as Ramsar sites), SACs and SPAs</td>
<td>Within the geographical extent of the HHASAM traffic model (see Figure 3.2 of Appendix 8.5 for further details)</td>
</tr>
<tr>
<td><strong>Statutory sites designated under national legislation</strong></td>
<td>SSSIs and National Nature Reserves (NNRs).</td>
<td>Within the geographical extent of the HHASAM traffic model (see Figure 3.2 of Appendix 8.5 for further details)</td>
</tr>
<tr>
<td><strong>Locally designated sites</strong></td>
<td>Local Wildlife Sites (LWS) identified by individual planning authorities using locally derived classification criteria Local Nature Reserves (LNR)</td>
<td>The study area plus an additional area of search of 2km</td>
</tr>
<tr>
<td><strong>HPI and SPI, Red listed species and Legally protected species.</strong></td>
<td>HPIs and SPIs, species recorded on The IUCN Red List of Threatened Species and / or local Red Lists for the UK or relevant sub-units (for example regions or counties) and legally protected habitats and species include those listed on Schedules 1, 5 and 8 of the Wildlife and Countryside Act 1981 (as amended) and those included on Schedules 2 and 5 of the Habitats Regulations. Badger and Hedgerows are afforded protection under the Protection of Badgers Act 1992 and the Hedgerows Regulations 1997 respectively.</td>
<td>The study area plus an additional area of search of 2km – other than for otter and terrestrial invertebrates where a 5km additional area of search was used.</td>
</tr>
<tr>
<td><strong>Legally controlled species</strong></td>
<td>Legally controlled species include those listed on Schedule 9 of the Wildlife and Countryside Act 1981 (as amended).</td>
<td>The study area plus an additional area of search of 250m</td>
</tr>
</tbody>
</table>

---

13 Additional areas of search were discussed and agreed as appropriate with Natural England.

14 The HHASAM modelled area includes the roads on which a change in number or distribution of road traffic may be realised due to the DCO Project. This traffic may result in changes in the level of nitrogen deposition at European sites or SSSIs. This effect has the largest potential ZOI of all those identified, hence its choice as a search area.

15 LWS are also known as Sites of Nature Conservation Importance (SNCI), Sites of Importance for Nature Conservation (SINC) and Biological Notification Sites (BNS) within the study area.

16 Local Nature Reserves are designated under national legislation. However, they are more akin to Local Wildlife Sites than SSSIs hence the categorisation in Table 8.4.

17 A 2km search area for locally designated sites, SPI, HPI and other conservation notable or legally protected species is a precautionary professional judgement based on the potential extent of indirect effects.

18 Red listed species for the purposes of this assessment refer to those noted using IUCN criteria as being ‘Near Threatened’, ‘Vulnerable’, ‘Endangered’ and ‘Critically Endangered’, and those present on local Red Lists in the categories ‘Nationally Scarce’ and ‘Nationally Rare’.

19 The presence of legally controlled species is only relevant with regard to direct effects from the DCO Project. Therefore, only presence within the Site and immediately adjacent areas requires consideration.
8.2.6 © Heathrow Airport Limited 2019

### Bat roosting locations

Bat roost locations are considered separately from other species records in accordance with guidance. The study area plus an additional area of search of 10km².

8.4.4 A total of 33 organisations were contacted in 2017 (to inform the EIA Scoping Report) and 2018 (to provide relevant updates for the PEIR) and asked to provide any relevant data held for the last ten years (2008-2018²¹); 28 responded. Of these organisations, 13 provided data directly, and the remaining 15 confirmed that they either provide all of their data to local biological records centres (from which data had already been requested), the data is publicly available, or they are not data holding organisations, and five are yet to respond. **Table 8.5** lists the organisations that have responded to the data requests, together with the nature of that data.

#### Table 8.5: Data sources used to inform the Biodiversity assessment

<table>
<thead>
<tr>
<th>Organisation</th>
<th>Data provided</th>
<th>Date of response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Berkshire Reptile and Amphibian Group (BRAG)</td>
<td>Confirmation provided that all records are held by Thames Valley Environmental Records Centre (TVERC) and can be obtained centrally.</td>
<td>08 March 2017</td>
</tr>
<tr>
<td>Berkshire, Buckinghamshire and Oxfordshire Wildlife Trust (BBOWT)</td>
<td>As a project Partner of TVERC, BBOWT supply data to this record centre.</td>
<td>N/A – but confirmation provided via TVERC website</td>
</tr>
<tr>
<td>Berkshire and South Buckinghamshire Bat Group (BSBBG)</td>
<td>Bat records for the area of search were provided as per data request.</td>
<td>07 June 2017 &amp; 06 July 2018</td>
</tr>
<tr>
<td>Berkshire Mammal Group (BMG)</td>
<td>Confirmation provided that all records are held by the local record centre (Thames Valley Environmental Records Centre) and can be obtained centrally.</td>
<td>23 March 2017</td>
</tr>
<tr>
<td>Berkshire Ornithological Club (BOC)</td>
<td>Ornithological records for the area of search were provided as per data request.</td>
<td>26 June 2017 &amp; 19 June 2018</td>
</tr>
<tr>
<td>Binfield Badger Club (BBC)</td>
<td>Badger records for the area of search were provided as per data request.</td>
<td>21 June 2018</td>
</tr>
<tr>
<td>Botanical Society for Britain and Ireland (BSBI)</td>
<td>Botanical records for the area of search were provided as per data request in 2017.</td>
<td>05 October 2017 &amp; 29 October 2018</td>
</tr>
</tbody>
</table>

²⁰ The 10km search area for bat roosts is taken from Collins, 2016
²¹ Note some data provided was in a format that increased this time range. Where relevant this data is referenced in the Biodiversity Desk Study Report.
<table>
<thead>
<tr>
<th>Organisation</th>
<th>Data provided</th>
<th>Date of response</th>
</tr>
</thead>
<tbody>
<tr>
<td>British Bryological Society (BBS)</td>
<td>Confirmation provided that records are available via the NBN Gateway\textsuperscript{22} under the relevant licence.</td>
<td>07 June 2018</td>
</tr>
<tr>
<td>British Trust for Ornithology (BTO)</td>
<td>Ornithological records for the area of search were provided as per data request.</td>
<td>24 April 2017 &amp; 20 July 2018</td>
</tr>
<tr>
<td>Buckinghamshire and Milton Keynes Environmental Record Centre (BMERC)</td>
<td>Biological records for the area of search were provided as per data request.</td>
<td>04 April 2017 &amp; 29 June 2018</td>
</tr>
<tr>
<td>Buglife</td>
<td>Buglife confirmed that it is not a data holding organisation.</td>
<td>08 June 2018</td>
</tr>
<tr>
<td>Butterfly Conservation (BC)</td>
<td>Confirmation provided that all records are held by the relevant biological records centres and can be obtained centrally.</td>
<td>06 March 2017</td>
</tr>
<tr>
<td>Colne Valley Regional Park Authority</td>
<td>Confirmation that no records are held for the search area.</td>
<td>13 June 2018</td>
</tr>
<tr>
<td>Greenspace information for Greater London (GiGL)</td>
<td>Biological records for the area of search were provided as per data request.</td>
<td>31 March 2017 &amp; 28 June 2018</td>
</tr>
<tr>
<td>London Bat Group (LBG)</td>
<td>Bat records for the area of search were provided as per data request.</td>
<td>07 May 2017 &amp; 10 July 2018</td>
</tr>
<tr>
<td>London Bird Club (LBC)</td>
<td>Confirmation provided that all records are held by GiGL and can be obtained centrally.</td>
<td>15 March 2017</td>
</tr>
<tr>
<td>London Peregrines</td>
<td>Confirmation that no records were held for the study area.</td>
<td>13 June 2018</td>
</tr>
<tr>
<td>People’s Trust for Endangered Species (PTES)</td>
<td>Confirmation that datasets are provided to Local Record Centres.</td>
<td>08 June 2018</td>
</tr>
<tr>
<td>Plantlife (PL)</td>
<td>Confirmation provided that no records were held in the area of interest.</td>
<td>05 April 2017 &amp; 19 June 2018</td>
</tr>
<tr>
<td>Royal Society for the Protection of Birds (RSPB)</td>
<td>Ornithological records for the area of search were provided as per data request in 2017 and 2018.</td>
<td>08 June 2017 &amp; 13 August 2016</td>
</tr>
<tr>
<td>Surrey Amphibian and Reptile Group (SARG)</td>
<td>Reptile records for the search area were provided as requested.</td>
<td>21 June 2018</td>
</tr>
<tr>
<td>Surrey Bat Group (SBG)</td>
<td>Bat records for the area of search were provided as per data request.</td>
<td>17 May 2017 &amp; 16 July 2018</td>
</tr>
<tr>
<td>Surrey Biological Information Centre (SBIC)</td>
<td>Biological records for the area of search were provided as per data request.</td>
<td>16 July 2018</td>
</tr>
<tr>
<td>Surrey Dormouse Group (SDG)</td>
<td>Confirmation provided that all records are held by SBIC and can be obtained centrally.</td>
<td>31 March 2017</td>
</tr>
<tr>
<td>Surrey Mammal Group (SMG)</td>
<td>Confirmation provided that all records are held by SBIC and can be obtained centrally.</td>
<td>19 June 2018</td>
</tr>
<tr>
<td>Surrey Wildlife Trust (SWT)</td>
<td>SBIC is administered by Surrey.</td>
<td>N/A – confirmed via the SBIC</td>
</tr>
</tbody>
</table>

\textsuperscript{22} National Biodiversity Network (NBN) Gateway is a database for biodiversity information holding approximately 127 million species records.
Organisation | Data provided | Date of response |
--- | --- | ---
Wildlife Trust | all data can be obtained centrally. | website |
Thames Valley Environmental Records Centre (TVERC) | Biological records for the area of search were provided as per data request. | 30 March 2017, 28 June 2018 & 22 August 2018 |
West Surrey Badger Group (WSBG) | Confirmation provided that all records are held by SBIC and can be obtained centrally. | 15 March 2017 |

**Survey work**

8.4.5 A list of the ecological surveys carried out to inform the preparation of this chapter is provided in Table 8.6. The detailed methodologies for, and results of, these surveys can be found in Biodiversity Survey Method Statements published with the EIA Scoping Report (Heathrow, 2018). The Biodiversity Baseline Survey Reports, reporting on the field surveys to date have been used to inform the technical engagement, with final versions to be published at the time of application. The Biodiversity Survey Method Statements and Biodiversity Baseline Survey Reports have been reviewed and formally agreed as appropriate for defining the biodiversity baseline by Natural England at this preliminary stage of the DCO Project.

**Table 8.6: Survey work undertaken**

<table>
<thead>
<tr>
<th>Survey type</th>
<th>Date of surveys completed</th>
<th>Dates of future surveys</th>
<th>Relevant survey guidance</th>
<th>Survey coverage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase 1 habitat survey</td>
<td>May – October 2017 April – October 2018</td>
<td>April – October 2019</td>
<td>Phase 1 Habitat Survey Handbook (JNCC, 2010)</td>
<td>Of the ~5,802ha (100%) within the study area, ~2,186 hectares (37.7%) have been surveyed, with a further 1,061ha recorded as not requiring survey providing a total coverage of (~56%).</td>
</tr>
</tbody>
</table>

23 Future surveys are indicative only. The need for survey depends on a range of factors including survey results, evolving DCO Project design and availability of access to private land.

24 Survey coverage is provided to give an insight as to the current level of baseline data collected. The following terms are used to describe coverage (usage depends on survey type) – study area (as defined in Section 8.4); active area (all areas within the study area on which built infrastructure is proposed or construction activity is to take place).

25 Areas not requiring detailed survey are those, that when visited by surveyors, are dominated by high density development, such as Poyle Industrial Estate, or major roads such as the M25 carriageway.
### Biodiversity

<table>
<thead>
<tr>
<th>Survey type</th>
<th>Date of surveys completed</th>
<th>Dates of future surveys</th>
<th>Relevant survey guidance</th>
<th>Survey coverage</th>
</tr>
</thead>
<tbody>
<tr>
<td>National Vegetation Classification (NVC) survey</td>
<td>July – August 2017, April – August 2018</td>
<td>April – August 2019</td>
<td>National Vegetation Classification: User’s Handbook (Rodwell, 2010)</td>
<td>Of the ~1,146ha (100%) within the active area ~666ha (58.1%) have been surveyed, with a further 117ha recorded as not requiring survey providing a total coverage of (~68%).</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>British Plant Communities. Volume 1. Woodlands and scrub (Rodwell, 1991a)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>British Plant Communities. Volume 3. Grassland and montane communities (Rodwell, 1992)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>British Plant Communities. Volume 4. Aquatic communities, swamps and tall-herb fens (Rodwell, 1995)</td>
<td></td>
</tr>
<tr>
<td>Hedgerows Regulations</td>
<td>July – September, May – August</td>
<td>Hedgerow</td>
<td>~14% of hedgerows within the study area have been</td>
<td></td>
</tr>
</tbody>
</table>

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### Survey types

<table>
<thead>
<tr>
<th>Survey type</th>
<th>Date of surveys completed</th>
<th>Dates of future surveys</th>
<th>Relevant survey guidance</th>
<th>Survey coverage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assessment survey</td>
<td>2017 May – August 2018</td>
<td>2019</td>
<td>Regulations (1997)</td>
<td>scoped for the need for detailed surveys. Of the scoped in hedgerows ~77% have been surveyed.</td>
</tr>
<tr>
<td>Ditch Habitat Survey</td>
<td>June - August 2018</td>
<td>June - August 2019</td>
<td>Bespoke methodology adapted from the Farm Environment Plan (FEP) Manual; Higher Level Stewardship (Natural England, 2010)</td>
<td>~62% of ditches within the study area have been scoped for the need for detailed surveys. Of the scoped in ditches ~27% have been surveyed.</td>
</tr>
<tr>
<td>River Corridor Survey (RCS)</td>
<td>May – July 2017</td>
<td>May - June 2019</td>
<td>River Corridor Surveys: Methods and Procedures (National Rivers Authority, 1992)</td>
<td>The river length within the study area is approximately 48.2km. Of this 20.2km (42%) has been subject to survey.</td>
</tr>
<tr>
<td>River Habitat Survey (RHS)</td>
<td>May – July 2017</td>
<td>May - June 2019</td>
<td>The River Habitat Survey in Britain and Ireland Field Survey Guidance Manual (Environment Agency, 2003)</td>
<td>The river length within the study area is approximately 48.2km. Of this 20.2km (42%) has been subject to survey.</td>
</tr>
<tr>
<td>Macrophyte survey</td>
<td>June – September 2018</td>
<td>June - September 2019</td>
<td>Water quality: Guidance for the surveying of aquatic macrophytes in running waters (European Committee for Standardization, 2014a); River Assessment Method.</td>
<td>Of the 26 proposed river macrophyte surveys, 20 have been completed (76%). Of the 6 proposed lake macrophyte surveys, 6 have been completed (100%).</td>
</tr>
</tbody>
</table>

---

26. Hedgerows scoped out were those identified during the Phase 1 habitat survey as not supporting sufficient diversity of woody plants to qualify as an important hedgerow.

27. Ditches scoped out were those identified during the Phase 1 habitat survey as not supporting sufficient diversity of wetland indicator species (WIS) to qualify as a ditch of ‘moderate’ or ‘high’ environmental distinctiveness.

28. Dependent on the nature of the access (including health and safety considerations) some of this area has been subject to full River Corridor Surveys and River Habitat Surveys, with other areas being subject to characterisation only.
<table>
<thead>
<tr>
<th>Survey type</th>
<th>Date of surveys completed</th>
<th>Dates of future surveys</th>
<th>Relevant survey guidance</th>
<th>Survey coverage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Macroinvertebrate survey</td>
<td></td>
<td>March - May 2019, September – November 2019</td>
<td>Macrophytes and Phytobenthos (WFD-UKRAG, 2014a); Lake Assessment Method. Macrophytes and Phytobenthos (WFD-UKTAG, 2014b)</td>
<td>Of the 52 samples proposed for collection (over 26 survey locations) 37 have been taken (72%)</td>
</tr>
<tr>
<td>Fish survey (eDNA testing)</td>
<td>June – October 2017, June – October 2018</td>
<td>June – October 2019</td>
<td>Guidelines for the selection of sampling methods and devices for benthic macroinvertebrates in fresh waters (European Committee of Standardization, 2014b); River Assessment Method. Benthic Invertebrate Fauna. Invertebrates: Whalley, Hawkes, Paisley &amp; Trigg (WHPT) metric in River Invertebrate Classification Tool (RICT) (WFD-UKTAG, 2014c)</td>
<td>Of the 52 samples proposed for collection (over 26 survey locations) 36 have been taken (69%)</td>
</tr>
<tr>
<td>Fish survey (electro-fishing)</td>
<td>June – October 2018</td>
<td>June – October 2019</td>
<td>Instruction provided by NatureMetrics.</td>
<td>Of the 26 electro fishing surveys proposed (over 26 survey locations) 14 have been completed (54%)</td>
</tr>
</tbody>
</table>
### Survey type

<table>
<thead>
<tr>
<th>Survey type</th>
<th>Date of surveys completed</th>
<th>Dates of future surveys</th>
<th>Relevant survey guidance</th>
<th>Survey coverage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Otter survey</td>
<td>May 2017 – May 2018, May 2018 – December 2018</td>
<td>January – December 2019</td>
<td>(Fisheries Classification Scheme 2 (FCS2) (WFD-UkTAG, 2008))</td>
<td></td>
</tr>
</tbody>
</table>

\(^{29}\) The bat surveys comprise a suite of complimentary surveys to characterise the types of bats present, their level of activity, roost sites and commuting areas. The surveys have extended beyond the study area (for example where bats have been radiotracked) making an estimate of coverage difficult. All surveys have been undertaken following agreement of adequacy with Natural England - see Sections 8.5 and 8.10 for further details of the characterisation of the baseline.
<table>
<thead>
<tr>
<th>Survey type</th>
<th>Date of surveys completed</th>
<th>Dates of future surveys</th>
<th>Relevant survey guidance</th>
<th>Survey coverage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Badger survey</td>
<td>October 2017 – March 2018</td>
<td>April – October 2019</td>
<td>Surveying badgers, (1989)</td>
<td>In the study area, ~2,948 hectares (51%) is considered suitable for badgers. Of this ~1,564 hectares (53%) have been surveyed.</td>
</tr>
<tr>
<td>Hazel dormouse survey</td>
<td>March - October 2018</td>
<td>No further survey planned</td>
<td>Dormouse surveys for mitigation licencing (2011)</td>
<td>Coverage of proposed sampling area was completed (100%)</td>
</tr>
<tr>
<td>Great crested newt survey</td>
<td>April 2017 – June 2017</td>
<td>March – June 2019</td>
<td>Great crested newt mitigation guidelines (2001)</td>
<td>80% of waterbodies identified within the study area have been considered with regards great crested newts. 44% of the water bodies identified are located within the active area, of which 80% have been considered.</td>
</tr>
<tr>
<td>Reptile survey</td>
<td>March – October 2017</td>
<td>March to October 2019</td>
<td>Froglife Advice Sheet 10 (Froglife, 1999) and Herpetofauna Workers’ Manual (Gent and Gibson, 1998)</td>
<td>93% of land within the study area has been scoped for suitability, 1,053ha (18%) of which is considered potentially suitable for reptiles. Of this, 325ha (31%) have been surveyed to date. 86% of land within the active area has been</td>
</tr>
</tbody>
</table>
## Chapter 8: Biodiversity

### Survey type

<table>
<thead>
<tr>
<th>Survey type</th>
<th>Date of surveys completed</th>
<th>Dates of future surveys</th>
<th>Relevant survey guidance</th>
<th>Survey coverage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breeding bird survey</td>
<td>March - June 2017</td>
<td>March to June 2019</td>
<td>British Trust for Ornithology (BTO) Common Bird Census Methodology (Gilbert et al. 1998)</td>
<td>In the study area, ~2,002ha were considered to require breeding bird survey. Of this ~1,119 hectares (56%) have been surveyed to date.</td>
</tr>
<tr>
<td></td>
<td>March – June 2018</td>
<td></td>
<td></td>
<td>In the active area ~876ha were considered to require breeding bird survey. Of this ~640 (73%) have been surveyed to date.</td>
</tr>
<tr>
<td>Breeding kingfisher survey</td>
<td>April to August 2017</td>
<td>No further survey planned</td>
<td>British Trust for Ornithology Waterways Breeding Bird Survey Methodology (BTO 2018)</td>
<td>In the study area 32.89km of transect routes were identified alongside suitable habitat (watercourses and water bodies). Surveys have been completed covering 27.17km (~70%) with either full or partial coverage.</td>
</tr>
<tr>
<td></td>
<td>April to August 2018</td>
<td></td>
<td></td>
<td>In the active area 16.98km of transect routes were identified alongside suitable habitat (watercourses and water bodies. Surveys have been completed covering 12.77 (~75%) with either full or partial coverage.</td>
</tr>
<tr>
<td>Breeding barn owl survey</td>
<td>March – August 2018</td>
<td>March – August 2019</td>
<td>CIEEM Barn Owl Survey Guidance (Shawyer 2011)</td>
<td>In the study area, 2,002ha were initially considered for breeding barn owl survey. Of this, ~1,054ha (~53%) have been surveyed to date and subject to scoping and investigative survey.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>In the active area ~876ha were initially considered for breeding barn owl survey.</td>
</tr>
</tbody>
</table>
### Biodiversity

<table>
<thead>
<tr>
<th>Survey type</th>
<th>Date of surveys completed</th>
<th>Dates of future surveys</th>
<th>Relevant survey guidance</th>
<th>Survey coverage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breeding little ringed plover survey</td>
<td>N/A&lt;sup&gt;30&lt;/sup&gt;</td>
<td>Survey to be undertaken in suitable sites identified in early 2019</td>
<td>BTO Little Ringed Plover and Ringed Plover Methodology (Conway et al. 2008)</td>
<td>N/A</td>
</tr>
<tr>
<td>Winter bird survey - waterbodies</td>
<td>September 2014 – March 2015 September 2015 – March 2016 September 2016 – March 2017 September 2017 – March 2018</td>
<td>No further survey planned</td>
<td>Wetland Bird Survey (WeBS) Core Counts (Bibby et al. 2000)</td>
<td>In the study area, ~1,177ha were considered suitable for wintering water bird survey. Of this, ~1,170ha (~99%) have been surveyed. In the active area ~82ha were considered suitable for wintering water bird survey. Of this ~75ha (~92%) have been surveyed to date.</td>
</tr>
<tr>
<td>Winter bird survey – waterbird flight monitoring</td>
<td>September 2018 – March 2019</td>
<td>No further survey planned</td>
<td>Scottish Natural Heritage (SNH) Vantage Point Guidance (SNH 2014)</td>
<td>N/A – this survey is focused on identifying behavioural patterns in bird flight between water bodies.</td>
</tr>
<tr>
<td>Terrestrial wintering bird survey</td>
<td>September 2017 – March 2018</td>
<td>No further survey planned</td>
<td>BTO Winter Farmland Bird Survey (Atkinson et al. 2006)</td>
<td>In the study area, ~2,002ha were considered suitable for wintering bird surveys. Of this, ~1,512ha (~76%) have been surveyed to date. In the active area ~876ha were considered suitable for wintering bird survey of this ~683 (~78%) have been surveyed to date.</td>
</tr>
</tbody>
</table>

<sup>30</sup> Due to very limited habitat suitable for breeding for this species and land access to date no specific surveys for little ringed plover were completed in 2017 or 2018.
### 8.5 Overall baseline

#### Introduction

8.5.1 The description of the ecological features below provides a summary of the biodiversity baseline as determined through desk study and field survey. At this stage of the DCO Project a complete overview of the habitats and species present is not available as the field survey is still ongoing. This baseline therefore reflects knowledge to date; however coverage has been extensive (see Table 8.6) providing confidence that the characterisation of the study area is robust and can form a reasonable basis for the assessment provided within this chapter.

8.5.2 A summary of the biodiversity surveys being undertaken in 2019 for each ecological feature scoped in to the assessment is provided in Section 8.10.
Current baseline

Site context and surrounding habitats

8.5.3 The land within the study area is approximately 5,802ha in extent comprising a range of broad habitat types including built development (residential and commercial premises and transport infrastructure), farmland (arable land, improved pasture and rough grazing), semi-natural habitats (often established on capped landfill or areas previously used for sand and gravel extraction), rivers (the River Colne (Main River), Wraysbury River (Main River), Duke of Northumberland’s River (Main River), Longford River (ordinary watercourse), Colne Brook (Main River), Horton Brook (ordinary watercourse), Poyle Channel (Main River), Bigley Ditch (Main River) and River Crane (Main River)), water supply reservoirs and recreational facilities (sports pitches, golf courses, public parks etc.). Areas of semi-natural habitat are fragmented by the presence of motorways, A-roads, the existing airport and other development, with main routes of connectivity (for wildlife) between areas being provided by the river network (including where it passes under major roads and borders the Airport).

8.5.4 Within the study area land management practices differ markedly from intensive arable production, through commercial use (for example landfilling activities) to abandonment (in other words, no management). There are large areas set aside for management to benefit biodiversity and/or the local community. These areas include Harmondsworth Moor (created in the late 1990s / early 2000s on approximately 100ha of landfill and former gravel works), Cranford Park (historic parkland totalling 58ha) and approximately 170ha owned and managed by Heathrow (including sites such as Robb’s Nursery and Oaks Road Biodiversity Site).

Statutory nature conservation sites (International/European)

8.5.5 Figure 8.2, Volume 2 illustrates the locations of the statutory nature conservation sites designated under international conventions or via European directives, whilst Table 8.7 provides information on the designations.

Table 8.7: European sites designated for nature conservation

<table>
<thead>
<tr>
<th>Site name</th>
<th>Designation</th>
<th>Designated features</th>
<th>Approximate distance (km) / direction from the Site</th>
</tr>
</thead>
<tbody>
<tr>
<td>South West London Waterbodies</td>
<td>Ramsar site</td>
<td>Wintering populations of gadwall <em>Anas strepera</em> and spring/autumn peaking populations of shoveler</td>
<td>Adjacent to the Site</td>
</tr>
<tr>
<td>Site name</td>
<td>Designation</td>
<td>Designated features</td>
<td>Approximate distance (km) / direction from the Site</td>
</tr>
<tr>
<td>---------------------------</td>
<td>-------------</td>
<td>--------------------------------------------------------------------------------------</td>
<td>------------------------------------------------------</td>
</tr>
<tr>
<td>South West London Waterbodies</td>
<td>SPA</td>
<td>Anas clypeata&lt;br&gt;Wintering populations of gadwall and shoveler</td>
<td>Adjacent to the Site</td>
</tr>
<tr>
<td>Windsor Forest and Great Park</td>
<td>SAC</td>
<td>Atlantic acidophilous beech forests with <em>ilex</em> and sometimes also <em>Taxus</em> in the shrub layer (Beech forests on acid soils) &lt;br&gt;Old acidophilous oak woods with <em>Quercus robur</em> on sandy plains. (Dry oak-dominated woodland) &lt;br&gt;Violet click beetle <em>Limoniscus violaceus</em></td>
<td>4.30 SW</td>
</tr>
<tr>
<td>Richmond Park</td>
<td>SAC</td>
<td>Stag beetle <em>Lucanus cervus</em></td>
<td>6.68 E</td>
</tr>
<tr>
<td>Burnham Beeches</td>
<td>SAC</td>
<td>Atlantic acidophilous beech forests with <em>ilex</em> and sometimes also <em>Taxus</em> in the shrub layer (Beech forests on acid soils)</td>
<td>8.09 NW</td>
</tr>
<tr>
<td>Thames Basin Heaths</td>
<td>SPA</td>
<td>Breeding woodlark <em>Lullula arborea</em>, nightjar <em>Caprimulgus europaeus</em> and Dartford warbler <em>Sylvia undata</em></td>
<td>9.31 SW</td>
</tr>
<tr>
<td>Thursley, Ash, Pirbright and Chobham</td>
<td>SAC</td>
<td>Depressions on peat substrates of the <em>Rhynchosporion</em> &lt;br&gt;European dry heaths &lt;br&gt;Northern Atlantic wet heaths with <em>Erica tetralix</em>. (Wet heathland with cross-leaved heath)</td>
<td>9.31 SW</td>
</tr>
<tr>
<td>Wimbledon Common</td>
<td>SAC</td>
<td>European dry heaths &lt;br&gt;Northern Atlantic wet heaths with <em>Erica tetralix</em>. (Wet heathland with cross-leaved heath) &lt;br&gt;Stag beetle</td>
<td>10.29 E</td>
</tr>
<tr>
<td>Chiltern Beechwoods</td>
<td>SAC</td>
<td><em>Asperulo-Fagetum</em> beech forests &lt;br&gt;Semi-natural dry grasslands and scrubland facies on calcareous substrates (<em>Festuco-Brometalia</em>) (includes the priority feature ‘important orchid rich sites’) &lt;br&gt;Stag beetle</td>
<td>16.36 NW</td>
</tr>
</tbody>
</table>
A total of seven NNRs and 120 SSSIs were identified through the desk study (see Figure 8.3, Volume 2 and Appendix 8.2). Of these designations, Staines Moor SSSI is partially within the Site. Unit 1 of Staines Moor (known as Poyle’s Meadow) comprises two fields which are separated from the main area of the SSSI by the M25. They cover 8.7ha (comprising approximately 1.7% of the SSSI) and are in ‘unfavourable-declining’ condition as classified by Natural England in 2017. Despite the current condition of the fields, areas of the notified feature (MG5b grassland) still remain.

In addition to the NNRs and SSSIs, nine LNRs (see Figure 8.4, Volume 2) were also identified during the desk study. Two of these are within the Site, namely the Arthur Jacobs LNR and Cranebank LNR. The Arthur Jacobs LNR comprises wetland habitats created from derelict sewage sludge lagoons (note this site is also designated as an LWS); Cranebank LNR comprises flood meadows alongside the River Crane (note this site lies within the Crane Corridor LWS).

The desk study returned details of a total of 99 non-statutory designated sites. These comprise 11 Local Wildlife Sites (LWS), 61 Sites of Importance for Nature Conservation (SINC) (10 Metropolitan, 14 Borough Grade 1, 22 Borough Grade II and 15 Local grade), 16 Sites of Nature Conservation Importance (SNCL), nine Biological Notification Sites (BNS) and two conservation road verges. These non-statutory designated sites are shown on Figure 8.4.

Of these non-statutory designated sites, 22 are fully or partially within the Site. These sites are listed below:

1. Arthur Jacobs LWS / LNR
2. Bedfont Lakes Country Park SINC (Metropolitan)
3. Cairns Lane SINC (local)\(^{31}\)
4. Colne Brook LWS
5. Crane Corridor SINC (Metropolitan) (including Cranebank LNR)
6. Cranford Countryside Park and Open Space SINC (Borough grade I)
7. Cranford Lane Gravel Workings SINC (Borough grade II)
8. Duke of Northumberland’s River at Bedfont SINC (Metropolitan)
9. East of Poyle Meadow SNCI
10. Field Close Open Space Roughs SINC (Local)
11. Greenham’s Fishing Pond SNCI
12. Hatton Meadows SINC (Borough Grade I)
13. Longford River at Feltham SINC (Borough grade I)
14. Lower Colne SINC (Metropolitan)\(^{32}\)
15. Mayfield Farm and Water Treatment Works SINC (Borough grade I)\(^{33}\)
16. Old Slade Lakes LWS
17. River Colne (County Boundary to Staines Moor) SNCI
18. Stanwell II SNCI
19. Stockley Road Rough SINC (Local)
20. Wall Garden Farm Sand Heaps SINC (Borough grade I)
21. West of Poyle Meadow SNCI
22. Wraysbury Reservoir SNCI.

**Habitats**

8.5.10 Eleven HPI were identified during the desk study from the Priority Habitat Inventory (MAGIC Website, Natural England). A breakdown and extent of the habitat types are identified in **Table 8.8**, and their distribution is shown on **Figure 8.5, Volume 2**.

\(^{31}\) This LWS is owned and managed by Heathrow  
\(^{32}\) This LWS is partially owned and managed by Heathrow  
\(^{33}\) This LWS is owned, operated and managed by Heathrow
### Table 8.8: HPI identified during the desk study

<table>
<thead>
<tr>
<th>Habitat</th>
<th>Area within the Site (ha)</th>
<th>Percentage cover the Site (%)</th>
<th>Area within the study area (ha)</th>
<th>Percentage cover the study area (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ancient woodland</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Coastal and floodplain grazing marsh</td>
<td>0</td>
<td>0</td>
<td>33</td>
<td>1</td>
</tr>
<tr>
<td>Deciduous woodland</td>
<td>96</td>
<td>3</td>
<td>279</td>
<td>4</td>
</tr>
<tr>
<td>Good quality semi-improved grassland</td>
<td>28</td>
<td>1</td>
<td>36</td>
<td>1</td>
</tr>
<tr>
<td>Lowland dry acid grassland</td>
<td>0</td>
<td>0</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>Lowland fens</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Lowland heathland</td>
<td>0</td>
<td>0</td>
<td>7</td>
<td>0</td>
</tr>
<tr>
<td>Lowland meadows</td>
<td>10</td>
<td>0</td>
<td>73</td>
<td>1</td>
</tr>
<tr>
<td>Purple moor grass and rush pastures</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Reedbeds</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Traditional orchard</td>
<td>2</td>
<td>0</td>
<td>6</td>
<td>0</td>
</tr>
</tbody>
</table>

8.5.11 In addition to the habitats recorded on the Priority Habitat Inventory, several other habitat types recorded during the field survey qualify as HPI in England. These include rivers, ponds and lakes.

8.5.12 By the end of the 2018 survey period, approximately 2,186ha had been subject to Phase 1 habitat survey; a further 1,061ha was identified as not requiring detailed survey32 (see Figure 8.6, Volume 2). Of the 2,186ha, 1,920ha (87%) is within the study area (as described in Section 8.4) and 962ha (44%) is within the Site. The broad habitat types identified regularly included (see Figure 8.7, Volume 2):

1. Woodland (lowland mixed deciduous woodland, wet woodland and plantation woodland)
2. Hedgerows
3. Grasslands
4. Swamp
5. Ditches
6. Standing water (ponds)
7. Standing water (lakes and reservoirs).
Approximately 135ha of the habitats identified during the Phase 1 habitat survey have also been the subject of NVC survey. Thirteen of the hedgerows identified were also surveyed to determine whether they were ‘important’ as defined by the Hedgerows Regulations 1997.

Woodland

Approximately 162ha of woodland habitats have been recorded to date, of which 45% is within the Site. Of this:

1. Approximately 1ha comprises woodland on the Ancient Woodland Inventory
2. Approximately 80ha comprises semi-natural woodland
3. Approximately 81ha comprises plantation woodland.

The Ancient Woodland (approximately 1ha in extent) lies adjacent to Richings Park Golf Course and is immediately to the north of the M4 (this area is outside of the Site). Following NVC survey, this woodland was identified as W8a Fraxinus excelsior-Acer campestre-Mercurialis perennis woodland, which qualifies as an HPI.

The semi-natural woodland identified occurs in a large number of locations, ranging in size between 0.01 and 4.92ha. In addition, there are multiple linear sections of this habitat that typically run alongside watercourses and associated riparian habitats. The smaller areas of woodland are heavily influenced by edge effects including the presence of invasive species.

Approximately 40ha of semi-natural woodland has been subject to NVC survey. Of this 19ha has been classified as HPI; comprising 14ha of wet woodland (5.7ha within the Site) and 5ha of lowland deciduous woodland (4.6ha within the Site). The identified NVC communities for these HPI are:

1. W6a Alnus glutinosa-Urtica dioica woodland, typical sub-community
2. W6b Alnus glutinosa-Urtica dioica woodland, Salix fragilis sub-community
3. W6d Alnus glutinosa-Urtica dioica woodland, Sambucus nigra sub-community
4. W8a Fraxinus excelsior-Acer campestre-Mercurialis perennis woodland, Primula vulgaris-Glechoma hederacea sub-community.

The remaining semi-natural woodland subject to NVC survey comprised semi-natural woodland that does not meet the criteria to be an HPI. These woodlands are classified as:

1. W8d Hedera helix sub-community
2. W21a Crataegus monogyna-Hedera helix scrub.
8.5.19 Approximately 40ha of semi-natural woodland identified during the Phase 1 habitat survey to date still requires NVC survey (scheduled for 2019).

8.5.20 Approximately 80ha of the woodland surveyed is classified as plantation woodland (approximately 76ha of broadleaved plantation, 1ha of coniferous plantation, and 4ha of mixed plantation, respectively) and consists almost entirely of planting within public parks, and screens alongside motorways and major roadways. The largest area of plantation woodland is within Harmondsworth Moor, which contained over 40 individual blocks.

8.5.21 All woodland qualifies as a priority habitat under the London Biodiversity Action Plan (BAP). Wet woodland is listed on the Hounslow BAP, native woodland on the Buckinghamshire BAP with lowland mixed deciduous woodland and wet woodland on the Surrey BAP.

8.5.22 Veteran trees have been identified through the desk study only; an arboriculture survey is planned for 2019. Within the Site there are three veteran trees and two considered to be notable identified (Woodland Trust, n.d).

Hedgerow

8.5.23 A total of 171 hedgerows were identified during the Phase 1 Habitat Survey. Twenty-three of these hedgerows were classed as native and species-rich, as they consisted of greater than 80% native species and were also found to support at least five native woody species in any 30m section. These 23 hedgerows were subject to Hedgerow Regulations Assessments.

8.5.24 Six of these hedgerows were classified as ‘important’ under the Hedgerows Regulations 1997. These hedgerows often comprised hawthorn *Crataegus monogyna*, field maple *Acer campestre*, elder *Sambucus nigra*, crab apple *Malus sylvestris*, wild cherry *Prunus avium*, hazel *Corylus avellana*, blackthorn *Prunus spinosa*, dog-rose *Rosa canina*, pedunculate oak *Quercus robur* and/or wild privet *Ligustrum vulgare*. Four of these hedgerows lie within the Site.

8.5.25 A further 126 hedgerows identified were dominated by native woody species but were species poor (for example being dominated by typical hedging species such as hawthorn and blackthorn). All native hedgerows over 20m in length (149 of 171, both species-rich and species-poor), are defined as HPI. A total of 134 HPI hedgerows lie within the Site.

Grassland

8.5.26 A total of approximately 836ha of grassland was identified during the Phase 1 Habitat Survey. Grassland types identified were:

1. Unimproved neutral grassland (2.2ha)
2. Semi-improved neutral grassland (approximately 129ha)
3. Poor semi-improved grassland (approximately 175ha)
4. Improved grassland (approximately 269ha)
5. Marshy grassland (approximately 48ha)
6. Amenity grassland (approximately 212ha).

8.5.27 The majority of the grasslands surveyed were species-poor (~656ha); these included improved grassland, poor semi-improved grassland and amenity grassland. Approximately 180ha of the grassland surveyed had the potential to be species-rich (as identified during the Phase 1 habitat survey), and of these, sixteen sites (approximately 91ha of which ~33ha is within the Site) have so far been subject to NVC surveys. The remaining 91ha of grassland will be subject to NVC survey in 2019.

8.5.28 Of the grasslands subject to NVC surveys, all three of the unimproved grassland areas were found to be HPI covering approximately 23ha (6.5ha is within the Site). All of these grasslands were located within Staines Moor SSSI. Two NVC sub-communities were identified:

1. MG5a Centaureo-Cynosuretum cristati grassland, Lathyrus pratensis sub-community
2. MG5b Cynosurus cristatus-Centaurea nigra grassland, Galium verum sub-community.

8.5.29 The remaining ~69ha (~20ha is within the Site) of grassland that were subjected to NVC survey were semi-improved neutral grassland and did not qualify as HPI. These comprised thirteen individual sections that were subject to survey, grassland types present included:

1. One MG6b Lolio-Cynosuretum cristati grassland, Anthoxanthum odoratum sub-community, which is of moderate species-richness and is located within Staines Moor SSSI
2. Seven sites resembling MG1 Arrhenatheretum elatius grasslands, which were generally dry, species-poor, coarse grasslands
3. Three sites resembling MG9a Holcus lanatus-Deschampsia cespitosa grassland, Poa trivialis sub-community, which were wet, species-poor, coarse grasslands. One of these sites was located within Staines Moor SSSI
4. One grassland resembling MG10b Holco-Juncetum effusi rush-pasture, Juncus inflexus sub-community, which is species-poor and short
5. One other grassland located within Staines Moor SSSI was a mosaic of marshy grassland with swamp and included both MG9 and MG10 communities, as well as S6 Carex riparia swamp, S15 Acorus calamus swamp, and S28b Phalaris arundinacea tall-herb fen, Epilobium hirsutum-Urtica dioica sub-community. This mix is characteristic of the alluvial floodplain meadows.

8.5.30 This mixture of grasslands within Staines Moor SSSI ensures a mosaic of unimproved grassland (HPI), semi-improved neutral grassland (non HPI), marshy grassland (non-HPI) and swamp (non-HPI) which is synonymous with its designation as alluvial floodplain.

8.5.31 For the purposes of this assessment, all remaining semi-improved neutral grassland that will be subject to NVC survey in 2019 is considered to be non-HPI. This is because none of this grassland subject to survey to date has so far been classified as HPI including within areas ostensibly managed for biodiversity.

Swamp, marginal and inundation

8.5.32 Swamp habitats covering approximately 5ha (4.8ha is within the Site) have so far been surveyed. These areas are typically found as reedbeds around lake perimeters and in isolated wetland areas. The largest singular swamp was an artificial reedbed located within Mayfield Farm (a water treatment facility operated by Heathrow) measuring 2.2ha in extent. Marginal and inundation habitats were also found associated with river and pond habitats.

8.5.33 Three discrete areas of swamp (approximately 3ha in extent) were subject to NVC surveys. Two most resembled S6 Carex riparia swamp, which were species-poor and dominated by either greater pond sedge Carex riparia, as is typical of this community, or by slender-tufted sedge Carex acuta. The third area of swamp surveyed was a mosaic of S12b Typha latifolia swamp, Mentha aquatica sub-community and S18a Carex otrubae swamp, Carex otrubae sub-community. None of the swamp habitats surveyed to date qualify as HPI.

Ditches

8.5.34 A total of 150 ditches were identified with 81 assessed in accordance with the ditch survey method statement. Of these 81 ditches, 71 were scoped out of detailed survey as they did not support enough wetland indicator species to warrant a classification of either moderate or high distinctiveness. Of the remaining ten ditches, four were classified as high distinctiveness and the remaining six were categorised as moderate distinctiveness. Ditches are not categorised as HPI habitats.

8.5.35 The remaining 69 ditches identified are due to undergo assessment in 2019.
Standing water (ponds)

8.5.36 A total of 46 ponds (waterbodies under 2ha) were surveyed (38 are within the Site). These were a mix of smaller fishing lakes, sewage treatment reservoirs, balancing ponds, ponds managed for biodiversity and ornamental ponds. All of these ponds are considered to fulfil the criteria as HPI\textsuperscript{34}.

Standing water (lakes)

8.5.37 A total of 16 freshwater lakes, recorded as HPI, have been surveyed to date, ranging in area from 2ha to 9.5ha, covering a total area of 570ha (31.7ha is within the Site). Aquatic macrophyte communities indicate nutrient statuses ranging from eutrophic to mesotrophic, comprising species typically found within these lake types. The morphology of the lakes was typical of manmade gravel pits, with steep marginal gradients that rapidly exceeded depths suitable for submerged aquatic macrophyte communities. Many of the lakes have been stocked with fish by anglers. Other large water bodies present in the study area are the large water supply reservoirs owned and operated by Thames Water; namely Staines North, Staines South, King George VI, Wraysbury and Queen Mother Reservoir, these have not yet been surveyed.

Other habitats

8.5.38 The remainder of the areas subject to survey in 2017 and 2018 largely supported habitats such as tall ruderal vegetation, arable land, and areas of hard standing and buildings (including roads, industrial premises and residential development).

Notable plant species

8.5.39 The desk study returned records of one species listed on Schedule 8 of the Wildlife and Countryside Act 1981 (as amended) (Sch 8 WCA), seven SPI, 21 species threatened (Critically Endangered, Endangered and Vulnerable) in England and/or Great Britain (Stroh \textit{et al}, 2014), two nationally rare species, 16 nationally scarce species\textsuperscript{35} and two London BAP priority species\textsuperscript{36}.

\textsuperscript{34} Ponds are all considered to be HPI as the criteria governing qualifications requires extensive data on the flora and fauna that inhabit them. This information is not available and hence a precautionary view has been taken.

\textsuperscript{35} Nationally Scarce species estimated to occur within the range of 16 to 100 ten-kilometre squares in Great Britain. This includes: species categorised into two Nationally Notable groups pre-1994: Notable A and Notable B (with some species not categorised and listed as Notable); and species categorised into two Nationally Scarce groups post-1994: Nationally Scarce A and Nationally Scarce B (with some species not categorised and listed as Nationally Scarce).

\textsuperscript{36} Data available within the desk study report.
During the habitat surveys the following protected and/or notable plant species were identified:

1. Bluebell *Hyacinthoides non-scripta* is protected against sale under Section 13.2 and Sch 8 WCA. This species was observed in abundance in much of the woodland across the study area, but in particular within Cranford Park, and a patch of woodland between the M4 and Colnbrook Bypass.

2. Common chicory *Cichorium intybus*, listed as vulnerable in England, was located within arable land north of the M4 and west of the M25.

3. Cornflower *Centaurea cyanus* is a SPI which was recorded in an arable field north of A4 Bath Road.

4. Lesser spearwort *Ranunculus flammula* is vulnerable in England. It was recorded in one location at Staines Moor SSSI.

5. Annual beard-grass *Polypogon monspeliensis* is nationally scarce. It was recorded in one location south of Colnbrook.

6. Mistletoe *Viscum album* is a priority species in the London BAP. It was observed in several locations including on land north of the M4 and west of the M25.

7. Pointed stonewort *Nitella mucronata*, a nationally scarce species of stonewort, has been recorded within Saxon Lake.

A total of 33 invasive plant species were identified from the desk study, with over 747 individual records. These include 12 species listed on Sch 9 WCA.

Six invasive non-native plant species were recorded during the field surveys undertaken to date. These were:

1. Eighteen field records of Japanese knotweed *Fallopia japonica* were taken, including along the Colne Brook, Wraysbury River and River Colne.

2. Thirteen field records of giant hogweed *Heracleum mantegazzianum* were recorded, including along the Wraysbury River, River Colne and River Crane.

3. Three field records of rhododendron *Rhododendron ponticum* were identified; one in woodland adjacent to the M4, and two within Cranford Park.

4. Multiple records of cotoneaster *Cotoneaster spp.* were taken within ornamental flowerbeds and car park plantings (individual cotoneaster plants were not identified to species level).

5. Four field records of floating pennywort *Hydrocotyle ranunculoides* were taken along the River Colne, Wraysbury River and Colne Brook.
6. Indian balsam\(^{37}\) *Impatiens glandulifera* was recorded in abundance throughout the areas covered by survey, and was recorded along all watercourses as well as on the banks of the majority of waterbodies.

7. Canadian waterweed *Elodea canadensis* and/or Nuttall’s waterweed *Elodea nuttallii* were recorded on the Wraysbury River, River Crane, Swan Lake, Colnbrook North Lake, Orlitts Lake, Old Slade Lake, Colnbrook West and Saxon Lake.

**River habitats**

8.5.43 River Corridor Surveys (RCS) and River Habitat Surveys (RHS) were undertaken at locations along the Longford River, Duke of Northumberland’s River, Horton Brook, Colne Brook, Wraysbury River, River Colne and River Crane in 2017 and 2018\(^{38}\). Survey locations are shown on Figure 8.8, Volume 2. All channels surveyed to date were found to have been subject to heavy modification. All rivers within the Site qualify as HPI.

8.5.44 All river sections surveyed (referred to as reaches) contained re-sectioned (in other words widened and deepened reaches) and/or reinforced channels (in other words banks strengthened), with several major bridges and weirs also recorded.

8.5.45 Habitat quality assessments were undertaken for all watercourses using the data collected. Habitat quality classifications are shown on Figure 8.9, Volume 2. Overall habitat quality along the Longford River and Duke of Northumberland’s River is low and doesn’t support a diverse and resilient ecosystem. The River Colne varies between moderate and poor habitat quality whilst the Wraysbury River is dominated by poor quality habitat, likely due to historical channel modification. The Colne Brook varies between low to high habitat quality, with habitat quality being best in reaches where macrophyte growth and flow diversity is good. The Horton Brook has been assessed with low habitat quality due to extensive channel modifications, limited primary productivity and heavy shading which has prevented macrophyte growth. The River Crane varies between moderate to low, with habitat quality being best where the reach has been sensitively managed to restore riparian habitat for aquatic macrophytes and fauna.

**Macrophytes**

8.5.46 Species typical of eutrophic (high-nutrient environment), standing or slow-flowing water were common in all water courses surveyed (see Figure 8.8, Volume 2 for

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\(^{37}\) Indian balsam is also known as Himalayan balsam.

\(^{38}\) The Bigley Ditch, Poyle Channel and Bonehead Ditch are yet to be surveyed.
sampling locations), including common club-rush *Schoenoplectus lacustris*, yellow water-lily *Nuphar lutea*, arrowhead *Sagittaria sagittifolia* and unbranched bur-reed *Sparganium emersum*.

8.5.47 Communities comprising stream water-crowfoot *Ranunculus penicillatus* ssp. *pseudofluitans*, river water-dropwort *Oenanthe fluviatilis* and water-starwort *Callitriche* sp. were recorded occasionally along the Wraysbury River, indicating a more meso-eutrophic, calcareous environment.

8.5.48 The Longford River and Duke of Northumberland’s River are severely modified with reinforced concrete banks. The vegetation present in these rivers was planted within gabion baskets using coir matting. These are placed periodically along the reaches and one particular section (along the western boundary of the Airport) contained an abundance of established common reed *Phragmites australis*, which covers over 70% of the width of the river.

8.5.49 Macrophytes recorded in Colnbrook North Lake, Colnbrook West, Orlitts Lake and Old Slade Lake are very limited in diversity and all indicate a high-nutrient environment. Species present include Nuttall’s waterweed, rigid hornwort *Ceratophyllum demersum*, least duckweed *Lemna minuta* and ivy-leaved duckweed *Lemna trisulca*.

8.5.50 The communities of macrophytes recorded at Saxon Lake and Swan Lake reflect lower nutrient, meso-eutrophic waterbodies. Saxon Lake is dominated by charophytes, a family of macro-algae which are intolerant of pollution and high-nutrient levels and are an excellent indicator of high water quality. Pointed stonewort, a nationally scarce species, was recorded within Saxon Lake. Swan Lake also has a good diversity of charophytes, but also exhibits some levels of nutrient input with the presence of Canadian waterweed, Nuttall’s waterweed, rigid hornwort and fennel pondweed *Potamogeton pectinatus*. An extensive stand of *Cladophora* algae was recorded, a further indication of nutrient influx.

**Macroinvertebrates**

8.5.51 Macroinvertebrate surveys were undertaken in May 2018 across the River Colne, Colne Brook, Duke of Northumberland’s River, Wraysbury River and Horton Brook (see Figure 8.8, Volume 2 for sampling locations) to assess community composition and the sensitivities of species present to various pressures, for example pollution, low flows and sedimentation. At the time of writing, data from autumn sampling was not yet available and so the following analyses are based solely upon spring macroinvertebrate communities.

8.5.52 Forty-eight different macroinvertebrates were identified to species level between the five samples taken from the River Colne. The most abundant species included waterlouse *Asellus aquaticus*, the snail *Bithynia leachii* and the crustacean...
Gammarus pulex. At the family level, Oligochaeta (worms) and Chironomidae (flies) were both abundant. The Community Composition Index (CCI) suggests that the macroinvertebrate community present is of ‘moderate’ conservation value overall. Families of relatively high conservation value identified in the River Colne samples included various families of flies (Ceratopogonidae, Empididae and Limoniidae). The species of highest conservation value was the long-horned caddisfly Mystacides nigra.

8.5.53 Twenty-five different species were identified in the macroinvertebrate sample collected from Colne Brook in spring 2018. The most abundant species in the sample included the snails Potamopyrgus antipodarum and Gyraulus albus. Crustaceans of the genus Gammarus were also abundant, however they could not always be identified to species level. At the family level, counts of Oligochaeta (worms) and Chironomidae (flies) were high. Overall, the conservation value of the macroinvertebrate community at this site is categorised as ‘moderate’. The species of highest conservation value recorded here were the river bug Aphelocheirus aestivalis and the whorl snail Bithynia leachii.

8.5.54 Sixteen macroinvertebrate species were identified in the sample collected from the Duke of Northumberland’s River. Waterlouse A. aquaticus and the shrimp Crangonyx pseudogracilis were the most abundant. The CCI score suggests a community of macroinvertebrates of ‘moderate’ conservation value. The gastropod Bithynia leachii and the damselfly Calopteryx virgo were the macroinvertebrates of highest conservation value identified to species level.

8.5.55 The macroinvertebrate sample from the Wraysbury River was the most diverse of all the samples collected in spring 2018; 34 species were recorded. The beetle Elmis aenea, the snail Gammarus pulex and the blue-winged olive nymph Serratella ignita were the most frequently recorded. Macroinvertebrates of the Simuliidae (black flies) and Chironomidae (flies) families were also abundant but not identified to species level. The CCI score suggests that the conservation value of the species assemblage is categorised as ‘fairly high’. Of note, individuals of the family Empididae (flies) were recorded at the site and the species of highest conservation value were the aquatic bug Aphelocheirus aestivalis, snail Bithynia leachii and the caddisfly Brachycentrus subnubilus.

8.5.56 Horton Brook had the least diverse macroinvertebrate community of the five rivers surveyed in spring 2018. Fifteen macroinvertebrates were identified to species level, with crustacean Gammarus fossarum and the aquatic snail Potamopyrgus antipodarum being the most abundant. Chironomids (flies) were also abundant, however they were not identified to species level. The CCI score indicates a community of ‘fairly high’ conservation value with the crayfish family Astacidae and species of the caddisfly family Limnephilidae present.
**Fish**

8.5.57 The desk study, which included Environment Agency monitoring data, showed the presence of a diverse fish community dominated by cyprinid species (for example chub *Leuciscus cephalus*) within the Horton Brook, River Colne, Colne Brook, Wraysbury River, The Duke of Northumberland’s River and Longford River (see Figure 8.8, Volume 2 for sampling locations). Two species of conservation interest were identified, namely European bullhead *Cottus gobio*\(^{39}\), within the Colne Brook, River Colne, Wraysbury River, River Crane and Duke of Northumberland’s River and European eel *Anguilla anguilla* within the River Colne, Poyle Channel, Colne Brook, Wraysbury River, River Crane and Duke of Northumberland’s River.

8.5.58 A low number (up to three individuals) of brown trout *Salmo trutta* were recorded in 2003, 2007 and 2014 from reaches of the Wraysbury River within Harmondsworth Moor, which is likely a result of the river being stocked with the species.

8.5.59 Analysis of environmental DNA (eDNA) within water samples collected in autumn 2017 and spring 2018 identified 14 species and 17 species respectively within the Colne Brook, Duke of Northumberland’s River, Horton Brook, River Colne, Wraybury River, Swan Lake, Colnbrook West and Orlitts Lake. These species were barbel *Barbus barbus*, bleak *Alburnus alburnus*, bream *Abramis brama*, carp *Cyprinus carpio*, chub, dace *Leuciscus leuciscus*, European eel, European bullhead, gudgeon *Gobio spp.*, minnow *Phoxinus phoxinus*, nine-spined stickleback *Pungitius pungitius*, perch *Perca fluviatilis*, pike *Esox lucius*, roach *Rutilus rutilus*, stone loach *Barbatula barbatula*, tench *Tinca tinca* and three-spined stickleback *Gasterosteus aculeatus*. The species identified are those that would typically be expected to occur in the area around Heathrow and are characteristic of a fish community dominated by cyprinid species.

8.5.60 Electro-fishing surveys conducted in 2018 over 14 sites and across seven watercourses identified 16 species. Roach were caught at most sites while carp, European eel, ruffe *Gymnocephalus cernua*, stone loach and tench were considerably less common and caught at fewer sites.

8.5.61 Three-spined stickleback and nine-spined stickleback were recorded exclusively within the eDNA analysis, while ruffe was only recorded during the electro-fishing surveys. This gives an overall total of 18 species recorded between the two survey types.

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\(^{39}\) European bullhead and European eel are both listed on Annex II of Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora; barbel is listed on Annex 4 of this directive.
White-clawed crayfish

8.5.62 There are two records of the native white-clawed crayfish *Austropotamobius pallipes* from 2010, located just outside the boundary of the desk study (see Figure 8.8, Volume 2). The white-clawed crayfish is an SPI and its presence is also reflective of unpolluted, mesotrophic waters.

8.5.63 Surveys were conducted along the River Colne, Colne Brook and the Wraysbury River in 2018, where habitats were considered most suitable for the white-clawed crayfish. No white-clawed crayfish were detected.

Signal crayfish

8.5.64 The invasive species signal crayfish *Pacifastacus leniusculus* predates the native white-clawed crayfish and is a vector for the crayfish plague, a disease which can cause mass mortalities of white-clawed crayfish.

8.5.65 Signal crayfish presence was recorded in the River Colne, Horton Brook, Wraysbury River, Duke of Northumberland’s River and Colne Brook. Standing water bodies Swan Lake, Orlitts Lake and Colnbrook West were tested for signal crayfish presence using eDNA analysis, although no positive results were returned (see Figure 8.8 for sampling locations).

Otter

8.5.66 One non-statutory site, Little Britain SINC, lists otter *Lutra lutra* within the citation. Little Britain SINC is located within the Colne Valley, comprising a variety of habitats including lakes, rivers (the River Colne and River Frays), scrub, areas of wasteland, woodland and neutral grassland. The river corridors provide connectivity between the SINC and habitats within the Site. The desk study identified six records of otter between 2008 and 2016 within the wider area (see Figure 8.10, Volume 2).

8.5.67 Surveys for otters were undertaken and the survey coverage is detailed in Figure 8.10. The field surveys confirmed otter activity along eight water courses and around six water bodies. These are listed below and shown on Figure 8.10:

1. Colne Brook;
2. Poyle Channel
3. Wraysbury River
4. River Colne
5. River Crane
6. Colne Brook
7. Bigley Ditch  
8. Bonehead Ditch  
9. Colnbrook West Lake  
10. Orlitts Lake  
11. Old Slade Lake  
12. Hythe Lagoon  
13. Colne Mere  
14. Wraysbury II (North).

8.5.68 Field signs recorded comprised mainly of otter spraints (droppings) with occasional records of slides (entry points to water) and feeding signs (Figure 8.10). Evidence of otter resting sites were recorded along the Colne Brook, Wraysbury River, River Colne and around Orlitts Lake.

8.5.69 Seven spraints in suitable condition were sent for DNA analysis; all were confirmed as being otter. Of the seven spraints analysed, four were confirmed as being deposited by females; the sex could not be determined for the remaining three samples due to the DNA being degraded.

8.5.70 Terrestrial habitats associated with water courses have been identified with potential to support breeding activity by otter. Mature trees, dense scrub and a proliferation of willows are present alongside the River Colne, Colne Brook (through Old Slade Lake LWS), Poyle Channel and along the Wraysbury River. The lakes which are closest to the main water channels are the most likely features to be utilised by otters. The suitability of terrestrial habitat has been mapped and is detailed in Figure 8.10.

Water vole

8.5.71 Four non-statutory sites within the study area have water vole *Arvicola amphibius* noted within their citation. These are: Little Britain SINC (within the Colne Valley); Lower Colne SINC (associated with sections of the rivers Colne, Wraysbury and Frays); Crane Corridor SINC (including 5km of the River Crane); and the Bedfont SINC (alongside the Duke of Northumberland’s River). The river corridors provide connectivity between the SINCs listed and other suitable habitats.

8.5.72 The desk study identified 195 records of water voles within the wider area. These records were from between 2009 and 2015. Additionally water vole were translocated to the Stanwell Moor Ditch in 2002 (this is assumed to be the Bonehead ditch as it is noted that it lies partially within Staines Moor SSSI), to facilitate the delivery of T5.
No evidence of water vole activity was identified during the surveys completed in 2017 and 2018. However, suitable habitat for the species is widespread within the Site and wider study area. Additional surveys were undertaken in areas where views from the bankside were hampered to ensure a robust assessment, these included boat surveys and water vole raft surveys.

The presence of American mink *Neovison vison*, a species which predates water vole, was confirmed by the desk and field surveys. Evidence of mink activity was found during the 2017 and 2018 field surveys on the Colne Brook, Wraysbury River and Orlitts Lake.

**Bats**

The Little Britain SINC has three bat species listed on its citation, noctule *Nyctalus noctula*, Daubenton’s bat *Myotis daubentonii* and soprano pipistrelle *Pipistrellus pygmaeus*. The desk study identified twelve species or genus in the area including common pipistrelle *Pipistrellus pipistrellus*, soprano pipistrelle, Nathusius’ pipistrelle *Pipistrellus nathusii*, noctule, Daubenton's bat, serotine *Eptesicus serotinus*, Leisler's Bat *Nyctalus leisleri*, Brandt’s *Myotis brandti* and whiskered bat *Myotis mystacinus*. This included records of roosts at 28 locations for a variety of species including soprano and common pipistrelles, Leisler's Bat, noctule, Daubenton's bat, Nathusius' pipistrelle and Myotis bats (*Myotis* bats were not assigned to species).

Field survey data collected in 2017 and 2018 confirmed eleven bat species or genus; this included all those listed above, plus brown long-eared bat *Plecotus auritus* and Natterer's bat *Myotis nattererii*. Some bat calls recorded during the survey programme were unable to be identified to species level and records of bats from the *Myotis* genus (for example Daubenton's bat, Natterer's bat) were grouped together because of the difficulty in separating these species from their calls alone. Common pipistrelle and soprano pipistrelle bats were the most frequently recorded species using traditional survey methods, *Myotis* bats were also regularly recorded. Relative to common and soprano pipistrelle, low numbers of noctule, serotine, Leisler's bat, Nathusius’ pipistrelle, brown long-eared, whiskered, Brandt’s and Natterer’s bat were recorded during surveys. Recorded activity levels were highest around lakes, rivers and ponds, with concentrated activity recorded around the water bodies within the Old Slade Lake LWS and Swan Lake. The River Colne and Colne Brook also supported greater levels of bat activity relative to the other areas surveyed.

Advanced surveys (described in Biodiversity Survey Method Statements, available at the time of application) trapped over 1,300 bats across 2017 and 2018; soprano pipistrelles were caught in the greatest numbers (over 600 bats) followed by Daubenton's bats (over 500 bats); over 50 brown long-eared bats were caught and
common pipistrelle bats were caught in low numbers compared to other species. Over 50 of the bats caught were fitted with radio transmitters and tracked using radio telemetry to identify roost locations, flight lines and foraging areas; and for certain species (as agreed with Natural England) to identify core habitat areas or Minimum Convex Polygons (MCPs).

Field surveys completed during 2017 and 2018 identified over 70 bat roosts in a number of buildings, underpasses and trees. Roosts were recorded for brown long-eared bat, soprano, common and Nathusius pipistrelle, noctule, Daubenton’s bat and Natterer’s bat and included maternity, transitional, night and hibernation roosts. Bat roosts identified in 2017 and 2018 are showing in Figures 8.11 to 8.15, Volume 2.

**Badger**

The desk study data provided eight historical records of badger *Meles meles*. Four were not supplied with location details as these were treated as confidential by the data supplier.

During the field surveys, eleven outlier setts, two subsidiary setts and one unknown sett (comprising records of badger using a manmade structure) were recorded. All recorded setts displayed limited activity levels at the time of survey, and sett entrances were classified as being partially active or disused with the exception of one outlier sett, which was classified as well used.

Badger activity (for example foraging signs, latrines etc.) was most commonly recorded in the habitats present between the A4 and the M4 (see Figure 8.16, Volume 2. Note sett locations are not shown on this figure. These confidential records have been provided to Natural England). Evidence of foraging signs was widely dispersed across the study area, with the majority being within the Site. In total 37 independent records of badger activity have been logged, this comprised of 11 signs of foraging and 26 latrines. Signs of activity were most common in the area between Harmondsworth and Sipson.

**Hazel dormouse**

The desk study provided no records of hazel dormouse *Muscardinus avellanarius*. However, field surveys identified 15 distinct locations within the study area that provide suitable habitat to support hazel dormouse.

These areas were subject to hazel dormouse survey in 2018; no evidence of this species was recorded, hence it has not been included within the assessment.

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40 On Figure 8.11 (a to e) for tree roosts located using radio telemetry, the exact tree could not be confirmed for all roosts, where the exact tree could not be located the area was recorded and is listed as Tree Area.
Great crested newt

8.5.84 Eleven historical records of great crested newt *Triturus cristatus* were returned as part of the desk study. All of these records were outside of the Site and isolated from it by existing development.

8.5.85 A desk-based exercise identified a total of 238 water bodies requiring consideration with regard to great crested newt. Of these, 28 could be discounted from the need for any field survey as they are isolated from any proposed development activity or are known to be stocked for angling. An additional 23 water bodies are residential ponds and as such were also excluded from field survey.

8.5.86 Field scoping surveys were undertaken on 143 of the remaining 187 water bodies to determine which had the potential to support great crested newts. Those not subject to a field survey scoping visit were those where access was not available. Of those visited, 46 ponds, lakes, and reservoirs and 51 ditches were discounted from detailed survey due to them being dry, inaccessible for health and safety reasons, contained fish (stocked for angling) or were not present (in other words, recorded on OS maps but no longer in existence).

8.5.87 Field survey scoping visits identified 46 water bodies as having the potential to support great crested newt. Thirty-seven (26 ponds and 11 ditches) of these were accessible for further survey (Figure 8.17, Volume 2).

8.5.88 Two water bodies returned positive results from eDNA surveys for great crested newt. One of these ponds is located within Harmondsworth Moor and the other lies between the banks of the Wraysbury Reservoir and the M25 (Figure 8.17).

8.5.89 Smooth newt *Lissotriton vulgaris* were recorded in 16 of the 40 water bodies sampled for metabarcoding analysis. Other amphibian species recorded were common toad *Bufo bufo* and common frog *Rana temporaria*.

Reptiles

8.5.90 The desk study returned a total of 529 records of four species of reptile, comprising 156 records of grass snake *Natrix helvetica*, 125 records of slow worm *Anguis fragillis*, 24 records of common lizard *Zootica vivipara* and 22443 records of adder *Vipera berus* (Figure 8.18, Volume 2).

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41 Further consideration will be given to those water bodies considered inaccessible in 2019.
42 One identified using standard great crested newt eDNA sampling methods and one using the metabarcoding technique (see Biodiversity Survey Method Statements – available at the time of application).
43 Two hundred and twelve of these records were provided by GiGL, however the locations of these records were requested to be kept confidential. Discussions with local ecologists suggest that these are likely to be within the vicinity of Hounslow Heath.
During the course of the field surveys, two species of reptile were recorded: slow worm and grass snake, the locations of which are shown on Figure 8.18. In line with Froglife guidelines (Froglife, 1999), the population size class assessment undertaken in 2018 shows that a ‘low’ population of grass snake and a ‘good’ population of slow worms are present within the Site (see Figure 8.18).

**Birds - breeding**

The desk study returned records of 100 species of bird known to breed within the study area. Eight of these species are listed on Schedule 1 of the Wildlife & Countryside Act 1981 (as amended) (herein referred to as Schedule 1 species). These are barn owl *Tyto alba*, black redstart *Phoenicurus ochruros*, Cetti’s warbler *Cettia cetti*, hobby *Falco subbuteo*, kingfisher *Alcedo atthis*, little ringed plover *Charadrius dubius*, peregrine *Falco peregrinus* and red kite *Milvus milvus*.

A total of 61 species have been confirmed as breeding within the study area during field surveys. This includes species listed on Schedule 1, the Birds of Conservation Concern red list and those identified as SPI. Table 8.9 provides a summary of the number of territories recorded in each survey season and conservation status of each notable species recorded. Figure 8.19, Volume 2 shows the number of species recorded in each survey area and Figure 8.20, Volume 2 shows the estimated territory centres of all notable species identified during the surveys.

**Table 8.9: Notable breeding bird summary**

<table>
<thead>
<tr>
<th>Species</th>
<th>No. of territories identified in 2017</th>
<th>No. of territories identified in 2018</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bullfinch <em>Pyrrhula pyrrhula</em></td>
<td>4</td>
<td>0</td>
<td>SPI</td>
</tr>
<tr>
<td>Cetti’s warbler</td>
<td>4</td>
<td>20</td>
<td>Schedule 1</td>
</tr>
<tr>
<td>Dunnoch <em>Prunella modularis</em></td>
<td>99</td>
<td>69</td>
<td>SPI</td>
</tr>
<tr>
<td>Grey wagtail <em>Motacilla cinerea</em></td>
<td>3</td>
<td>0</td>
<td>Birds of Conservation Concern (BoCC) Red Listed</td>
</tr>
<tr>
<td>House sparrow <em>Passer domesticus</em></td>
<td>50+</td>
<td>0</td>
<td>SPI, BoCC Red Listed</td>
</tr>
<tr>
<td>Kingfisher</td>
<td>1</td>
<td>2</td>
<td>Schedule 1</td>
</tr>
</tbody>
</table>
### Table: Species and Conservation Status

<table>
<thead>
<tr>
<th>Species</th>
<th>No. of territories identified in 2017</th>
<th>No. of territories identified in 2018</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lapwing <em>Vanellus vanellus</em></td>
<td>4</td>
<td>9</td>
<td>SPI, BoCC Red Listed</td>
</tr>
<tr>
<td>Linnet <em>Carduelis cannabina</em></td>
<td>4</td>
<td>6</td>
<td>SPI, BoCC Red Listed</td>
</tr>
<tr>
<td>Little ringed plover</td>
<td>0</td>
<td>2</td>
<td>Schedule 1</td>
</tr>
<tr>
<td>Mistle thrush <em>Turdus viscivorus</em></td>
<td>1</td>
<td>4</td>
<td>BoCC Red Listed</td>
</tr>
<tr>
<td>Reed bunting <em>Emberiza schoeniclus</em></td>
<td>1</td>
<td>14</td>
<td>SPI</td>
</tr>
<tr>
<td>Skylark <em>Alauda arvensis</em></td>
<td>16</td>
<td>72</td>
<td>SPI, BoCC Red Listed</td>
</tr>
<tr>
<td>Starling <em>Sturnus vulgaris</em></td>
<td>45+</td>
<td>11</td>
<td>SPI, BoCC Red Listed</td>
</tr>
<tr>
<td>Song thrush <em>Turdus philomelos</em></td>
<td>49</td>
<td>26</td>
<td>SPI, BoCC Red Listed</td>
</tr>
</tbody>
</table>

8.5.94 Assemblages of greatest diversity and species of higher conservation concern tended to be found in highest concentrations in areas of scattered and dense scrub. Areas of extensive urban habitat were also found to be of value to a range of notable species including house sparrow, starling, song thrush and mistle thrush.

8.5.95 Kingfisher were recorded on all of the surveyed watercourses during the survey periods. Key areas of activity have been identified on the River Colne, Wraysbury River, Duke of Northumberland’s River, Colne Brook and River Crane. In these areas, activities associated with breeding have been recorded, such as adult birds carrying fish and adult birds calling loudly to one another. Juvenile birds have also been recorded in a number of locations. In 2018, two confirmed nest locations were identified with a third assumed territory. *Figure 8.21, Volume 2* shows observations of kingfisher recorded during targeted surveys completed in 2017 and 2018 and also observations recorded during CBC surveys in 2017 and 2018.

8.5.96 Surveys during 2018 found no evidence of nesting barn owl. The survey results found that the area is dominated by habitats of low and intermediate value for the species, with only small areas of optimal habitat. However, regular incidental and survey sightings throughout the year alongside historical records of bird strikes with aircraft indicate that barn owl use the airfield and its surround for foraging and it is likely that they breed locally. *Figure 8.22, Volume 2* shows all barn owl observations recorded between 2017 and 2018.
**Birds – wintering waterbirds**

8.5.97 Results gathered between 2014 and 2018 from the reservoirs and lakes in the study area show considerable variation in both distribution and peak counts of target species. Target species were identified as those listed on the designations of the SWLW SPA / Ramsar site and constituent SSSI citations (gadwall, shoveler, black-necked grebe *Podiceps nigricollis*, cormorant *Phalacrocorax carbo*, goldeneye *Bucephala clangula*, goosander *Mergus merganser*, great-crested grebe *Podiceps cristatus*, pochard *Aythya farina*, smew *Mergus albellus*, tufted duck *Aythya fuligula*).

8.5.98 [Figures 8.23 and 8.24, Volume 2](#) show peak counts for gadwall and shoveler at each of the waterbodies surveyed. These have been calculated using results from all four years of survey.

8.5.99 Key locations for gadwall were focused around the Wraysbury and Horton area with the population favouring waterbodies such as Kingsmead, Colne Mere and Horton South. Shoveler were shown to be more site faithful with peak counts occurring at Staines Reservoir (North and South) in all years of monitoring.

8.5.100 Black-necked grebe were recorded on five out of 37 waterbodies. They were only regularly recorded on the two Staines Reservoirs with small counts of between one and four birds typical in all four seasons.

8.5.101 Cormorant were widespread, recorded on 36 of 37 waterbodies surveyed with a peak count of 529 birds recorded on Queen Mother Reservoir. Large flocks were also recorded at the nearby large reservoirs (King George VI, Staines and Wraysbury).

8.5.102 Goldeneye were recorded on 20 of the 37 waterbodies surveyed with the largest counts recorded at Colne Mere, King George VI Reservoir, Staines Reservoirs and Wraysbury Reservoir.

8.5.103 Goosander were recorded on 11 of the 37 waterbodies surveyed. The waterbodies around the Wraysbury Gravel Pits SSSI were the most regularly used, including Wraysbury II, Wraysbury Reservoir, Colne Mere, Wraysbury I South, and Hythe Lagoon.

8.5.104 Great crested grebe were widespread, recorded on 36 of 37 waterbodies surveyed. The larger reservoirs held the bulk of the population, with peak counts of 96-200 birds recorded at Staines Reservoir North, Wraysbury Reservoir, Queen Mother Reservoir and King George VI Reservoir.

8.5.105 Pochard were recorded on 32 of the 37 waterbodies surveyed. A substantial proportion of the population was recorded on Staines Reservoir North with regular moderate counts at Hythe Lagoon and Princes Lake.
8.5.106 During the 2014-18 surveys, smew were recorded in low numbers. Birds were noted on nine of the 37 waterbodies surveyed but were only seen with any regularity on Princes Lake.

8.5.107 Tufted duck were recorded on all of the 37 waterbodies surveyed over the four seasons. The highest numbers were recorded on Staines Reservoir North with a peak of 2,475. Other waterbodies where flocks of more than 300 birds were recorded included, Queen Mother Reservoir, Kingsmead, Horton South, Wraysbury Reservoir, Wraysbury II North, Wraysbury II South and Staines Reservoir South.

8.5.108 Monitoring to determine the level of anthropogenic disturbance of the waterbirds discussed above was completed during 2016/17 and 2017/18. A total of 9,240 aircraft overflights were recorded during the survey, with only 82 resulting in a detectable response by waterbirds. This amounts to waterbirds’ responses to less than 1% of the total number of flights recorded. Gadwall were recorded as being disturbed by aircraft on ten occasions and shoveler on only two occasions, with other species occasionally disturbed including coot Fulica atra, cormorant, great crested grebe, pochard and tufted duck.

8.5.109 Waterbirds were much more frequently disturbed by people undertaking recreational activities such as walking, jogging, angling or bird watching. This type of disturbance amounted to over 75% of all the disturbance events recorded (other disturbance events included maintenance works on reservoirs and presence of predators).

8.5.110 Flight line surveys have been undertaken between September 2018 and March 2019. Provisional results from September 2018 – January 2019 resulted in 1,128 flights of target species. Key areas of activity were centred around Horton Lakes; King George VI Reservoir and Wraysbury Reservoir with regular foraging movements of cormorant, in particular. Total flights across the survey area during the period September 2018 to January 2019 were: gadwall 46; shoveler 22; cormorant 1,004; tufted duck 33; pochard 14; goosander 6; great crested grebe 2 and unidentified pochard/tufted duck. There were no records of black-necked grebe, goldeneye or smew during the flight line surveys. Results show regular flights of cormorant between Old Slade Lake LWS and Saxon Lake and also from these areas to Wraysbury Reservoir. Gadwall and shoveler were recorded at all vantage points in low numbers.

**Birds – wintering birds (terrestrial habitats)**

8.5.111 Winter bird survey results of terrestrial habitats found 27 notable species, including: eight Schedule 1 species, 14 SPI and 17 species categorised as Red on the BoCC list. The majority of these species were recorded in habitats including
parkland, pasture, woodland and arable farmland. **Table 8.10** summarises the notable species recorded during the winter walkover surveys in 2017/18.

**Table 8.10: Notable wintering bird summary for terrestrial habitat**

<table>
<thead>
<tr>
<th>Species</th>
<th>Schedule 1 (Y/N)</th>
<th>SPI (Y/N)</th>
<th>BoCC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bullfinch</td>
<td>N</td>
<td>Y</td>
<td>Amber</td>
</tr>
<tr>
<td>Dunnock</td>
<td>N</td>
<td>Y</td>
<td>Amber</td>
</tr>
<tr>
<td>Fieldfare <em>Turdus pilaris</em></td>
<td>Y</td>
<td>N</td>
<td>Red</td>
</tr>
<tr>
<td>Red kite</td>
<td>Y</td>
<td>N</td>
<td>Green</td>
</tr>
<tr>
<td>Lapwing</td>
<td>N</td>
<td>Y</td>
<td>Red</td>
</tr>
<tr>
<td>Linnet</td>
<td>N</td>
<td>Y</td>
<td>Red</td>
</tr>
<tr>
<td>Mistle thrush</td>
<td>N</td>
<td>N</td>
<td>Red</td>
</tr>
<tr>
<td>Redwing <em>Turdus iliacus</em></td>
<td>Y</td>
<td>N</td>
<td>Red</td>
</tr>
<tr>
<td>Skylark</td>
<td>N</td>
<td>Y</td>
<td>Red</td>
</tr>
<tr>
<td>Starling</td>
<td>N</td>
<td>Y</td>
<td>Red</td>
</tr>
<tr>
<td>Song thrush</td>
<td>N</td>
<td>Y</td>
<td>Red</td>
</tr>
<tr>
<td>Brambling <em>Fringilla montifringilla</em></td>
<td>N</td>
<td>N</td>
<td>Green</td>
</tr>
<tr>
<td>Cetti’s warbler</td>
<td>Y</td>
<td>N</td>
<td>Green</td>
</tr>
<tr>
<td>Grey wagtail</td>
<td>N</td>
<td>N</td>
<td>Red</td>
</tr>
<tr>
<td>Hawfinch <em>Coccothraustes coccothraustes</em></td>
<td>N</td>
<td>Y</td>
<td>Red</td>
</tr>
<tr>
<td>Herring gull <em>Larus argentatus</em></td>
<td>N</td>
<td>Y</td>
<td>Red</td>
</tr>
<tr>
<td>House sparrow</td>
<td>N</td>
<td>Y</td>
<td>Red</td>
</tr>
<tr>
<td>Hobby</td>
<td>Y</td>
<td>N</td>
<td>Green</td>
</tr>
<tr>
<td>Kingfisher</td>
<td>Y</td>
<td>N</td>
<td>Green</td>
</tr>
<tr>
<td>Lesser redpoll <em>Carduelis</em></td>
<td>N</td>
<td>Y</td>
<td>Red</td>
</tr>
</tbody>
</table>
### Terrestrial invertebrates

8.5.112 Terrestrial invertebrate species considered to be species of importance are:

1. Those listed on Annex II of the Habitats Directive
2. Those listed on Schedule 5 of the WCA
3. Invertebrates identified as SPIs
4. Nationally Rare species identified in the British Red Data Books (RDB) (Duffey 1992) as they are estimated to occur in 15 or fewer ten-kilometre squares in Great Britain\(^44\)
5. Nationally Scarce (Ball 1986) species estimated to occur within the range of 16 to 100 ten-kilometre squares of the British National Grid system\(^45\).

8.5.113 The data search produced a total of 6,996 records from which 167 invertebrate species of importance have been identified. Historical records consist of the following designations (with several species falling under more than one designation):

1. Two species listed on Annex II of The Habitats Directive (stag beetle and Jersey tiger moth *Euplagia quadripunctaria*)

\(^44\) Nationally Rare species are further categorised as follows: and are categorised as follows: RDB 1 (Endangered), RDB 2 (Vulnerable), RDB 3 (Rare), or RDB K (unknown).

\(^45\) Nationally Scarce species are categorised into two National Notable groups where sufficient information is available: Na (occur within 16 to 30 ten-km squares) and Nb (occur within 31 to 100 ten-km squares).
2. Three species listed on Schedule 5 of the WCA (all protection from sale only)
3. Sixty SPIs
4. Seven species listed as near-threatened or above using post-2001 IUCN criteria
5. Eighteen Nationally Rare/Red Data Book listed species

8.5.114 Detailed surveys were undertaken in late August and early September 2017 and between April and September 2018. A total of 1,713 species have been recorded from all surveys to date (Figure 8.21, Volume 2).

8.5.115 Of these, 138 species of importance within a range of orders were found across the study area. These fell into the following categories, with provisional designations included and seven species falling under more than one designation:

1. Seven species listed as SPI
2. Seven species listed as near threatened or above using post-2001 IUCN criteria (four NT or provisionally NT, two VU or provisionally VU; one EN)
3. Twenty-four Nationally Rare species (two RDB 1, five RDB 2, ten RDB 3, five RDB K and two Nationally Rare)
4. One-hundred and five Nationally Scarce/Notable species (13 Notable/Scarce A, 45 Notable/Scarce B, 48 uncategorised Nationally Scarce/Notable or provisionally Nationally Scarce/Notable)
5. One species previously un-recorded in Great Britain
6. One species that is either a new genus to Great Britain (a South African adventive\(^46\)) or a previously undescribed species (currently awaiting confirmation).

8.5.116 Additional species of note found in the study area, which do not fall under the criteria for species of importance because they have not yet been assigned a conservation status, are:

1. *Agrilus olivicolor* (a jewel beetle) – recent addition to Britain, possibly only the fourth known record. Appears to live on oak trees (*Quercus spp.*) but may also utilise other broadleaved tree species. It is a saproxylic species, for which deadwood is important

\(^{46}\) Adventive is a term currently only specifically used for moth, and describes a species only found in Britain as a result of deliberate or accidental importation by humans.
2. *Trixagus leseigneuri* (a click beetle) – not officially recognised as British yet; it has been recorded on mainland Britain but as yet has not been formally recognised as the article containing details has yet to be published. The ecology of this species in Britain is not well known but it is likely to be associated with ancient broadleaved woodland, parkland and lines of old trees. The larvae are likely to develop in decaying wood.

Habitat associations were assigned to the species recorded based on surveyors’ knowledge or relevant literature and databases, including Pantheon, a resource developed by Natural England and the Biological Records Centre for the analysis of invertebrate survey results. Table 8.11 shows the number of species, and the number of species with conservation status, according to the broad biotopes and habitats used by Pantheon47.

**Table 8.11: Landscape scale Pantheon Output**

<table>
<thead>
<tr>
<th>Broad biotope</th>
<th>Habitat</th>
<th>No. of species</th>
<th>No. of species with conservation status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Open habitats</td>
<td>Tall sward and scrub</td>
<td>557</td>
<td>36</td>
</tr>
<tr>
<td>Tree-associated</td>
<td>Arboreal</td>
<td>236</td>
<td>15</td>
</tr>
<tr>
<td>Open habitats</td>
<td>Short sward and bare ground</td>
<td>182</td>
<td>32</td>
</tr>
<tr>
<td>Tree-associated</td>
<td>Shaded woodland floor</td>
<td>157</td>
<td>9</td>
</tr>
<tr>
<td>Tree-associated</td>
<td>Decaying wood</td>
<td>135</td>
<td>30</td>
</tr>
<tr>
<td>Wetland</td>
<td>Peatland</td>
<td>103</td>
<td>10</td>
</tr>
<tr>
<td>Wetland</td>
<td>Marshland</td>
<td>83</td>
<td>3</td>
</tr>
<tr>
<td>Wetland</td>
<td>Running water</td>
<td>42</td>
<td>1</td>
</tr>
<tr>
<td>Wetland</td>
<td>Wet woodland</td>
<td>37</td>
<td>1</td>
</tr>
<tr>
<td>Tree-associated</td>
<td>Wet woodland</td>
<td>36</td>
<td>1</td>
</tr>
</tbody>
</table>

47 The Pantheon database assigns terrestrial invertebrate species to assemblages associated with certain habitats. This classification is undertaken at three different levels: broad biotope types; habitat types; and specific assemblage types. This report primarily refers to the habitat types associated with the terrestrial invertebrate species recorded during field surveys.
### Broad biotope | Habitat | No. of species | No. of species with conservation status |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Coastal</td>
<td>Saltmarsh</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>Open habitats</td>
<td>Upland</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>Wetland</td>
<td>Lake</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Coastal</td>
<td>Brackish pools and ditches</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Coastal</td>
<td>Sandy beach</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

The information in **Table 8.11** was used to determine the assemblages considered within the scope of the assessment (**Section 8.6**) and the assessment (**Sections 8.10 and 8.11**).

**Future baseline**

The future biodiversity baseline will largely be driven by any predicted changes in land use in the absence of the development of the DCO Project. These land use changes are mainly associated with restoration plans for landfilling and quarrying operations within the Site. All of these changes have the potential to improve the baseline situation by the provision of habitats of better quality and condition than those currently present. These improvements need to be considered as part of the future baseline to ensure that the effects on biodiversity are not underplayed. For example if the DCO Project was to extinguish a prior consent to restore a quarry to an area of wildflower meadow, the habitat that would have been created would be considered as present.

Consented developments within the bounds of the existing airport (for example the Kilobox Apron Development and Runway Access Taxiway project) do not alter the future biodiversity baseline due to them resulting in changes to operational areas dominated by hardstanding only.

Within this PEIR the baseline is taken to be that derived from desk study and field survey data. Within the ES all relevant restoration / habitat creation plans will be taken in to account through both the assessment and the biodiversity offsetting metric (see **Section 8.12**). When calculating the losses to biodiversity in the ES the outcomes of these remediation plans will be considered as opposed to the value offered currently. At this stage of the DCO Project the information required to facilitate this calculation is not available.
8.5.122 Future development projects, such as the Western Rail Link to Heathrow Project are considered as part of the cumulative effects assessment in Section 8.11.

8.5.123 Changes due to climate change and trends in the size and extent of habitats and species may result in the baseline altering over time. The current baseline will be used as the basis for the assessment in Section 8.10 because the vast majority of the likely significant effects associated with biodiversity would be delivered prior to the anticipated opening of the North West Runway (pre-2027). Within this period of eight years (2019 to 2027) it is unlikely that changes due to climate change (great enough to alter habitat types) or trends in population size or habitat extent will be apparent. For those ecological features where likely significant effects may occur at the latter stages of the DCO Project (2035 onwards) changes in climate (as detailed in Table 10.18 of Chapter 10: Climate Change) may result in the baseline altering, although how it may and to what extent are uncertain. This will be considered further when defining the future baseline in the ES, however for the purposes of the PEIR the current baseline is considered to represent a reasonable assumption for the assessment.

8.5.124 Climatic changes in the longer term (post completion of construction) are considered in Chapter 10. Projections of future conditions will be accounted for in the design of green infrastructure through the design of habitats created as part of the DCO Project (for example the specification of appropriate species mixes).

8.6 Scope of the assessment

Ecological features – determining importance

8.6.1 The starting point for defining the scope of the assessment was to use the baseline data that were collected through the desk study and field surveys (see Section 8.4 and 8.5) to determine which of the identified ecological features are ‘important’. Only those ecological features positively identified during the field surveys have been subject to assessment within this chapter. This is because the desk study information covers a wider area than that likely to be affected by the DCO Project and contains many records without locational details. Following CIEEM (2018) guidance, the importance of ecological features was determined using a geographic scale. The importance of the ecological features has been described in relation to UK legislation and policy and with regard to the extent of habitat or size of population that may be affected by the DCO Project.

8.6.2 As the importance of ecological features is determined with regard to the extent of habitat or size of population that may be affected by the DCO Project, each status can differ from that which would be conferred by legislative protection or identification as a conservation notable species. For example, house sparrow is
important at a national level because it is a SPI and features on the Birds of Conservation Concern red list. However, a small population that could be affected by a development would often be assessed as being of less than national importance due to the large, albeit declining, national population (in excess of 5 million pairs). Similarly, a small length of hedgerow, a HPI, even if deemed to be ‘important’ with regard to the Hedgerows Regulations, may not be considered to be of national importance due to the extent of this habitat type across a given county.

8.6.3 Wherever possible, information regarding the extent and population size, population trends and distribution of the ecological features has been used, to inform the categorisation described in Table 8.12 to determine importance at the project level. Where detailed criteria or contextual data are not available, professional judgement was used to determine importance. A justification of all determinations of importance is provided in Appendix 8.2 (for all ecological features) to ensure transparency.

Table 8.12: Importance of ecological features at the project level

<table>
<thead>
<tr>
<th>Geographic context of importance</th>
<th>Example / Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>International or European</td>
<td>1. European sites including SPAs, SACs, candidate SACs and Sites of Community Importance (SCI). Potential SPAs (pSPA), possible SACs (pSACs), Ramsar sites (designated under international convention) and proposed Ramsar sites should also be considered in the same manner in accordance with national planning policy.</td>
</tr>
<tr>
<td></td>
<td>2. Areas of habitat or populations of species which meet the published selection criteria, based on discussions with Natural England and field data collected to inform the EcIA, for designation as a European site or Ramsar site, but which are not themselves currently designated at this level.</td>
</tr>
<tr>
<td>National</td>
<td>1. A nationally designated site including SSSIs and NNRs.</td>
</tr>
<tr>
<td></td>
<td>2. Areas (and the populations of species which inhabit them) which meet the criteria within the guidelines for selection of biological SSSIs but which are not themselves designated based on field data collected to inform the EcIA, and in agreement with Natural England.</td>
</tr>
<tr>
<td></td>
<td>3. HPI and SPI, Red listed and legally protected species that are not addressed directly in Part 2 of the ‘Guidelines for Selection of Biological SSSIs’ but can be determined to be of national importance using the principles described in Part 1 of the guidance.</td>
</tr>
<tr>
<td></td>
<td>4. Areas of Ancient Woodland (woodland listed within the Ancient Woodland Inventory or identified as meeting the qualifying criteria) and ancient and veteran trees therein.</td>
</tr>
</tbody>
</table>
8.6.8 © Heathrow Airport Limited 2019

### Geographic context of importance

<table>
<thead>
<tr>
<th>Geographic context of importance</th>
<th>Example / Description</th>
</tr>
</thead>
</table>
| **Regional**                     | 1. The South East Biodiversity Strategy and Draft London Environment Strategy provide information on habitats at a regional scale. Habitats of regional importance will be determined on the basis of the targets set in these documents.  
2. Regularly occurring HPI and populations of SPI, Red listed and legally protected species may be of regional importance in the context of published information on population size and distribution. |
| **County / metropolitan (Buckinghamshire, Berkshire, Surrey, Greater London)** | 1. LNRs and Non-Statutory Designated sites including: LWSs, SINC of Metropolitan Importance, SNCI and, BNSs designated in the County / metropolitan context.  
2. Areas which based on field data collected to inform the EcIA meet the published selection criteria for those sites listed above (for habitats or species, including those listed in relevant Local Biodiversity Action Plans) but which are not themselves designated. |
| **Borough (local authority boundaries: South Bucks, Slough, Windsor and Maidenhead, Hillingdon, Hounslow, Spelthorne)** | 1. Designated sites: SINCs designated in the sub-county (Borough or Local level) area context.  
2. Areas of habitats or populations of species identified during field data gathering to inform the EcIA which meet the published selection criteria for those sites listed above. |
| **Local**                        | 1. HPI and SPI, Red listed and legally protected species that based on their extent, population size, quality etc. are determined to be at a lesser level of importance than the geographic contexts above.  
2. Common and widespread habitats occurring within the study area in proportions greater than may be expected in the local context.  
3. Common and widespread native species occurring within the study area in numbers greater than may be expected in the local context. |
| **Negligible**                   | 1. Common and widespread habitats and species that do not occur in levels elevated above those of the surrounding area.  
2. Areas of heavily modified or managed land uses (for example hard standing used for car parking, as roads etc.) |

8.6.4 With the exception of species receiving specific legal protection or subject to legal control (for example invasive species), all ecological features that were determined to be important at a negligible level only were scoped out of the assessment at this stage. Further, ecological features of local importance, where there was a specific technical justification, were also scoped out. Specific justification for exclusion of each of these ecological features is provided in Appendix 8.2.
Legally protected species and ecological features that are of sufficient importance that effects upon them as a result of the development of the DCO Project could be significant, were then taken through to the next stage of the scoping assessment. Through an understanding of the activities associated with the DCO Project and the resulting environmental change, it is possible to identify ecological features that may be subject to likely significant effects. In order to identify such ecological features, all the activities and consequent environmental changes associated with the construction and operation of the DCO Project have therefore been considered. Given the ongoing design process, the environmental changes have been considered in broad categories only at this stage of the DCO Project.

**Spatial Scope**

8.6.6 Key to establishing a likely significant effect is the determination of a ZOI for each ecological feature (in other words the area within which a significant effect on an ecological feature may occur as a result of the DCO Project). ZOIs differ depending on the type of environmental change (in other words the change from the existing baseline) as a result of the DCO Project and the ecological feature being considered.

8.6.7 The construction and operation phases of the DCO Project may result in the following environmental changes:

1. Land take / land cover change (resulting in habitat loss or degradation and/or loss of fauna)
2. Fragmentation of habitats (resulting in a reduction of connectivity)
3. Increased noise and vibration (resulting in disturbance / displacement)
4. Increased light levels (resulting in disturbance / displacement)
5. Changes in hydrology (groundwater levels, surface water run-off rates, river flows and lake levels; resulting in habitat change)
6. Pollution events (including liberation of dust, sediments and chemicals; resulting in habitat degradation or deleterious effects on individual organisms)
7. Emission events (changes in concentrations and deposition rates of nitrogen; resulting in habitat degradation)

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48 The effects of increased levels of noise, vibration and light on ecological features are assessed in light of paragraph 5.216 of the Landscape and Visual Impacts section of the ANPS. Tranquillity is considered in Chapter 15: Landscape and Visual Amenity
8. Changes in patterns of recreational activity (resulting in disturbance / displacement and habitat degradation)

9. Increased wildlife collision rates with aircraft or road traffic (resulting in death or injury of individual animals)

10. Introduction of invasive non-native species (resulting in habitat degradation)

8.6.8 The most straightforward ZOI to define is the area affected by land-take and direct land-cover changes associated with the DCO Project. This ZOI is the same for all affected ecological features. By contrast, for each environmental change that can extend beyond the area affected by land-take and land-cover change (for example noise created by construction or operation), the ZOI may vary between ecological features, dependent upon their sensitivity to the change and the precise nature of the change. For example, a dormouse might only be disturbed by noise generated very close to its nest, whilst nesting peregrine might be disturbed by noise generated at a much greater distance; other species (for example many invertebrates) may be unaffected by changes in noise. In view of these complexities, the definition of the ZOI that extends beyond the land-take area was based upon professional judgement informed, as far as possible, by a review of published evidence (for example disturbance criteria for various species) and discussions with the technical specialists who have been working on other chapters of the PEIR (for example extent of changes in air quality).

8.6.9 It should be noted that the avoidance of potential effects through design are implicitly taken in to account through the consideration of each ZOI. When scoping in or out ecological features from further assessment, environmental measures (see Section 8.7) associated with good practice environmental measures that are described within the draft Code of Construction Practice (CoCP) have been taken in to account (for example dust suppression, appropriately scheduled vegetation removal etc.) and referenced in Appendix 8.2.

8.6.10 Ecological features that are scoped into the assessment (in other words, those of sufficient importance occurring within a relevant ZOI) are included in Table 8.13. For each ecological feature presented in Table 8.13, the potential environmental changes and broad effects resulting from the DCO Project are provided. Appendix 8.2 provides the same information for all ecological features.

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49 The potential effects associated with emissions from aircraft, road traffic, construction plant and airport operations is considered with regard to statutorily designated sites (European sites and SSSIs) only based on DMRB guidance and discussion and agreement with Natural England.

50 Changes in recreational activity are considered with regard to statutory and non-statutorily designated sites and areas of irreplaceable habitat only.

51 Invasive non-native species are those listed by the GB Non Native Species Secretariat. A sub-set of these species are legally controlled through being listed on Schedule 9 of the Wildlife and Countryside Act 1981 (as amended).
environmental changes and broad effects, including those scoped in and out; the justification for the ZOIs used and the justification for the scoping decision.
Table 8.13: Environmental changes, broad potential effects, ZOIs and justification for scoped in ecological features

<table>
<thead>
<tr>
<th>Ecological feature</th>
<th>Importance – legislation and policy</th>
<th>Importance – DCO Project level</th>
<th>Environmental changes and effects</th>
<th>ZOI</th>
</tr>
</thead>
<tbody>
<tr>
<td>European sites</td>
<td>International</td>
<td>International</td>
<td>Land take / land cover change (resulting in habitat loss or degradation)</td>
<td>Within the Site</td>
</tr>
<tr>
<td>European sites</td>
<td>International</td>
<td>International</td>
<td>Fragmentation of habitats (resulting in a reduction of connectivity)</td>
<td>4km</td>
</tr>
<tr>
<td>European sites</td>
<td>International</td>
<td>International</td>
<td>Increased noise and vibration (resulting in disturbance / displacement)</td>
<td>7.5km</td>
</tr>
<tr>
<td>European sites</td>
<td>International</td>
<td>International</td>
<td>Emission events (changes in concentrations and deposition rates of nitrogen; resulting in habitat degradation)</td>
<td>HHASAM model extent</td>
</tr>
<tr>
<td>European sites</td>
<td>International</td>
<td>International</td>
<td>Changes in patterns of recreational activity (resulting in disturbance / displacement and habitat degradation)</td>
<td>5km</td>
</tr>
<tr>
<td>SSSIs</td>
<td>National</td>
<td>National</td>
<td>Land take / land cover change (resulting in habitat loss or degradation)</td>
<td>Within the Site</td>
</tr>
<tr>
<td>SSSIs</td>
<td>National</td>
<td>National</td>
<td>Increased noise and vibration (resulting in disturbance / displacement)</td>
<td>7.5km</td>
</tr>
<tr>
<td>SSSIs</td>
<td>National</td>
<td>National</td>
<td>Changes in hydrology (groundwater levels, surface water run-off rates, river flows and lake levels; resulting in habitat change)</td>
<td>Groundwater modelling output as shown on</td>
</tr>
<tr>
<td>Ecological feature</td>
<td>Importance – legislation and policy</td>
<td>Importance – DCO Project level</td>
<td>Environmental changes and effects</td>
<td>ZOI</td>
</tr>
<tr>
<td>--------------------</td>
<td>-------------------------------------</td>
<td>--------------------------------</td>
<td>---------------------------------</td>
<td>-----</td>
</tr>
<tr>
<td>SSSIs</td>
<td>National</td>
<td>National</td>
<td>Emission events (changes in concentrations and deposition rates of nitrogen; resulting in habitat degradation)</td>
<td>HHASAM model extent</td>
</tr>
<tr>
<td>SSSIs</td>
<td>National</td>
<td>National</td>
<td>Changes in patterns of recreational activity (resulting in disturbance / displacement and habitat degradation)</td>
<td>5km</td>
</tr>
<tr>
<td>LWS / LNR</td>
<td>County / Metropolitan / Borough</td>
<td>County / Metropolitan / Borough</td>
<td>Land take / land cover change (resulting in habitat loss or degradation)</td>
<td>Within the Site</td>
</tr>
<tr>
<td>Veteran trees</td>
<td>National</td>
<td>National</td>
<td>Land take / land cover change (resulting in habitat loss or degradation)</td>
<td>At least 15 times the diameter (at breast height) of a veteran tree or 5m from the edge of its canopy if that is greater</td>
</tr>
<tr>
<td>Semi-natural woodland (HPI)</td>
<td>National</td>
<td>County / Metropolitan</td>
<td>Land take / land cover change (resulting in habitat loss or degradation)</td>
<td>50m</td>
</tr>
</tbody>
</table>

---

52 Importance dependent on the status provided by the designating authority
### Ecological feature

<table>
<thead>
<tr>
<th>Ecological feature</th>
<th>Importance – legislation and policy</th>
<th>Importance – DCO Project level</th>
<th>Environmental changes and effects</th>
<th>ZOI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Semi-natural woodland (HPI)</td>
<td>National</td>
<td>County / Metropolitan</td>
<td>Changes in hydrology (groundwater levels, surface water run-off rates, river flows and lake levels; resulting in habitat change)</td>
<td>Groundwater modelling output as shown on Figure 8.30.</td>
</tr>
<tr>
<td>Semi-natural woodland (non-HPI)</td>
<td>County / Metropolitan</td>
<td>Borough</td>
<td>Land take / land cover change (resulting in habitat loss or degradation)</td>
<td>50m</td>
</tr>
<tr>
<td>Plantation woodland</td>
<td>Borough</td>
<td>Borough</td>
<td>Land take / land cover change (resulting in habitat loss or degradation)</td>
<td>15m</td>
</tr>
<tr>
<td>Native, species-rich Hedgerows (HPI)</td>
<td>National</td>
<td>County / Metropolitan</td>
<td>Land take / land cover change (resulting in habitat loss or degradation)</td>
<td>6m</td>
</tr>
<tr>
<td>Native, species-poor Hedgerows (HPI)</td>
<td>National</td>
<td>Borough</td>
<td>Land take / land cover change (resulting in habitat loss or degradation)</td>
<td>6m</td>
</tr>
<tr>
<td>Swamps (non-HPI)</td>
<td>National</td>
<td>Borough</td>
<td>Land take / land cover change (resulting in habitat loss or degradation)</td>
<td>30m</td>
</tr>
<tr>
<td>Swamps (non-HPI)</td>
<td>National</td>
<td>Borough</td>
<td>Changes in hydrology (groundwater levels, surface water run-off rates, river flows and lake levels; resulting in habitat change)</td>
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<td>County / Metropolitan</td>
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### Ecological feature

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<th>Environmental changes and effects</th>
<th>ZOI</th>
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<td>Regional</td>
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### Ecological feature

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</tr>
</tbody>
</table>
### Table: Ecological Features and Environmental Impacts

<table>
<thead>
<tr>
<th>Ecological feature</th>
<th>Importance – legislation and policy</th>
<th>Importance – DCO Project level</th>
<th>Environmental changes and effects</th>
<th>ZOI</th>
</tr>
</thead>
<tbody>
<tr>
<td>shaded woodland floor</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Terrestrial invertebrate assemblage associated with shaded woodland floor</td>
<td>National</td>
<td>County / Metropolitan</td>
<td>Fragmentation of habitats (reduction of connectivity)</td>
<td>500m</td>
</tr>
<tr>
<td>Terrestrial invertebrate assemblage associated with shaded woodland floor</td>
<td>National</td>
<td>County / Metropolitan</td>
<td>Increased light levels (disturbance / displacement)</td>
<td>500m</td>
</tr>
<tr>
<td>Terrestrial invertebrate assemblage associated with shaded woodland floor</td>
<td>National</td>
<td>County / Metropolitan</td>
<td>Changes in hydrology (groundwater levels, surface water run-off rates, river flows and lake levels; resulting in habitat change)</td>
<td>Groundwater modelling output as shown on Figure 8.30.</td>
</tr>
<tr>
<td>Terrestrial invertebrate assemblage associated with wetland biotopes</td>
<td>National</td>
<td>County / Metropolitan</td>
<td>Land take / land cover change (resulting in habitat loss or degradation)</td>
<td>The Site</td>
</tr>
<tr>
<td>Terrestrial invertebrate assemblage associated with wetland biotopes</td>
<td>National</td>
<td>County / Metropolitan</td>
<td>Fragmentation of habitats (reduction of connectivity)</td>
<td>500m</td>
</tr>
<tr>
<td>Terrestrial invertebrate assemblage associated with wetland biotopes</td>
<td>National</td>
<td>County / Metropolitan</td>
<td>Increased light levels (disturbance / displacement)</td>
<td>500m</td>
</tr>
<tr>
<td>Ecological feature</td>
<td>Importance – legislation and policy</td>
<td>Importance – DCO Project level</td>
<td>Environmental changes and effects</td>
<td>ZOI</td>
</tr>
<tr>
<td>-------------------</td>
<td>-----------------------------------</td>
<td>--------------------------------</td>
<td>----------------------------------</td>
<td>-----</td>
</tr>
<tr>
<td>invertebrate assemblage associated with wetland biotopes</td>
<td></td>
<td></td>
<td>displacement)</td>
<td></td>
</tr>
<tr>
<td>Terrestrial invertebrate assemblage associated with wetland biotopes</td>
<td>National</td>
<td>County / Metropolitan</td>
<td>Changes in hydrology (groundwater levels, surface water run-off rates, river flows and lake levels; resulting in habitat change)</td>
<td>Groundwater modelling output as shown on Figure 8.30.</td>
</tr>
<tr>
<td>Wintering waterbird assemblage – international notable species</td>
<td>International</td>
<td>International</td>
<td>See entries for European sites as all identified occurrences of this ecological feature are associated with the SWLW SPA / Ramsar site.</td>
<td>N/A</td>
</tr>
<tr>
<td>Wintering waterbird assemblage – national notable species</td>
<td>National</td>
<td>National</td>
<td>See entries for SSSI as all identified occurrences of this ecological feature is within Staines Moor SSSI. It will therefore be assessed with respect to the SSSI.</td>
<td>N/A</td>
</tr>
<tr>
<td>Wintering waterbird assemblage - regionally important species</td>
<td>Regional</td>
<td>Regional</td>
<td>Land take / land cover change (resulting in habitat loss or degradation)</td>
<td>100m</td>
</tr>
<tr>
<td>Wintering waterbird assemblage - regionally important species</td>
<td>Regional</td>
<td>Regional</td>
<td>Increased noise and vibration (disturbance / displacement)</td>
<td>7.5km</td>
</tr>
</tbody>
</table>

Wintering waterbird

County / Metropolitan | County / Metropolitan | Land take / land cover change (resulting in habitat loss or degradation) | 100m |
## Ecological Feature

<table>
<thead>
<tr>
<th>Ecological Feature</th>
<th>Importance – legislation and policy</th>
<th>Importance – DCO Project level</th>
<th>Environmental changes and effects</th>
<th>ZOI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assemblage – county important species</td>
<td></td>
<td></td>
<td>degradation)</td>
<td></td>
</tr>
<tr>
<td>Wintering waterbird assemblage – county important species</td>
<td>County / Metropolitan</td>
<td>County / Metropolitan</td>
<td>Increased noise and vibration (disturbance / displacement)</td>
<td>7.5km</td>
</tr>
<tr>
<td>Breeding Birds – Barn owl</td>
<td>National</td>
<td>County / Metropolitan</td>
<td>Land take / land cover change (resulting in habitat loss or degradation)</td>
<td>1km</td>
</tr>
<tr>
<td>Breeding Birds – Barn owl</td>
<td>National</td>
<td>County / Metropolitan</td>
<td>Fragmentation of habitats (reduction of connectivity)</td>
<td>1km</td>
</tr>
<tr>
<td>Breeding Birds – Barn owl</td>
<td>National</td>
<td>County / Metropolitan</td>
<td>Increased noise and vibration (disturbance / displacement)</td>
<td>150m</td>
</tr>
<tr>
<td>Breeding Birds – Barn owl</td>
<td>National</td>
<td>County / Metropolitan</td>
<td>Increased wildlife Collision Rates (death or injury)</td>
<td>13km</td>
</tr>
<tr>
<td>Breeding Birds – Kingfisher</td>
<td>National</td>
<td>County / Metropolitan</td>
<td>Land take / land cover change (resulting in habitat loss or degradation)</td>
<td>3km</td>
</tr>
<tr>
<td>Breeding Birds – Kingfisher</td>
<td>National</td>
<td>County / Metropolitan</td>
<td>Fragmentation of habitats (reduction of connectivity)</td>
<td>3km</td>
</tr>
<tr>
<td>Breeding Birds – Kingfisher</td>
<td>National</td>
<td>County / Metropolitan</td>
<td>Increased noise and vibration (disturbance / displacement)</td>
<td>250m</td>
</tr>
<tr>
<td>Breeding bird assemblage – county notable species</td>
<td>National</td>
<td>County / Metropolitan</td>
<td>Land take / land cover change (resulting in habitat loss or degradation)</td>
<td>3km</td>
</tr>
<tr>
<td>Breeding bird</td>
<td>National</td>
<td>County / Metropolitan</td>
<td>Increased noise and vibration</td>
<td>250m</td>
</tr>
<tr>
<td>Ecological feature</td>
<td>Importance – legislation and policy</td>
<td>Importance – DCO Project level</td>
<td>Environmental changes and effects</td>
<td>ZOI</td>
</tr>
<tr>
<td>--------------------</td>
<td>------------------------------------</td>
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<td>-----------------------------------</td>
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</tr>
<tr>
<td>assemblage – county notable species</td>
<td></td>
<td></td>
<td>(disturbance / displacement)</td>
<td></td>
</tr>
<tr>
<td>Breeding bird assemblage – county notable species</td>
<td>National</td>
<td>County / Metropolitan</td>
<td>Increased light levels (disturbance / displacement)</td>
<td>100m</td>
</tr>
<tr>
<td>Breeding bird assemblage – county notable species</td>
<td>National</td>
<td>County / Metropolitan</td>
<td>Changes in hydrology (groundwater levels, surface water run-off rates, river flows and lake levels; resulting in habitat change)</td>
<td>Groundwater modelling output as shown on Figure 8.30.</td>
</tr>
<tr>
<td>Breeding bird assemblage - borough notable species</td>
<td>National</td>
<td>Borough</td>
<td>Land take / land cover change (resulting in habitat loss or degradation)</td>
<td>1.5km</td>
</tr>
<tr>
<td>Breeding bird assemblage - borough notable species</td>
<td>National</td>
<td>Borough</td>
<td>Increased noise and vibration (disturbance / displacement)</td>
<td>25m</td>
</tr>
<tr>
<td>Breeding bird assemblage - borough notable species</td>
<td>National</td>
<td>Borough</td>
<td>Increased light levels (disturbance / displacement)</td>
<td>100m</td>
</tr>
<tr>
<td>Breeding bird assemblage - borough notable species</td>
<td>National</td>
<td>Borough</td>
<td>Changes in hydrology (groundwater levels, surface water run-off rates, river flows and lake levels; resulting in habitat change)</td>
<td>Groundwater modelling output as shown on Figure 8.30.</td>
</tr>
<tr>
<td>Terrestrial</td>
<td>National</td>
<td>County / Metropolitan</td>
<td>Land take / land cover change</td>
<td>300m</td>
</tr>
<tr>
<td>Ecological feature</td>
<td>Importance – legislation and policy</td>
<td>Importance – DCO Project level</td>
<td>Environmental changes and effects</td>
<td>ZOI</td>
</tr>
<tr>
<td>--------------------------------------------------------</td>
<td>-------------------------------------</td>
<td>--------------------------------</td>
<td>------------------------------------------------------------------------</td>
<td>-----</td>
</tr>
<tr>
<td>wintering bird assemblage - county notable species</td>
<td></td>
<td></td>
<td>(resulting in habitat loss or degradation)</td>
<td></td>
</tr>
<tr>
<td>Terrestrial wintering bird assemblage - county notable species</td>
<td>National</td>
<td>County / Metropolitan</td>
<td>Increased noise and vibration (disturbance / displacement)</td>
<td>40m</td>
</tr>
<tr>
<td>Terrestrial wintering bird assemblage - county notable species</td>
<td>National</td>
<td>County / Metropolitan</td>
<td>Increased light levels (disturbance / displacement)</td>
<td>100m</td>
</tr>
</tbody>
</table>
Temporal scope

8.6.11 The DCO Project is complicated by having both construction and operational activities often occurring at the same time. The effects of these activities are also felt by different ecological features, at different times. For example, one ecological feature may be being affected by construction activity whereas another, at the same time, is only being affected by noise from overflying aircraft.

8.6.12 Within the assessment (Sections 8.10 and 8.11) each of the likely significant effects scoped in to the assessment will either be considered with regard to a worst-case scenario or across a number of assessment years (as described in Chapter 5: Approach to the EIA). Table 8.15 provides the approach taken with regard to each environmental change identified.

8.6.13 The DCO Project would be delivered across three broad phases. Phase 1 would run from c. 2022 to 2026 and includes major earthworks associated with airfield expansion, river diversions, changes to the M25, A4 and other roads, construction of rail facilities and utility diversions. Phase 2 would run from c. late 2026 to 2033 and would include further work to the road network, airfield and other infrastructure. Phase 3 would run from c. 2034 to 2050 and includes relatively low levels of development, with the majority focused on changes within the airfield to build capacity.

Table 8.14: Approach to assessment with regard to temporal scope

<table>
<thead>
<tr>
<th>Environmental change</th>
<th>Timing of main effect</th>
<th>Assessment approach</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land take / land cover change</td>
<td>Largely within Phases 1 and 2 (c. 2022 to 2026 and c. 2026 to 2033 respectively)</td>
<td>Totality of loss / change assumed to occur at a single point in time at the start of the construction. To enable comparison with other technical chapters this year is considered to be 2024.</td>
</tr>
<tr>
<td>Fragmentation of habitats</td>
<td>Across all phases</td>
<td>The changes in habitat connectivity that occur over time will need to be considered to ensure effective assessment of the likely significant effects on different species. However, the information needed to enable this to happen is not yet available and therefore a qualitative assessment will be provided at PEIR stage only. At application stage a comparison will be done at 2024, 2027, 2035 and 2050.</td>
</tr>
<tr>
<td>Environmental change</td>
<td>Timing of main effect</td>
<td>Assessment approach</td>
</tr>
<tr>
<td>----------------------------------------------------------</td>
<td>-----------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Increased noise and vibration</td>
<td>Across all phases</td>
<td>Sources of disturbance are assumed to act at a single point in time. Sources of disturbance associated with construction and operation (ground-based activity and aircraft flights) are assumed to occur at peak levels at all points. To enable comparison with other technical chapters this year is considered to be 2024.</td>
</tr>
<tr>
<td>Increased light levels</td>
<td>Across all phases</td>
<td>The maximum extent of light spill into areas neighbouring both construction and operational sites is considered as a worst-case scenario. To enable comparison with other technical chapters this year is considered to be 2024.</td>
</tr>
<tr>
<td>Changes in hydrology</td>
<td>Across all phases</td>
<td>The maximum extent of the changes in groundwater through all phases has been determined providing a single composite footprint (see Figure 8.30)[53]. Other elements associated with surface water run-off and river flows are dealt with at this stage through assumptions detailed in Section 8.9.</td>
</tr>
<tr>
<td>Emissions events</td>
<td>Across all phases</td>
<td>Emissions are assessed in line with the output of the models (including the assessment years) provided in Chapter 7: Air quality and odour.</td>
</tr>
<tr>
<td>Changes in patterns of recreational activity due to temporary influx of construction workers</td>
<td>Phases 1 and 2</td>
<td>The peak workforce is assumed to be present at all stages of construction. To enable comparison with other technical chapters this year is considered to be 2024.</td>
</tr>
<tr>
<td>Increased wildlife collision rates</td>
<td>Across all phases</td>
<td>The effects of wildlife collision rates are assessed against the predicted worst case (in other words the greatest number of additional traffic movements above baseline). To enable comparison with other technical chapters this year is considered to be 2050.</td>
</tr>
</tbody>
</table>

[53] The composite is the maximum extent of changes shown in the ground water model output (as described in Chapter 21: Water Environment) from all stages merged to present a worst case scenario.
8.6.14 The likely significant effects at this stage of the DCO Project are being considered with regard to the broad definitions of environmental change described above. At the time of the ES, the increased levels of information regarding ecological features, construction methods and timings and a more evolved understanding of the infrastructure (including green infrastructure) integral to the DCO Project will allow subdivision (for example changes to habitat connectivity between years) of the likely significant effects where appropriate.

8.7 Embedded environmental measures

Introduction

8.7.1 A range of environmental measures have been embedded into the DCO Project design. These are set out in Table 8.15 –Table 8.17 below, along with how it is anticipated that they will be implemented.
### Table 8.15: Summary of the embedded environmental measures in the design and how these influence the Biodiversity assessment

<table>
<thead>
<tr>
<th>Ecological Features</th>
<th>Changes and effects</th>
<th>Embedded measures and influence on assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Staines Moor SSSI</td>
<td>Land take / land cover change (resulting in habitat loss or degradation and/or loss of fauna)</td>
<td>Land take within Staines Moor SSSI will be minimised through the design of J14 of the M25 (see Chapter 6: Project Description) and a restricted working area around the proposed infrastructure.</td>
</tr>
<tr>
<td>Habitats and associated legally protected and notable species</td>
<td>Land take / land cover change (resulting in habitat loss or degradation and/or loss of fauna)</td>
<td>The principles of the green infrastructure strategy are provided in the Preferred Masterplan and is shown on Figures 6.2 and 6.13. With respect to biodiversity the green infrastructure will be designed to provide high quality habitats to support the ecological features known to be present, that are extensive and well connected. The delivery of green infrastructure, including its timing, will be key to a number of processes including determining whether the likely effects identified will be significant, the provision of compensation for residual effects (see Section 12) and the detailing and issuing of licences from both the Habitats Regulations and the Protection of Badgers Act. Key elements of the green infrastructure design will be the provision of naturalised water courses (with measures to ensure they are passable to fish) and associated riparian habitats, a functioning Covered River Corridor, measures to manage wildlife strike risk through habitat design, measures to facilitate movement (for example underpasses for mammals, fish passes and hop overs for barn owl) and prevent road traffic collisions (for example mammal fencing), as well as the provision of habitats characteristic of the area (grassland, woodland etc.) capable of supporting the species displaced (for our current thinking in this regard, see Appendix 8.4). The green infrastructure design will be developed prior to an application being made for development consent. Within this chapter the principles of that design</td>
</tr>
</tbody>
</table>

---

54 Ecological features have been grouped where appropriate in this table to avoid repetition.
<table>
<thead>
<tr>
<th>Ecological Features</th>
<th>Changes and effects</th>
<th>Embedded measures and influence on assessment</th>
</tr>
</thead>
</table>
| **Habitats and associated legally protected and notable species** | Land take / land cover change (resulting in habitat loss or degradation and/or loss of fauna)  
Fragmentation of habitats (resulting in a reduction of connectivity) | Habitat loss and fragmentation within the construction area would be phased to enable legally protected and notable species to be maintained within and navigate through the landscape in to areas of existing or created/improved habitat, thereby maintaining connectivity whilst the green infrastructure is delivered.  
The locations, timings and design will be developed prior to an application being made. However, the principles will be underpinned by the need to use this information within applications for licensing (from the Habitats Regulations and Protection of Badgers Act) and method statements necessary to relocate other species such as reptiles and fish.  
As the green infrastructure is delivered habitats within the construction area would be sequentially lost to development. Within the assessment it has been assumed that the detailed construction programme (to be developed between PEIR and ES stage) allows sufficient temporal and geographic flexibility to enable delivery of the necessary environmental measures. |
| **Light sensitive species including bats, badgers, otters and terrestrial invertebrates** | Increased light levels (resulting in disturbance / displacement) | A lighting design of all temporary and permanent lighting will be developed once contractors are appointed; however the principles of lighting design will be detailed at the time of application. The lighting design would account for the potential effects on biodiversity by taking measures to minimise lighting usage, minimise light spill, use most appropriate wave lengths of light and locate lighting in the most appropriate locations.  
Although lighting designs are not developed at this stage, this assessment assumes that measures can be taken to minimise the effect of light on biodiversity (although not eliminate it). |
| **Reptiles and great crested newts** | Wildlife collision rates with aircraft or road traffic (resulting in death or injury of individual animals) | Receptor site creation and translocation of individuals from all areas affected by construction activity.  
Habitat creation and translocation would be undertaken at appropriate times of year, under an agreed method statement. For great crested newts this would be |
Mammals (badgers, bats and otter)

Wildlife collision rates with aircraft or road traffic (resulting in death or injury of individual animals)

Speed limits of 10mph to be imposed on all construction haul roads to minimise the risk of road traffic collisions.

Provision of suitable road crossings (for example tunnels) on temporary and permanent roads to minimise use of the carriageway by mammals.

Within the assessment these environmental measures are relied upon as they are tried and tested methods used widely for development projects of all scales.

Fish

Land take / land cover change (resulting in habitat loss or degradation and/or loss of fauna)

Fish would be removed in advance from areas where water is to be drained or diverted and transported to an appropriate release site.

Within this assessment these measures inform the assessment of effects on European eel, European bullhead, barbel and the fish assemblage.

Table 8.16: Summary of the good practice environmental measures and how these influence the Biodiversity assessment

<table>
<thead>
<tr>
<th>Ecological Features</th>
<th>Changes and effects</th>
<th>Embedded measures and influence on assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breeding birds</td>
<td>Land take / land cover change (resulting in habitat loss or degradation and/or loss of fauna)</td>
<td>Vegetation removal to be scheduled over winter to avoid bird breeding season. If not possible for all areas any vegetation removal would be undertaken under supervision and appropriately managed if active nests are present. Within the scope of the assessment it has been assumed that the scheduling of vegetation removal allows the potential for the damage or destruction of</td>
</tr>
</tbody>
</table>
### Flora and Fauna

<table>
<thead>
<tr>
<th>Changes and effects</th>
<th>Embedded measures and influence on assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emission events (changes in concentrations and deposition rates of nitrogen; resulting in habitat degradation)</td>
<td>The use of tried and tested pollution prevention and dust suppression techniques that are common on all large construction sites (see draft CoCP). Within the scope of the assessment it has been assumed that the use of tried and tested control measures enables consideration of the effects of pollutants and dust to be scoped out.</td>
</tr>
<tr>
<td>Pollution events (including liberation of dust, sediments and chemicals; resulting in habitat degradation or deleterious effects on individual organisms)</td>
<td></td>
</tr>
</tbody>
</table>

### Habitats

<table>
<thead>
<tr>
<th>Changes and effects</th>
<th>Embedded measures and influence on assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction of invasive non-native species (resulting in habitat degradation)</td>
<td>The use of tried and tested invasive species control and biosecurity measures to avoid the spread of infested materials. Within the scope of the assessment it has been assumed that the use of tried and tested control measures enables consideration of the spread of invasive species to be scoped out.</td>
</tr>
</tbody>
</table>

### Table 8.17: Summary of the environmental measures during operation and how these influence the Biodiversity assessment

<table>
<thead>
<tr>
<th>Ecological Feature</th>
<th>Changes and effects</th>
<th>Embedded measures and influence on assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Habitats and associated legally protected and notable species</td>
<td>Land take / land cover change (resulting in habitat loss or degradation and/or loss of fauna)</td>
<td>All habitats created or improved will require ongoing management to ensure that they are delivering the necessary biodiversity mitigation or biodiversity offset in the long term. In order to achieve this a range of monitoring, review and remediation triggers would be developed. For the purposes of this assessment, the management and</td>
</tr>
<tr>
<td>Ecological Feature</td>
<td>Changes and effects</td>
<td>Embedded measures and influence on assessment</td>
</tr>
<tr>
<td>----------------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Flora and Fauna</td>
<td>Emission events (changes in concentrations and deposition rates of nitrogen; resulting in habitat degradation)</td>
<td>Monitoring of the biodiversity mitigation and offsetting enables confidence to be assumed in the delivery of the measures described in Table 8.16 and 8.17.</td>
</tr>
<tr>
<td></td>
<td>Pollution events (including liberation of dust, sediments and chemicals; resulting in habitat degradation or deleterious effects on individual organisms)</td>
<td>The use of tried and tested pollution prevention and dust suppression techniques that are common on all major infrastructure sites.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Within this assessment it has been assumed that the use of tried and tested control measures enables consideration of the effects of pollutants and dust to be scoped out.</td>
</tr>
</tbody>
</table>
8.8  Assessment methodology for the PEIR

Introduction

8.8.1 The generic project-wide approach to the assessment methodology is set out in Section 5.4 of Chapter 5. However, whilst this has informed the approach that has been used in this biodiversity assessment, it is necessary to align with the standard industry guidance provided by CIEEM (2018). The approach used in this chapter is also expected to be used within the biodiversity assessment that will be detailed in the ES.

8.8.2 The assessment is based upon not only the results of the desk study and field surveys, but also relevant published information (for example on the status, distribution, sensitivity to environmental changes and ecology of the features scoped in to the assessment, where this information is available), and professional knowledge of ecological processes and functions.

8.8.3 For each scoped-in ecological feature (see Table 8.13), effects were assessed against the baseline conditions (see Section 8.10) for that feature during construction and operation.

8.8.4 Throughout the assessment process, findings about likely significant effects were used to inform the definition of requirements for additional baseline data gathering and the identification of environmental measures to avoid or reduce adverse effects or to deliver enhancements (see Section 8.7). The results of the assessment, as set out in Section 8.10, reflect the current DCO Project design (incorporating the environmental measures described in Table 8.15, Table 8.16 and Table 8.17).

8.8.5 The spatial extent of the assessment of each potential significant effect (see Table 8.13) reflects the area occupied by the ecological feature that is being assessed and the ZOI of the changes that are likely to affect it. Where part of a designated biodiversity site is located within the ecological feature’s ZOI relating to a particular biophysical change as a result of the DCO Project, an assessment would be made of the effects on the designated site as a whole. A similar approach has been taken for areas of notable habitat. For species that occur within the ZOI, the assessment has considered the total area that is used by the affected individuals or the local population of the species (for example for foraging or as breeding territories).
Significance evaluation methodology

8.8.6 CIEEM (2018) defines a significant effect as one “that either supports or undermines biodiversity conservation objectives for ‘important ecological features’ or for biodiversity in general”.

8.8.7 When considering likely significant effects on biodiversity features, whether these be negative or positive, the following characteristics of environmental change have been taken into account:

1. Extent – the spatial or geographical area over which the environmental change may occur
2. Magnitude – the size, amount, intensity or volume of the environmental change
3. Duration – the length of time over which the environmental change may occur
4. Frequency – the number of times an environmental change may occur
5. Timing – the periods of the day/year/season during which an environmental change may occur
6. Reversibility – whether the environmental change can be reversed through restoration actions or regeneration.

8.8.8 Although the characteristics described above are all important in assessing effects, a scale of the environmental change as a result of the DCO Project has been described in Table 8.18 to provide an understanding of the relative change from the baseline position.

Table 8.18: Guidelines for the assessment of the scale of change

<table>
<thead>
<tr>
<th>Scale of Change</th>
<th>Criteria and Resultant Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>The change permanently (or over the long-term) negatively or positively affects the conservation status of a habitat/species, reducing or increasing the ability to sustain the habitat or the population level of the species within a given geographic area through changes including land take, habitat fragmentation (reducing habitat connectivity) and changes in hydrology. Relative to the wider habitat resource/species population, a large area of habitat or large proportion of the wider species population is affected. For designated sites, integrity is compromised. There may be a change in the level of importance of the ecological feature in the context of the DCO Project.</td>
</tr>
<tr>
<td>Medium</td>
<td>The change permanently (or over the long term) negatively or positively affects the conservation status of a habitat/species reducing or increasing the ability to sustain</td>
</tr>
</tbody>
</table>

55 These characteristics are accounted for in Sections 8.10 and 8.11, however they are not always explicitly referenced for the sake of brevity.
Heathrow Expansion
PRELIMINARY ENVIRONMENTAL INFORMATION REPORT: Chapter 8: Biodiversity

<table>
<thead>
<tr>
<th>Scale of Change</th>
<th>Criteria and Resultant Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>the habitat or the population level of the species within a given geographic area through changes including land take, habitat fragmentation (reducing habitat connectivity) and changes in hydrology. Relative to the wider habitat resource/species population, a small-medium area of habitat or small-medium proportion of the wider species population is affected. There may be a change in the level of importance of this ecological feature in the context of the DCO Project.</td>
</tr>
<tr>
<td>Low</td>
<td>The quality or extent of designated sites or habitats or the sizes of species’ populations, experience some small scale reduction or increase. These changes are likely to be within the range of natural variability and there is not expected to be any permanent change in the conservation status of the species/habitat or integrity of the designated site. The change is unlikely to modify the evaluation of the ecological feature in terms of its importance.</td>
</tr>
<tr>
<td>Very Low</td>
<td>Although there may be some effects on individuals or parts of a habitat area or designated site, the quality or extent of sites and habitats, or the size of species populations would experience little or no change. Any changes are likely to be within the range of natural variability and there would be no short-term or long-term change to conservation status of habitats/species or the integrity of designated sites.</td>
</tr>
<tr>
<td>Negligible</td>
<td>A change, the level of which is so low, it is not discernible on designated sites or habitats or the size of species’ populations, or changes that balance each other out over the lifespan of a project.</td>
</tr>
</tbody>
</table>

Negative effects

8.8.9 A negative effect is assessed as being significant if the favourable conservation status of an ecological feature would be compromised or lost as a result of the DCO Project. Conservation status is defined in CIEEM 2018 (in paragraph 5.3.2) as follows:

1. ‘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’

2. ‘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’.

8.8.10 The decision as to whether the conservation status of an ecological feature has been compromised has been made using professional judgement, drawing upon the results of the assessment of how each feature is likely to be affected by the DCO Project.
8.8.11 A similar procedure is used where designated sites may be affected by the DCO Project, except that the focus is on the effects on the integrity of each site; defined as:

‘the coherence of its ecological structure and function, across its whole area, that enables it to sustain the habitat, complex of habitats and/or the levels of populations of the species for which it was classified’.

8.8.12 The assessment of effects on integrity draws upon the assessment of effects on the conservation status of the features for which the site has been designated.

Positive effects

8.8.13 A development may result in positive effects where there is a resulting change from baseline that improves the quality of the environment (for example increases species diversity, increases the extent of a particular habitat etc.), or halts or slows down an existing decline. For a positive effect to be considered significant, the level of importance of an ecological feature determined at the baseline state would need to increase by one or more geographical levels (for example where an ecological feature of borough importance becomes of county importance following delivery of the DCO Project).

8.8.14 At this stage no assessment of the positive effects associated with the provision of green infrastructure (including a commitment to net gain) is provided. This is because the design of the green infrastructure has not evolved sufficiently to provide a reasoned assessment. However, the principles are sufficient to enable consideration of green infrastructure provision within the assessment of negative effects.

8.9 Assumptions and limitations of this assessment

Introduction

8.9.1 The information on ecological features is extensive, but is not yet complete due to the survey programme being ongoing. The information used in the assessment does however provide a good understanding of the types of ecological features present, their distribution and general condition. **Table 8.8** outlines the survey coverage achieved during 2017 and 2018, which alongside the desk study, provides for a characterisation of the study area that is robust and suitable to form the basis of the assessment within this chapter. The baseline to be presented within the ES will provide further information for assessment, although restrictions on access to some private land is likely to result in coverage that is not total. Where coverage is not total methods will be used to extrapolate to present a precautionary baseline in the ES.
The assessments in Sections 8.10 and 8.11 are based on the data gathered to date with a series of assumptions made where data gathering is incomplete. These assumptions are detailed in the relevant assessment sections.

The detailed construction programme and associated phasing of environmental measures has not been fully developed at this stage of the DCO Project. This is because the planning of construction activity is currently at a larger scale than that understood for ecological features. However, the employment of tried and tested good practice measures relevant to the legally protected species concerned, can and has been applied for the purposes of the assessment process. This is because the majority of these environmental measures relate to legal compliance, whilst the others are associated with good practice. Within this assessment a precautionary approach has been taken when considering the likely significant effects.

The design, location and extent of the green infrastructure is currently indicative only. This design, both within areas of development and across the wider landscape, will be determined through discussions with relevant stakeholders, the needs of individual species (particularly with regard to licensing) and the requirements of other technical disciplines for multi-functional land use (for example flood storage design). The principles behind the green infrastructure, as elucidated in the Preferred Masterplan document do however, provide the basis for the assessment provided in Section 8.10 and 8.11.

The use of rivers as a source of water (abstraction), a location for water disposal (discharge) and as a heat exchange, are all potentially required for the DCO Project. However, an understanding of the locations, extents and timings of these ideas has not yet been developed enough for assessment. It is assumed that as these activities would be controlled through permits granted by the Environment Agency, any deviations from the baseline would be minimal.

It has been assumed that the flows within river channels when outside of the Site (both upstream and downstream) remain as current as per design aims described in Chapter 21: Water Environment.

It has been assumed that surface water run-off rates to associated with the DCO Project to adjacent areas remain at current levels or become closer to green field rates as per design aims described in Chapter 21.

It has been assumed at this stage that diverted or new utilities (for example gas mains, electricity cables) would be installed using trenchless techniques (such as directional drilling) when crossing habitats that will be retained and are needed by various species to navigate the landscape.
8.9.9 The assessment of emissions (principally nitrogen) on designated sites is qualitative only. This is because the DCO Project is awaiting the publication of Defra guidance to enable an effective assessment of the likely significant effects to be undertaken in line with emerging thinking on this subject\textsuperscript{56}.

8.9.10 It is assumed that the borrow pit dug to the east of Saxon Lake would be used as thermal storage, meaning that the area would not support open water. Although filled with water, this area would be covered and thus not provide freshwater habitats. It is also assumed that this water body would remain separated from Saxon Lake.

8.9.11 Veteran trees are assessed within this chapter. However, there is no arboriculture survey data yet available. Although ecologists have target noted trees with a diameter at breast height in excess of 1m, this does not constitute a veteran tree survey based on English Nature guidance (Fay and de Becker, 2003). It is noted however, that there is a likelihood that some veteran trees will be lost through the delivery of the DCO Project. For the purposes of PEIR assessment is based on desk-study data only.

8.9.12 The assessments in Sections 8.10 and 8.11 are based on broadly defined likely significant effects. This is because the design of the DCO Project is still evolving and the baseline data is incomplete. However, the information available for both is more than adequate to provide a conclusion regarding significance. Each section provides information on what will help further inform the assessment at ES stage, at which time all conclusions drawn with respect to likely significant effects within this chapter will be reviewed.

8.10 Assessment of biodiversity effects

Introduction

8.10.1 This section is set out by ecological feature (as ordered in Table 8.13). For each ecological feature all the likely significant effects scoped in to the assessment are addressed and a preliminary conclusion provided on whether they are Significant or Not Significant. Information is also provided with regard to the future data gathering relevant to each ecological feature and the further information that will inform the final assessment to be provided at application for development consent.

\textsuperscript{56} Approaches to the assessment of emissions on designated sites is changing due to the issuing of a preliminary ruling by Advocate General Kokott in July 2018 with regard to the Dutch Nitrogen Action Plan and the Habitats Directive (Kokott, 2018).
Assessment of biodiversity effects – South West London Waterbodies SPA / Ramsar site

Detailed baseline

8.10.2 The location of the SWLW SPA / Ramsar site (an internationally important ecological feature) is shown on Figure 8.2. Associated with this SPA / Ramsar site are a number of permanent and temporary water bodies used by the designated features (known as functionally linked habitat). These water bodies include reservoirs, balancing / drainage ponds (both temporary and permanent) and old gravel pits.

8.10.3 The numbers of gadwall within the SWLW SPA / Ramsar site have fluctuated widely and have generally been in decline (a 38% decline from 1984/85-2009/10, WeBS alerts), with birds moving to other sites in the wider Thames Valley area, and moving to sites within the Wraysbury complex outside the SPA (Briggs 2007 and Briggs et al., 2012). This is in contrast to the regional and national trends for gadwall which show a continued increase in numbers. Numbers have increased by 144% in the UK, from 1990/91-2015/16 (Frost et al., 2018). Theories as to why the population of the SPA / Ramsar site has declined include certain water bodies becoming less suitable for gadwall due to recreational disturbance or stocking with carp, and a general redistribution of birds to occupy a greater range of water bodies in the region over time.

8.10.4 The numbers of shoveler on the SWLW SPA / Ramsar site have declined significantly over the short and longer term, with declines of 23% and 50% during 2005/06-09/10 and 1984/85-2009/10 respectively (Cook et al., 2013), and there is evidence that birds on some of the water bodies have been adversely affected by recreational disturbance (Underhill et al., 1993). The decline in shoveler numbers is in contrast to national and regional trends which also show a continued increase in numbers. Over the long-term, shoveler numbers have increased by 80% in the UK between 1990/91 and 2015/16 (Frost et al., 2018). As with gadwall the reasons for the fall in the SPA population is unknown, although recreational disturbance is considered to be a factor.

8.10.5 Surveys recording gadwall and shoveler population size and distribution were carried out over four consecutive seasons from 2014/15 to 2017/18 covering the water bodies of the SWLW SPA / Ramsar site and a number of other water bodies.

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57 Delays in agreeing access arrangements with land owners/managers in 2014/15 resulted in reduced coverage, with no surveys completed at the following water bodies: Wraysbury Reservoir, King George VI Reservoir, Thorpe Park No 1, Bessborough and Knight Reservoirs, Kempton Park Nature Reserve and Kempton Park Balancing Reservoir.
in the study area that provide functionally linked habitat (see Figure 8.26, Volume 2).

8.10.6 The study area encompassed two broad areas: the 25 waterbodies that form the Wraysbury complex (numbered 1-25), located either side of the M25 motorway and within the study area, and the five SPA waterbodies that are located within the Shepperton and Walton-on-Thames complexes located to the south of the Airport close to Kempton Park and Thorpe Park respectively.

8.10.7 Table 8.19 shows the peak and mean counts for gadwall and shoveler within the Wraysbury complex for each of the three seasons where all water bodies were counted and a three year-peak mean (also see Figures 8.23 and 8.24, Volume 2).

<table>
<thead>
<tr>
<th>Species</th>
<th>2015-2018 Peak Mean / Mean</th>
<th>2015/16 Peak / Mean</th>
<th>2016/17 Peak / Mean</th>
<th>2017/18 Peak / Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gadwall</td>
<td>505 275.2</td>
<td>639 368.7</td>
<td>455 262.5</td>
<td>421 194.4</td>
</tr>
<tr>
<td>Shoveler</td>
<td>532 166.7</td>
<td>849 173.1</td>
<td>336 181.4</td>
<td>411 145.6</td>
</tr>
</tbody>
</table>

Predicted effects and their significance

Land take and land cover change ((resulting in habitat loss or degradation)

8.10.8 The DCO Project would result in the permanent habitat loss of 26.72ha of functionally linked open water habitat. This loss of habitat would displace gadwall and shoveler and may result in individual birds losing condition as competition for resources (including food and refuge) increases. The losses would occur during the first phase of the construction period, prior to the anticipated opening of the North West Runway. The loss will be permanent.

8.10.9 A total of five lakes would be lost to gadwall and shoveler due to land take or land use change, these being: Old Slade Lake, Orlitts Lake, Colnbrook North, Colnbrook West and Swan Lake58. Saxon Lake would be retained, although infrastructure enabling the water present to be pumped to the airfield for use in fighting fires would be installed. Furthermore, Saxon Lake is likely to be managed in a way to avoid the attraction of a large number of birds in order to manage wildlife strike risk. As the exact changes to Saxon Lake are not known at this stage, it has been assumed that this water body would no longer be able to support gadwall or shoveler. These lakes lie outside of the SWLW SPA / Ramsar

58 Other lakes present within the Site would be retained as part of the DCO Project.
site boundary, and have the potential to provide functionally linked habitat to the designated features.

8.10.10 Table 8.20 shows combined (from the six waterbodies) peak and mean counts for gadwall and shoveler for each of the three years of monitoring. Monitoring at Saxon Lake was only completed in 2016/17 and 2017/18 and at Swan Lake in 2017/18 only.
Table 8.20: Combined peak and mean counts for Gadwall and Shoveler at the six water bodies to be lost to development

<table>
<thead>
<tr>
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<tbody>
<tr>
<td></td>
<td></td>
<td>Peak mean</td>
<td>Mean</td>
<td>Peak</td>
<td>Mean</td>
<td>Peak</td>
</tr>
<tr>
<td>Gadwall</td>
<td>Old Slade Lake</td>
<td>13</td>
<td>1.9</td>
<td>16</td>
<td>2.6</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>Colnbrook North</td>
<td>34</td>
<td>9.2</td>
<td>45</td>
<td>9.9</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>Orlitt's Lake</td>
<td>25</td>
<td>5.7</td>
<td>34</td>
<td>5.4</td>
<td>35</td>
</tr>
<tr>
<td></td>
<td>Colnbrook West</td>
<td>12</td>
<td>3.6</td>
<td>9</td>
<td>2.6</td>
<td>28</td>
</tr>
<tr>
<td></td>
<td>Old Slade Lake LWS⁵⁹</td>
<td>50</td>
<td>20.6</td>
<td>46</td>
<td>20.5</td>
<td>56</td>
</tr>
<tr>
<td></td>
<td>Saxon Lake</td>
<td>Not counted (NC)</td>
<td>NC</td>
<td>NC</td>
<td>NC</td>
<td>NC</td>
</tr>
<tr>
<td></td>
<td>Swan Lake</td>
<td>NC</td>
<td>NC</td>
<td>NC</td>
<td>NC</td>
<td>NC</td>
</tr>
<tr>
<td>Shoveler</td>
<td>Old Slade Lake</td>
<td>3</td>
<td>0.2</td>
<td>0</td>
<td>0</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>Colnbrook North</td>
<td>46</td>
<td>9.8</td>
<td>38</td>
<td>11.6</td>
<td>22</td>
</tr>
</tbody>
</table>

⁵⁹ Old Slade Lake LWS refers to combined counts for Old Slade Lake, Colnbrook North, Orlitts Lake and Colnbrook West.
### Species

<table>
<thead>
<tr>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Orlitt’s Lake</td>
<td>Lake</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Colnbrook West</td>
<td>&lt;1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>&lt;0.2</td>
</tr>
<tr>
<td>Old Slade Lake LWS</td>
<td>47</td>
<td>11.1</td>
<td>38</td>
<td>11.6</td>
<td>24</td>
<td>8.8</td>
</tr>
<tr>
<td>Saxon Lake</td>
<td>NC</td>
<td>NC</td>
<td>NC</td>
<td>NC</td>
<td>NC</td>
<td>NC</td>
</tr>
<tr>
<td>Swan Lake</td>
<td>NC</td>
<td>NC</td>
<td>NC</td>
<td>NC</td>
<td>NC</td>
<td>NC</td>
</tr>
</tbody>
</table>
8.111 Counts were undertaken at Saxon Lake on 25 occasions in the two winters between September 2016 and March 2018, with 21 occasions returning zero counts of gadwall and 24 occasions returning zero counts of shoveler. The peak count of four gadwall and two shoveler and the low number of records suggest that this water body is not commonly used by either species and does not provide functionally linked habitat whose loss would result in a change to the status of the population of the SWLW SPA / Ramsar site.

8.10.12 Counts were undertaken at Swan Lake on 14 occasions between September 2017 and March 2018, with 13 occasions returning zero counts of gadwall. No shoveler were recorded on this water body. The peak count of two gadwall and the infrequency of the records suggest that this water body is not commonly used and does not provide functionally linked habitat whose loss would result in a change to the status of the population of the SWLW SPA / Ramsar site.

8.10.13 Counts were undertaken at Old Slade Lake on 55 occasions in the four winters between September 2014 and March 2018, with 39 occasions returning zero counts for gadwall and 52 returning zero counts for shoveler. Peak counts of 20 for gadwall and seven for shoveler compared to mean counts of 1.9 (gadwall) and 0.2 (shoveler) suggest that this water body is not commonly used by either species and does not provide functionally linked habitat whose loss would result in a change to the status of the population of the SWLW SPA / Ramsar site.

8.10.14 Counts were undertaken at Colnbrook North on 55 occasions in the four winters between September 2014 and March 2018, with 12 occasions returning zero counts for gadwall and 22 returning zero counts for shoveler. Peak counts of 54 for gadwall and 96 for shoveler compared to mean counts of 9.2 (gadwall) and 9.8 (shoveler) suggest that this water body is frequently used by both species in moderate numbers with occasional large counts recorded. Colnbrook North provides functionally linked habitat for both species whose loss could result in a change to the status of the gadwall and shoveler population of the SWLW SPA / Ramsar site.

8.10.15 Counts were undertaken at Orlitts Lake on 55 occasions in the four winters between September 2014 and March 2018, with 21 occasions returning zero counts for gadwall and 46 returning zero counts for shoveler. Peak counts of 35 for gadwall and 10 for shoveler compared to mean counts of 5.7 gadwall and 0.8 shoveler suggest that this water body is frequently used by gadwall in small numbers, but is infrequently used by shoveler and only in small numbers. Orlitts Lakes provides functionally linked habitat for small numbers of both species however its loss would not result in a change to the status of the population of the SWLW SPA / Ramsar site.
8.10.16 Counts were undertaken at Colnbrook West on 55 occasions in the four winters between September 2014 and March 2018, with 23 occasions returning zero counts for gadwall and 52 returning zero counts for shoveler. Peak counts of 28 for gadwall and 2 for shoveler compared to mean counts of 3.6 gadwall and 0.1 shoveler suggest that this water body is regularly used by gadwall in small numbers, but is infrequently used by shoveler. Colnbrook West provides functionally linked habitat for small numbers of gadwall however its loss would not result in a change to the status of the population of the SWLW SPA / Ramsar site.

8.10.17 It is likely that birds displaced from the four lakes making up the Old Slade Lake LWS would seek refuge locally with numerous other waterbodies offering alternative feeding or roosting locations. However, potential physiological effects on individual birds (loss of fitness, reduced survival/breeding rates) as a result of increased energy expenditure and reduced feeding opportunities mean that a negative effect could still occur as a result of the habitat loss.

8.10.18 The landscape within which the gadwall and shoveler populations have fluctuated in number is dynamic. Changes include the creation of lagoons following gravel extraction, the maturing of some of these water bodies to provide good habitat for these species, whilst others are infilled and returned to agriculture or other land uses. Similarly, the water supply reservoirs provide opportunities for these species, although the draining and maintenance works required on these structures can alter their suitability between years (for example Staines South Reservoir was drained for much of the winter 2017/18 for maintenance). Further, differential levels of recreational disturbance occur as activities such as angling, water skiing and sailing can change the suitability of individual water bodies. Therefore, these species already adapt regularly to changes in the environment providing opportunity to effectively mitigate the losses through the provision of new or improved habitats.

8.10.19 Suitable replacement habitat would be delivered within the green infrastructure that is an integral part of the DCO Project. Although the exact locations, extent and number of water bodies is yet to be determined, the general principle that applies is to ensure that they provide good quality habitats that can support the same or greater numbers of these birds in the long term. These water bodies would be managed in a way as to maximise their attractiveness to gadwall and shoveler. This includes ensuring that any recreational activity in the vicinity is manageable and refuge areas are permanently available. The delivery of these water bodies can be relied upon within this assessment as their design and location is to be a key part of the evolution of the green infrastructure design prior to application stage (see Appendix 8.4).

8.10.20 The delivery of some or all of the new habitat prior to the loss of existing habitat would be necessary to ensure that the gadwall and shoveler populations are not
negatively affected. More details of the provision of environmental measures will be provided in the ES for development consent including details of locations, water body design and long term management. In general the water bodies would have banks dominated by tree planting, with areas of fringing reed to both minimise potential disturbance from people recreating in the area and to prevent them being attractive to species considered to present a wildlife strike risk (e.g. Canada goose).

8.10.21 Following the provision of alternative and connected habitat within the green infrastructure that is integral to the DCO Project, the scale of the environmental change is predicted to be very low, as little or no change to the populations of gadwall or shoveler is expected. The effect on this ecological feature of international importance is predicted to be **Not Significant**. The conclusions drawn at this stage are preliminary and will be reviewed at ES stage.

8.10.22 At the time of application the assessment of this likely significant effect will be further informed by a detailed understanding of the extent, location and timing of delivery of new and improved habitat to be created as part of the green infrastructure proposals, alongside information about its long term management.

**Fragmentation of habitats (reduction of connectivity)**

8.10.23 Habitat loss and habitat change may result in fragmentation of the landscape for gadwall and shoveler. This could be as a result of a loss of water bodies in particular locations that act as ‘stepping stones’ or due to the presence of physical infrastructure such as the North West Runway. Given the location of the North West Runway and the associated loss of functionally linked habitat, the loss of habitat connectivity is most likely on a north-south axis along the Colne Valley. As the North West Runway and associated infrastructure are long term assets this assessment assumes any effect is permanent.

8.10.24 Briggs (2007) and Briggs *et al.* (2012) recorded flight paths between waterbodies of the Wraysbury complex for both shoveler and gadwall. Flights for both species showed regular movements between waterbodies around Wraysbury, such as between Wraysbury II North and South, Hythe Lagoon and Colne Mere. There were also movements to and from Staines Reservoirs North and South from the waterbodies immediately adjacent to it such as Princes Lake and Bedfont Lakes. No movements north and south were recorded along the Colne Valley.

8.10.25 The data available from Briggs (2007) and Briggs *et al.* (2012) suggests that movements of gadwall and shoveler are localised once migratory flights are complete. This suggests that the potential for proposed development to sever routes up and down the Colne Valley is limited, especially given that the
movements’ birds already make to reach the SWLW SPA / Ramsar site involve flights across the Greater London area.

8.10.26 However, the amount of information on flight movements of gadwall and shoveler in the lower Colne Valley is limited. Therefore, field survey undertaken in the winter of 2018/19 has specifically targeted the recording of flight movements. This data is not available at this stage and will therefore be reported in the ES. However, anecdotal observations from surveyors undertaking this work, when allied with the data collected by Briggs (2007) and Briggs et al. (2012) suggest that any effect of fragmentation would be limited. Further, the provision of green infrastructure designed to improve general ecological connectivity should negate any potential effect that may occur.

8.10.27 Based on the current information available with regard to gadwall and shoveler flight activity, the scale of the environmental change is predicted to be very low, as little or no change to movements between water bodies is expected. The effect on this ecological feature of international importance is predicted to be Not Significant. The conclusions drawn at this stage are preliminary and will be reviewed at ES stage.

8.10.28 At the time of application, the assessment of this likely significant effect will be further informed by detailed field survey data focused on understanding local movements of gadwall and shoveler.

**Increased noise and vibration (resulting in disturbance / displacement)**

8.10.29 Noise and vibration created by construction activity, ground based operations, road vehicles accessing and egressing the Airport and aircraft during the take-off and landing cycle could disturb gadwall and shoveler (see paragraph 8.10.43 for discussion of recreational disturbance). The timing and location of the sources of noise and vibration will change over time depending on the activities taking place. It is likely that the activities most likely to disturb gadwall and shoveler are associated with the early construction phases (Phase 1 and 2), the release of further aircraft capacity on the existing northern and southern runways in 2024 and additional flights associated with the anticipated opening of the North West Runway late in 2026.

8.10.30 Construction activities are proposed within 1km of nine water bodies that supported gadwall and / or shoveler during field survey; over this distance the potential for noise generated by construction activity can be discounted. Seven of the water bodies were subject to survey, with the remaining two not being counted due to timing of access agreement. Of the seven water bodies counted three supported peak counts of three or less individuals of either species and mean counts of 0.5 birds. This suggests that these water bodies do not provide habitat
important to the support of the SPA / Ramsar site populations. The remaining six water bodies (including those not counted) are all within 300m of areas that would be subject to construction activity and are:

1. Water body 8 - Wraysbury Reservoir (gadwall peak of 6, mean of 0.3 / shoveler peak of 2, mean of 0.1)
2. Water body 20 - Stanwell Moor North (gadwall peak of 35, mean of 5.4 / shoveler peak of 13, mean of 1.3)
3. Water body 21 - King George VI Reservoir (gadwall peak of 96, mean of 6.7 / shoveler peak of 23, mean of 1.3)
4. Water body 22 - Staines North Reservoir (gadwall peak of 282, mean of 17.1 / shoveler peak of 745, mean of 40.4)
5. Un-surveyed water body - Rodney Meadow
6. Un-surveyed water body - Mayfield’s Lake.

Of these six water bodies, Rodney Meadow and Mayfield’s Lake are north of the M4 and over 500m from any proposed construction activities associated with the Airport. However, the works to alter Thorney Park Lake for flood storage are approximately 150m to 300m from Rodney Meadow and Mayfield’s Lake respectively. There would be no visual disturbance due to the presence of plant or workforce due to the presence of extensive tree cover between Thorney Park Lake and Rodney Meadow and Mayfield’s Lake. Therefore, it is noise that is the most likely source of disturbance (the intervening distance ruling out vibration effects). Research on the disturbance of waterbirds (Cutts et al. 2013) by construction (albeit on estuaries) provides a 70dB(A) threshold for disturbance (this sound level being recorded at the bird, as opposed to at the source). Given the nature of the works at Thorney Park Lake and the distance this threshold would not be exceeded (as the sound level falls with distance\(^60\)), and therefore no disturbance of birds on these lakes would be expected.

The large reservoirs (Wraysbury, King George VI and Staines North) all have high banks that would act to deflect noise created by construction activity and visually screen the presence of plant and workforce. The 70dB(A) threshold is already regularly exceeded by the proximity to the flight activity associated with the operational airport. Wraysbury Reservoir will (at its closest point) be within 100m of construction works associated with the changes to junction 14 of the M25. However, the M25 already lies approximately 60m from this reservoir and it is

\(^{60}\) Construction sound levels (measured at 2m from source) of 100dB(A) will be measured at ~62.5dB(A) at a distance of 150m from source; based on the inverse square law.
regularly over flown by large numbers of aircraft due to its position in relation to
Heathrow’s existing southern runway. Wraysbury Reservoir also supports very few
gadwall and shoveler, with the distribution of these birds being extensive (in other
words they have been noted using different areas within the reservoir). Given the
low numbers of birds present and the noise levels already encountered at this
water body it is considered unlikely that any gadwall or shoveler would be
disturbed. Both King George VI and Staines North are over 200m from proposed
construction and operational activities (with the exception of the installation of a
cycle path as part of the green loop (see Chapter 6: DCO Project Description)).
At this distance it is unlikely that any construction noise above the 70dB(A)
threshold for disturbance will be realised. Also, given the opportunity for any
birds disturbed to redistribute quickly to avoid any noise generated from
construction sites, the potential for an effect to be realised on the fitness of
individual gadwall or shoveler is negligible.

8.10.33 Stanwell Moor North is, at its closest point, approximately 280m from any
proposed construction activity. Given that this water body is less than 100m from
active mineral processing works and is still occupied by moderate numbers of both
gadwall and shoveler, the potential for construction activities at a greater distance,
and further away than the M25 at its closest point, suggests that disturbance at
this water body is also unlikely.

8.10.34 Disturbance associated with vehicle movement is considered unlikely. The large
reservoirs (Wraysbury, King George VI and Staines North and Staines South) all
have high banks that would act to deflect noise created by vehicle movements and
visually screen the waterbodies from roads. The other small waterbodies are either
located away from major or busy roads or screened from traffic noise and
movement by dense vegetation.

8.10.35 During operation it is only aircraft movements that could result in disturbance of
the designated features of the SWLW Waterbodies SPA / Ramsar site.

8.10.36 In the winters of 2016/17 and 2017/18 monitoring of the behavioural responses of
waterbirds to aircraft was undertaken on 12 water bodies that are currently
overflown (seven within the designation boundary and five functionally linked to it).
A total of 9,240 aircraft were recorded either directly overflying or flying adjacent to
the water bodies during the survey. Disturbance of gadwall was recorded on ten
occasions and predominantly resulted in low – moderate responses with birds
recorded becoming alert or swimming away on seven occasions. Only on three
occasions did aircraft disturbance result in gadwall taking flight. Disturbance of

61 In terms of the methodology for monitoring bird disturbance - low disturbance = birds alert and ‘watching’
the disturbance source; low to moderate = birds walking or swimming away; moderate to major = birds flying
less than 50m or running away; major = birds flying more than 50m.
shoveler was recorded on only two occasions with one resulting in a single bird swimming a short distance and the other resulting in a small flock of three birds taking flight.

8.10.37 As gadwall and shoveler (combined) only reacted to <0.1% of the aircraft observed it is concluded that they are habituated to aircraft in this area and a negative effect on them can be discounted. The preliminary conclusions drawn at this stage of the DCO Project are that the scale of change is predicted to be negligible and the effect **Not Significant** on this ecological feature of international importance.

8.10.38 At the time of application the assessment of this likely significant effect will be further informed by a more detailed understanding of construction activity (including duration and activity), the measures taken to reduce or mitigate noise and additional noise modelling outputs.

*Emission events (changes in concentrations and deposition rates of nitrogen; resulting in habitat degradation)*

8.10.39 The concentration of nitrogen oxides (NOx) within the air or the deposition of nitrogen on to vegetation can result in the degradation of habitats through nutrification or direct toxicity. The thresholds beyond which these issues may harm certain habitats, and the fauna and flora they support, are termed the critical load and critical level. The critical load is the level of exposure of natural systems to a pollutant under which level significant harmful effects on specified ecological features are not predicted to occur, whilst the critical level is concentrations of pollutants in the atmosphere above which direct adverse effects on receptors (including ecological features) may occur according to present knowledge. The critical load and critical level thresholds and the measurements at individual European sites are provided by the Air Pollution Information System (APIS Website).

8.10.40 As the SWLW SPA / Ramsar site currently experiences concentrations of nitrogen in exceedance of the critical level (although deposition well below the critical load\(^{62}\)) it is apparent that further increases could result in harmful effects on the designated features present through habitat degradation. For gadwall and shoveler this would be through the concentrations of NOx resulting in damage to food plants within the water bodies used for foraging.

8.10.41 At this stage of the DCO Project detailed air quality modelling outputs are not available for specific European sites (see Chapter 7: Air quality and odour);

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\(^{62}\) A critical load for standing water has not been set for the SWLW SPA / Ramsar site. However, it has been set for the low and medium altitude hay meadow present at 20 – 30 kg N/ha/yr. This habitat type is considered to be more sensitive to nitrogen inputs compared to the large water bodies, including drinking water reservoirs that make up the habitat used by the designated features.
therefore for this assessment outline traffic model predictions have been used as a proxy (see Chapter 19: Transport network users) as the likely largest source of pollutants. These model predictions are inherently cumulative as they use modelled traffic data that has been growthed for future traffic flows. These show that along Stanwell Moor Road (which runs between the Staines Reservoirs and King George VI Reservoir) an increase in traffic of 5.6% by the year 2035 is predicted (in comparison to traffic growth in the absence of the DCO Project in the same year). Although the number of vehicle movements is relatively low at ~1,100 as a precaution, the preliminary assessment is that the scale of change is medium and the effect Significant.

8.10.42 At the time of application the assessment of this likely significant effect will be further informed by a better understanding of the predicted changes in traffic numbers, the contribution of other sources (including aircraft) and the guidance on how to account for the effects on European sites within Defra guidance that is scheduled for release in summer 2019.

Changes in patterns of recreational activity (resulting in disturbance / displacement and habitat degradation)

8.10.43 In order to construct the major elements of the DCO Project, a large workforce would be required. These operatives would largely be home-based commuting to and from the Site on a daily basis. However, it is expected that at the peak of the construction (2023) that 2,800 Heathrow construction workers would temporarily relocate to the area. These Heathrow construction workers would be based either in private caravans located within the Site (approximately 500 people) or hotels/guest houses. These Heathrow construction workers may cause an increase in the local population; although as current residents would be relocated through compulsory purchase or through the wider property offer it is currently uncertain as to whether or not the change would be a net gain or net loss in population. In addition to the temporary workforce, a number of local residents would have their access to existing public open space restricted due to construction activity. These local residents would therefore seek alternative locations for undertaking activities such as dog walking, jogging and cycling; which could include accessing parts of the SWLW SPA / Ramsar site or associated functionally linked habitat.

8.10.44 The temporarily relocated workforce and local residents displaced from their usual recreational facilities could partake in activities within or close to the SWLW SPA / Ramsar site resulting in the disturbance of gadwall and shoveler, species that have been shown to be sensitive to the presence of people undertaking recreational activities such as dog walking and jogging.
8.10.45 However, the SWLW SPA / Ramsar site and its functionally linked habitat is largely inaccessible to temporary Heathrow construction workers and local residents as it is either not publicly accessible (for example Wraysbury and King George VI reservoirs) or only accessible by being a member of an angling syndicate or water sports club. Further, the accessible footpaths through these water bodies would require any member of the workforce to drive to the location, where there is limited parking and a lack of circular routes (other than those that utilise major roads).

8.10.46 Staines North Reservoir and Staines South Reservoir are separated by a causeway with public access. This footpath links Town Lane to the A3044 and does not provide an attractive recreational prospect as there is no circular route available other than following busy roads for over 3km. Although people do visit the causeway to bird watch (it being a place regularly monitored by local bird clubs and their members) the limited amount of parking and the likelihood that only a small proportion of the temporary workforce would share this hobby enables extensive additional recreational activity to be discounted.

8.10.47 There is also a public right of way that runs through Horton Lakes from Park Lane, Horton to Douglas Lane, Wraysbury. In both locations parking is strictly limited, with no parking facilities provided. In order to make this walk into a circular route a person would be required to walk approximately 3.5km along Station Road / Coppermill Lane and Stanwell Road. The lack of parking and potential for circular routes again suggests the potential for recreational users to be drawn to this area is negligible.

8.10.48 Lastly, the Colne Valley Way runs adjacent to King George VI Reservoir. This long distance path can be accessed at many locations and therefore would be more accessible to the temporary workforce than the previously described footpaths. However, it runs along the foot of the reservoir embankment which negates the potential for recreational users to disturb gadwall and shoveler unduly, this being due to the lack of visual stimuli.

8.10.49 Given the limited opportunities for people to actively disturb gadwall and shoveler and the provision of alternative areas of public open space (see Chapter 11: Community) the scale of this change is predicted to be negligible and the effect Not Significant on this ecological feature of international importance. These conclusions are preliminary and will be reviewed at ES stage.

8.10.50 At the time of application the assessment of this likely significant effect will be further informed by a better understanding of the predicted change in the population size due to an influx of temporary construction workers and a reduction in the number of local residents.
Assessment of biodiversity effects – all European sites (other than the SWLW SPA/Ramsar site)

**Detailed baseline**

8.10.51 There are eight European sites within the additional area of search described in Table 8.4, other than the South West London Waterbodies SPA / Ramsar site. These are (details of designated features can be found in Table 8.7):

1. Windsor Forest and Great Park SAC
2. Richmond Park SAC
3. Burnham Beeches SAC
4. Thames Basin Heaths SPA
5. Thursley, Ash, Pirbright and Chobham SAC
6. Wimbledon Common SAC
7. Chiltern Beechwoods SAC
8. Aston Rowant SAC

8.10.52 For each of the identified European sites the critical load is already in exceedance based on the data provided by the Air Pollution Information System (APIS Website).

8.10.53 For two of the identified European sites (Richmond Park SAC and Wimbledon Common SAC) the critical level is also exceeded at present.

**Emission events (changes in concentrations and deposition rates of nitrogen; resulting in habitat degradation)**

8.10.54 As all of the European sites described above currently experience levels of nitrogen deposition in exceedance of the critical load it is apparent that further increases could result in harmful effects on the designated features present through habitat degradation.

8.10.55 At this stage of the DCO Project detailed air quality modelling outputs are not available for specific European sites (see Chapter 7); therefore for this assessment outline traffic model predictions are used as a proxy (see Chapter 19: Transport network users) as the likely largest source of pollutants. These model predictions are inherently cumulative as they use modelled traffic data that has been growthed for future traffic flows. These show that at the closest point to each of the European sites listed in paragraph 8.10.51 traffic numbers are predicted to increase between 0.4% and 1.6% by the year 2035 in comparison to predicted traffic growth in the absence of the DCO Project in the same year.
8.10.56 As traffic predictions show increases within year, as well as between years (in other words baseline traffic levels in 2017 are also smaller than those predicted for 2035) it is precautionary to assume that there may be increasing emissions of nitrogen that could result in habitat degradation within these European sites. Although the scale of change would likely be low (based on the relatively small increase in traffic numbers and general improvements in the cleanliness of the UK vehicle fleet), as a precaution, the preliminary assessment is that a Significant effect could occur.

8.10.57 At the time of application the assessment of this likely significant effect will be further informed by a better understanding of the predicted changes in traffic numbers, the contribution of other sources (including aircraft) and the guidance on how to account for the effects on European sites within Defra guidance that is scheduled for release in summer 2019.

Assessment of biodiversity effects – Staines Moor SSSI

Detailed baseline

8.10.58 Staines Moor SSSI comprises six units, two of which are isolated from the main components by either the M25 or A30 (see Figure 8.3). There are nine notified features, these being:

1. Aggregations of non-breeding birds – goosander
2. Aggregations of non-breeding birds – pochard
3. Aggregations of non-breeding birds – shoveler
5. Flowing waters – Type III: base-rich, low energy lowland rivers and streams, generally with a stable flow regime
6. MG13 – Agrostis stolonifera - Alopercus geniculatus grassland
7. MG5 – Crnosurus cristatus – Centaurea nigra grassland
8. S22 – Glyceria fluitans water-margin vegetation

8.10.59 The six units are in various condition categories. Units 007, 008, 012 and 013 (note there are six units but they are not numbered sequentially) are in favourable condition, whilst unit 011 is in unfavourable – recovering condition. Unit 001 (known as Poyle Meadow) is in unfavourable declining condition.
Unit 001 is within the Site. Unit 001 is made up of two fields that have been largely neglected with horse grazing resulting in a close-cropped sward in one field, whilst joyriding and the burning out of stolen vehicles has resulted in extensive bare ground in the other. Further there is considerable invasion by scrub, particularly bramble *Rubus fruticosus*. Despite the historic poor management there are still remnants of MG5b grassland present, and other areas still appear to have the potential to be reinstated through sympathetic management. Within this unit also runs a short stretch of the Wraysbury River.

Units 012 and 013 are downstream of the Site as the River Colne and the Wraysbury River pass through these units respectively. Units 012 and 013 provide a large complex area of grassland and fen. Units 007 and 008 are the drinking water reservoirs King George VI, Staines North and Staines South which are included for their wintering bird interest. Unit 011 lies adjacent to Staines upon Thames and is outside of the study area.

**Predicted effects and their significance**

**Land take and land cover change (resulting in habitat loss or degradation)**

Poyle Meadow would be partially lost to the changes required at junction 14 of the M25. The diversion of a gas main across the SSSI is assumed to be achieved through the use of trenchless crossing techniques. During the development of the DCO Project design opportunities to reduce land take of the physical infrastructure on this SSSI unit were assessed. Although it is not possible for the geometry of the motorway junction to avoid the SSSI unit, the extent of development has been minimised. At this stage it is unknown how much of the unit will be required to facilitate both the infrastructure and the area required to construct it. It is assumed for the purposes of this assessment that the evolving design will enable portions of the SSSI unit to be maintained.

This unit has been in unfavourable – declining condition for a prolonged period of time (over a decade) due to inappropriate management. However, there are still pockets of habitat that resemble the single notified feature (MG5b) that occurs in this unit, although its occurrence is patchy. Until there is further understanding of the methods of construction within this SSSI unit it is not possible to determine the extent of the notified feature (or areas within which it could be re-established) lost.

The preliminary assumption is that there would be a loss of areas of the notified features representing a scale of change that is high and an effect that is Significant on a nationally important designated site. However, there is likely to

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63 As reported in Natural England’s condition assessment of the Staines Moor SSSI (Natural England, n.d.).
be an opportunity to improve the extent of the notified feature on this unit in the area that remains. This could be achieved through appropriate management, translocation of turfs from within the construction area or the collection and strewing of green hay. There is also potential to create similar habitat types within the green infrastructure proposed as part of the DCO Project. The approach to compensate for direct effects on the Staines Moor SSSI would be developed in detailed technical engagement with Natural England prior to the completion of the ES.

8.10.65 At the time of application the assessment of this likely significant effect will be further informed by a detailed understanding of the extent and location of the construction activity and the approach to environmental measures favoured by Natural England.

**Increased noise and vibration (resulting in disturbance / displacement)**

8.10.66 Noise and vibration created by construction activity, ground based operations, road vehicles accessing and egressing the Airport and aircraft during the take-off and landing cycle could disturb shoveler, goosander, pochard and tufted duck (see paragraph 8.10.29 for assessment of effects on shoveler and paragraph 8.10.43 for discussion of recreational disturbance). The timing and location of the sources of noise and vibration will change over time depending on the activities taking place. It is likely that the activities most likely to disturb the notified features of the SSSI are associated with the early construction phases (Phase 1 and 2), the release of further aircraft capacity on the existing northern and southern runways in 2024 and additional flights associated with the anticipated opening of the runway in 2026.

8.10.67 Construction activities are proposed within 1km of two of the three reservoirs forming part of Staines Moor SSSI. These water bodies support large numbers of pochard and tufted duck (Staines North Reservoir being particularly important for pochard) and very small numbers of goosander (at less than nationally important numbers).

8.10.68 These large reservoirs have high banks that would act to deflect noise created by construction activity and visually screen the presence of plant and workforce. The 70dB(A) threshold (taken from the waterbird disturbance mitigation toolkit) is already regularly exceeded by the proximity to the flight activity associated with the operational airport. Both King George VI and Staines North are over 200m from proposed construction and operational activities (with the exception of the installation of a cycle path as part of the green loop (see Chapter 6: DCO Project description). At this distance it is unlikely that any construction noise above the 70dB(A) threshold for disturbance will be realised. Also given the opportunity for any birds disturbed to redistribute quickly to avoid any noise generated from
construction sites (due to the very large extent of these water bodies) the potential for an effect to be realised on the fitness of individual pochard, goosander or tufted duck is negligible.

8.10.69 During operation it is only aircraft movements that could result in disturbance of the notified features of Staines Moor SSSI.

8.10.70 In the winters of 2016/17 and 2017/18 monitoring of the behavioural responses of waterbirds to aircraft was undertaken on 12 water bodies that are currently overflown (including all three water bodies supporting the notified ornithological features within the SSSI boundary). A total of 1,897 aircraft were recorded either directly overflying or flying adjacent to the water bodies of the SSSI during the survey. Disturbance of tufted duck was recorded on four occasions and pochard once. A single moderate event was recorded on King George VI reservoir with three birds swimming a short distance in response to a passing aircraft. On two occasions tufted duck took flight in response to aircraft over the northern basin of Staines reservoir with small flocks of 14 and two birds relocating within the water body. On the same water body tufted duck and pochard were recorded becoming alert in response to a single aircraft, though neither species swam away or took flight in response. No disturbance events involving goosander, caused by aircraft were recorded at Staines Moor SSSI.

8.10.71 As goosander, pochard and tufted duck (combined) only reacted to 0.2% of the aircraft recorded overflying the SSSI it is concluded that they are habituated to aircraft in this area and a negative effect on them can be discounted. The preliminary conclusions drawn at this stage of the DCO Project are that the scale of change is predicted to be negligible and the effect Not Significant.

Emission events (changes in concentrations and deposition rates of nitrogen; resulting in habitat degradation)

8.10.72 The concentration of nitrogen oxides (NOx) within the air or the deposition of nitrogen on to vegetation can result in the degradation of habitats through nutrification or direct toxicity.

8.10.73 As the Staines Moor SSSI currently experiences nitrogen concentrations in exceedance of the critical level (although deposition is well below the critical load\(^\text{64}\)) it is apparent that further increases could result in harmful effects on the designated features present through habitat degradation. For the grassland features and the vascular plant assemblage the concentrations of NOx could result

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\(^{64}\) A critical load for standing water has not been set for the SWLW SPA / Ramsar site. However, it has been set for the low and medium altitude hay meadow present at 20 – 30 kg N/ha/yr. This habitat type is considered to be more sensitive to nitrogen inputs compared to the large water bodies, including drinking water reservoirs, that make up the habitat used by the designated features.
in direct toxicity to individual plant species, whilst the wildfowl could be effected through the concentrations of NOx resulting in damage to food plants.

8.10.74 At this stage of the DCO Project detailed air quality modelling outputs are not available for Staines Moor SSSI (see Chapter 7); therefore for this assessment outline traffic model predictions have been used as a proxy (see Chapter 19) as the likely largest source of pollutants. These model predictions are inherently cumulative as they use modelled traffic data that has been growthed for future traffic flows. These show that along Stanwell Moor Road (which runs between the Staines Reservoirs and King George VI Reservoir) an increase in traffic of 5.6% by the year 2035 is predicted (in comparison to traffic growth in the absence of the DCO Project in the same year). Although the number of vehicle movements is relatively low at ~1,100 as a precaution, the preliminary assessment is that the scale of change is predicted to be medium, and the effect Significant.

8.10.75 At the time of application the assessment of this likely significant effect will be further informed by a better understanding of the predicted changes in traffic numbers, the contribution of other sources (including aircraft) and the guidance on how to account for the effects on designated sites within Defra guidance that is scheduled for release in summer 2019.

Changes in patterns of recreational activity (resulting in disturbance / displacement and habitat degradation)

8.10.76 The assessment for the ornithological notified features of Staines Moor SSSI, shoveler, goosander, pochard and tufted duck mirrors that presented for the SWLW Waterbodies SPA / Ramsar site (see paragraph 8.10.43 to 8.10.50). The preliminary conclusions drawn at this stage of the DCO Project are that the scale of change is negligible and the effect Not Significant on this ecological feature of national importance.

Assessment of biodiversity effects – Wraysbury Reservoir SSSI

Detailed baseline

8.10.77 Wraysbury Reservoir SSSI comprises a single unit that is in favourable condition. This unit entirely comprises a drinking water reservoir owned and operated by Thames Water. There are three notified features, these being:

1. Aggregations of non-breeding birds – cormorant
2. Aggregations of non-breeding birds – great crested grebe
3. Aggregations of non-breeding birds – shoveler.
Predicted effects and their significance

Increased noise and vibration (resulting in disturbance / displacement)

8.10.78 Noise and vibration created by construction activity, ground based operations, road vehicles accessing and egressing the Airport and aircraft during the take-off and landing cycle could disturb shoveler, great crested grebe and cormorant (see paragraph 8.10.29 for assessment of effects on shoveler and paragraph 8.10.43 for discussion of recreational disturbance). The timing and location of the sources of noise and vibration will change over time depending on the activities taking place. It is likely that the activities most likely to disturb the notified features of the SSSI are associated with the early construction phases (Phase 1 and 2), the release of further aircraft capacity on the existing northern and southern runways in 2024 and additional flights associated with the anticipated opening of the North West Runway in 2027.

8.10.79 Construction activities are proposed within 1km of Wraysbury Reservoir SSSI. This water body supports good numbers of great crested grebe and cormorant (peak counts for great crested grebe during the survey period was recorded on this reservoir).

8.10.80 Wraysbury Reservoir would (at its closest point) be within 100m of construction works associated with the changes to junction 14 of the M25. However, the M25 already lies approximately 60m from this reservoir and it is regularly over flown by large numbers of aircraft due to its position in relation to Heathrow’s existing southern runway. As noise levels are already high and the banks of the reservoir would damp sound from construction at the level of the M25 it is not expected that construction noise would result in a specific disturbance. Further, the distribution of birds using Wraysbury Reservoir is such that the majority are always at considerable distance from the proposed construction areas (the reservoir being over a kilometre wide and two kilometres long at points) making the potential for an effect to be realised on the fitness of individual great crested grebe or cormorant negligible.

8.10.81 During operation it is only aircraft movements that could result in disturbance of the notified features of Wraysbury Reservoir.

8.10.82 In the winters of 2016/17 and 2017/18 monitoring of the behavioural responses of waterbirds to aircraft was undertaken on 12 water bodies that are currently overflown (including all Wraysbury Reservoir). A total of 1,741 aircraft were recorded either directly overflying or flying adjacent to Wraysbury Reservoir during the survey. Disturbance of cormorant was recorded on one occasion on Wraysbury Reservoir. No instances of aircraft disturbance were recorded for great crested grebe.
On one occasion aircraft overflight resulted in moderate disturbance of cormorant with a flock of three birds swimming a short distance in response to the stimuli.

As cormorant and great crested grebe (combined) reacted to less than 0.1% of the aircraft monitored over Wraysbury Reservoir it is concluded that they are habituated to aircraft in this area and a negative effect on them can be discounted. The preliminary conclusions drawn at this stage of the DCO Project are that the scale of change is negligible and the effect **Not Significant** on this ecological feature of national importance.

**Emission events (changes in concentrations and deposition rates of nitrogen; resulting in habitat degradation)**

The concentration of nitrogen oxides (NOx) within the air or the deposition of nitrogen on to vegetation can result in the degradation of habitats through nutrification or direct toxicity.

As the Wraysbury Reservoir SSSI currently experiences nitrogen concentrations in exceedance of the critical level (although deposition is well below the critical load\(^{65}\)) it is apparent that further increases could result in harmful effects on the designated features present through habitat degradation. The concentrations of NOx could result in direct toxicity to individual plant species, which could affect the availability of food plants for the notified waterbirds.

At this stage of the DCO Project detailed air quality modelling outputs are not available for the Wraysbury Reservoir SSSI (see Chapter 7); therefore for this assessment outline traffic model predictions have been used as a proxy (see Chapter 19) as the likely largest source of pollutants. As the road network will be altered in this area a detailed comparison between the baseline situation and the DCO Project is yet to be completed. However, as traffic levels are predicted to rise in the locality as a precaution, the preliminary assessment is that the scale of change is medium and the effect **Significant**.

At the time of application the assessment of this likely significant effect will be further informed by a better understanding of the predicted changes in traffic numbers, the contribution of other sources (including aircraft) and the guidance on how to account for the effects on designated sites within Defra guidance that is scheduled for release in summer 2019.

\(^{65}\) A critical load for standing water has not been set for the SWLW SPA / Ramsar site. However, it has been set for the low and medium altitude hay meadow present at 20 – 30 kg N/ha/yr. This habitat type is considered to be more sensitive to nitrogen inputs compared to the large water bodies, including drinking water reservoirs, that make up the habitat used by the designated features.
Assessment of biodiversity effects – Wraysbury No 1 Gravel Pit SSSI

Detailed baseline

8.10.89 Wraysbury No. 1 Gravel Pit SSSI comprises a single unit that is in favourable condition. There is a single notified feature, this being:

1. Aggregations of non-breeding birds – gadwall.

8.10.90 This SSSI is overlapped by the designation of the SWLW Waterbodies SPA/Ramsar site. As the SSSIs only notified feature is also a feature of the SPA/Ramsar site the assessment of effects are common with those provided above, as the SPA/Ramsar site has the greatest level of importance.

Assessment of biodiversity effects – Wraysbury and Hythe End Gravel Pits SSSI

Detailed Baseline

8.10.91 Wraysbury and Hythe End Gravel Pits SSSI comprises six units, all of which are in favourable condition. This complex of water bodies and grassland are used at low levels for recreation including angling and water sports. There are four notified features, these being:

1. Aggregations of non-breeding birds – gadwall
2. Aggregations of non-breeding birds – goosander
3. Aggregations of non-breeding birds – tufted duck
4. Assemblages of breeding birds – lowland open waters and their margins.

Predicted effects and their significance

Increased noise and vibration (resulting in disturbance / displacement)

8.10.92 Noise and vibration created by construction activity, ground based operations or road vehicles accessing and egressing the Airport can be discounted as the nearest potential source would be over 1.4km away. Therefore, the potential disturbance that is most likely to result in disturbance of gadwall, goosander and tufted duck (see paragraph 8.10.29 for assessment of effects on shoveler and paragraph 8.10.43 for discussion of recreational disturbance) of Wraysbury and Hythe End Gravel Pits SSSI is associated with aircraft movements.

8.10.93 In the winters of 2016/17 and 2017/18 monitoring of the behavioural responses of waterbirds to aircraft was undertaken on 12 water bodies that are currently overflown (including all of the Wraysbury and Hythe End Gravel Pits SSSI). A total of 1,409 planes were recorded either directly overflying or flying adjacent to this
SSSI during the survey. Disturbance of goosander and tufted duck, was recorded on 17 occasions within the SSSI.

8.10.94 Three responses from goosander were recorded disturbing flocks of between one and three birds. Low-moderate responses were recorded on all three occasions with birds becoming alert or swimming a short distance.

8.10.95 Responses from tufted duck were recorded most frequently with aircraft overflight resulting in 14 responses, this included 12 low-moderate reactions where birds became alert or swam a short distance and two occasions when birds took flight.

8.10.96 As goosander and tufted duck (combined) only reacted to 1.2% of the aircraft monitored over this SSSI it is concluded that they are habituated to aircraft in this area and a negative effect on them can be discounted. The preliminary conclusions drawn at this stage of the DCO Project are that the scale of change is negligible and the effect Not Significant on this ecological feature of national importance.

Emission events (changes in concentrations and deposition rates of nitrogen; resulting in habitat degradation)

8.10.97 The concentration of nitrogen oxides (NOx) within the air or the deposition of nitrogen on to vegetation can result in the degradation of habitats through nutrification or direct toxicity.

8.10.98 As the Wraysbury Hythe End Gravel Pits SSSI currently experiences nitrogen concentrations in exceedance of the critical level66 (although deposition is well below the critical load67) it is apparent that further increases could result in harmful effects on the designated features present through habitat degradation. The concentrations of NOx could result in direct toxicity to individual plant species, which could affect the availability of food plants for the notified ornithological features.

8.10.99 At this stage of the DCO Project detailed air quality modelling outputs are not available for specific SSSIs (see Chapter 7); therefore for this assessment outline traffic model predictions have been used as a proxy (see Chapter 19) as the likely largest source of pollutants. No specific travel model predictions have yet been derived for the road network within 200m of the Wraysbury & Hythe End Gravel Pits SSSI. However, as traffic levels are predicted to rise in the locality as a result...
precaution, the preliminary assessment is that the scale of change is medium and the effect **Significant**.

8.10.100 At the time of application the assessment of this likely significant effect will be further informed by a better understanding of the predicted changes in traffic numbers, the contribution of other sources (including aircraft) and the guidance on how to account for the effects on designated sites within Defra guidance that is scheduled for release in summer 2019.

**Assessment of biodiversity effects – All SSSIs**

**Detailed baseline**

8.10.101 In total 120 SSSIs were identified within the area over which traffic modelling is being undertaken for the DCO Project. The names and details of notified features of each of these SSSIs can be found in Appendix 8.2, but have not been listed here for brevity. Of these 120 SSSIs, four are dealt with directly in the preceding paragraphs, namely Staines Moor SSSI, Wraysbury Reservoir SSSI, Warysbury No 1 Gravel Pit SSSI and Wraysbury and Hythe End Gravel Pits SSSI, these are not considered further within this section.

**Emission events (changes in concentrations and deposition rates of nitrogen; resulting in habitat degradation)**

8.10.102 The concentration of nitrogen oxides (NOx) within the air or the deposition of nitrogen on to vegetation can result in the degradation of habitats through nutrification or direct toxicity.

8.10.103 The majority of these SSSIs currently experience exceedences in their critical loads or critical levels (or both). Due to these frequent exceedences it is apparent that further increases could result in harmful effects on the designated features present through habitat degradation.

8.10.104 At this stage of the DCO Project detailed air quality modelling outputs are not available for specific SSSIs (see Chapter 7); therefore for this assessment outline traffic model predictions have been used as a proxy (see Chapter 19) as the likely largest source of pollutants. No specific travel model predictions have yet been derived for the road network within 200m of the 116 SSSIs in question. However, as traffic levels are predicted to rise around the European sites within the traffic modelled area (see paragraph 8.10.39 to 8.10.42) as as a precaution, the preliminary assessment is that the scale of change is medium and the effect **Significant**.

8.10.105 At the time of application the assessment of this likely significant effect will be further informed by a better understanding of the predicted changes in traffic
numbers, the contribution of other sources (including aircraft) and the guidance on how to account for the effects on designated sites within Defra guidance that is scheduled for release in summer 2019.

Assessment of biodiversity effects – LWS and LNRs

Detailed baseline

8.10.106 There are a total of 20 LWS and two LNR that lie fully or partially within the Site (these equating to 20 designated areas due to overlaps of LWS with LNR; 14 of which are ecological features of County / metropolitan importance and six are of borough importance). These are either fully or partially within areas identified for construction and operational activities, within areas of green infrastructure where improvements for recreation and transport (for example the creation of cycle paths or all weather footpaths) are proposed or within potential areas for habitat improvement or habitat creation. Table 8.21 describes the relevant LWS/LNR.

Table 8.21: LWS and LNR fully or partially within the Site

<table>
<thead>
<tr>
<th>Site Name</th>
<th>Description</th>
<th>Relation to the DCO Project</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arthur Jacobs LNR &amp; LWS</td>
<td>This site is managed for nature conservation. It is an old silt lagoon area where a variety of habitats have been established including ponds, grassland and woodland/scrub. Boundaries of the LNR and LWS are concurrent.</td>
<td>Change associated with proposed green infrastructure</td>
</tr>
<tr>
<td>Bedfont Lakes Country Park SINC (metropolitan)</td>
<td>A restored gravel extraction and land-fill site, now managed as a country park. The two former gravel pits, Bedfont Lake and Princes Lake, are of considerable ornithological interest, including breeding reed warbler, common tern and pochard, and wintering and passage wildfowl and waders. Water vole were reintroduced here and a good assemblage of invertebrates is present.</td>
<td>Change associated with proposed green infrastructure</td>
</tr>
<tr>
<td>Colne Brook LWS</td>
<td>The Colne Brook forms an important wildlife corridor in this intensively farmed and urban fringe landscape. The stream flows from the Horton Trading Estate at its upstream extent to Whitehall Lane at the downstream limit. This stretch comprises a range of aquatic, semi-aquatic and riparian habitats including a diverse in-stream system, moderate to species-rich emergent and aquatic communities and small areas of wet woodland and scrub.</td>
<td>Change associated with proposed green infrastructure</td>
</tr>
<tr>
<td>Cranebank LNR</td>
<td>Cranebank is a remnant of traditional riverside grazing land. Until 1999 the site was leased for horse pasture but its current usage is for nature conservation and recreation. The meadows are flooded every winter and are defined by a sward rich in damp-loving grasses and herbs. It is perhaps</td>
<td>Change associated with proposed green infrastructure</td>
</tr>
</tbody>
</table>
### Biodiversity

<table>
<thead>
<tr>
<th>Site Name</th>
<th>Description</th>
<th>Relation to the DCO Project</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Crane Corridor SINC (metropolitan)</strong></td>
<td>The River Crane is bordered by habitats including woodland, pasture, heathland and areas of open water. The width of the river corridor is exceptional by London standards and the river is one of the most natural in London, supporting uncommon aquatic plants. Breeding kingfisher, grey wagtail and reed warbler, and water vole are also present.</td>
<td>Partially lost to construction/operation Changes also associated with proposed green infrastructure</td>
</tr>
<tr>
<td><strong>Cranford Countryside Park and Open Space SINC (borough grade I)</strong></td>
<td>The central portion of the site comprises a mixture of amenity grassland given a ‘hay-meadow’ cut, and late cut grassland. These are interspersed with small copses with trees and shrubs, some of them recently planted.</td>
<td>Change associated with proposed green infrastructure</td>
</tr>
<tr>
<td><strong>Cranford Gravel Lane Workings SINC (borough grade II)</strong></td>
<td>The site comprises vegetated spoil heaps with wildflowers and developing scrub resulting from past gravel extraction with seasonally wet ditches and depressions. To the north there is a meadow with native hedges and trees.</td>
<td>Change associated with proposed green infrastructure</td>
</tr>
<tr>
<td><strong>Duke of Northumberland’s at Bedfont SINC (metropolitan)</strong></td>
<td>This section of the Duke of Northumberland’s River has good water quality and supports an excellent assemblage of aquatic invertebrates. The Environment Agency places the river in the top 6% of rivers in the UK for macro-invertebrates. The fish population is also important, within the top 20% of UK rivers in terms of species diversity. The river has a diverse emergent and aquatic vegetation, and also supports water vole.</td>
<td>Change associated with proposed green infrastructure</td>
</tr>
<tr>
<td><strong>East of Poyle Meadows SNCI</strong></td>
<td>Diversity of habitats including pond, swamp, grassland and scrub. Selected for its diverse wetland habitat including NVC swamp communities S4, S7 and S12. Species indicative of Thames Alluvial soils are supported, and the Nationally Notable Roesel’s Bush Cricket has been recorded on the site.</td>
<td>Lost to construction/operation</td>
</tr>
<tr>
<td><strong>Greenham’s Fishing Pond SNCI</strong></td>
<td>The site is selected for its wetland habitat (NVC communities S13, S14 &amp; S19). The lake and a 10-metre buffer strip were selected in 1996 for the presence of 2 Nationally Notable water beetles. The Nationally Notable water beetle <em>Ilybus fenestratus</em> was recorded in 2010. The status of all three species is currently under review.</td>
<td>Lost to construction/operation</td>
</tr>
<tr>
<td><strong>Hatton Meadows SINC (borough grade I)</strong></td>
<td>The site comprises wide expanses of acid and semi improved grassland, which are cut for hay in the autumn months. The site is good for winter bird flocks including skylark, reed bunting, chaffinch, bullfinch and meadow pipit. Little owl and kestrel nest</td>
<td>Partially lost to construction/operation Changes also associated with proposed green infrastructure</td>
</tr>
<tr>
<td>Site Name</td>
<td>Description</td>
<td>Relation to the DCO Project</td>
</tr>
<tr>
<td>-----------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td>Little Britain SINC (metropolitan)</td>
<td>Supports a variety of habitats including lakes, rivers, scrub, areas of wasteland, woodland and neutral grassland. The Colne and Frays rivers are clean, fast flowing and support an interesting range of marginal habitats, including valuable areas of wet woodland. Of particular importance are the areas of unimproved floodplain grassland, which support a lush flora including nationally scarce species. The lakes attract various breeding and wintering birds. The site supports specially-protected water voles and there are also recent reports of otters in the vicinity. The area is also of importance for bats, with noctule, Daubenton’s bat and soprano pipistrelle all present in good numbers.</td>
<td>Partially lost to construction/operation</td>
</tr>
<tr>
<td>Lower Colne SNCI (metropolitan)</td>
<td>One of the finest river systems in London, including sections of the rivers Colne, Wraysbury and Frays. These originate as chalk streams and collectively support a diverse aquatic and marginal flora including several plants with a restricted London distribution and that are nationally declining/rare. Breeding kingfisher and grey wagtail, water vole and a diversity of fish are also present.</td>
<td>Partially lost to construction/operation</td>
</tr>
<tr>
<td>Mayfield Farm and Water Treatment Works SINC (borough grade I)</td>
<td>The site contains a complex of natural and manmade habitats which include one of the largest reedbeds in Hounslow (approximately 3 ha in size), open water reservoirs, wetland communities, herb rich grasslands and species rich ponds. Lapwing, reed warblers, reed buntings, sedge warblers, linnets and skylarks are amongst a number of important species that use the site. The reedbed has also been trapped for moths and has several important species typical of that habitat.</td>
<td>Partially lost to construction/operation</td>
</tr>
<tr>
<td>Old Slade Lake LWS</td>
<td>The site consists of a complex of flooded gravel pits fringed by secondary woodland, scrub, ruderal grassland, tree planting and a stretch of the Colne Brook.</td>
<td>Lost to construction/operation</td>
</tr>
<tr>
<td>River Colne (from county boundary to Staines Moor), Stanwell Moor SNCI</td>
<td>River Colne, a fast-flowing river with good aquatic and marginal vegetation and areas of bare ground which are attractive to breeding birds.</td>
<td>Partially lost to construction/operation</td>
</tr>
<tr>
<td>Stanwell II SNCI</td>
<td>Mosaic of gravel pits and ditches supporting a range of marginal vegetation including fen. Main interest lies in the relatively large area of fen vegetation (approximately five ha), which is of county Importance. It is also important for other wetland habitats, such as reed beds which support reed bunting.</td>
<td>Lost to construction/operation</td>
</tr>
<tr>
<td>Stockley Road Rough SINC (local)</td>
<td>The site is a mixture of scrub, tall herbs and grasses.</td>
<td>Partially lost to construction/operation</td>
</tr>
</tbody>
</table>
### Site Name | Description | Relation to the DCO Project
--- | --- | ---
Wall Garden Farm Sand Heaps SINC (Borough Grade 1) | A series of large sand heaps associated with adjacent active gravel workings. These support a breeding colony of sand martins. The extensive reseeded grassland and ruderal areas to the north and east, along with included operational silt pits, provide habitats likely to give rise to a large biomass of invertebrate aerial plankton. Skylark is present in the grassland. | Partially lost to construction/operation Changes also associated with proposed green infrastructure

West of Poyle Meadows SNCI | A natural river channel with good marginal vegetation along the western bank. The eastern bank of the river forms part of the flood meadow of Poyle meadows. Adjoining grassland supports botanical interest. This stretch of river was shown by the Environment Agency to be in the top 13% of UK watercourses due to its macroinvertebrate diversity. It was also selected as a natural river channel with good marginal vegetation including species uncommon in Surrey. The eastern bank forms part of the Poyle Meadow SSSI and the SNCI is an important protective buffer to the SSSI. | Change associated with proposed green infrastructure

Wraysbury Reservoir SNCI | Steeply sloping, terraced improved grassland banks grazed by sheep. The reservoir itself is now excluded from the SNCI as it is a SSSI. The grassland surrounding Wraysbury Reservoir itself is selected as an important buffer for the Wraysbury Reservoir SSSI. Wraysbury Reservoir supports two species on the conservation concern list for Surrey, shoveler and gadwall. It is also important for tufted duck, great crested grebe and cormorant. | Partially lost to construction/operation Changes also associated with proposed green infrastructure

8.10.107 The assessment of the potential effects on LWS and LNR focuses on those that would be fully or partially lost to the construction or operational activities associated with the DCO Project. The positive effects that may occur due to any habitat creation or improvement works associated with the green infrastructure proposals (see Chapter 6) are not assessed here as the design has not evolved sufficiently to provide any further information or draw any conclusions.

8.10.108 The likely significant effects on individual habitats, flora and fauna are considered separately, as opposed to as a feature of the LWS and LNR. This is because the important features of non-statutory sites are not detailed in the same way as those associated with European sites or SSSIs (i.e. as listed designated or notified features) making identifying core features for assessment difficult. Therefore, the assessment associated with LWS and LNR is an assessment of the collective importance of the designations as ecological features.
Land take and land cover change (resulting in habitat loss or degradation)

8.10.109 The total loss of LWS or LNR would result in the designation being extinguished and all of the features of note being lost. At this stage of the DCO Project, total loss has been assumed for all LWS or LNR where construction or operational activities are expected to occupy more than 75% of the area. This is to be precautionary as the exact working areas and the methods of construction are not known. The DCO Project would lead to the complete loss of the following LWS:

1. East of Poyle Meadows SINC
2. Greenham’s Fishing Pond SNCI
3. Old Slade Lake LWS
4. Wall Garden Farms Sand Heaps SINC

8.10.110 The DCO Project would result in the partial loss of the following LWS:

1. Arthur Jacobs LWS / LNR (loss = 0.37ha of 4.14ha)
2. Bedfont Lakes Country Park SINC (loss = 0.18ha of 89.21ha)
3. Colne Brook LWS (loss = 0.99ha of 7.87ha)
4. Crane Corridor SNCI (loss = 3.61ha of 167.10ha)
5. Duke of Northumberland’s River at Bedfont SINC (loss = 0.45ha of 7.05ha)
6. Little Britain SINC (loss = 0.05ha of 101.59ha)
7. Lower Colne SNCI (loss = 91.63ha of 141.31ha)
8. Mayfield Farm and Water Treatment Works SINC (loss = 31.98ha of 45.27ha)
9. River Colne (from county boundary to Staines Moor)/Stanwell Moor SNCI (loss = 1.37ha of 5.62ha)
10. Stanwell II SINC (loss = 1.09ha of 5.87ha)
11. Stockley Road Rough SINC (loss = 0.48ha of 1.74ha)
12. West of Poyle Meadow SINC (loss = 0.71ha of 1.15ha)
13. Wraysbury Reservoir SNCI (loss = 1.48ha of 48.68ha).

8.10.111 The total loss of non-statutorily designated habitat equates to 175.86ha.

68 This is a precautionary professional judgement being used at this stage of the DCO Project. When further details are available around construction, at application stage, this will be quantified.
For all of the LWS partially lost, the design of the green infrastructure would be tailored to ensure that valuable habitats are maintained wherever possible, are connected to a wider network of semi-natural habitats and retain the potential for being enhanced in the long-term. Further, the habitats that the green infrastructure proposal would bring for the purposes of nature conservation would be designed in such a way as to enable designation as LWS in the future (noting that Heathrow cannot control the designation process), as has been achieved on many of the sites created as part of the legacy of the T5 development. However, at this stage of the DCO Project the green infrastructure design is not evolved sufficiently to understand the long term futures of these partially lost LWS. The green infrastructure would also not reverse the direct effects of land take and therefore cannot avoid or mitigate the effect directly.

The preliminary conclusions drawn at this stage of the DCO Project are that the scale of the change to LWS would be high and the effect is Significant on these ecological features of County / metropolitan or borough importance. The design of green infrastructure, although being designed to deliver a net gain, would not alter the outcome of this assessment.

At the time of application the assessment of this likely significant effect will be further informed by a more detailed understanding of the losses due to construction activity and the extent and location of compensatory habitat to be created as part of the green infrastructure proposals.

**Assessment of biodiversity effects – Veteran Trees**

*Detailed baseline*

There is currently limited information from the desk study about the distribution of veteran trees. This information has been used to identify three veteran trees and two listed as notable within or close to areas where construction activity is proposed. This includes two veteran (both walnut *Juglans regia*) and two notable trees (one walnut and one pine *Pinus spp.*) within the curtilage of Harmondsworth Great Barn and one veteran tree adjacent to Harmondsworth Lane (an ash). However, during Phase 1 habitat survey further large trees have been identified that may qualify as veteran trees.

Specialist arboriculture survey will be undertaken in 2019 to identify veteran trees based on guidance provided by English Nature (2005).
Predicted effects and their significance

Land take and land cover change (resulting in habitat loss or degradation)

8.10.117 The veteran trees identified by the desk study are all located in areas where detailed design is likely to enable them to be retained. However, given the extent of land take (either temporarily or permanently) is estimated to be ~1,146ha there remains a likelihood that one or more veteran trees may be lost to development.

8.10.118 Adopting a precautionary approach, the desk-study information suggests that the occurrence of veteran trees in the vicinity of the Site is limited. This is unsurprising given the extensive sand and gravel extraction and infrastructure construction that has occurred in this area. Therefore, the loss of even a small number of veteran trees is likely to result in a scale of change that is medium and an effect that is Significant for an ecological feature of national importance. As this conclusion is drawn from consideration of limited information it will be reviewed within the ES following the gathering of arboriculture data.

8.10.119 At the time of application the assessment of this likely significant effect will be further informed by a detailed understanding of veteran tree presence and the losses due to construction activity.

Assessment of biodiversity effects – Semi-natural Woodland (HPI)

Detailed baseline

8.10.120 The field surveys have so far identified approximately 17.9ha of semi-natural woodland (HPI) within the study area, an ecological feature of County / metropolitan importance. This habitat occurs in 15 fragments that range in size from 0.05ha to 4.8ha. Due to the patchy distribution of this habitat the species composition differs depending on the fragment of woodland being described. This includes wet woodlands with crack willow *Salix fragilis* or alder abundant in the canopy and grey willow *Salix atrocinerea* and elder typical of the understorey, with common nettle *Urtica dioica*, bramble and cleavers *Galium aparine* typical species in the ground flora. Alternatively, ash and English elm is abundant in the canopy, with bramble, common nettle and bluebell *Hyacinthoidies non-scripta* in the ground flora. The majority of these woodlands were relatively small or narrow (up to 1.5ha) and influenced by edge effects, such as degradation by wind and rubbish, and encroachment by grassland or non-native species.

8.10.121 Within the Site, field surveys have identified 10.4ha of this habitat occurring in 12 patches that range in size from 0.05ha to 4.6ha. Extrapolating using satellite imagery suggests that the extent of this habitat within the Site is approximately 41ha. This extrapolation is based on the assumption that the amount of woodland
identified from satellite imagery outside of areas subject to field survey occurs in the same proportions of HPI and non-HPI semi-natural woodland as that recorded to date.

8.10.122 Further survey in 2019 will focus on identifying further areas of this habitat within the study area.

**Predicted effects and their significance**

**Land take / land cover change (resulting in habitat loss or degradation)**

8.10.123 The construction and operation of the DCO Project would result in the loss or change of semi-natural woodland (HPI). The majority of this would be associated with direct losses as land is cleared to facilitate the construction of DCO Project components. Areas of woodland immediately adjacent to these activities (in other words lie within the 50m ZOI identified in Table 8.13) may be subject to negative habitat change from edge effects including trampling, wind throw and changes in hydrology (see paragraphs 8.10.128 to 8.10.130 for assessment of hydrological effects). The combined extent of this habitat loss and potential change is 17.47ha (based on field survey and extrapolated data); representing a reduction of 13.5% across the study area. The woodland that would be lost or may be degraded is assumed to be permanently lost in these areas within this assessment.

8.10.124 The losses of semi-natural woodland (HPI) would occur in Phases 1 and 2 of development (between 2022 and 2027). This is because the major elements of infrastructure outside of the current airfield (which contains no woodland) are delivered during these phases. However, in terms of woodland persistence this timescale is very short (in other words woodlands exist over decades or centuries) and the losses are therefore considered in this assessment to be lost at a single point in time. However, outside of the assessment of significance, the timing of losses (and the timing of replacements) will be accounted for within the biodiversity offsetting calculations provided in the ES (see Section 8.12) in order to ensure biodiversity gains delivered are calculated correctly.

8.10.125 The loss of this area of woodland would be compensated for within the green infrastructure that is integral to the DCO Project. However, this compensation would not deliver the same quality of habitat, or opportunities for associated fauna in the short or medium terms (as woodland takes time to develop). In order to ensure that the compensation is adequate, as a principle, the evolving design of the green infrastructure would ensure that sufficient biodiversity units are delivered for this woodland type to ensure no net loss (see Section 8.12 with regard to biodiversity offsetting). In practice this would ensure that considerably larger areas of woodland would be created in order to compensate for the losses sustained by the DCO Project. The woodland created would be designed to be characteristic of
the woodlands present across the landscape, be in large enough blocks to
minimise edge effects and support a varied ground, shrub and canopy layer
capable of enabling these woodlands to be classified as HPI in future years (see
Appendix 8.4). These woodlands would be managed in the long term for the
benefit of biodiversity and the local community.

8.10.126 The preliminary conclusions drawn at this stage of the DCO Project are that the
scale of change is predicted to be medium (see Table 8.18) due to the extent of
the loss. Although woodland would be created at a scale in excess of that lost to
development, the time taken for this newly created habitat to reach maturity means
that the effect is still considered to be negative and Significant on an ecological
feature of County / metropolitan importance.

8.10.127 At the time of application the assessment of this likely significant effect will be
further informed by increased quantities of baseline data and a detailed
understanding of the extent and location of compensatory habitat to be created as
part of the green infrastructure proposals. At application stage the significance of
the positive effects associated with the green infrastructure design will be
considered as part of the assessment.

Changes in hydrology (groundwater levels, surface water run-off rates, river flows and lake
levels; resulting in habitat change)

8.10.128 The wet woodland (NVC category W6) element of the semi-natural woodland
(HPI) category is identified as being groundwater dependent terrestrial ecosystem
In addition to the areas of wet woodland to be lost under the footprint of the DCO
Project (see paragraphs 8.10.123 to 8.10.127), approximately 26.28ha of wet
woodland\(^\text{69}\) are likely to be affected by changes in the groundwater level, based on
a composite worst case model.

8.10.129 As described above (paragraph 8.10.123) woodland lost to land take or change
will be compensated for within the green infrastructure that is integral to the DCO
Project. However, the preliminary conclusions drawn at this stage of the DCO
Project are that the scale of change is predicted to be medium (see Table 8.18)
due to the extent of the loss. Although woodland would be created at a scale in
excess of that lost to development, the time taken for this newly created habitat to
reach maturity means that the effect is still considered to be negative and
Significant on an ecological feature of County / metropolitan importance.

\(^{69}\) This is a worst case as the extrapolated extent of woodland not yet surveyed within the HPI category has
all been assumed to be wet woodland.
At the time of application the assessment of this likely significant effect will be further informed by increased quantities of baseline data, a more detailed understanding of the changes to hydrology (especially around environmental measures and discharges) and a detailed understanding of the extent and location of compensatory habitat to be created as part of the green infrastructure proposals. At application stage the significance of the positive effects associated with the green infrastructure design will be considered as part of the assessment.

Assessment of biodiversity effects – Semi-natural Woodland (non-HPI)

Detailed baseline

The field surveys have identified approximately 12.5ha of semi-natural woodland (non-HPI) within the study area, an ecological feature of borough importance. This habitat occurs in 11 fragments that range in size from 0.2ha to 3.2ha. Due to the patchy distribution of this habitat the species composition differs depending on the fragment of woodland being described. However, typical canopy species recorded across this woodland type include ash, English elm and pedunculate oak, with an often well-developed understorey including hazel, hawthorn *Crataegus monogyna*, elder and field maple. The ground flora is either dominated by common ivy or is heterogeneous with regularly recorded plants including bluebell, lords-and-ladies *Arum maculatum* and common nettle. The majority of these woodlands are relatively small or narrow (up to 1.5ha) and influenced by edge effects, such as degradation by wind and rubbish, and encroachment by grassland or non-native species.

Within the Site, field surveys have identified 0.17ha of this habitat occurs in 3 patches that range in size from 0.01ha to 0.17ha. Extrapolating using satellite imagery suggests that the extent of this habitat within the Site is approximately 18.32ha. This extrapolation is based on the assumption that the amount of woodland identified from satellite imagery outside of areas subject to field survey occurs in the same proportions of HPI and non-HPI semi-natural woodland as that recorded to date.

Further survey in 2019 will focus on identifying any additional areas of this habitat within the study area. Where access restrictions remain in place use of remote sensing data will be used, if practicable, to provide greater confidence to extrapolated data.
Predicted effects and their significance

Land take and land cover change (resulting in habitat loss or degradation)

8.10.134 The construction and operation of the DCO Project would result in the loss or change of semi-natural woodland (non-HPI). The majority of this would be associated with direct losses as land is cleared to facilitate the construction of DCO Project components. Areas of woodland immediately adjacent to these activities (in other words lie within the 50m ZOI identified in Table 8.13) may be subject to negative habitat change from edge effects including trampling and wind throw. The combined extent of this habitat loss and potential change is 8.07ha (based on field survey and extrapolated data); representing a reduction of 8.84% across the study area. The woodland that would be lost or may be degraded is assumed to be permanently lost in these areas within this assessment.

8.10.135 As with semi-natural woodland (HPI), the semi-natural woodland (non-HPI) would be lost in Phases 1 and 2 of the development (between 2022 and 2027). Although within this assessment it is assumed that they are lost at a single point in time; this avoids an under estimate of the likely significant effect.

8.10.136 The loss of this area of woodland would be compensated for within the green infrastructure that is integral to the DCO Project. However, this compensation would not deliver the same quality of habitat, or opportunities for associated fauna in the short or medium terms (as woodland takes time to develop). In order to ensure that the compensation is adequate, as a principle, the evolving design of the green infrastructure would ensure that sufficient biodiversity units are delivered for this woodland type to ensure no net loss (see Section 8.12 with regard to biodiversity offsetting). The woodland created would be designed to achieve HPI status as it matures to eventually exceed the importance of the woodland that it replaces. Appendix 8.4 provides a description of the types of woodland that could be created as part of the green infrastructure proposals.

8.10.137 The preliminary conclusions drawn at this stage of the DCO Project are that the scale of change is predicted to be medium (see Table 8.18) due to the extent of the loss. Although woodland would be created at a scale in excess of that lost to development, the time taken for this newly created habitat to reach maturity means that the effect is still considered to be negative and Significant on an ecological feature of borough importance.

8.10.138 At the time of application the assessment of this likely significant effect will be further informed by increased quantities of baseline data and a detailed understanding of the extent and location of compensatory habitat to be created as part of the green infrastructure proposals. At application stage the significance of
the positive effects associated with the green infrastructure design will be considered as part of the assessment.

**Assessment of biodiversity effects – Plantation Woodland**

**Detailed baseline**

**8.10.139** The field surveys have identified approximately 76ha of plantation woodland within the study area; much of this is associated with plantings in Harmondsworth Moor and along roadsides. The plantations identified within the study area differ in size and shape dependent on the reason for their establishment (for example as a feature within a public park or as a screen along a roadside or industrial premise). Overall the plantation woodland present in the study area forms an ecological feature of borough importance. The majority of the plantations consist of native species such as ash, sycamore *Acer pseudoplatanus* or birch. The age range of the plantations differ with some having been established relatively recently (within the last 10 years) and others having reached maturity. Edge effects and the type of management (or lack thereof) often determines the condition of plantation woodland identified during the survey.

**8.10.140** Within the Site 51ha of this habitat occurs. Extrapolating using satellite imagery suggests that the extent of this habitat within the Site is approximately 96ha.

**8.10.141** Further survey in 2019 will focus on identifying further areas of this habitat within the study area. Where access restrictions remain in place use of remote sensing data will be used, if practicable, to provide greater confidence to extrapolated data.

**Predicted effects and their significance**

**Land take and land cover change (resulting in habitat loss or degradation)**

**8.10.142** The construction and operation of the DCO Project would result in the loss or change of 47.24ha of plantation woodland (based on field survey and extrapolated data); representing a reduction of 17.89% across the study area. The losses are associated with clearance of construction areas and habitat change in any pockets of this habitat directly adjacent to the works (in other words lies within the 15m ZOI identified in Table 8.13). The plantation woodland that would be lost or may be degraded is assumed to be permanently lost in this assessment.

**8.10.143** Plantation woodland would be lost in Phases 1 and 2 of the DCO Project (between 2022 and 2027). Because of the widespread distribution of this habitat it is expected that losses would be occurring at most points within this time period (other than over the bird breeding periods where legal obligations will prevent large scale tree felling). However, as the scale of the overall loss, in comparison to
the extent of the ecological feature remaining is key in determining whether a likely significant effect is predicted, this assessment considers that all plantation woodland is lost at a single point in time at the beginning of construction. It should however be noted that outside of the conclusion regarding significance, the temporal distribution of habitat loss and habitat gain is accounted for within the biodiversity offsetting metric (see Section 8.12).

8.10.144 The loss of plantation woodland would be compensated for within the green infrastructure that is integral to the DCO Project. However, the type of woodland to be delivered as part of the green infrastructure would be designed to be of greater quality than the plantation woodland being lost. The aim would be to establish woodlands with a varied ground, shrub and canopy layer capable of enabling these woodlands to be classified as HPI in future years. The aim of delivering woodland with a diverse structure that is managed in the long term provides the potential for the woodland resource in the area to be of greater quality than it is currently.

8.10.145 Despite the green infrastructure aiming to provide greater extents of woodland than that lost and for these to be of better quality, it is not possible at this stage of the DCO Project to draw conclusions regarding the significance of this positive effect. This is because at this stage of the DCO Project the location, extent and details of the timing of establishment the green infrastructure have not yet been determined. The preliminary conclusions drawn at this stage of the DCO Project are that the scale of change is predicted to be medium (see Table 8.18) due to the extent of the loss and the time taken for new woodland habitat to become fully established, with the effect being negative and Significant on an ecological feature of borough importance.

8.10.146 At the time of application the assessment of this likely significant effect will be further informed by increased quantities of baseline data and a detailed understanding of the extent and location of compensatory habitat to be created as part of the green infrastructure proposals. At application stage the significance of the positive effects associated with the green infrastructure design will be considered as part of the assessment.

Assessment of biodiversity effects – Native, species-rich hedgerow (HPI)

Detailed baseline

8.10.147 Field survey has identified 3,457m of native, species-rich hedgerow (HPI) within the study area, to date. Of this length of hedgerow 1,134m qualifies as ‘important’ with regards to the Hedgerows Regulations 1997; although importance of this ecological feature as determined per the method in Section 8.4 is County / metropolitan. The majority of the hedgerow recorded lies to the west of the existing
airfield in areas where land use is agricultural. For this assessment an extrapolation of the extent of hedgerow in areas not yet surveyed has not been carried out. This is because it is difficult to accurately record hedgerow extent using Ordnance Survey maps and satellite imagery only\(^{70}\).

8.10.148 Hedgerows within this category commonly comprise of the following woody species: hawthorn, blackthorn, elder, dog-rose, field maple, hazel, wild cherry, ash and pedunculate oak. The associated ground flora includes common nettle, false oat-grass *Arrhenatherum elatius*, Yorkshire-fog *Holcus lanatus*, lords-and-ladies, bramble, garlic mustard *Alliaria petiolata*, creeping thistle *Cirsium arvense*, cow parsley *Anthriscus sylvestris* and meadowsweet *Filipendula ulmaria*. Hedgerow structure varies although the majority are less than 2m wide and 2m high. Management of the hedgerows appears predominantly to be undertaken by mechanical flail.

8.10.149 Further survey in 2019 will focus on identifying further species-rich hedgerows within the study area. Where access restrictions remain in place use of remote sensing data will be used, if practicable, to provide greater confidence to extrapolated data.

**Predicted effects and their significance**

**Land take and land cover change (resulting in habitat loss or degradation)**

8.10.150 The construction and operation of the DCO Project would result in the loss or change of ~2,022m of this habitat; representing a reduction of 58.17% across the study area\(^{71}\). It is possible that a proportion of the hedgerow that marks the boundaries of areas that would be subject to construction and operation may be retained as part of boundary treatments (for example to help with screening). However, at this stage there is no detail on where this may occur and therefore all hedgerows within areas proposed for construction or operation are assessed as being permanently lost.

8.10.151 Hedgerows would be removed during the winter period, wherever possible, to avoid conflicts with active nests of breeding birds. These hedgerows would, in the vast majority of cases, be removed in the early phases of construction during site clearance activities (Phases 1 and 2). For the purposes of this assessment the

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70 Note due to the locations of survey data currently focused around the footprint of the DCO Project hard infrastructure (due to the prioritisation of survey effort) the information is adequate to enable an assessment to be provided.

71 Note due to the locations of survey data currently focused around the footprint of the DCO Project hard infrastructure (due to the prioritisation of survey effort) this percentage is considered to be a worst case that is likely to reduce markedly by the time of application. This is because the percentage of hedgerows surveyed outside of the area that would be directly affected by land take will increase over 2019.
losses are assumed to occur at a single point in time as a worst-case assumption. The loss of these hedgerows would result in both a reduction of length of these ecological features as well as a reduction in habitat connectivity. In order to ensure that the loss of hedgerows is adequately compensated the green infrastructure design would focus on the delivery of new lengths of native, species-rich hedgerow that are considerably greater in length than those lost to development (length to be created being informed by the biodiversity offsetting metric described in Section 8.12). The location of these hedgerows is not currently known, however they will be designed to link up various habitats within the landscape (for example woodland patches and scrub) to promote the movement of flora and fauna and delivered sufficiently early to ensure that an alternative network of hedgerows is available prior to the loss of existing features as a result of development.

8.10.152 Hedgerows become established relatively quickly (approximately five years - see Appendix 8.6), using standard methods that are known to be successful and there is the potential to provide greater lengths of hedgerow than those lost in the short term through the design and implementation of the green infrastructure proposals, therefore the scale of change can be assumed to be low. The preliminary conclusions drawn at this stage of the DCO Project are that the effect on this County / metropolitan ecological feature is predicted to be Not Significant. Following the establishment of new hedgerows the potential for a positive significant effect associated with this ecological feature is high; however as the green infrastructure proposals are still being developed no conclusion is drawn in this assessment.

8.10.153 At the time of application the assessment of this likely significant effect will be further informed by increased quantities of baseline data and a detailed understanding of the extent and location of hedgerow habitat to be created, and associated delivery programme, as part of the green infrastructure proposals. At application stage the significance of the positive effects associated with the green infrastructure design will be considered as part of the assessment.

**Assessment of biodiversity effects – Native, species-poor hedgerow (HPI)**

**Detailed baseline**

8.10.154 Field survey has identified 23,579.88m of native, species-poor hedgerow (HPI) within the study area, to date. This ecological feature is of borough importance. The majority of this type of hedgerow recorded lies to the west and north of the existing airfield in areas where land use is agricultural. Where access has not been available for field survey, hedgerows have been identified by satellite imagery. For this assessment an extrapolation of the extent of hedgerow in areas not yet surveyed has not been carried out. This is because it is difficult to
accurately record hedgerow extent using Ordnance Survey maps and satellite imagery only.

8.10.155 Hedgerows within this category commonly comprise predominantly of hawthorn. The associated ground flora includes bramble, common nettle, false oat-grass, Yorkshire-fog and garlic mustard. Hedgerow structure varies although the majority are less than 2m wide and 2m high. Management of the hedgerows appears predominantly to be undertaken by mechanical flail.

8.10.156 Further survey in 2019 will focus on identifying further species-poor hedgerows within the study area. Where access restrictions remain in place use of remote sensing data will be used, if practicable, to provide greater confidence to extrapolated data.

**Predicted effects and their significance**

*Land take and land cover change (resulting in habitat loss or degradation)*

8.10.157 The construction and operation of the DCO Project would result in the loss or change of 14,300.32 m of this habitat (based on field survey and extrapolated data); representing a reduction of 60.64% across the study area. It is possible that a proportion of the hedgerow that marks the boundaries of areas that would be subject to construction and operation may be retained as part of boundary treatments (for example to help with screening). However, at this stage there is no detail on where this may occur and therefore all hedgerows within areas proposed for construction or operation are assessed as being permanently lost.

8.10.158 Hedgerows would be removed during the winter period, wherever possible, to avoid conflicts with active nests of breeding birds. These hedgerows would, in the vast majority of cases, be removed in the early phases of construction during site clearance activities (Phases 1 and 2). For the purposes of this assessment the losses are assumed to occur at a single point in time as a worst-case assumption. The loss of these hedgerows would result in both a reduction of length of these ecological features as well as a reduction in habitat connectivity.

8.10.159 **Paragraph 8.10.151** describes the approach to green infrastructure design for the DCO Project. This approach would lead to the establishment of greater lengths of hedgerow than those being lost, and ensure that the quality of the habitat is improved. This is because native, species-poor hedgerows would be replaced by native, species-rich hedgerows. The location of these hedgerows is not currently known, however they would be designed to link up various habitats within the landscape (for example woodland patches and scrub) to promote the movement of flora and fauna and delivered sufficiently early to ensure that an alternative
network of hedgerows is available prior to the loss of existing features as a result of development.

8.10.160 Hedgerows become established relatively quickly (see Appendix 8.6), using standard methods that are known to be successful and there is the potential to provide greater lengths of hedgerow than those lost in the short term through the design and implementation of the green infrastructure proposals, therefore the scale of change can be assumed to be low. The preliminary conclusions drawn at this stage of the DCO Project are that the effect on this ecological feature of borough importance is predicted to be Not Significant. Following the establishment of new hedgerows the potential for a positive significant effect associated with this ecological feature is high; however as the green infrastructure proposals are still being developed no conclusion is drawn in this assessment.

8.10.161 At the time of application the assessment of this likely significant effect will be further informed by increased quantities of baseline data and a detailed understanding of the extent and location of hedgerow habitat to be created, and associated delivery programme, as part of the green infrastructure proposals. At application stage the significance of the positive effects associated with the green infrastructure design will be considered as part of the assessment.

Assessment of biodiversity effects – Swamps (non-HPI)

Detailed baseline

8.10.162 The field surveys have identified a limited extent of approximately 4.9ha of reedbed swamp (non-HPI) within the study area. These patches of reedbed are too small to be classified as HPI or of conservation importance higher than borough level. They are dominated by stands of common reed with a water table at or above ground level for most of the year.

8.10.163 Within the Site 4.5a of this habitat occurs in 21 patches that range in size from 0.01ha to 1.6ha. Extrapolating using satellite imagery suggests that the extent of this habitat within the Site is approximately 6.3ha. This extrapolation is based on the assumption that the amount of reedbed swamp identified from satellite imagery outside of areas subject to field survey occurs in the same proportions as that recorded to date.

8.10.164 Further survey in 2019 will focus on identifying further areas of this habitat within the study area. Where access restrictions remain in place use of remote sensing data will be used, if practicable, to provide greater confidence to extrapolated data.
Predicted effects and their significance

Land take and land cover change (resulting in habitat loss or degradation)

8.10.165 The construction and operation of the DCO Project would result in the loss or change of 0.53ha of this habitat (based on field survey and extrapolated data); representing a reduction of 8.4% across the study area. The reedbed swamp (non-HPI) that would be lost or may be degraded (in other words lies within the 30m Zol identified in Table 8.13) is assumed to be permanently lost in these areas within this assessment. The largest extent of this habitat, the artificial reedbed at Mayfield Farm, would be retained during the construction works. Following construction this water treatment facility would support considerably larger areas of reedbed used for water treatment than currently. Although this reedbed is engineered its value for biodiversity is demonstrated by its designation as the Mayfield Farm and Water Treatment Works SINC (Borough grade I). Further water treatment facilities with reed beds are being considered in the south-west of the Site, north of Staines Moor SSSI.

8.10.166 The areas of reedbed swamp to be lost are therefore associated with the small patches associated with river, lake, ditch and pond habitats that will be lost to the development. Although these areas are typically small in size, they do provide important habitat heterogeneity within the landscape. These areas will be lost during the first two phases of construction (from 2022 to 2027); however as with other habitats the loss is assessed as being delivered at a single point in time.

8.10.167 Through the green infrastructure proposals reedbed will be established in a wide range of habitats created, including within ponds, lakes and ditches. It is likely that they will also be planted within new river channels, although before this can be confirmed it will need to be established that this will not inhibit their hydrological function. Reed is quick to establish making it likely that the delivery of greater extents of this habitat, than those being lost, will be achieved early in the programme (before 2027). The aim will be to establish both small patches (as currently occurs) alongside some larger areas with the aim of reaching HPI status.

8.10.168 The preliminary conclusions drawn at this stage of the DCO Project are that the scale of the change for this ecological feature of borough importance is very low with the effect being Not Significant. However, it is recognised that in the longer term there will be a positive increase in the extent of reedbed. As the green infrastructure design is not yet evolved enough to understand the location and extent of reedbed to be created, the potential significance of this positive change cannot yet be assessed.

8.10.169 At the time of application the assessment of this effect will be further informed by increased quantities of baseline data and a detailed understanding of the extent
and location of compensatory habitat to be created as part of the green infrastructure proposals. At application stage the significance of the positive effects associated with the green infrastructure design will be considered as part of the assessment.

Changes in hydrology (groundwater levels, surface water run-off rates, river flows and lake levels; resulting in habitat change)

8.10.170 Swamps are identified as being groundwater dependent terrestrial ecosystem (GWDTE) by the UK Technical Advisory Group on the Water Framework Directive. In addition to the areas of swamp to be lost under the footprint of the DCO Project (see paragraphs 8.10.165 to 8.10.169), approximately 0.78ha of swamp is likely to be affected by changes in the groundwater level, based on a composite worst case model.

8.10.171 As described above (paragraph 8.10.167) swamp lost to land take or change will be compensated for within the green infrastructure that is integral to the DCO Project. The preliminary conclusions drawn at this stage of the DCO Project are that the scale of the change for this ecological feature of borough importance is very low with the effect being Not Significant. However, it is recognised that in the longer term there will be a positive increase in the extent of reedbed. As the green infrastructure design is not yet evolved enough to understand the detail of the reedbed to be created, the potential significance of this positive change cannot yet be assessed.

8.10.172 At the time of application the assessment of this likely significant effect will be further informed by increased quantities of baseline data, a more detailed understanding of the changes to hydrology (especially around environmental measures and discharges) and a detailed understanding of the extent and location of compensatory habitat to be created as part of the green infrastructure proposals. At application stage the significance of the positive effects associated with the green infrastructure design will be considered as part of the assessment.

Assessment of biodiversity effects – Ditches (non-HPI)

Detailed baseline

8.10.173 The field surveys have identified a limited length of 5,690m of ditches (of high and medium distinctiveness) within the study area; 4,737m of which is within the Site. This ecological feature is of borough importance. For this assessment an extrapolation of the extent of ditches in areas not yet surveyed has not been carried out. This is because it is difficult to accurately record ditch extent using Ordnance Survey maps and satellite imagery only.
The ditches surveyed were typically within or adjacent to woodland or within species-rich or amenity grassland. Flora in the ditches included greater pond sedge, gypsywort *Lycopus europaeus*, common duckweed *Lemna minor*, fool’s watercress *Apium nodiflorum*, yellow iris *Iris pseudacorus* and bittersweet *Solanum dulcamara*.

Further survey in 2019 will focus on identifying further ditches within the study area. Where access restrictions remain in place use of remote sensing data will be used, if practicable, to provide greater confidence to extrapolated data.

**Predicted effects and their significance**

**Land take and land cover change (resulting in habitat loss or degradation)**

The construction and operation of the DCO Project would result in the loss or change of 2,668m of this habitat; representing a reduction 46.89%\(^2\) across the study area. The ditches (medium and high distinctiveness) that would be lost or may be degraded (in other words lies within the 20m Zol identified in Table 8.13) are assumed to be permanently lost in these areas within this assessment.

Losses are expected to occur early in Phases 1 and 2 of the DCO Project, with alterations to the way in which surface water moves across or leaves construction sites being important considerations in the control of sediment laden run-off or the loss of pollutants. The ditch network provides both a habitat valuable for biodiversity, as well as a resource providing a function for various land managers (for example farmers and quarry operators).

The green infrastructure will include new ditch habitats that are designed to provide a diverse flora and hold water for the majority of the year\(^3\). Further, existing ditches present in areas where habitat creation is proposed will be improved. The location of ditches within the green infrastructure will be determined both through landscape design and an understanding of the local hydrological conditions. The green infrastructure will provide a greater length of ditch of medium or high distinctiveness than that lost.

The preliminary conclusions drawn at this stage of the DCO Project are that the scale of the change for this ecological feature of borough importance is low with the effect being **Not Significant**. However, it is recognised that in the longer term

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\(^2\) Note due to the locations of survey data currently focused around the footprint of the DCO Project hard infrastructure (due to the prioritisation of survey effort) this percentage is considered to be a worst case that is likely to reduce markedly by the time of application. This is because the percentage of ditches surveyed outside of the area that would be directly affected by land take will increase over 2019.

\(^3\) Ditches created will be functional wherever possible through inclusion with the Sustainable Urban Drainage solutions designed for the DCO Project.
there will be a positive increase in the length of ditches. As the green infrastructure design is not yet evolved enough to understand the location and extent of ditch (of medium and high distinctiveness) to be created, the potential significance of this positive chance cannot yet be assessed.

8.10.180 At the time of application the assessment of this likely significant effect will be further informed by increased quantities of baseline data and a detailed understanding of the extent and location of compensatory habitat to be created as part of the green infrastructure proposals. At application stage the significance of the positive effects associated with the green infrastructure design will be considered as part of the assessment.

Changes in hydrology (groundwater levels, surface water run-off rates, river flows and lake levels; resulting in habitat change)

8.10.181 Although ditches are not a habitat type identified as being a GWDTE by the UK Technical Advisory Group on the Water Framework Directive, they can support wetland communities that are listed. In addition to the ditches to be lost under the footprint of the DCO Project (see paragraphs 8.10.177 to 8.10.181), approximately 1,870m of ditches (32% of ditches in study area) are likely to be affected by changes in the groundwater level, based on a composite worst case model.

8.10.182 As described above (paragraph 8.10.179) ditches lost to land take or change will be compensated for within the green infrastructure that is integral to the DCO Project. The preliminary conclusions drawn at this stage of the DCO Project are that the scale of the change for this ecological feature of borough importance is low with the effect being Not Significant.

8.10.183 At the time of application the assessment of this likely significant effect will be further informed by increased quantities of baseline data, a more detailed understanding of the changes to hydrology (especially around environmental measures and discharges) and a detailed understanding of the extent and location of compensatory habitat to be created as part of the green infrastructure proposals. At application stage the significance of the positive effects associated with the green infrastructure design will be considered as part of the assessment.

Assessment of biodiversity effects – Standing water (ponds) (HPI)

Detailed baseline

8.10.184 The field surveys and desk study have identified 67 ponds; 54 of these are within the Site. Ponds are an ecological feature of borough importance and are defined as standing waterbodies of less than 2ha. Most are HPI because of the presence
of protected or threatened species, exceptional assemblages of key biotic groups, high ecological quality or limited geographic distribution. For the purposes of this assessment all ponds are assumed to qualify as HPI. The ponds were variable in size, depth, species assemblage and location within broad habitat types, but were often shallow, and typically supported species such as yellow iris, fool's watercress, branched bur-reed *Sparganium erectum* and common reed along the edges, with overhanging crack willow, goat willow *Salix caprea* and alder trees. Several ponds were dominated by common duckweed or common reed and others had no aquatic vegetation (at time of survey). A small proportion of surveyed ponds were ornamental (with hard or rockery-like banks) or stocked with fish.

Further survey in 2019 will focus on identifying additional ponds within the study area and visiting those already identified through desk study.

**Predicted effects and their significance**

**Land take and land cover change (resulting in habitat loss or degradation)**

The construction and operation of the DCO Project would result in the loss or change of 47 ponds. As with other habitats that losses will almost entirely be realised within Phases 1 and 2 of the DCO Project (2022 to 2027). It is assumed for the purposes of this assessment that, even though ponds are a discrete feature, micro-siting of construction works will not enable the retention of any ponds within active areas of construction.

The green infrastructure proposals, as they evolve, are highly likely to show a considerable increase in the number of ponds. This is because they provide a valuable habitat for a range of legally protected and conservation notable species for which environmental measures will be provided, as well as providing an opportunity to provide freshwater habitats that can be managed effectively to minimise the risk of wildlife strike. The provision of many of these ponds would also be delivered early in the programme in order to enable the implementation of the necessary environmental measures.

The preliminary conclusions drawn at this stage of the DCO Project are that the scale of change is predicted to be low (see Table 8.18) due to the number of ponds to be lost against the number that will be created as part of the green infrastructure. With the effect on this ecological feature of borough importance being **Not Significant**. As the green infrastructure design is not yet evolved enough to understand the location and number of ponds to be created, the potential significance of this positive change cannot yet be assessed.

At the time of application the assessment of this likely significant effect will be further informed by increased quantities of baseline data and a detailed
understanding of the extent and location of compensatory habitat to be created as part of the green infrastructure proposals. At application stage the significance of the positive effects associated with the green infrastructure design will be considered as part of the assessment.

Changes in hydrology (groundwater levels, surface water run-off rates, river flows and lake levels; resulting in habitat change)

8.10.190 All standing water could be groundwater fed. In addition to the ponds to be lost under the footprint of the DCO Project (see paragraphs 8.10.187 to 8.10.190), approximately 38 ponds (54% of the ponds in the study area) are likely to be affected by changes in the groundwater level, based on a composite worst case model.

8.10.191 As described above (paragraph 8.10.188) ponds lost to land take or change will be compensated for within the green infrastructure that is integral to the DCO Project. The preliminary conclusions drawn at this stage of the DCO Project are that the scale of the change for this ecological feature of borough importance is low with the effect being Not Significant.

8.10.192 At the time of application the assessment of this likely significant effect will be further informed by increased quantities of baseline data, a more detailed understanding of the changes to hydrology (especially around environmental measures and discharges) and a detailed understanding of the extent and location of compensatory habitat to be created as part of the green infrastructure proposals. At application stage the significance of the positive effects associated with the green infrastructure design will be considered as part of the assessment.

Assessment of biodiversity effects – Standing water (lakes) (HPI)

Detailed baseline

8.10.193 Baseline conditions for freshwater lakes within the study area have been described using results from lake macrophyte surveys and an assessment of nutrient statuses using LEAFPACS2 LMNI74 (Lake Macrophyte Nutrient Index) scores. Six lake macrophyte surveys were undertaken in 2018, shown in Figure 8.8. These lakes are described below. Further lakes / reservoirs in the study area will be sampled in 2019.

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74 The Lake Macrophyte Nutrient Index uses information on individual taxon and their associations with different nutrient regimes to provide an understanding of a water body’s nutrient status.
Saxon Lake

8.10.194 Saxon Lake has extensive charophyte cover from the littoral zone to depths of approximately six metres, where excellent water clarity allows for light to penetrate the water column to such depths. Its overall surface area equates to 7.12ha. These dense charophyte meadows are ecologically important as they are a sink for nutrients and provide valuable habitat for invertebrates. They are also highly sensitive to deterioration in water quality. In Saxon Lake, charophyte species recorded were fragile stonewort *Chara globularis*, opposite stonewort *Chara contraria*, common stonewort *Chara vulgaris* and pointed stonewort, which indicate a stable water body that is calcium-rich and low in phosphate. Pointed stonewort is recognised as a nationally scarce species. The Schedule 9 INNS (WCA, 1981) Nuttall’s waterweed was recorded occasionally in the open water. The marginal community consisted of species typical of lowland standing waterbodies, such as common reed and bulrush *Typha latifolia*.

8.10.195 A Lake Macrophyte Nutrient Index (LMNI) score of 6.11 for Saxon Lake suggests that nutrient levels are fairly low in comparison to other lakes within the area, which is reflected by the excellent clarity of the water column and the total number of submerged taxa identified as seven.

Swan Lake

8.10.196 Swan Lake is of moderate to high nutrient status, with high clarity in the water column and aquatic macrophytes colonising the majority of the water body. It is the smallest lake of all the surveyed standing waters in 2018, totalling 1.49ha. Charophyte species were recorded in low abundance but were particularly extensive on the western shore. Two Schedule 9 INNS of submerged macrophyte were recorded in low abundance, Canadian waterweed and Nuttall’s waterweed. Excess nutrient inputs were reflected by the presence of fennel pondweed *Potamogeton pectinatus*, rigid hornwort *Ceratophyllum demersum* and extensive *Cladophora* algae in the narrow, shallower section of the lake.

8.10.197 The LMNI score for Swan Lake was 6.72, comparable to Saxon Lake and reflective of moderate to high nutrient status. Water clarity was good in general, with a high number of submerged taxa (nine) and a diverse range of functional groups (five).

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75 Typically a pond is considered to be a water body of 2ha or less. Swan Lake is being considered as a lake due to it forming a loose complex of water bodies with the others described within this section.
Colnbrook North

Colnbrook North is a heavily shaded gravel pit lake with an area of 2.25 ha and of high nutrient status. A total of four submerged species were recorded during the survey. Low species diversity, with the dominating abundance of Nuttall's waterweed, suggests hyper-eutrophication of the lake. The lake margins were dominated by a dense layer of least duckweed on the surface, with an underlying layer of ivy-leaved duckweed which restricted light from penetrating the water column. Marginal species were typical of broad-leaved woodland habitat, including goat willow and gypsywort.

The LMNI for Colnbrook North Lake is calculated to be 8.03, suggestive of a high nutrient status for this water body. This is reflected in the low number of submerged taxa recorded (four) and dominance of Nuttall’s waterweed throughout the water body. The eutrophic status of this water body is suggestive of high nutrient loading, likely from external sources.

Colnbrook West

Colnbrook West is a high nutrient status water body with high turbidity in the water column and an area of 2.32ha. Only three submerged macrophyte species were recorded during the survey, one of which Nuttall’s waterweed, is an INNS which dominates the open water. Rigid hornwort also occurred with high abundance in the open water but was not the dominant species. The margins were characterised by the dense coverage of the INNS least duckweed, which limited light through the water column. Marginal flora was typical for a lowland standing water body and exhibited higher diversity than its submerged counterparts. Willow species dominated the broadleaf canopy with an understory of purple loosestrife *Lythrum salicaria* and great willowherb *Epilobium hirsutum*.

Colnbrook West has the highest LMNI value, with 8.06, which suggests high nutrient conditions. It also exhibited the lowest number of submerged taxa of three and is therefore classified as eutrophic.

Orlitts Lake

Orlitts Lake is a high nutrient status water body, which at the time of survey in 2018 was experiencing a severe algal bloom across the entire lake. It has a total area of 3.98ha. Five submerged macrophytes were recorded, two of which are INNS (Nuttall’s waterweed and least duckweed). The high abundance of rigid hornwort and the presence of fennel pondweed further reflected the eutrophic environment. Due to the steep shelving of the margins, a characteristic commonly found in gravel pit lakes, there was a lack of hydrosere development. The marginal community was confined to a narrow fringe, consisting of bulrush, lesser bulrush *Typha angustifolia*, the hybrid *Typha x glauca*, greater pond sedge and branched
bur-reed. In general, the macrophyte community was homogeneous in the open water, comprising only rigid hornwort.

8.10.203 The LMNI value for Orlitts Lake is 7.92, suggesting a fairly high nutrient status, while the total number of submerged taxa recorded was five.

**Old Slade Lake**

8.10.204 Old Slade Lake is a carp-stocked fishing lake, popular for shore angling, with high turbidity in the water column. It is the largest of the surveyed gravel pits, with a total area of 9.49ha. The submerged macrophyte community predominantly consisted of rigid hornwort and Nuttall’s waterweed, the high abundance of both indicating an elevated nutrient status within the water body. The occasional presence of fan-leaved water-crowfoot *Ranunculus circinatus* in the shallow littoral zone suggests the lake has a history of base-rich, meso-eutrophic conditions, suggesting that the elevated nutrient status could be relatively recent. Steep margins to the lake limited the development of a hydrosere, which restricted the marginal communities to a narrow fringe of common reed and bulrush and species typical of a broadleaf woodland further up the bank, including goat willow, crack willow and bittersweet.

8.10.205 The LMNI value for Old Slade Lake is 7.29, which suggests a fairly high nutrient status. This could be attributed to bottom-feeders such as carp, which continually graze the lake bed, disturbing sediments and consequently releasing phosphorus into the water column (Moss, 2010).

8.10.206 Further surveys in 2019 will use the same methods to record information for other lakes in the study area.

**Predicted effects and their significance**

**Land take and land cover change (resulting in habitat loss or degradation)**

8.10.207 The construction and operation of the DCO Project would result in a total loss of five lakes, namely Old Slade Lake, Colnbrook North, Orlitts Lake, Colnbrook West and Swan Lake. These five lakes represent an area equivalent to 3.78% of the resource within the study area. No reservoirs would be altered as part of the DCO Project.

8.10.208 As with other habitats, lake losses would almost entirely be realised within Phases 1 and 2 of the DCO Project. This will result in the reduction of freshwater habitat

76 This figure is low as this category includes the extent of the drinking water reservoirs in the study area.
availability within the immediate local area for plant and animal species reliant on such habitat.

8.10.209 Although Saxon Lake would be retained as an open water body, it is proposed to be used as a source for non-potable water for use in emergency (for fire-fighting). This would require the installation of pumping equipment and pipework to transport water to the airfield. Although for use in emergencies this equipment would need to be regularly tested. When in use this equipment could result in a drop in the lake level by one metre. This change could alter the current habitats within the lake as the charophyte meadows are unable to persist if desiccated.

8.10.210 Other changes to Saxon Lake include the potential for water within Saxon Lake to be used for heat exchange purposes to provide the DCO Project with renewable energy. The information on heat exchange as part of the DCO Project is at a concept stage only and contain a number of different options (some including consideration of Saxon Lake and some not), therefore it is not possible to understand how this technology would affect this standing water habitat at this stage. However, heating or cooling of this water body could alter the nature of Saxon Lake.

8.10.211 In addition, Saxon Lake would need to be altered to reduce the risk of wildlife strike risk. Saxon Lake supports a range of wildfowl and other birds (particularly gulls) that represent a wildlife collision risk for the currently operational airport. This water body is used over winter as a stop off point for gulls moving from central London to roosts on Queen Mother Reservoir and Wraysbury Reservoir. Currently the location of Saxon Lake (1.5km north of the existing northern runway) partially negates the associated collision risk, with the remaining risk monitored and managed by Heathrow’s operational staff. However, as the North West Runway would be closer to Saxon Lake than at present, manipulation of this water body would be required to reduce its availability to wintering gulls. This requires a reduction in the surface area of the lake. This in turn may affect the conditions present within this lake. Until the implications of these proposals are fully understood, it is not possible to design a detailed and effective approach although options could include the use of floating islands of vegetation (used on various water bodies within the UK to enhance water quality and biodiversity) or the creation of earth bunds within the lake.

8.10.212 The green infrastructure proposals would include the provision of new standing water habitats. The majority of these habitats will be small in size (such as ponds and wet ditches) due to the need to manage wildlife strike risk, although new lakes will be provided in strategic locations to ensure sufficient functionally linked habitat remains to support the designated features of the SWLW SPA / Ramsar site (see paragraphs 8.10.2 to 8.10.50 for assessment of the SWLW SPA / Ramsar site). The lakes created would be designed to be characteristic of those in the wider
landscape and provide good opportunities for bankside, emergent and submerged vegetation enabling these lakes to be classified as HPI as they become established. These lakes would be managed in the long term for the benefit of biodiversity and the local community.

8.10.213 A precautionary approach to the loss or change of lakes is taken at this stage of the DCO Project as the design of the green infrastructure (including consideration of wildlife strike risk), fire water infrastructure and heat exchange plans are yet to be developed in detail. The loss of 5 lakes and change of another results in preliminary conclusions of a scale of change that is medium (as defined in Table 8.18) and an effect that is Significant on an ecological feature of County / metropolitan importance. It is acknowledged that the significance of this effect may change as the design progresses.

8.10.214 At the time of application the assessment of this likely significant effect will be further informed by a detailed understanding of the design elements that may directly affect lakes (particularly Saxon Lake) and the extent and location of compensatory habitat to be created as part of the green infrastructure proposals. At application stage the significance of the positive effects associated with the green infrastructure design will be considered within the assessment.

Changes in hydrology (groundwater levels, surface water run-off rates, and lake levels; resulting in habitat change)

8.10.215 Potential changes to hydrology and hydrogeology in the study area may result in changes to groundwater levels and groundwater-surface water interaction which could lead to changes to lake habitats. Within the study area predicted local changes to lakes that are to be retained affect Saxon Lake only.

8.10.216 As described in paragraphs 8.10.208 to 8.10.217 the potential effects on Saxon Lake due to fire water infrastructure and the need to manage wildlife strike risk are uncertain at this stage of the DCO Project. However, it is apparent that Saxon Lake is likely to be subject to a scale of change that is medium (as defined in Table 8.18) and an effect that is Significant on an ecological feature of County / metropolitan importance.

8.10.217 At the time of application the assessment of this likely significant effect will be further informed by a detailed understanding of the design elements that may directly affect Saxon Lake and the extent and location of compensatory habitat to be created as part of the green infrastructure proposals. At application stage the significance of the positive effects associated with the green infrastructure design will be considered within the assessment.
Assessment of biodiversity effects – Rivers (HPI)

Detailed baseline

8.10.218 River habitat surveys (RHS), river corridor surveys (RCS), river macrophyte surveys, macroinvertebrate surveys and river habitat quality mapping have been used to describe the baseline conditions of the watercourses within the study area. Data were collected from the river reaches shown in Figure 8.8. Those water courses surveyed to date are described below; surveys in 2019 will use the same methods to further record information for the Bigley Ditch and Poyle Channel.

River Colne

8.10.219 As it flows through Harmondsworth Moor, the channel of the River Colne is significantly modified with over-deepened, re-sectioned reaches and extensive embankments on both sides. It is largely characterised by slow flow with some isolated areas of ripple flow. Water is impounded by weirs and dam structures. Extensive channel shading and lack of channel, marginal and bank features were observed, which contribute to low habitat diversity. However, fallen trees, exposed tree roots and large woody debris (LWD) were recorded occasionally, which offer refuge to juvenile fish and invertebrates. The macrophyte cover and diversity increased with distance downstream in this upper section of the River Colne, despite overhanging broadleaf canopy frequently shading the watercourse. River habitat quality within Harmondsworth Moor on the River Colne was assessed as moderate (with reference to the Habitat Quality Assessment (HQA) classes of the RHS; see Figure 8.9 for the HQA classes and the Habitat Modification Classes (HMC) of the surveyed reaches in the study area). Immediately downstream of this segment, habitat quality is considered to be high due to increased diversity and connectivity.

8.10.220 The character of downstream reaches of the river, through Stanwell and Staines Moors, changes from heavily embanked with dense bankside broadleaf woodland to a meandering and unshaded channel. Although the embanked section through Stanwell Moor lacks diversity of natural features and flow types, overhanging boughs, fallen trees and LWD potentially provide sheltered habitats for juvenile fish, small mammals and invertebrates. Where light has penetrated through to the watercourse, submerged and emergent macrophytes have flourished, providing a more diverse range of habitats. The reaches through Stanwell Moor were variously assessed as having low to high habitat quality. In the less shaded lower reaches of Staines Moor, submerged and emergent macrophytes heavily populate the channel creating a sinuous planform in places and more diverse flow. Along these lower reaches, the channel is generally over-widened due to cattle poaching and the bank has eroded leading to slow flow and increased turbidity, which could
jeopardise the submerged macrophyte communities. The absence of in-channel features along this section of the river contributes to a lack of habitat diversity. Habitat quality of the River Colne was largely considered to be poor through Staines Moor, partly due to the shallow depth limiting fish passage.

8.10.221 Species recorded on the River Colne were typical of standing or slow flowing water, including yellow water-lily, arrowhead and unbranched bur-reed. Species characteristic of nutrient-rich conditions were also recorded, including branched bur-reed, bulrush *Typha latifolia* and reed sweet-grass *Glyceria maxima*. Two controlled INNS were recorded along the River Colne: floating pennywort and Indian balsam. Floating pennywort was a significant issue along the surveyed reaches of the River Colne, where it was observed as rapidly colonising the watercourse as the survey season progressed, having a notable effect on the width of the channel, flow and availability of light for submerged species below.

**Wraysbury River**

8.10.222 The Wraysbury River north of the M4 is heavily modified (i.e. re-sectioned and straightened), which reduces flow diversity. Poor habitat diversity is compounded by the overall lack of in-channel and marginal features. Both banks of the channel are steep and colonised by broadleaf trees and scrub, except for a section of concrete reinforcements installed where the river flows beneath the M4. Poor habitat diversity and the highly fragmented nature of this reach indicates a poorly functioning habitat. Consequently, this reach was classified as being of low quality. South of the M4 and throughout Harmondsworth Moor habitat diversity increases considerably. Increased flow, regular occurrence of gravel substrate, exposed tree roots and macrophytes provide refugia for a diverse invertebrate community and habitat for fish at various life stages.

8.10.223 Further downstream, habitat quality is spatially variable as the Wraysbury River is culverted beneath, and then flows alongside, the M25. The watercourse has been subjected to extensive modification and is embanked on the left side to alleviate flooding during periods of high rainfall. The banks in this area are moderately steep, with little channel diversity and limited riparian vegetation. Smooth flow was extensively recorded along the upper, mid and lower reaches on the day of survey. A major weir is located within this section of the river, impounding water upstream. This has enabled emergent macrophyte species to colonise the channel, consequently narrowing the width and creating a sinuous planform with a rippled flow. This re-naturalisation has created habitats that are valuable for invertebrates, wildfowl and fish.

8.10.224 Overall, high quality habitat was scarce along the surveyed reaches of the Wraysbury River, with low quality habitat dominant. Poor habitat quality in this
segment of river is likely a consequence of historical channel modification (re-alignment, and re-sectioning).

8.10.225 Macrophyte species typical of slow flowing water were recorded on the Wraysbury River, including common club-rush, yellow water-lily and arrowhead. A community of river water-dropwort, water-starwort and stream water-crowfoot frequently occurred along the reach through Harmondsworth Moor, which indicates a meso-eutrophic, calcareous environment. This was particularly notable since river water-dropwort has experienced an overall decline in the London area (Preston and Croft, 2014). Floating pennywort was occasionally recorded.

The Longford River

8.10.226 The Longford River is an artificial water course which is extensively reinforced at the toe of the bank. Consequently, flow diversity is poor and is dominated by a slow glide. The impoundment of water by several dams and weirs allows for the colonisation of emergent macrophytes, which provide habitat for macroinvertebrates and fish. No fish passes or barrier modifications were observed at the dams and weirs to enable fish migration. LWD is occasionally present, providing further valuable habitat and some diversity in flow. The habitat quality assessment determined that quality is low in the Longford River as functional habitat is very limited and is largely provided by planted gabion baskets from previous channel enhancement works.

8.10.227 Marginal species that reflect slow flowing or standing water dominated the artificial channel, including common reed and great willowherb. Water-starwort was recorded in low abundance within the watercourse. Two INNS species were recorded in low abundance along the surveyed reach: orange balsam *Impatiens capensis* and monkey flower *Mimulus guttatus*.

Duke of Northumberland’s River

8.10.228 The Duke of Northumberland’s River has poor sinuosity along the channel having been heavily straightened and reinforced throughout the surveyed reaches. However, good habitat diversity was recorded in the upper reach of the river adjacent to Harmondsworth Moor, approximately 1.2km north of the current airport boundary, owing to overhanging and fallen trees which provide habitat for juvenile fish, invertebrates and small mammals. Aquatic macrophytes frequently choke the channel and marginal emergent species encroach across the channel, significantly narrowing the watercourse and introducing a diversity of flow. Further downstream towards the Colnbrook By-pass, the river exhibits a lack of in-channel and marginal features and has low macrophyte diversity. Both sides of the river were dominated by broadleaf woodland habitat, beyond which parkland becomes the dominant land-use. The habitat quality assessment determined that in general the
Duke of Northumberland’s River was unlikely to support a diverse and resilient ecosystem and therefore habitat quality was assessed as low.

8.10.229 To the east of the Longford Roundabout the watercourse was modified into a concrete channel, creating a homogenous habitat with poor variability. Channel enhancement works, including planted gabion baskets and marginal reed/sedge habitat, were the only refugia observed. A gliding flow was dominant within the watercourse, while habitat quality was accordingly assessed as low.

8.10.230 Habitat quality in the reaches between the Longford Roundabout in the north and the Western Perimeter Road Roundabout in the south was assessed as low. The watercourse continued within the concrete channel, thereby limiting functional habitat. Planted gabion baskets from previous channel enhancement works dominated the watercourse. Large woody debris, also part of previous channel enhancement works, were present. Flow diversity was very low and dominated by a gliding flow.

8.10.231 A macrophyte survey was undertaken on the lower reaches of the river, where the channel is confined by artificial concrete embankments. Recorded marginal vegetation include greater pond sedge and common reed, which both indicate standing or slow flowing water. Branched bur-reed and bulrush were also recorded, indicating a high nutrient environment.

Colne Brook

8.10.232 The upper reaches of the Colne Brook (upstream of Old Slade Lake) have been re-sectioned and over-deepened, with reinforced banks in some places. Consequently, river flow was slow throughout. The channel was extensively shaded by well-established bank vegetation, and there was a general paucity of marginal, channel and bank features, which combined to result in poor habitat diversity. Where light did occasionally penetrate the water column, a good diversity of emergent, floating and submerged macrophytes was present. Downstream of the surveyed section, alongside Old Slade Lake, the watercourse displayed higher sinuosity, with discrete habitats such as underwater tree roots, exposed bankside roots, fallen trees, LWD and overhanging boughs recorded intermittently. Overall, due to the channel reinforcements and the predominantly limited natural river features, the upper section of the Colne Brook was largely classified as moderate quality in the habitat quality assessment.

8.10.233 The lower surveyed reaches of the watercourse, south of Wraysbury Train Station, had both moderate and high habitat quality. River margins in this surveyed section were dominated by reed/sedge and macrophyte growth. Flow diversity overall remained poor, except for a short reach assessed as high quality, 0.5km downstream of the train station. In this reach gravel habitat, overhanging trees,
macrophyte and flow diversity were well connected creating high value functional habitat. Habitat quality was markedly lower further downstream towards Hythe End, except for a short section consisting of a single gravel riffle where flow was more diverse. Here, riparian shading of the channel was not limiting for primary production (the generation of plants), with overhanging marginal trees providing fish refuge from predation. Overall, habitat quality on the Colne Brook was varied.

The Colne Brook supported macrophyte species with a preference for standing or slow flowing water such as common duckweed, unbranched bur-reed and yellow water-lily. Species of more eutrophic conditions were also recorded, including branched bur-reed. Unusually, a species with a preference for calcareous conditions was recorded, watercress *Rorippa nasturtium-aquaticum*.

**Horton Brook**

In the reaches surveyed on the Horton Brook there were extensive channel modifications (re-sectioned). It is dominated by a slow glide flow, which has resulted in silt deposition throughout. The channel is heavily shaded by bankside broadleaf woodland, limiting primary productivity. No aquatic macrophytes were observed within the channel across the entire RHS and RCS surveyed reaches. In some areas, the presence of exposed bankside roots, fallen trees and LWD provide flow and habitat diversity, but overall the surveys identified a general lack of channel, marginal and bank features, as well as poor habitat connectivity. For these reasons, river habitat quality was assessed as low for the majority of assessed reaches.

Two river macrophyte survey were undertaken on the Horton Brook. One surveyed reach was located upstream of the RHS and RCS surveys, where there was little shading from broadleaf woodland. Evidence for excess nutrient input was observed; this upper surveyed reach was choked with the INNS least duckweed and filamentous algae, with reed sweet-grass dominating the margins. The river continued on through to urban broadleaf woodland, where the second reach was surveyed for macrophytes. No aquatic macrophytes or marginal flora were recorded, most likely due to heavy shading over the channel.

**River Crane**

The upper reach of the River Crane is artificially over-widened and re-sectioned. It is characterised by steep and undercut banks, a slow smooth flow and a lack of in-channel features. Where the channel is not heavily shaded, submerged macrophyte communities have established, providing sheltered habitats for juvenile fish and macroinvertebrates. High algal biomass on the river bed and turbid water indicate potential water quality issues within the upper reach.
The variety of niche habitats within the channel improved downstream, where semi-natural broadleaf woodland provides overhanging boughs, exposed bankside roots, underwater tree roots, fallen trees and large woody debris. Emergent riparian vegetation has also colonised sections of the river, creating planform sinuosity and diversity of flow. However, substantial shading by broadleaf trees and tall ruderal growth limits submerged macrophyte growth in the mid and lower surveyed reaches. The lower surveyed reach is managed by Friends of the River Crane Environment, who have restored a multitude of natural features along the reach to provide extensive habitat for fauna. This has also contributed to a diversity in flow, supporting habitat for fish spawning. Poaching of the banks has been minimised by a wooden walkway which runs parallel to the river.

Further surveys in 2019 will use the same methods to record information for additional reaches on the rivers described above, as well as on the Bigley Ditch and Poyle Channel.

Predicted effects and their significance

Land take and land cover change (resulting in habitat loss or degradation)

The DCO Project would result in permanent loss of river habitat as a result of river diversions. This will have a direct effect on the following watercourses: River Colne, Wraysbury River, Duke of Northumberland’s River, the Longford River, the Colne Brook and the Bigley Ditch. The resulting river lengths that are expected to be lost as a result of the DCO Project are listed in Table 8.22. The total loss of river channel is 15.2km, with habitats of high, moderate and low quality all being lost within the study area.

<table>
<thead>
<tr>
<th>Watercourse</th>
<th>Approximate length of main existing channel in the study area (km)</th>
<th>Approximate length of main channel to be lost in the study area (km)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colne Brook</td>
<td>9.2</td>
<td>1.9</td>
</tr>
<tr>
<td>Duke of Northumberland’s River</td>
<td>10.5</td>
<td>4.5</td>
</tr>
<tr>
<td>Wraysbury River</td>
<td>6.3</td>
<td>2.5</td>
</tr>
<tr>
<td>River Colne</td>
<td>11.2</td>
<td>3.1</td>
</tr>
<tr>
<td>Bigley Ditch</td>
<td>2.9</td>
<td>No loss</td>
</tr>
<tr>
<td>Longford River</td>
<td>8.1</td>
<td>3.2</td>
</tr>
<tr>
<td><strong>Total: approximately 15.2km of baseline river channel length lost</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
In order to ensure that the water is able to continue to flow across the landscape, and to provide new river channel and riparian habitat, a total of approximately 11.3km of new channel would be created (net loss of 3.9km) by river diversions around the Airport and through a structure known as the Covered River Corridor (CRC). The CRC allows part of the new network of watercourses to pass beneath the Airport, where the flows from the Wraysbury River will combine with those of the River Colne in to a single channel, and the Duke of Northumberland’s flow will be combined with the Longford River into a single parallel channel. Further information on the river diversions and the CRC, including elements of the design to provide in-channel and riparian habitat for biodiversity, is provided in Chapter 21.

The new channels would be designed to include:

1. An appropriate river channel planform providing ecological connectivity within the Colne Valley

2. A low flow channel planform of moderate-low sinuosity, with a riparian corridor either side of the channel; The planform would include the provision of back waters and scrapes and meander within 40m of river corridor where possible

3. Space would be provided for riparian corridors of between 8m and 20m either side of the river channel. In these corridors, appropriate vegetation would be provided to maximise the ecological connection between the floodplain and the channel once matured

4. An asymmetrical, naturalised, cross section to drive flow diversity and variability in velocity and depth across the channel to provide habitat for a range of species

5. A substrate with an appropriate size, sorting, lithology of sediment on the bed

6. Lining of the new channels would only occur where underlying sediment is contaminated and therefore increasing the risk of water quality contamination; everywhere else the design would allow for free movement of water in the hyporheic zone (the region beneath and alongside a stream bed where shallow groundwater and surface water mixes).

In addition to the creation of new river channel (through river diversions or the CRC), there would be further environmental measures implemented in the local river system to improve conditions outside of the Site. These could include measures in the River Colne and River Crane catchments such as improving flow diversity, habitat enhancement and river restoration, weir modifications and invasive species control. A long list of potential opportunities has been identified.
through stakeholder engagement (see Chapter 21) and will be subject to refinement for application stage.

8.10.244 The preliminary conclusions drawn at this stage of the DCO Project are that the scale of change is predicted to be high (see Table 8.18) due to the length of river channel to be lost or altered. With the effect on this ecological feature of regional importance being **Significant**. As the design of the new channels is still evolving the potential significance of any positive improvements cannot yet be assessed.

8.10.245 At the time of application the assessment of this likely significant effect will be further informed by increased quantities of baseline data and a detailed understanding of the design of new river channels and associated riparian habitat to be created as part of the green infrastructure proposals. At application stage the significance of the positive effects associated with the green infrastructure design will be considered within the assessment.

**Changes in hydrology (surface water run-off rates and river flows resulting in habitat change)**

8.10.246 The predicted changes to groundwater have the potential to result in changes to hydrology and hydrogeology in the study area. This may lead to changes in groundwater levels and groundwater-surface water interaction which could lead to changes to river habitats. Within the study area predicted local changes to the water table may affect a number of waterbodies including the River Colne, Wraysbury River, the Colne Brook, the Longford River, the Duke of Northumberland’s River and the Horton Brook. Although flows are not expected to change upstream and downstream of the Site, local changes to river habitats may result due to alterations to water table. These changes could affect the diversity and availability of river habitats.

8.10.247 The results of the groundwater model are at this stage preliminary, and therefore this assessment will be reviewed at application stage to take account of further refinements to the groundwater model and evolution of design. However, the preliminary conclusion, drawn at this stage on a precautionary basis, is that the scale of change is medium (as defined in Table 8.18) and the effect is **Significant** on an ecological feature of regional importance.

8.10.248 At the time of application the assessment of this likely significant effect will be further informed by increased quantities of baseline data, refined modelling outputs and a detailed understanding of the design of new river channels and associated riparian habitat to be created as part of the green infrastructure proposals. At application stage the significance of the positive effects associated with the green infrastructure design will also be considered as part of the assessment.
**Assessment of biodiversity effects – Pointed Stonewort**

**Detailed baseline**

8.10.249 Pointed stonewort has been recorded in one location only during the field season, namely Saxon Lake (see Figure 8.8 for location). Records from the survey indicate that the species has predominantly colonised the lake at greater depths, between approximately 3.3 to 6.6m.

8.10.250 This species is nationally scarce and indicative of calcium rich and low phosphate waters. Charophyte communities - and therefore populations of pointed stonewort - within the shallow littoral zone are considered ecologically important as they provide valuable habitat to a range of zooplankton and invertebrate species and are integral primary producers (Pereira-Ramos, 1981). Beds of charophytes, such as those recorded in Saxon Lake, comprise a high biomass and therefore store large concentrations of nutrients which are slowly released over time, thereby naturally regulating the waterbody’s nutrient levels (Moore, 1986).

8.10.251 Further survey in 2019 will determine the status of this species elsewhere within the study area.

**Predicted effects and their significance**

**Land take and land cover change (resulting in habitat loss or degradation) of Saxon lake**

8.10.252 Saxon Lake supports a range of wildfowl and other birds (particularly gulls) that represent a wildlife collision risk for the currently operational airport. This water body is used over winter as a stop off point for gulls moving from central London to roosts on Queen Mother Reservoir and Wraysbury Reservoir. Currently the location of Saxon Lake (~1.5km north of the existing northern runway) partially negates the associated collision risk, with the remaining risk monitored and managed by Heathrow’s operational staff. However, as the North West Runway would be closer to Saxon Lake than at present manipulation of this water body would be required to reduce its availability to wintering gulls; options could include the use of floating islands of vegetation. This in turn may affect the distribution of and conditions for pointed stonewort. Until the implications of these proposals are fully understood, it is not possible to design a detailed and effective approach, although it is assumed as a precaution that the extent of open water and the level of light that penetrates the water column, both of which are integral habitat requirements for the success of pointed stonewort populations and the charophyte meadows it resides in may be reduced.

8.10.253 Further to the potential change in habitat to limit use by wintering birds, Saxon Lake will be retained and used as a storage lake in conjunction with the installation
of Fire Water Infrastructure, with up to 1m of water depth abstracted for fire extinguishing purposes if necessary. The volume of water abstracted from the lake and the reduction in water depth could lead to desiccation of pointed stonewort. Pointed stonewort is unable to persist when desiccated, therefore it is assumed that this species would be lost from Saxon Lake.

8.10.254 In addition, there is also the potential for water within Saxon Lake to be used for heat exchange purposes to provide the DCO Project with renewable energy. The proposals for heat exchange are at a concept stage only and contain a number of different options (some including consideration of Saxon Lake and some not). It is not possible to understand whether or not this technology would affect pointed stonewort at this stage, however for the purposes of this assessment it is assumed that this species would be lost as it is sensitive to changes in water conditions.

8.10.255 As design information about potential solutions are developed the magnitude of the change and thus the resulting effect on pointed stonewort will be better understood. On a precautionary and preliminary basis it is assumed, as a worst-case scenario, that this species would be lost to the study area. The scale of change for the DCO Project is therefore assumed to be high (as assuming a loss of the local population) and the effect Significant for this ecological feature of County / metropolitan importance.

8.10.256 At the time of application, the assessment of this likely significant effect will be further informed by greater understanding of the design of infrastructure around Saxon Lake and further macrophyte survey data identifying whether or not this species is present in other locations in the study area.

Changes in hydrology (groundwater levels, surface water run-off rates, and lake levels; resulting in habitat change)

8.10.257 Saxon Lake could be affected by alteration of the water table during the construction and operational activities associated with the DCO Project. However, these changes are, at this preliminary stage, likely to result in less difference in the surface level of the lake in comparison to its usage (including tests of equipment) as a source of water for extinguishing fires. However, as these changes may exacerbate those described in paragraphs 8.10.253 to 8.10.257, on a precautionary and preliminary basis it is concluded that the scale of change for the DCO Project is high (as assuming a loss of the local population) and the effect Significant for this ecological feature of County / metropolitan importance.

8.10.258 At the time of application, the assessment of this likely significant effect will be further informed by greater understanding of the design of infrastructure around Saxon Lake, refined model outputs and further macrophyte survey data identifying whether or not this species is present in other locations in the study area.
**Assessment of biodiversity effects – European eel**

**Detailed baseline**

8.10.259 European eel were recorded in low numbers (cumulative abundance: three individuals) during electrofishing surveys. Eel were captured in the Wraysbury River as it flows through Harmondsworth Moor and Staines Moor and the upstream reaches of the Colne Brook. The use of eDNA sampling techniques also provided positive results for eel in the Colne Brook, Wraysbury River, River Colne and Duke of Northumberland’s River.

8.10.260 As eel is a migratory species, the results gathered provide evidence that the reaches sampled are used as migratory routes. The low density of eel is indicative of the length of time eel take to migrate into upper reaches of river systems. Upstream migration of eel occurs irregularly (during the warmer months of the year) and can span several years, with much of their freshwater lives spent migrating. The lack of deeper water, large cobbles and boulders reduce the potential for presence of yellow eel (resident stage of life cycle) within the study area.

8.10.261 Further survey in 2019 will provide further information on the distribution and numbers of eels present in the study area.

**Predicted effects and their significance**

**Land take and land cover change (resulting in habitat loss or degradation)**

8.10.262 The DCO Project will result in permanent loss of river corridor. This will have a direct effect on habitat availability for European eel in the following watercourses: River Colne, Poyle Channel, Colne Brook, Wraysbury River, River Crane and Duke of Northumberland’s River. The total loss of river channel would be approximately 15.2km (see Table 8.22). The habitats lost within these rivers include good diversity of in-channel features. The presence of high habitat diversity is important to this species as it provides the opportunities for shelter and ambush points for hunting.

8.10.263 To ensure that the water is able to continue to flow across the landscape, and to provide new river channel and riparian habitat, a total of 11.3km of new channel will be created. The new channels would be designed to include a diversity of habitat suitable for European eel, including soft sediment, dense stands of vegetation, coarse substrate, undercut banks, exposed tree roots, pools and deeper water. Some of this new channel length (0.7km) would be within the CRC (which will allow water to flow underneath the North West Runway and associated taxiways). The CRC is being designed to allow for habitat diversity through
There will also be further environmental measures implemented in the local river system (outside of the Site) to improve conditions. These measures could include modifications to weirs in both upstream and downstream reaches in the River Colne and River Crane catchments that improve access to habitat for European eel. Details of the list of potential off-Site environmental measures are described in Chapter 21.

In summary, approximately 15.2km of existing river corridor containing suitable habitat for European eel would be lost. Habitat loss would be offset in part by the creation of 11.3km of new river channel, which is to include a diversity of habitats suitable for this species. This effect is therefore considered temporary. However, the suitability of new channel features cannot yet be guaranteed. Consequently, a precautionary approach to the assessment is employed at this stage. The scale of change associated with the initial loss of approximately 15.2km is therefore assessed as high and is expected to have a Significant effect on this ecological feature of regional importance.

At the time of application, the assessment of this likely significant effect will be further informed by the increased design information for the CRC and other new river channels. Further fish surveys scheduled for 2019 may also provide increased information on the distribution and numbers of eels present in the study area.

**Fragmentation of habitats (reduction of connectivity)**

Habitat fragmentation as a result of construction activities would likely have a direct effect and/or disruptive effect on the migration routes of European eel in the Colne Brook, Wraysbury River, River Colne and Duke of Northumberland’s River. Habitat connectivity is important for life cycle dependent activities; European eel is a catadromous species (migrate from fresh water to sea to spawn), migrating thousands of kilometres to complete its life cycle. Fragmentation of these river corridors may have detrimental effects on population recruitment within these rivers.

Habitat fragmentation is considered likely to be temporary should the design of new channels, including the CRC, provide suitable habitat for European eel migration following establishment. Any new structures and impoundments would be fitted with appropriate fish passage for eels in accordance with the Eels (England and Wales) Regulations 2009. The application of these principles within the new channels should safeguard eel migratory routes.
8.10.269 Furthermore, unlike salmon European eel are less specific in selection of suitable freshwater corridors for completion of their life cycle. Throughout all phases of development there would be routes available to eel through to the upstream reaches of the Colne catchment. These include the newly diverted channels, the Poyle Channel and the River Crane and Grand Union Canal.

8.10.270 Despite an undertaking to maintain functioning rivers at all stages, a precautionary approach is taken to the assessment at this point as the methodology and timing of river channel diversion are not detailed yet for the DCO Project. Therefore, the preliminary conclusion is that the scale of change is expected to be medium and the effect **Significant** on this ecological feature of regional importance.

8.10.271 At the time of application, the assessment of this likely significant effect will be further informed by the increased design information for the CRC and other new river channels. Further fish surveys scheduled for 2019 may also provide increased information on the distribution and numbers of eels present in the study area.

*Increased noise and vibration (resulting in disturbance and displacement)*

8.10.272 There is a significant gap in the scientific knowledge concerning most fish species and noise disturbance. The focus of most research has been from marine construction projects where it is understood that regardless of the construction technique, the rapid release of energy from noise is likely to result in a stress wave that travels through water that may result in a temporary or permanent hearing loss to fish or shifts in their threshold response levels (Popper *et al*., 2006). There has also been reported damage to the swim bladder resulting in death from several species of fish by exposure to pile driving sounds within 50m of source (Gill and Bartlett, 2010). Specifically, for European eel, reduction in spatial performance, elevated ventilation and metabolic rates (indicators of stress) and compromise of anti-predator behaviour has been demonstrated in response to acute acoustic events in a laboratory study (Simpson *et al*., 2014).

8.10.273 It is therefore considered that vibration and noise generated during construction of the DCO Project have the potential to disturb and displace European eel, which could have important physiological and behavioural effects, compromising survival or migration. Effects are most likely to occur within 50m of construction activities, but the mobile nature of this species means that individuals are likely to move away from the disturbance and utilise alternative corridors for access and upstream migration. The current baseline suggests that disturbance due to existing operational activities does not affect the presence of European eel in areas adjacent to the airfield.
8.10.274 The effects of noise and vibration during construction are currently not quantified with regard to individual river corridors. Consequently, a precautionary approach has been adopted within this assessment present, the effects of noise or vibration disturbance on European eel would potentially result in a scale of change that is medium and an effect that is **Significant** on an ecological feature of regional importance.

8.10.275 At the time of application, the assessment of this likely significant effect will be further informed by further fish surveys scheduled in 2019 which will provide increased information on the distribution and numbers of eels present in the study area, as well as a more detailed understanding of the types of construction activity that are to occur and the associated noise and vibration created.

*Increased light intensity (resulting in disturbance / displacement)*

8.10.276 European eel are photophobic and exhibit a preference for migration during the night (Durif & Elie, 2008). Research has shown that violet and green light bands are optimal for this species (i.e. not white and red) and suits its biological requirements (Kulinski & Styczynska-Jurewicz, 2002). A number of activities during construction and operational phases of the DCO Project may increase lighting levels including lighting associated with security, any night time construction activities, illumination of operational areas and vehicle headlights. Such anthropogenic lighting is typically ultra-violet, emitting white wavelengths of the light spectrum. Increased light intensity near watercourses will likely result in a reduction in the quality of suitable habitat for European eel, avoidance of the effected habitats and/or inhibit eel migration with potential significant effects on localised populations.

8.10.277 A sensitive lighting strategy would be designed to ensure construction and operational lighting minimises negative effects on watercourses. This would include measures to minimise lighting, using directional lighting aimed only where necessary, and preventing light spill onto watercourses where reasonably practicable. The selection of least detrimental lighting types such as narrow spectrum light sources that emit minimal ultra-violet light and avoidance of white wavelengths of the light spectrum would be used where reasonably practicable.

8.10.278 In the absence of a detailed lighting assessment, a precautionary approach has been adopted, and a significant effect cannot be ruled out at this stage. Therefore, at present, the effects of increased light intensity on European eel would result in a scale of change that is medium and an effect that is **Significant** on an ecological feature of regional importance.

8.10.279 At the time of application, the assessment of this likely significant effect will be further informed by additional information on lighting design for the DCO Project.
alongside a detailed assessment of effects on aquatic habitats and species within the Site. Further fish surveys scheduled in 2019 may also provide increased information on the distribution and numbers of eels present in the study area.

Changes in hydrology (groundwater levels, surface water run-off rates, river flows and lake levels; resulting in habitat change)

8.10.280 The predicted changes to groundwater have the potential to result in changes to hydrology and hydrogeology in the study area. This may lead to changes in groundwater levels and groundwater-surface water interaction which could lead to changes to river habitats. Within the study area predicted local changes to the water table may affect a number of waterbodies including the River Colne, Wraysbury River, Colne Brook, the Longford River, the Duke of Northumberland’s River and the Horton Brook. Although flows are not expected to change upstream and downstream of the Site, local changes to river habitats may result due to alterations to water table. These changes could affect the suitability of river habitats for European eel.

8.10.281 The results of the groundwater model are at this stage preliminary, and therefore this assessment will be reviewed at application stage to take account of further refinements to the groundwater model and evolution of design. However, the preliminary conclusion, drawn at this stage on a precautionary basis, is that the scale of change is medium (as defined in Table 8.18) and the effect is Significant on an ecological feature of regional importance.

8.10.282 At the time of application the assessment of this likely significant effect will be further informed by increased quantities of baseline data, refined modelling outputs and a detailed understanding of the design of new river channels and associated riparian habitat to be created as part of the green infrastructure proposals. At application stage the significance of the positive effects associated with the green infrastructure design will be considered within the assessment.

Assessment of biodiversity effects – European bullhead

Detailed baseline

8.10.283 European bullhead were recorded during electrofishing surveys in all but two rivers; namely the Horton Brook and Bigley Ditch. Abundant populations were recorded on the Wraysbury River as it flowed through Harmondsworth Moor, and the Colne Brook in Thorney Park Golf Club. The River Colne, Longford River and Duke of Northumberland’s River each support smaller populations, likely due to a general lack of optimal habitat for bullhead in these rivers.
Although no bullhead were caught during electro-fishing surveys in the River Colne, bullhead eDNA was detected in this river confirming presence of this species.

Survey scheduled for 2019 will provide further information on the distribution and number of this species present in the study area.

**Predicted effects and their significance**

**Land take and land cover change (resulting in habitat loss or degradation)**

The DCO Project would result in the loss of existing river channels (15.2km), directly affecting identified bullhead populations in the Colne Brook, River Colne, Wraysbury River, Duke of Northumberland’s and Longford River. Although the quality of habitats within the surveyed reaches of these rivers is not considered to be of high quality, they do currently support bullhead populations.

Bullhead prefer clear and fast-flowing water in small streams to medium-sized rivers and rely on a variety of habitats to complete their life cycle. Coarse substrates with large stones are important for breeding while riffles are important to juveniles. Sheltered sections created by woody debris and tree roots, as well as the presence of macrophyte cover are preferred by adult fish. During high flows slack waters are important in providing refuge (Tomlinson and Perrow, 2003). Such features are uncommon within the River Colne, Wraysbury River, Longford River and Duke of Northumberland’s River, but patches of gravel beds are extant in the Colne Brook.

To ensure that the water is able to continue to flow across the landscape, and to provide new river channel and riparian habitat, a total of 11.3km of new channel would be created (see Chapter 6). Embedded environmental measures will aim to deliver improved habitat quality in the constructed channels compared to the habitats that will be lost. A section (approximately 0.7km) of the created channel will be within the CRC, which will allow water to flow underneath the North West Runway and associated taxiways. The CRC is being designed to allow for habitat diversity through channel bed roughness, water depth variability, creation of flow refuges, and sufficient light to stimulate macrophyte growth. However, it should be noted that the design of channel features (both within exposed reaches and within the CRC) has not yet been finalised. Consequently, their suitability for bullhead cannot yet be guaranteed and a precautionary approach is adopted in this assessment.

The scale of the change on bullhead populations due to loss and degradation of habitats is therefore considered high and **Significant** on an ecological feature of
regional importance. Effects are likely to be greater in the Colne Brook and Wraysbury River, both of which support relatively large bullhead populations.

8.10.290 At the time of application, the assessment of this likely significant effect will be further informed by increased design of the CRC. The further fish surveys scheduled in 2019 may also provide increased information on the distribution and numbers of European bullhead present in the study area.

**Fragmentation of habitats (reduction of connectivity)**

8.10.291 Although bullhead will move between different habitat types to complete its life cycle, their home ranges are generally small with movements in the order of 10m to 200m. The DCO Project would result in the loss of existing river channels (15.2km) which may result in habitat fragmentation if this change reduces habitat connectivity to a point where populations become isolated. Habitat fragmentation can lead to an absence or limitation of genetic exchange between populations.

8.10.292 To ensure that connectivity is retained, a total of 11.3km of new river corridor would be created in open channels and in the CRC, with an aim to retain habitat connectivity and diversity through design. New structures and impoundments would be fitted with appropriate fish passage for relevant species including bullhead.

8.10.293 Habitat fragmentation is therefore considered temporary until the newly created channels have matured, and connectivity has been established between habitats upstream and downstream of the CRC. However, the design of channel features has not yet been finalised. As such, their suitability for facilitating bullhead movement and colonisation cannot yet be guaranteed, and a precautionary approach has been adopted in this assessment.

8.10.294 As bullhead is not a migratory species and abundance is currently good in the effected rivers, the scale of the change on bullhead populations due to habitat fragmentation is considered moderate and the effect **Significant** on this ecological feature of regional importance.

8.10.295 At the time of application, the assessment of this likely significant effect will be further informed by the increased design of the new channels and the CRC. Further fish surveys scheduled in 2019 may also provide increased information on the distribution and numbers of bullhead present in the study area.

**Increased noise and vibration (resulting in disturbance / displacement)**

8.10.296 As discussed in paragraph 8.10.273 for European eel, there is a lack of research on the effect of noise and vibration disturbance on most fish species, with no identified literature concerning the effect of noise or vibration disturbance
specifically on European bullhead populations in rivers. The absence of research cannot preclude a potential effect however, and in the absence of noise modelling results at this stage of the assessment, it must be considered possible that noise and vibration resulting from construction activities would result in bullhead displacement.

8.10.297 As a precautionary measure, it should be assumed that the effects of increased noise and vibration on European bullhead would result in a scale of change that is moderate and an effect that is Significant on an ecological feature of regional importance, but this may reduce once noise modelling results are available.

8.10.298 At the time of application, the assessment of this likely significant effect will be further informed by fish surveys scheduled in 2019 to inform the baseline and establish the distribution and size of bullhead populations in the study area and information on sources of disturbance and their locations.

Changes in hydrology (groundwater levels, surface water run-off rates, river flows and lake levels; resulting in habitat change)

8.10.299 The predicted changes to groundwater have the potential to result in changes to hydrology and hydrogeology in the study area. This may lead to changes in groundwater levels and groundwater-surface water interaction which could lead to changes to river habitats. Within the study area predicted local changes to the water table may affect a number of waterbodies including the River Colne, Wraysbury River, Colne Brook, the Longford River, the Duke of Northumberland’s River and the Horton Brook. Although flows are not expected to change upstream and downstream of the Site, local changes to river habitats may result due to alterations to water table. These changes could affect the suitability of river habitats for European bullhead.

8.10.300 The results of the groundwater model are at this stage preliminary, and therefore this assessment will be reviewed at application stage to take account of further refinements to the groundwater model and evolution of design. However, the preliminary conclusion, drawn at this stage on a precautionary basis, is that the scale of change is medium (as defined in Table 8.18) and the effect is Significant on an ecological feature of regional importance.

8.10.301 At the time of application the assessment of this likely significant effect will be further informed by increased quantities of baseline data, refined modelling outputs and a detailed understanding of the design of new river channels and associated riparian habitat to be created as part of the green infrastructure proposals. At application stage the significance of the positive effects associated with the green infrastructure design will be considered as part of the assessment.
Assessment of biodiversity effects – Barbel

Detailed baseline

8.10.302 Barbel were recorded in electrofishing surveys and through eDNA sampling in the Wraysbury River and River Colne as they flow through Harmondsworth Moor, and further downstream on the River Colne as it passes T5. Results from eDNA surveys also confirm the presence of this species in the Duke of Northumberland’s River. Barbel are potamodromous, living and undertaking spawning migrations within freshwater. Barbel prefer habitats characterised by a moderate to strong flow, high oxygen concentration, a clean substrate of sand, gravel and rocks.

8.10.303 In total 50 individuals were caught during the electrofishing surveys in 2018; the highest density (0.03 individuals/m²) was recorded in the Wraysbury River and lowest (0.001 individuals/m²) in the River Colne (near T5).

8.10.304 Further survey in 2019 will provide additional information on the distribution and number of this species present in the study area.

Predicted effects and their significance

Land take and land cover change (resulting in habitat loss or degradation)

8.10.305 The DCO Project would result in permanent loss of river corridor, which has the potential to affect barbel populations in the Wraysbury River and the River Colne through loss of habitat. Approximately 5.6km of river corridor will be lost in the Wraysbury River and the River Colne combined (see Table 8.22). Although habitats preferred by barbel (moderate flow and abundant gravel/pebble substrate) are uncommon within these rivers (the notable exception is within the stretch of the Wraysbury River flowing through Harmondsworth Moor, where suitable spawning habitat is evident) there is evidence of this species in both rivers and with channel enhancements the sub-optimal habitats could be substantially improved upon.

8.10.306 To ensure that surface water can continue to flow across the landscape, and to provide new river channel and riparian habitat, a total of 11.3km of new channel would be created, including 0.8km in the realigned Wraysbury River and 3.3km in the combined Wraysbury River and the River Colne channel. A section of the combined channel (0.7km) would be within the CRC, allowing water to flow underneath the North West Runway and associated taxiways. The new channels would be designed to allow for habitat diversity through channel bed roughness, water depth variability, creation of flow refuges, and sufficient light in the CRC to stimulate macrophyte growth, with the potential to improve habitat suitability for barbel.
Given that the existing river habitat is deemed to be sub-optimal and new channel would be created, the effect of habitat loss on barbel is considered temporary. However, the design of channel features has not yet been finalised. Consequently, their suitability for barbel cannot yet be guaranteed and a precautionary approach has therefore been taken in this assessment of habitat loss and degradation. The scale of change on barbel populations from loss of habitat and degradation is therefore considered to be medium and the effect **Significant** for this ecological feature of County / metropolitan importance.

At the time of application, the assessment of this likely significant effect will be further informed by increased design of the new river channels including the CRC. Additional fish surveys scheduled for 2019 may also provide increased information on the distribution and numbers of barbel present at the Site.

**Fragmentation of habitats (reduction of connectivity)**

The DCO Project would result in the loss of existing river channels, including a 5.6km loss in the Wraysbury and River Colne combined. Habitat fragmentation may occur if this change reduces habitat connectivity to a point where populations will become isolated leading to an absence or limitation of genetic exchange between populations. Habitat fragmentation as a result of construction activities are likely to have negative implications on barbel populations in the River Colne and Wraysbury River. As a migratory species, habitat connectivity is particularly relevant to this species, as they undertake migration to access spawning habitats in upstream reaches.

To mitigate for the loss and/or change of river corridor, a total of 11.3km of new channel would be created, including 0.8km in the realigned Wraysbury River and 3.3km in the combined Wraysbury River and the River Colne channel. A section of the combined channel (0.7km) would be within the CRC, allowing water to flow underneath the North West Runway and associated taxiways. The CRC and the construction of new open channels would aim to retain habitat connectivity and include a high diversity of flow and substrate type. New structures and impoundments would be fitted with appropriate fish passage for relevant cyprinid species, including barbel. The application of these principles within the new channels should safeguard barbel migratory routes.

Habitat fragmentation is therefore considered temporary until the newly created channels have matured and habitats have been established. However, the design of channel features have not yet been finalised and as such, their suitability for facilitating barbel movement and migration cannot yet be guaranteed. Therefore, a precautionary approach has been taken in this assessment of barbel. The scale of the change is considered high and the resulting effect **Significant** on this ecological feature of County / metropolitan importance.
Increased noise and vibration (resulting in disturbance / displacement)

8.10.312 As previously stated for European eel (paragraph 8.10.273), there is a significant gap in the scientific knowledge concerning the effect of noise and vibration disturbance on most fish species with no literature concerning the effect of noise or vibration disturbance on barbel populations in rivers identified. The absence of research cannot preclude this effect however, and in the absence of noise modelling results at this stage of the assessment, it must be considered possible that noise and vibration resulting from construction activities would result in negative effects on barbel.

8.10.313 As a precautionary measure, it should be assumed that the effects of increased noise and vibration on barbel would result in a scale of change that is medium and an effect that is ** Significant** on this ecological feature of County / metropolitan importance, but this may reduce once further information is available.

8.10.314 At the time of application, the assessment of this likely significant effect will be further informed by fish surveys scheduled for 2019. These will provide additional data for the assessment of baseline population size and distribution throughout the study area.

Changes in hydrology (groundwater levels, surface water run-off rates, river flows and lake levels; resulting in habitat change)

8.10.315 The predicted changes to groundwater have the potential to result in changes to hydrology and hydrogeology in the study area. This may lead to changes in groundwater levels and groundwater-surface water interaction which could lead to changes to river habitats. Within the study area predicted local changes to the water table may affect a number of waterbodies including the River Colne, Wraysbury River, Colne Brook, the Longford River, the Duke of Northumberland’s River and the Horton Brook. Although flows are not expected to change upstream and downstream of the Site, local changes to river habitats may result due to alterations to water table. These changes could affect the suitability of river habitats for barbel.

8.10.316 The results of the groundwater model are at this stage preliminary, and therefore this assessment will be reviewed at application stage to take account of further refinements to the groundwater model and evolution of design. However, the preliminary conclusion, drawn at this stage on a precautionary basis, is that the scale of change is medium (as defined in Table 8.18) and the effect is ** Significant** on an ecological feature of County / metropolitan importance.

8.10.317 At the time of application the assessment of this likely significant effect will be further informed by increased quantities of baseline data, refined modelling outputs and a detailed understanding of the design of new river channels and
associated riparian habitat to be created as part of the green infrastructure proposals. At application stage the significance of the positive effects associated with the green infrastructure design will be considered as part of the assessment.

Assessment of biodiversity effects – common fish assemblage

**Detailed baseline**

8.10.318 A total of 18 fish species (including European eel, European bullhead and barbel, which are assessed separately) were identified through electrofishing and eDNA sampling on six rivers. The species identified (through all survey methods) were barbel, bleak, bream, carp, chub, dace, European eel, European bullhead, gudgeon, minnow, nine-spined stickleback, perch, pike, roach, ruffe, stone loach, tench and three-spined stickleback. Roach was the most common species present overall, with 3,638 individuals caught in total during electrofishing surveys.

8.10.319 Electrofishing data from the Colne Brook indicated a much higher population abundance and diversity in the upstream reaches of river compared to the downstream reaches. Upstream surveys identified minnow, gudgeon, perch, pike and tench, in addition to European eel and abundant European bullhead. The high abundance of rheophilic species (species associated with faster flowing water) at the upstream survey location is indicative of healthy stream conditions; moderate to strong flow, a high oxygen concentration, clean flushed substrate of sand and gravel, and shallow water. The species composition at the downstream electrofishing site didn’t include bullhead or eel, suggesting that habitat types were dominated by glide flow (smooth surface flows). However, 2018 eDNA surveys of the downstream site returned greater species diversity. Species identified included bream, carp, chub, dace, eel, bullhead, gudgeon, minnow, nine-spined stickleback, perch, pike, roach, stone loach, tench and three-spined stickleback.

8.10.320 Species composition in the Duke of Northumberland’s River was dominated by roach. Bullhead, chub, dace, gudgeon, minnow, perch, bleak, bream, tench, stone loach and pike were also recorded during electrofishing surveys, though in much smaller numbers. In addition to the species recorded by electrofishing, eDNA surveys also identified barbel, eel and nine-spined stickleback. The relatively high diversity of fish identified in this watercourse is indicative of high-quality habitat, particularly in the downstream reaches, despite the artificial nature of much of this channel. Gabions and overhanging vegetation likely provided cover to support large populations of fish, particularly roach. Additionally, much of the watercourse here is netted significantly reducing avian predation. Areas characterised by heavy siltation and low dissolved oxygen contrition were identified in the furthest upstream of the surveyed reaches (north-west of Heathrow).
8.10.321 As with the Duke of Northumberland’s River, the fish community of the Longford River was dominated by roach, which suggested a slow-flowing water course. Other species identified by electrofishing survey were bleak, gudgeon, bream, bullhead, chub, dace, perch, pike ruffe and stone loach. Overhanging vegetation and gabions provided plentiful refuge for fish and netting reduced avian predation significantly.

8.10.322 The fish population abundance estimate for Horton Brook was relatively low. The electrofishing survey returned perch, pike and roach. Chub, dace, eel, bullhead, tench, three-spined stickleback and nine-spined stickleback were also identified in a water sample taken for eDNA analysis in 2018.

8.10.323 Relatively high species richness but low fish density was recorded in the River Colne upstream of Harmondsworth Moor. Roach was the most abundant species, contributing 50% to overall abundance. Bleak, barbel, bream, carp, chub, dace, gudgeon, minnow, perch and pike were also identified between electrofishing surveys and eDNA surveys. The further downstream electrofishing surveys (conducted north of Stanwell Moor) identified moderate to high species richness. Bleak, barbel, bullhead, chub, minnow, perch, pike and roach were all recorded, but with relatively low abundance. eDNA surveys conducted in 2018 at the site identified the same species, with the addition of eel and three-spined stickleback. The information collected on this watercourse suggests the presence of potentially moderate value habitat with a diverse fish community, although fish density decreased downstream.

8.10.324 Conditions in the Wraysbury River were similar to those described above for the River Colne. Moderate to high species diversity was recorded within the river flowing through Harmondsworth Moor. Species recorded by electrofishing survey included; barbel, bullhead, chub, dace, gudgeon, minnow, perch, pike, roach, bleak, bream, eel and stone loach. The eDNA survey results were consistent with electrofishing results. Further downstream (west of Stanwell Moor), population abundance was lower, but species diversity remained relatively high (based on eDNA and electrofishing results). Minnow was the most abundant species, with bullhead, chub, dace, eel, gudgeon, perch, bream, stone loach, barbel, tench, roach and pike also recorded. The mix of species with a preference for both moderate to fast and slow water in the Wraysbury River suggests high habitat diversity and likely some nutrient enrichment.

Predicted effects and their significance

Land take and land cover change (resulting in habitat loss or degradation)

8.10.325 The DCO Project would result in the permanent loss of 15.2km of river channels and the creation of new ones in order to move water around and underneath the
North West Runway and associated infrastructure. This habitat loss and habitat change will result in direct loss of fish habitat in the Colne Brook, River Colne, Wraysbury River, Duke of Northumberland’s River and Longford River.

8.10.326 The loss or change of common fish habitat could result in a reduction in species diversity and/or abundance. For example, the loss of areas of moderate to fast flow over gravel substrate could shift the fish community composition towards species with a preference for deeper, slower flows and higher nutrient concentrations. The loss of shallower marginal areas, with woody debris and tree roots could limit population recruitment through the loss of nursery and rearing habitat for smaller fish species.

8.10.327 In order to ensure that the water is able to continue to flow across the landscape, and to provide new river channel and riparian habitat, a total of 11.3km of new channel would be created. The new channels will be designed to include a diversity of habitat suitable for fish species, including soft sediment, dense stands of vegetation, coarse substrate, undercut banks, exposed tree roots, pools and deeper water. Some of this new channel length (0.7km) would be within the CRC, designed to allow for habitat diversity through channel bed roughness, water depth variability, creation of flow refuges, and sufficient light to stimulate macrophyte growth.

8.10.328 There would also be further environmental measures implemented in the wider local river system to improve conditions. These measures could include modifications to weirs in both upstream and downstream reaches in the Colne and Crane catchments and measures to improve habitat conditions for fish species. Currently it is not possible to quantify the length of river outside of the areas of habitat creation that may be subject to improvement, however a list of opportunities is provided in Chapter 21.

8.10.329 To mitigate the loss of standing water bodies and associated suitable habitat for fish, the green infrastructure proposals will result in landscape-scale habitat creation and enhancements which will include standing freshwater habitat.

8.10.330 Despite considerable undertakings in the inclusion of standing water bodies in the green infrastructure proposals, inclusion of a diversity of habitats in the new river channels and the provision of river improvements within the Colne and Crane catchments, it must be taken into consideration that the design of these features is not yet finalised and therefore their suitability for fish cannot yet be guaranteed. However, there is confidence that after a maturation period the new water bodies will be usable by fish.

8.10.331 This effect is therefore considered temporary. However, a precautionary approach to the assessment of this effect has been taken as the design of the green
infrastructure and new river channels have not yet been finalised and the suitability of the water bodies for fish cannot be properly assessed. At present, it is considered that the loss or change of 15.2km of river corridor and five lakes, and habitat change in another lake containing suitable fish habitat, would result in a scale of change that is moderate and an effect that is **Significant** on this ecological feature of borough importance.

8.10.332 At the time of application, the assessment of this likely significant effect will be further informed as the green infrastructure design evolves, specifically with regard to the design of specific habitats for fish. Further fish surveys scheduled in 2019 will also provide increased information on the fish assemblage present within the Site.

**Fragmentation of habitats (reduction of connectivity)**

8.10.333 The DCO Project would result in the loss of existing river channels (15.2km) which may result in habitat fragmentation if this change reduces habitat connectivity. Habitat fragmentation is likely to have negative implications for fish communities in the Colne Brook, Wraysbury River, River Colne, the Longford River and Duke of Northumberland’s River. Habitat connectivity is important to life cycle dependent activities, particularly as different fish species operate on different spatial scales.

8.10.334 Most species in the common fish assemblage are more gregarious with relatively small home ranges. However, adult roach can migrate considerable distances in spring to locate suitable spawning habitat, usually associated with submerged and emergent vegetation. There is also evidence of limited dace migration before spawning periods. Effects are similar to those described for barbel, although it is understood that barbel would undertake longer migrations.

8.10.335 To ensure that connectivity is retained, a total of 11.3km of new river corridor would be created in open channels and in the CRC, with aim to retain habitat connectivity and diversity. New structures and impoundments would be fitted with appropriate fish passage measures. Successful design application should ensure habitat connectivity and retain fish migratory routes between habitats upstream and downstream of the DCO Project.

8.10.336 Habitat fragmentation is therefore considered temporary until the newly created channels have matured, and connectivity has been established between habitats upstream and downstream of the CRC. However, the design of channel features has not yet been finalised. As such, their suitability for addressing habitat fragmentation and facilitating fish movement cannot yet be guaranteed, and a precautionary approach has been adopted.
As the common fish assemblage are generally widespread, the scale of change is considered moderate, and the effect **Significant** on this ecological feature of borough importance.

At the time of application, the assessment of this likely significant effect will be further informed by fish surveys in 2019, to inform the baseline and establish the distribution and size of fish populations in the study area. Further information will also be available with regard to new channel design and off-site river improvements.

**Increased noise and vibration (resulting in disturbance / displacement)**

As discussed for European eel, European bullhead and barbel, there is a significant gap in the scientific knowledge concerning the effect of noise and vibration disturbance on most fish species. The absence of research cannot preclude this effect however, and in the absence of noise modelling results at this stage of the assessment, it must be considered possible that noise and vibration resulting from construction activities would result in fish displacement.

As a precautionary measure, it should be assumed that the effects of increased noise and vibration on common fish assemblages will result in a scale of change that is moderate and an effect that is **Significant** on this ecological feature of borough importance, but this may reduce once noise modelling results are available.

At the time of application, the assessment of this likely significant effect will be further informed by fish surveys to inform the baseline and establish the distribution and size of fish populations in the study area, as well as information on the sources and locations of noise sources.

**Changes in hydrology (groundwater levels, surface water run-off rates, river flows and lake levels; resulting in habitat change)**

The predicted changes to groundwater have the potential to result in changes to hydrology and hydrogeology in the study area. This may lead to changes in groundwater levels and groundwater-surface water interaction which could lead to changes to river habitats. Within the study area predicted local changes to the water table may affect a number of waterbodies including the River Colne, Wraysbury River, Colne Brook, the Longford River, the Duke of Northumberland’s River and the Horton Brook. Although flows are not expected to change upstream and downstream of the Site, local changes to river habitats may result due to alterations to water table. These changes could affect the suitability of river habitats for fish.
The results of the groundwater model are at this stage preliminary, and therefore this assessment will be reviewed at application stage to take account of further refinements to the groundwater model and evolution of design. However, the preliminary conclusion, drawn at this stage on a precautionary basis, is that the scale of change is medium (as defined in Table 8.18) and the effect is Significant on an ecological feature of borough importance.

At the time of application the assessment of this likely significant effect will be further informed by increased quantities of baseline data, refined modelling outputs and a detailed understanding of the design of new river channels and associated riparian habitat to be created as part of the green infrastructure proposals. At application stage the significance of the positive effects associated with the green infrastructure design will be considered as part of the assessment.

**Assessment of biodiversity effects – Brown long-eared bats**

**Detailed baseline**

Brown long-eared bats are predominantly a woodland species, preferring mature broadleaf woodland, but will also forage around scrub, tree lines and parkland. The study area supports very little mature woodland, with the main resource comprising Old Wood (adjacent to the south of the M4).

Desk study records identified one brown long-eared bat within the study area; the exact location was not provided by the record centre. The field surveys identified 12 brown long-eared roosts within the study area, details for which are provided in Table 8.23. Locations in relation to the Site are shown in Figure 8.11 to 8.15, Volume 2.

Access to complete internal inspections or emergence / re-entry surveys has not been possible for all roosts in order to establish roost size and importance. Where the exact status of a roost was uncertain or not yet confirmed by surveys, a precautionary approach has been taken for assessment and a higher level of importance assigned.

**Table 8.23: Summary of roost results for brown long-eared bat**

<table>
<thead>
<tr>
<th>Roost reference*</th>
<th>Roost type**</th>
<th>Approximate number of bats**</th>
<th>Roost importance***</th>
<th>Predicted effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>B553</td>
<td>Day</td>
<td>&gt;1</td>
<td>Local</td>
<td>Loss</td>
</tr>
<tr>
<td>B1146</td>
<td>Maternity</td>
<td>15</td>
<td>County</td>
<td>Retained</td>
</tr>
<tr>
<td>B131</td>
<td>Day</td>
<td>Droppings only</td>
<td>Local</td>
<td>Retained</td>
</tr>
<tr>
<td>B129</td>
<td>Maternity</td>
<td>11</td>
<td>County</td>
<td>Retained</td>
</tr>
</tbody>
</table>
### Roost reference** Roost type** Approximate number of bats** Roost importance*** Predicted effect

<table>
<thead>
<tr>
<th><strong>Roost reference</strong></th>
<th><strong>Roost type</strong></th>
<th><strong>Approximate number of bats</strong></th>
<th><strong>Roost importance</strong></th>
<th><strong>Predicted effect</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>B3259</td>
<td>Maternity</td>
<td>Not recorded</td>
<td>County</td>
<td>Retained</td>
</tr>
<tr>
<td>B3260</td>
<td>Maternity</td>
<td>45</td>
<td>County</td>
<td>Retained</td>
</tr>
<tr>
<td>Tree Area 1</td>
<td>Night</td>
<td>1</td>
<td>Local</td>
<td>Loss</td>
</tr>
<tr>
<td>Tree Area 2</td>
<td>Unknown (potential maternity)</td>
<td>Not recorded</td>
<td>County</td>
<td>Retained</td>
</tr>
<tr>
<td>B3265</td>
<td>Day</td>
<td>&gt;1</td>
<td>Local</td>
<td>Retained</td>
</tr>
<tr>
<td>B128</td>
<td>Day</td>
<td>&gt;1</td>
<td>Local</td>
<td>Retained</td>
</tr>
<tr>
<td>B1089</td>
<td>Night</td>
<td>1</td>
<td>Local</td>
<td>Loss</td>
</tr>
<tr>
<td>B562</td>
<td>Night</td>
<td>1</td>
<td>Local</td>
<td>Loss</td>
</tr>
</tbody>
</table>

*Where the roost was located using radio telemetry, access may have been restricted and the specific tree not confirmed. B = building roost, and T = tree roost

**Established via further survey where access was granted, and a licence signed by the landowner. Where the status of the roost could not be confirmed, a worst-case scenario has been adopted.

***See Appendix 8.3: Assigning importance to bats, Volume 3.

8.10.348 Active transect and passive detector surveys recorded very low activity for this species, however long-eared bats are often under recorded on detector surveys due to their very quiet echolocation calls. It is not possible to distinguish between brown and grey long-eared bats from calls alone, however due to the location of the DCO Project, the known distribution of both of these species, results from the desk study and survey work, all activity has been attributed to brown long-eared bats. Notably the greatest levels of activity were recorded adjacent to the lake in Thorney Country Park and along the northern edge of Harmondsworth village. Brown long-eared bats were not recorded utilising underpasses to cross beneath the M4 or M25.

8.10.349 Trapping surveys caught a total of 52 brown long-eared bats, which is considered a low capture rate and is not unsurprising given the low availability of suitable habitats. A total of 12 brown long-eared bats have been radio tagged and tracked, which alongside ringing data indicates there are three separate brown long-eared bat colonies present in the study area, with no movement of individuals recorded between these areas.

8.10.350 Colony 1 has the maternity roost in Harmondsworth Great Barn (B129, Figure 8.11) with the territory boundary formed by the M4 and M25. The survey results indicate that this population is likely to support around eight breeding females. There are no notable blocks of woodland in this area and suitable habitat is restricted to small groups of trees, tree lines and parkland/scrub habitat.
Colony 2 is located west of the M25 (and south of the M4) around Colnbrook with two maternity roosts confirmed; one in a building and one in a tree (building B1146 and Tree Area 2, Figure 8.11). This colony has limited suitable foraging habitat available. Foraging areas identified included Old Wood (woodland adjacent to the M4 by the Horton Brook) and the tree lined Colne Brook and Horton Brook; surveys indicate that this population is likely to be around eight to ten breeding females.

Colony 3 is located north of the M4 and west of the M25 around Richings Park, with roosts in Buildings B3259 and B3260 (Figure 8.11). Suitable habitat is provided for this colony across Richings Park golf course, providing greater foraging habitats for this colony in comparison to Colony 1 or 2. The exact population of breeding females has not been clearly identified, however it is considered to be approximately 25-30 breeding females.

Further advanced survey work will be undertaken in 2019, including radio-tracking and ringing of brown long-eared bats, particularly in habitat to the north of the M4 and east of the M25.

**Predicted effects and their significance**

*Land take and land cover change (resulting in habitat loss or degradation)*

The construction works would result in permanent and temporary loss or degradation of copses, scrub, hedgerows, treelines, rivers and ruderal and grassland habitats that offer known foraging and roosting habitat for brown long eared bats. The three colonies would each be affected differentially by the DCO Project and are described individually below. The majority of land take and land use change would take place during the first two phases of the DCO Project (2022 – 2027) and are assumed to represent permanent changes.

Colony 1: It is estimated the colony located around Harmondsworth will permanently lose approximately 63% of its core foraging area, with additional foraging areas lost temporarily during the construction phase. The construction of the North West Runway and associated airport infrastructure would result in the permanent loss of the southern half of Harmondsworth Moor which is an important foraging habitat for this colony. There would also be a permanent loss of three night roosts and one day roost (B562, Tree Area 1, B1089 and B553, Figures 8.11 to 8.15). The maternity roost in Harmondsworth Barn (B129, Figure 8.11) and an adjacent occasional roost (B131) would be retained, however approximately 90m to the north of these roosts development would take place including the construction of the diverted A4, diversion of rivers and the construction and use of construction compounds and borrow pits.
Colony 2: The majority of the core foraging and commuting habitat for this colony would be retained with approximately 9% of its core foraging habitat permanently lost. The roosts which have either been confirmed, or are considered likely to be, maternity roosts for this colony would be retained as part of proposals (Tree Area 2 and B1146). Based on radiotracking results, the Horton Brook and the section of the Colne Brook south of the A4 have been identified as important commuting and foraging habitat for this colony, and these would be retained as part of the DCO Project.

Colony 3: The colony north of the M4 (confirmed or likely maternity roosts in buildings B3259 and B3260) would have no permanent habitat loss with all roosts retained. There would be temporary loss of foraging habitat comprising arable field boundaries during the construction phase to support the creation of flood storage and to provide a borrow pit. This habitat is not located within the core foraging area of this colony as indicated by radiotracking, with extensive more optimal habitat located around Richings Park.

It is predicted that due to the extent of permanent foraging and commuting habitat loss within the home range of colony 1 that there would be insufficient habitat to support this colony during the construction phase. This colony has not been recorded crossing the M4 north or M25 west and as such is unlikely to disperse to suitable retained habitat within the wider landscape. Within the area currently used by this species there is not sufficient flexibility within the areas that would remain undisturbed by the DCO Project to create or improve enough habitat to ensure that the needs of colony 1 would be met. Whilst colony 1 is assessed as being lost, environmental measures would be put in place to try support this colony, including the provision of connectivity for brown long-eared across the A4 as they may disperse north through the M4 underpasses into the wider landscape or a proportion of the colony may survive on the limited retained undisturbed foraging habitats, however these measures cannot be relied upon for the purposes of assessment.

For colonies 2 and 3 the green infrastructure that would be provided would result in landscape scale habitat creation and enhancement within their existing home ranges. Although the design has not yet evolved to a point where a detailed description of created or improved habitat types can be provided the summary in Appendix 8.4 provides an understanding of the types of measures that will be taken to improve the current situation (for both foraging and roosting) for colonies 2 and 3, and indeed brown long-eared bats in the wider area.
8.10.360 The measures taken specifically for brown long-eared bats would include the provision of small buildings designed to maximise roosting opportunities, reinforcement planting to expand and enhance existing woodland and improvements in woodland management to improve suitability for foraging. In addition, improvements of identified movement corridors such as the Horton Brook will be used to increase habitat connectivity.

8.10.361 The removal of known foraging, commuting and roosting habitat and the habitat creation strategy relating to bats would be required to take place under licence from Natural England. A method statement would be followed to ensure phasing of work minimises effects on bat populations, work is undertaken in an appropriate manner, at the least sensitive times of year, and under direct ecological supervision where necessary.

8.10.362 Roosting provision, habitat creation and enhancement would be multiphase, areas of planting would be undertaken early in the programme to minimise the time taken for habitats to establish and reach suitability to support foraging and commuting, planting would then be ongoing throughout the construction programme, detail on the timing of measures will be provided at the time of application.

8.10.363 In summary, brown long-eared colonies 2 and 3 would lose a small area of foraging and commuting habitat within the construction phase. These losses would be temporary, and the proposed green infrastructure would result in an increase in suitable habitat over time; however, colony 1 is likely to be lost. The preliminary conclusions drawn at this stage of the DCO Project are that the scale of change is high and the likely effect Significant on an ecological feature of County / metropolitan importance.

8.10.364 At the time of application, the assessment of this likely significant effect will be further informed by a quantification of home-range size of the individual colonies, colony counts and the potential identification of further roost sites. Further, the design of newly created and improved roosting, foraging and commuting habitat will have been developed to inform the assessment.

Fragmentation of habitats (reduction of connectivity)

8.10.365 The fragmentation of habitats through the creation of unsuitable areas (such as construction sites or built infrastructure) can isolate bat roosts from other roosts in their home range and their foraging habitat, requiring bats to commute further to

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Permanent buildings designed to support roosting bats and other wildlife. There are many designs in use across the UK such as the Barn Owl Trusts Wildlife Tower - [https://www.barnowltrust.org.uk/barn-owl-nestbox/wildlife-tower/](https://www.barnowltrust.org.uk/barn-owl-nestbox/wildlife-tower/) (accessed January 2019).
foraging areas or utilise less optimal habitat. Small and isolated populations are more prone to local extinction events as the ability to move between patches as conditions change is compromised and populations may become more genetically isolated reducing the fitness of the population over time. Brown long-eared bats are particularly vulnerable to fragmentation with this species being averse to crossing open spaces.

8.10.366 The degree of habitat fragmentation associated with the DCO Project would change over time, due to the phasing of both the construction of infrastructure and the delivery of green infrastructure. Further, the green infrastructure would develop in complexity and condition as it matures, becoming more suitable for bat populations in general and specifically brown long-eared bats over time. As the construction takes place over an extended period and is concurrent with the completion and commissioning of certain pieces of built and green infrastructure, the habitat connectivity will fluctuate until the delivery of the DCO Project is complete. It is also necessary to understand that some routes of potential connectivity will be more valuable than others (for example river corridors, hedgerows and treelines provide good commuting habitats for brown long-eared bats).

8.10.367 At this stage of the DCO Project the construction programme is high level and considers large blocks of land only. However, the delivery of construction in these areas will be more subtle, with certain areas being actively worked upon at any given time whilst others remain undisturbed. In addition, design of boundary features around individual construction areas that may be key to maintaining connectivity in the short term have not yet been determined, and nor has the design of adjacent areas of green infrastructure. This means that at this stage of the DCO Project a quantified assessment of habitat connectivity for brown long-eared bats is not possible.

8.10.368 Connectivity will be designed to ensure maternity roosts are not isolated from important retained core foraging areas and colonies will be connected to the wider areas of green infrastructure proposed (including areas within the developed area) as the DCO Project progresses.

8.10.369 The environmental measure proposed for retained colonies of brown long-eared bats will enable the populations in the long term to expand in distribution and abundance through the provision of greater extents of suitable habitat types specifically aimed at improving opportunities for brown long-eared bats (for example the construction of suitable artificial roosting sites).

8.10.370 The removal of known foraging, commuting and roosting habitat and the habitat creation strategy relating to bats would take place under licence from Natural England. A method statement will be followed to ensure phasing of work
minimises effects on bat populations, work is undertaken in an appropriate manner, at the least sensitive times of year, and under direct ecological supervision where necessary.

8.10.371 Colony 1 is assessed as being lost due to land take (paragraph 8.10.355), environmental measures would however be put in place to try to support this colony, including the provision of connectivity for brown long-eared across the re-routed A4 as they may disperse north underneath the M4 at the crossings of the River Colne and the Wraysbury River. Colony 2 located west of the M25 with roosts in Colnbrook and Old Wood would be a key focus for the consideration of habitat connectivity with the Horton Brook and lower segment of the Colne brook being important features for commuting, this colony also crosses the existing A4 so alterations to this road will design in connectivity for brown long-eared bats. Construction works which may cause fragmentation within the home range of colony 3 are limited and temporary during construction, and are of a scale that would be considered very low to negligible.

8.10.372 The effects of fragmentation would occur during the construction phase only and would not threaten the viability of the retained colonies of brown long-eared bats. The preliminary conclusions drawn at this stage of the DCO Project are that the scale of change predicted is low and the likely effect is Not Significant on an ecological feature of County / metropolitan importance.

8.10.373 At the time of application the assessment of this likely significant effect will be further informed by a quantification of habitat connectivity based on the green infrastructure proposals, as well as further information on the distribution of bat populations based on field survey undertaken in 2019.

**Increased noise and vibration (resulting in disturbance / displacement)**

8.10.374 Noise and vibration generated during the construction and operational phases of the DCO Project has the potential to reduce the suitability of commuting and foraging habitat, cause roost disturbance and abandonment and overall reduction in survival and reproductive rates. Brown long-eared bats may be particularly vulnerable to these effects due to them adopting passive listening as part of their foraging strategy. Effects are most likely to occur where roosts and important foraging and commuting habitats are within 60m-80m of construction activities and new operational areas.

8.10.375 During operation brown long-eared colony 1 located in Harmondsworth would be subject to a permanent reduction of foraging habitat comprising up to 60m either side of the new A4 route due to the additional traffic noise through current foraging areas. As detailed in (paragraph 8.10.355) it is predicted that due to the extent of permanent foraging and commuting habitat loss due to land take this colony is
assessed as being lost, therefore the effect of noise and vibration on this colony is not considered further. Colonies 2 and 3 are situated at sufficient distances (outside the ZOI of 60m) to avoid the main effects of noise and vibration. The preliminary conclusions drawn at this stage of the DCO Project are that the scale of change is very low to negligible and the effect **Not Significant** on an ecological feature of County / metropolitan importance.

8.10.376 At the time of application, the assessment of the effect of noise and vibration will be further informed by a detailed noise assessment for the DCO Project.

*Increased light levels (resulting in disturbance / displacement)*

8.10.377 Increased light levels can cause a range of negative effects on bat populations including roost abandonment and delayed emergence, a reduction in the quality or avoidance of foraging and commuting habitat leading to habitat fragmentation and a reduction of fitness to bat populations. A number of activities during construction and operational phases of the DCO Project may increase lighting levels including those associated with security, any night time construction activities, illumination of operational areas and vehicle headlights. Brown long-eared bats are considered to be a light-sensitive species and are particularly susceptible to the negative effects of such disturbance.

8.10.378 A sensitive lighting strategy would be designed to ensure construction and operational lighting minimises negative effects on bats, this would include measures such as minimum essential lighting only, using directional lighting aimed only where necessary, preventing light spill onto key retained foraging or commuting habitats or known/potential bat roosts and where reasonably practicable, the selection of least detrimental lighting types such as narrow spectrum light sources, that emit minimal ultra-violet light and avoid white and blue wavelengths of the light spectrum.

8.10.379 In the absence of a detailed lighting assessment, a precautionary approach to the assessment is required. The scale of change is predicted to be medium and the effect **Significant** on this ecological feature of County / metropolitan importance.

8.10.380 A detailed lighting assessment for the DCO Project alongside a detailed assessment of effects on the bat populations within the study area will be undertaken and presented at the time of application and this will include specific sampling points undertaken at key roosting, foraging and commuting habitats.

*Changes in hydrology (groundwater levels, surface water run-off rates, river flows and lake levels; resulting in habitat change)*

8.10.381 Changes in GWDTE due to an alteration of the water table level could result in the suitability of some habitats that remain in-situ within or outside of the Site reducing...
for brown long-eared bat. For this species the greatest potential effect may be associated with the degradation of woodland within the W6 NVC category (see paragraphs 8.10.128 to 8.10.130). As these changes will add to the land take and land cover change described in paragraphs 8.10.355 to 8.10.365 the preliminary conclusions drawn at this stage of the DCO Project are that the scale of change is high and the likely effect Significant on an ecological feature of County / metropolitan importance.

8.10.382 At the time of application, the assessment of this likely significant effect will be further informed by a quantification of home-range size of the individual colonies, colony counts, the potential identification of further roost sites and refined groundwater modelling outputs. Further, the design of newly created and improved roosting, foraging and commuting habitat will have been developed to inform the assessment.

Wildlife collision rates with aircraft or road traffic (resulting in death or injury of individual animals)

8.10.383 Increased vehicle movements, alterations to existing roads and the creation of new roads (both temporary and permanent) may increase collision rates of brown long-eared bats and road vehicles. Bats have low reproductive rates and high mobility, and are therefore more susceptible to population decline and ultimately local extinction by the additional mortality caused by vehicle collisions.

8.10.384 Brown long-eared bats are a relatively slow and low-flying species and are, as such, at risk of collision with road traffic. It is not considered that they are at risk of collision with aircraft as they are flying at lower altitudes than planes landing or taking off from Heathrow when in habitats where they are not displaced by light (in other words aircraft are only low enough to strike brown long-eared bats when over the airfield, a place that is inhospitable to this species due to high light levels).

8.10.385 Colony 1 is most at risk from increased road vehicle collisions due to the proposed rerouting of the A4 through Harmondsworth Moor, this colony is however already assessed as being lost due to land take (paragraph 8.10.355). Environmental measures would however be put in place to try to support this colony, including the provision of connectivity for brown long-eared across the A4. It is considered the risk of vehicle collisions within the home range of colony 3 is low and limited to construction traffic only.

8.10.386 Colony 2, located west of the M25 with roosts in Colnbrook and Old Wood, is the colony to be retained that would be most at risk, with alterations to the A4 within their home range potentially resulting in an increase in vehicle collisions. Bats from this colony do currently cross the A4 and where proposals result in an increased collision risk along roads, connective measures will be provided such as
underpasses, tree planting providing ‘hop-overs’ or ‘green bridges’ which would provide crossing points. Major river crossings under roads (such as the Colne Brook under the A4), will be suitable to support bat commuting. Speed limits would also be specified in a draft CoCP to be enforced throughout the construction phase.

8.10.387 It is considered the risk of vehicle collisions within the home range of colony 3 is low and limited to construction traffic only, construction works in this area are would predominately be during the day when bats are inactive.

8.10.388 Based on available information it is predicted increased vehicle collision would not threaten the favourable conservation status of the retained colonies of brown long-eared bats. The preliminary conclusions drawn at this stage of the DCO Project are that the scale of change predicted is low and the effect is Not Significant on this ecological feature of County / metropolitan importance.

8.10.389 At the time of application, the assessment of the effect of wildlife collisions will be further informed by a detailed traffic assessment for the DCO Project.

Assessment of biodiversity effects – Daubenton’s bats

Detailed baseline

8.10.390 Daubenton’s bats are predominantly associated with foraging around water bodies such as lakes, ponds, rivers and canals where they feed on aquatic invertebrates. The study area supports a large number of lakes and rivers, which provide suitable habitat for Daubenton’s bat. Desk study records from 2018 did not identify any roosts within the study area.

8.10.391 Field survey work has identified 26 Daubenton’s roosts, details for which are provided below in Table 8.24. Locations in relation to the Site are shown in Figures 8.11 to 8.15.

8.10.392 Access to complete internal inspections or emergence / re-entry surveys has not been possible for all roosts in order to establish roost size and importance. Where the exact status of a roost was uncertain or not yet confirmed by surveys, a precautionary approach has been taken for assessment and a higher level of importance assigned.

Table 8.24: Summary of roost results for Daubenton’s bat

<table>
<thead>
<tr>
<th>Roost reference*</th>
<th>Roost type**</th>
<th>Approximate number of bats**</th>
<th>Roost importance***</th>
<th>Predicted effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>T4005</td>
<td>Unknown</td>
<td>Not recorded</td>
<td>Regional</td>
<td>Retained</td>
</tr>
<tr>
<td>Roost reference*</td>
<td>Roost type**</td>
<td>Approximate number of bats**</td>
<td>Roost importance***</td>
<td>Predicted effect</td>
</tr>
<tr>
<td>------------------</td>
<td>--------------</td>
<td>------------------------------</td>
<td>--------------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>T4000</td>
<td>Maternity</td>
<td>11</td>
<td>Regional</td>
<td>Retained</td>
</tr>
<tr>
<td>T4004</td>
<td>Day</td>
<td>&gt;1</td>
<td>County</td>
<td>Retained</td>
</tr>
<tr>
<td>T4002</td>
<td>Unknown</td>
<td>Not recorded</td>
<td>Regional</td>
<td>Retained</td>
</tr>
<tr>
<td>U8</td>
<td>Maternity</td>
<td>120</td>
<td>Regional</td>
<td>Disturbance</td>
</tr>
<tr>
<td>Tree Area 5</td>
<td>Night</td>
<td>1</td>
<td>County</td>
<td>Loss</td>
</tr>
<tr>
<td>T4003</td>
<td>Maternity</td>
<td>56</td>
<td>Regional</td>
<td>Retained</td>
</tr>
<tr>
<td>U1</td>
<td>Night</td>
<td>1</td>
<td>County</td>
<td>Loss</td>
</tr>
<tr>
<td>T2519</td>
<td>Maternity</td>
<td>66</td>
<td>Regional</td>
<td>Retained</td>
</tr>
<tr>
<td>Tree Area 7</td>
<td>Night</td>
<td>1</td>
<td>County</td>
<td>Loss</td>
</tr>
<tr>
<td>U35</td>
<td>Maternity</td>
<td>4</td>
<td>Regional</td>
<td>Retained</td>
</tr>
<tr>
<td>Tree Area 6</td>
<td>Night</td>
<td>1</td>
<td>County</td>
<td>Loss</td>
</tr>
<tr>
<td>T2450</td>
<td>Maternity</td>
<td>10</td>
<td>Regional</td>
<td>Retained</td>
</tr>
<tr>
<td>T2867</td>
<td>Day</td>
<td>1</td>
<td>County</td>
<td>Retained</td>
</tr>
<tr>
<td>Tree Area 8</td>
<td>Night</td>
<td>1</td>
<td>County</td>
<td>Loss</td>
</tr>
<tr>
<td>T2629</td>
<td>Maternity</td>
<td>10</td>
<td>Regional</td>
<td>Retained</td>
</tr>
<tr>
<td>T0078</td>
<td>Unknown (potential maternity)</td>
<td>&gt;1</td>
<td>County</td>
<td>Retained</td>
</tr>
<tr>
<td>T2422</td>
<td>Unknown (potential maternity)</td>
<td>&gt;1</td>
<td>County</td>
<td>Retained</td>
</tr>
<tr>
<td>T4010</td>
<td>Unknown (potential maternity)</td>
<td>Not recorded</td>
<td>Regional</td>
<td>Retained</td>
</tr>
<tr>
<td>T4011</td>
<td>Unknown (potential maternity)</td>
<td>Not recorded</td>
<td>Regional</td>
<td>Retained</td>
</tr>
<tr>
<td>T4012</td>
<td>Unknown (potential maternity)</td>
<td>Not recorded</td>
<td>Regional</td>
<td>Retained</td>
</tr>
<tr>
<td>T4015</td>
<td>Maternity</td>
<td>&gt;2</td>
<td>Regional</td>
<td>Retained</td>
</tr>
<tr>
<td>T4016</td>
<td>Night</td>
<td>1</td>
<td>County</td>
<td>Retained</td>
</tr>
<tr>
<td>T4006</td>
<td>Night</td>
<td>1</td>
<td>County</td>
<td>Loss</td>
</tr>
<tr>
<td>Tree Area 12</td>
<td>Night</td>
<td>1</td>
<td>County</td>
<td>Loss</td>
</tr>
</tbody>
</table>

*Where the roost was located using radio telemetry, access may have been restricted and the specific tree not confirmed. B = building roost, and T = tree roost

**Established via further survey where access was granted, and a licence signed by the landowner. Where the status of the roost could not be confirmed, a worst-case scenario has been adopted.

***See Appendix 8.3.
The majority of Myotis species recorded during active transect and passive detector surveys could not be identified to species level. It is considered likely the majority of Myotis activity recorded is from Daubenton's bats due to widespread availability of suitable aquatic habitat and the results of the trapping and radiotracking for this species. Greatest activity levels for Myotis was recorded around Old Slade Lake, Saxon Lake, Orlitts Lake and Colnbrook West Lakes.

Daubenton's were the second most common species caught during trapping surveys (after soprano pipistrelle bats) with a total of 500 bats caught across all surveys. The high population of Daubenton's bats corresponds with the availability of suitable habitats for this species, with a number of large waterbodies alongside rivers and ditches throughout the study area and the wider landscape.

Radiotracking and ringing surveys clearly show that the Daubenton's population recorded within the study area is all part of one colony. All areas that bats have been trapped, and ringed/tagged have all been connected to each other, demonstrating that this is one widespread population moving between a large numbers of roosts. Radiotracking indicates that bats are also connected to further foraging areas in the wider landscape with bats repeatedly commuting out of range to lake systems to the north, and the far south-west.

The ringing and re-trapping results indicate a local population of around 150 adult females, however, if this colony is also linked to populations present using water bodies notably further north and south-west, the total colony may be much larger.

An extensive level of survey effort has been conducted for Daubenton's bat which is considered to provide a representative baseline to inform an assessment of the likely significant effects on these species. Notwithstanding, further advanced survey work will be undertaken in 2019.

**Predicted effects and their significance**

**Land take and land cover change (resulting in habitat loss or degradation)**

The construction works would result in the permanent and temporary loss or degradation of waterbodies, copses, scrub, hedgerows, treelines, rivers and ruderal and grassland habitats that are known to offer foraging and roosting habitat for Daubenton's bats. It is estimated that approximately 22% of existing habitat within the home range of the colony would be permanently lost including the network of lakes comprising Colnbrook West, Orlitts and Old Slade Lake. The majority of land-take and land-use change would take place during the first two

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78 Myotis species comprise bat species within the genus Myotis, these are difficult to separate based on call parameters alone and include Daubenton’s bat, Natterer’s, Brandt’s and whiskered bat.
phases of the DCO Project (2022 – 2027) and are assumed to represent permanent changes.

8.10.399 Eight Daubenton’s night roosts would be lost (Tree Area 5, Tree Area 6, Tree Area 7 (two night roosts), Tree Area 8, Tree Area 12, T4006 and U1) with the largest maternity roost recorded during surveys, in the underpass of the M4/M25 junction supporting approximately 120 adult bats (U8), being subject to disturbance from works. In the absence of environmental measures, it is predicted there would be a long term negative effect due to the permanent and or long-term loss of foraging habitat leading to the favourable conservation status of this colony being compromised.

8.10.400 The green infrastructure that would be provided would result in landscape scale habitat creation and enhancement within the existing home range of the Daubenton’s colony. Although the design has not yet evolved to a point where a detailed description of created or improved habitat types can be provided, the habitat descriptions (see Appendix 8.4) provide an understanding of the types of measures that would be taken to improve the current situation (for both foraging and roosting).

8.10.401 The measures taken specifically for Daubenton’s bats would include the provision of a similar or greater area of waterbodies to mitigate for the loss of important aquatic habitats, these would be widespread across green infrastructure areas. However, key locations would include the network of arable fields north of Underpass U8 (Figures 8.11 to 8.15), directly north of Old Slade Lake. Small buildings designed to maximise roosting opportunities, would be provided and reinforcement planting and improvements in woodland management would expand and enhance existing woodland to improve suitability for foraging, improvements would also be made to identified movement corridors such as the Horton Brook to increase habitat connectivity.

8.10.402 The removal of known foraging, commuting and roosting habitat and the habitat creation strategy relating to bats would be required to take place under licence from Natural England. A method statement will be followed to ensure phasing of work minimises effects on bat populations, work is undertaken in an appropriate manner, at the least sensitive times of year, and under direct ecological supervision where necessary.

8.10.403 Roosting provision, habitat creation and enhancement would be multiphase, areas of planting would be undertaken early in the programme to minimise the time taken for habitats to establish and reach suitability to support foraging and commuting. Planting would then be ongoing throughout the construction programme, detail on the timing of measures will be provided at the time of application.
The Daubenton’s population is comprised of one colony with a very large territory with commuting, foraging and roosting recorded widely across the Site and the surrounding landscape. As part of the DCO Project a large area of foraging and commuting habitat would be retained within their territory, which is considered sufficient to maintain this population. This would be supplemented by extensive areas of newly created or improved habitat that would provide the possibility of population expansion as these areas become established. However, initial habitat losses would be likely to cause a reduction in the distribution and abundance of the Daubenton’s population in specific locations, although these losses would be temporary as green infrastructure is delivered.

It is considered that the negative effects of land take and land cover change would be temporary and would not threaten the favourable conservation status of the retained Daubenton’s colony. The preliminary conclusions drawn at this stage of the DCO Project are that the scale of the change predicted is low and the likely effect is Not Significant on an ecological feature of regional importance.

At the time of application, the assessment of this likely significant effect will be further informed by a quantification of home-range size of the individual colonies, and the potential identification of further roost sites. In addition, the design of newly created and improved roosting, foraging and commuting habitat will have been developed to inform the assessment.

**Fragmentation of habitats (reduction of connectivity)**

Paragraph 8.10.366 outlines the range of the negative effects that fragmentation can cause to bat populations and details the approach to phasing and maintaining connectivity throughout the landscape for all bat populations recorded within the Site.

The Daubenton’s population is widespread and comprises one colony with roosts recorded in all four sectors created by junction 15 of the M25. Movement across the area is facilitated by underpasses on the M4 and M25. Radiotracking indicates that north/south movement through the landscape and the Site is focused to the west of the M25, along the Colne Brook and Horton Brook.

The proposed diversion of the Colne Brook would cause a temporary reduction in north/south connectivity through the Site during the construction phase. This is because the newly created channel would not support well established habitats prior to the loss of the existing corridor. Environmental measures would include the retention and improvement of the existing M4 and M25 underpasses to support movement from the areas affected by the DCO Project to retained and enhanced habitats north of the M4. The sections of new river diversion (including the Colne Brook) would comprise habitats suitable to support commuting bats, which
alongside retention and enhancement of the existing Horton Brook river channel will maintain the existing north/south connectivity through the Site.

Any reduction in connectivity is considered to be temporary during the construction phase only (particularly associated with the Colne Brook diversion). During this period the colony would have a large area of retained and enhanced habitat to the north of the M4 within their current home range, the temporary reduction in connectivity is not considered to alter the favourable conservation status of the population. The preliminary conclusions drawn at this stage of the DCO Project are that the scale of change predicted is low and the likely effect is **Not Significant** on an ecological feature of regional importance.

At the time of application, the assessment of this likely significant effect will be further informed by a quantification of habitat connectivity based on the green infrastructure proposals.

**Increased noise and vibration (resulting in disturbance / displacement)**

Noise and vibration generated during the construction and operational phases has the potential to reduce the suitability of commuting and foraging habitat, cause roost disturbance and abandonment (displacement) and overall reduction in survival and reproductive rates. Effects are most likely to occur where roosts and important foraging and commuting habitats are within ~60m-80m of construction activities and new operational areas.

In the absence of detailed construction design, it is estimated that one roost within the study area is within sufficient the ZOI where a likely significant effect from noise or vibration disturbance may occur. This comprises the maternity roost in underpass 8 (U8 – located under the M4 as the Colne Brook crosses the motorway), supporting approximately 120 bats. This roost is close to the proposed Colne Brook diversion works and the infilling of Old Slade Lake. These works would be temporary during the construction phase only.

During construction, measures would be taken to minimise noise and vibration in this area. However, as details of construction works are not yet known it is not currently possible to determine what measures would be implemented. However, the use of physical measures (such as noise barriers) or temporal measures (in other words timing of works to avoid sensitive seasonal periods) should enable effective environmental measures to be implemented.

The Daubenton’s population comprises one colony within a large territory with a number of roosts recorded widely across the Site and the surrounding landscape. It is considered the effects of noise and vibration would be temporary and would occur during the construction phase only and would not threaten the favourable conservation status of the retained colony. The preliminary conclusions drawn at
this stage of the DCO Project are that the scale of change predicted is low and the likely effect is **Not Significant** on an ecological feature of regional importance.

8.10.416 A detailed noise and vibration assessment for the DCO Project will be undertaken and presented at time of application alongside a detailed assessment of effects on the bat populations on site.

**Increased light intensity (resulting in disturbance / displacement)**

8.10.417 As detailed in paragraph 8.10.378 increased light levels can cause a range of negative effects on bat populations and may be caused by a number of activities during construction and operation. Daubenton’s bats are considered a light-sensitive species, being particularly susceptible to the negative effects of light disturbance.

8.10.418 A sensitive lighting strategy will be designed to ensure construction and operational lighting minimises negative effects on bats, as summarised in paragraph 8.10.379.

8.10.419 In the absence of a detailed lighting assessment, a precautionary approach to the assessment is required. The scale of change is predicted to be medium and the effect **Significant** on this ecological feature of regional importance.

8.10.420 A detailed lighting assessment for the DCO Project alongside a detailed assessment of effects on the bat populations within the study area will be undertaken and presented at the time of application and this will include specific sampling points undertaken at key roosting, foraging and commuting habitats.

**Changes in hydrology (groundwater levels, surface water run-off rates, river flows and lake levels; resulting in habitat change)**

8.10.421 Changes in GWDTE due to an alteration of the water table level could result in the suitability of some habitats that remain in-situ within or outside of the Site reducing for Daubenton’s bat. For this species the greatest potential effect may be associated with the potential degradation of standing water, river and swamp habitats. As these changes will add only marginally to the land take and land cover change described in paragraphs 8.10.399 to 8.10.407 the preliminary conclusions drawn at this stage of the DCO Project are that the scale of change is is low and the likely effect is **Not Significant** on an ecological feature of regional importance.

8.10.422 At the time of application, the assessment of this likely significant effect will be further informed by a quantification of home-range size of the individual colonies, colony counts, the potential identification of further roost sites and refined groundwater modelling outputs. Further, the design of newly created and improved
roosting, foraging and commuting habitat will have been developed to inform the assessment.

Wildlife collision rates with aircraft or road traffic (resulting in death or injury of individual animals)

Paragraph 8.10.384 outlines the causes and negative effects of increased vehicle collisions on bat populations alongside the general environmental measures which would be incorporated to mitigate vehicle collision risk for all bat populations recorded within the Site. Daubenton’s bats flying strategy makes them at risk of collision with road traffic but not air traffic as detailed in Section 8.10.382 (same as above).

Daubenton’s bats are using the river network across the Site for commuting across their home range. Where new roads such as the proposed A4 re-routing creates new river crossings, the design will facilitate commuting by bats under the road, incorporating measures such as suitable height and lighting.

Based on available information the risk to Daubenton’s bats from vehicle collision is considered low and is not considered to alter the favourable conservation status of the population. The preliminary conclusions drawn at this stage of the DCO Project are that the scale of change predicted is very low and the likely effect is Not Significant on an ecological feature of regional importance.

At the time of application, the assessment of the effect of wildlife collisions will be further informed by a detailed traffic assessment for the DCO Project.

Assessment of biodiversity effects – Soprano pipistrell

Detailed baseline

Soprano pipistrell bats are associated with aquatic and riparian habitats, along with semi-natural woodland and tree lines. The study area supports a number of lakes and rivers, which provide suitable habitat for soprano pipistrelle.

Desk study records from 2018 identified 12 soprano pipistrell bat roosts within the study area, one of these is located within the Site within Harmondsworth village.

The field surveys identified 30 soprano pipistrell roosts, details for which are provided below in Table 8.25. Locations in relation to the Site are shown in Figures 8.11, 8.13, 8.14 and Figure 8.15. Additionally, eight Pipistrellus spp. roosts which could not be identified between soprano and common pipistrelle were recorded, these are presented in Table 8.26.

Access to complete internal inspections or emergence / re-entry surveys has not been possible for all roosts in order to establish roost size and importance. Where
the exact status of a roost was uncertain or not yet confirmed by surveys, a precautionary approach has been taken for assessment and a higher level of importance assigned.

Table 8.25: Summary of roost results for soprano pipistrelle

<table>
<thead>
<tr>
<th>Roost reference*</th>
<th>Roost type**</th>
<th>Approximate number of bats**</th>
<th>Roost importance***</th>
<th>Predicted effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>B696</td>
<td>Maternity</td>
<td>Not recorded</td>
<td>County</td>
<td>Loss</td>
</tr>
<tr>
<td>T4004</td>
<td>Day</td>
<td>&gt;1</td>
<td>Local</td>
<td>Retained</td>
</tr>
<tr>
<td>B715</td>
<td>Maternity</td>
<td>12</td>
<td>County</td>
<td>Loss</td>
</tr>
<tr>
<td>U8</td>
<td>Day</td>
<td>4</td>
<td>Local</td>
<td>Disturbed</td>
</tr>
<tr>
<td>B129</td>
<td>Day</td>
<td>1</td>
<td>Local</td>
<td>Retained</td>
</tr>
<tr>
<td>B3263</td>
<td>Maternity</td>
<td>Not recorded</td>
<td>County</td>
<td>Retained</td>
</tr>
<tr>
<td>B3264</td>
<td>Maternity</td>
<td>130</td>
<td>County</td>
<td>Retained</td>
</tr>
<tr>
<td>Tree Area 6</td>
<td>Night</td>
<td>Not recorded</td>
<td>Local</td>
<td>Retained</td>
</tr>
<tr>
<td>B131</td>
<td>Maternity</td>
<td>10</td>
<td>County</td>
<td>Retained</td>
</tr>
<tr>
<td>B695</td>
<td>Maternity</td>
<td>25-30</td>
<td>County</td>
<td>Loss</td>
</tr>
<tr>
<td>U7</td>
<td>Day</td>
<td>2</td>
<td>Local</td>
<td>Retained</td>
</tr>
<tr>
<td>B85</td>
<td>Day</td>
<td>1</td>
<td>Local</td>
<td>Loss</td>
</tr>
<tr>
<td>B252</td>
<td>Day</td>
<td>1</td>
<td>Local</td>
<td>Loss</td>
</tr>
<tr>
<td>B577</td>
<td>Night</td>
<td>2</td>
<td>Local</td>
<td>Loss</td>
</tr>
<tr>
<td>B664</td>
<td>Unknown</td>
<td>Droppings only</td>
<td>Local</td>
<td>Loss</td>
</tr>
<tr>
<td>B665</td>
<td>Unknown</td>
<td>Droppings only</td>
<td>Local</td>
<td>Loss</td>
</tr>
<tr>
<td>B666</td>
<td>Unknown</td>
<td>Droppings only</td>
<td>Local</td>
<td>Loss</td>
</tr>
<tr>
<td>B679</td>
<td>Day</td>
<td>1</td>
<td>Local</td>
<td>Loss</td>
</tr>
<tr>
<td>B1715</td>
<td>Day</td>
<td>1</td>
<td>Local</td>
<td>Retained</td>
</tr>
<tr>
<td>T2189</td>
<td>Unknown</td>
<td>Droppings only</td>
<td>Local</td>
<td>Loss</td>
</tr>
<tr>
<td>B3267</td>
<td>Unknown (potential maternity)</td>
<td>&gt;1</td>
<td>County</td>
<td>Retained</td>
</tr>
<tr>
<td>Tree Area 9</td>
<td>Night</td>
<td>1</td>
<td>Local</td>
<td>Loss</td>
</tr>
<tr>
<td>B3268</td>
<td>Night</td>
<td>1</td>
<td>Local</td>
<td>Retained</td>
</tr>
<tr>
<td>B3269</td>
<td>Unknown (potential maternity)</td>
<td>&gt;1</td>
<td>Local</td>
<td>Retained</td>
</tr>
<tr>
<td>B3270</td>
<td>Maternity</td>
<td>Not recorded</td>
<td>County</td>
<td>Retained</td>
</tr>
<tr>
<td>B3271</td>
<td>Unknown (potential maternity)</td>
<td>&gt;1</td>
<td>County</td>
<td>Retained</td>
</tr>
</tbody>
</table>
Across the study area, running water courses and their associated bankside vegetation, and open water habitats provide important foraging and commuting habitat with treelines, woodland, hedgerows and scrub also used by soprano pipistrelle. The open water bodies Old Slade, Orlitts and Colnbrook West Lakes alongside lakes in Poyle and Mayfield’s lake had relatively higher levels of recorded activity. Soprano pipistrelle were the most frequently recorded species during activity transects, passive detector and trapping surveys. This is likely due to their adaptive nature, their close association to riparian habitats and their high tolerance to artificially-lit, urban areas which occur in abundance across the study area.
8.10.432 Maternity roosts have been confirmed present within all four sectors of the M4/M25 junction. Over double the number of adult females and juveniles to males have been caught, demonstrating that a large breeding population is present within the study area with a broad spread of available roosts.

8.10.433 Radiotracking has shown that soprano pipistrelle are commonly passing through the underpasses under the M4 and M25, to areas in close proximity to other soprano pipistrelle roosts, and areas used by other radio tagged soprano pipistrelle bats. Survey results to date do not allow firm conclusions to be made with regards to likely colonies and status and size of roosts, however the recorded overlapping of territories, foraging close to other maternity roosts and shared use of foraging resources indicates that one larger colony may be present which is fragmented into smaller maternity roosts, or satellite roosts.

8.10.434 Further advanced survey work will be undertaken in 2019, including additional radiotracking of soprano pipistrelles to further understand the distribution of colonies across the study area and seeking to gain colony counts and establish status for current and additional roosts.

**Predicted effects and their significance**

*Land take and land cover change (resulting in habitat loss or degradation)*

8.10.435 The construction works would result in the permanent and temporary loss or degradation of waterbodies, copses, scrub, hedgerows, treelines, rivers and ruderal and grassland habitats that offer known foraging and roosting habitat for soprano pipistrelle. This includes the network of lakes comprising Colnbrook West Lake, Colnbrook North Lake, Orlitts Lake and Old Slade Lake. The majority of the land-take and land-cover change would occur during the first phase of the DCO Project (Phases 1 and 2).

8.10.436 As detailed in **Table 8.25** and **Table 8.26**, 13 soprano pipistrelle roosts and three Pipistrellus spp. roosts would be lost. The status of all roosts has not yet been established, however based on current information it is considered this is likely to comprise three maternity roosts, three night roosts, eight day roosts, one hibernation roost and one roost where status can either not be determined based on survey results.

8.10.437 In the absence of environmental measures, it is predicted there would be a long-term negative effect due to the permanent and or long-term loss of roosting and foraging habitat, leading to the favourable conservation status of this colony being compromised.

8.10.438 The general environmental measures, phasing and licensing approach as detailed in paragraphs **8.10.402 – 8.10.404** for Daubenton’s bats would also form the
approach for soprano pipistrelle. Both species cover a similar distribution area, and are associated with similar aquatic and riparian habitat types across the Site.

8.10.439 Results indicate the soprano pipistrelle population may be comprised of one colony with a large territory with commuting, foraging and roosting recorded widely across the Site and the surrounding landscape. As part of proposals a large area of foraging and commuting habitat and roosting sites would be retained within their territory, which is considered sufficient to maintain this population. This would be supplemented by extensive areas of newly created or improved habitat that would provide the possibility of population expansion as these areas become established. However, initial habitat losses would be likely to cause a reduction in the distribution and abundance of the soprano pipistrelle population in specific locations, although these losses would be temporary as green infrastructure is delivered.

8.10.440 It is considered that the negative effects of land take and land cover change would be temporary and would not threaten the favourable conservation status of the retained soprano pipistrelle colony. The preliminary conclusions drawn at this stage of the DCO Project are that the scale of the negative change predicted is low and the likely effect is **Not Significant** on an ecological feature of regional importance.

8.10.441 At the time of application, the assessment of this likely significant effect will be further informed by an estimation of home-range size for the soprano pipistrelle colonies, colony counts and the potential identification of further roost sites. In addition, the design of newly created and improved roosting, foraging and commuting habitat will have been developed to inform the assessment.

**Fragmentation of habitats (reduction of connectivity)**

8.10.442 **Paragraph 8.10.366** outlines the range of the negative effects on fragmentation can cause to bat populations and details the approach to phasing and maintaining connectivity throughout the landscape for all bat populations recorded within the Site.

8.10.443 The soprano pipistrelle population is widespread, and results indicate is comprised of one colony with roosts recorded on all four sectors of the M25/M4 junction, using the motorway underpasses for movement. Radiotracking indicates that north/south movement through the landscape and the Site is focussed to the west of the M25, along the Colne Brook.

8.10.444 Environmental measures would include the retention and improvement of the existing M4 and M25 underpasses to support movement from the areas affected by the DCO Project to retained and enhanced habitats north and south of the M4. The sections of new river diversion (including the Colne Brook) would comprise
habitats suitable to support commuting bats, which alongside retention and enhancement of the existing Horton Brook river channel would maintain the existing north/south connectivity through the Site.

8.10.445 The Colne Brook diversion would cause a temporary reduction in north/south connectivity through the Site during the construction phase (in other words prior to the diverted Colne Brook corridor providing established habitats). During this period the colony would have a large area of retained and enhanced habitat to the north and south of the M4 and A4 available within their current home range, making the temporary reduction in connectivity unlikely to alter the favourable conservation status of the population. The preliminary conclusions drawn at this stage of the DCO Project are that the scale of change predicted is low and the likely effect is **Not Significant** on an ecological feature of regional importance.

8.10.446 At the time of application, the assessment of this likely significant effect will be further informed by a quantification of habitat connectivity based on the green infrastructure proposals, as well as further information on soprano pipistrelle population based on field survey undertaken in 2019.

**Increased noise and vibration (resulting in disturbance / displacement)**

8.10.447 As detailed in paragraph 8.10.413 increased noise and vibration levels can cause a range of negative effects on bat populations and may be caused by a number of activities during construction and operation.

8.10.448 In the absence of detailed construction design, it is estimated that one roost is within the ZOI where a likely significant effect from noise or vibration disturbance may occur. This comprises the day roost in underpass 8 (beneath the M4 where the Colne Brook passes under the motorway), supporting approximately four bats. This roost is close (within ~50m) to the proposed Colne Brook diversion works and the infilling of Old Slade Lake. These works will be temporary during the construction phase only.

8.10.449 As detailed in paragraph 8.10.417 during the construction period sensitive measures and timing would be adopted to control the effects from noise and vibration throughout the construction works.

8.10.450 Results indicate the soprano pipistrelle population comprises one colony with a large territory and a number of roosts recorded widely across the Site and the surrounding landscape. It is considered the effects of noise and vibration would be temporary and would occur during the construction phase only and would not threaten the favourable conservation status of the retained colonies. The preliminary conclusions drawn at this stage of the DCO Project are that the scale of change predicted is low and the likely effect is **Not Significant** on an ecological feature of regional importance.
A detailed noise and vibration assessment for the DCO Project will be undertaken and presented at time of application alongside a detailed assessment of effects on the bat populations across the Site.

**Increased light intensity (resulting in disturbance / displacement)**

As detailed in paragraph 8.10.378 increased light levels can cause a range of negative effects on bat populations and may be caused by a number of activities during construction and operation. Soprano pipistrelle bats are considered a light-tolerant species, being less sensitive to the negative effects of light disturbance.

A sensitive lighting strategy will be designed to ensure construction and operational lighting minimises negative effects on bats, as summarised in paragraph 8.10.379.

In the absence of a detailed lighting assessment, a precautionary approach to the assessment is required at this stage, despite this species being relatively light tolerant. The scale of change is predicted to be medium and the effect Significant on this ecological feature of regional importance.

A detailed lighting assessment for the DCO Project alongside a detailed assessment of effects on the bat populations within the study area will be undertaken and presented at the time of application and this will include specific sampling points undertaken at key roosting, foraging and commuting habitats.

**Changes in hydrology (groundwater levels, surface water run-off rates, river flows and lake levels; resulting in habitat change)**

Changes in GWDTE due to an alteration of the water table level could result in the suitability of some habitats that remain in-situ within or outside of the Site reducing for soprano pipistrelle. For this species the greatest potential effect may be associated with the potential degradation of standing water, river, wet woodland and swamp habitats. As these changes will add only marginally to the land take and land cover change described in paragraphs 8.10.436 to 8.10.442 the preliminary conclusions drawn at this stage of the DCO Project are that the scale of change is is low and the likely effect is Not Significant on an ecological feature of regional importance.

At the time of application, the assessment of this likely significant effect will be further informed by a quantification of home-range size of the individual colonies, colony counts, the potential identification of further roost sites and refined groundwater modelling outputs. Further, the design of newly created and improved roosting, foraging and commuting habitat will have been developed to inform the assessment.
Wildlife collision rates with aircraft or road traffic (resulting in death or injury of individual animals)

8.10.458 Paragraph 8.10.384 outlines the causes and negative effects of increased vehicle collisions on bat populations alongside the general environmental measures which would also be incorporated to mitigate vehicle collision risk for all bat populations recorded within the Site.

8.10.459 It is considered that soprano pipistrelle have a very low risk of collision with aircraft, with the bats flying height being below the height of aircraft. Collision risk would only occur when aircraft are at very low altitude on take-off and landing, at this point aircraft would be over very well-lit habitat dominated by hardstanding (in other words the airfield) providing sub-optimal habitat for soprano pipistrelle. This species is however relatively tolerant to artificial light and could commute across the airfield. However, the provision of optimal commuting routes away from the North West Runway through the development of green infrastructure should limit any such movements. Further, the limited published research on bats colliding with aircraft indicates a very low-level risk of collision (in total five bat strike incidents have been reported over a 10-year interval, 2006–2015 at three airports in Ireland) and therefore the scale of change is considered to be negligible.\(^{79}\)

8.10.460 Soprano pipistrelle bats' flying strategy makes them at risk of collision with road traffic. Where proposals may result in increased collision risk, such as where new roads cross known soprano pipistrelle habitat, connective measures would be provided such as underpasses, tree planting providing 'hop-overs' or 'green bridges', providing crossing points. Speed limits would also be specified for all haul roads to be enforced throughout the construction phase.

8.10.461 Soprano pipistrelle bats are using the river network across the Site for commuting across their home range. Where new roads such as the proposed A4 re-routing creates new river crossings, design would be suitable to facilitate commuting under the road for bat populations, incorporating measures such as suitable height and lighting.

8.10.462 Based on available information, the potential collision rate for soprano pipistrelle bats from increased vehicular traffic is considered low and is not considered to alter the favourable conservation status of the population. The preliminary conclusions drawn at this stage of the DCO Project are that the scale of change predicted is very low and the likely effect is Not Significant for this ecological feature of regional importance.

\(^{79}\) There are no reported bat strikes at Heathrow despite structured monitoring to recover wildlife strikes
At the time of application, the assessment of the effect of wildlife collisions will be further informed by a detailed traffic assessment for the DCO Project.

Assessment of biodiversity effects – common pipistrelle

Detailed baseline

Common pipistrelle utilise a wide range of habitats present in the study area, including lakes and rivers, farmland, open woodland, gardens and large hedgerows.

Desk study records from 2018 identified eight common pipistrelle roosts within the study area, including roosts in Harmondsworth, Longford and Bedfont Court Estate within the Site.

Field survey work identified six common pipistrelle roosts, details for which are provided in Table 8.27. Additionally, eight Pipistrellus roosts, which could not be identified between soprano and common pipistrelle, were recorded which are provided in Table 8.28. Locations in relation to the Site are shown in Figures 8.11 and 8.13.

Access to complete detailed internal inspections or emergence / re-entry surveys has not been possible for all roosts in order to establish roost size and importance. Where the exact status of a roost was uncertain or not yet confirmed by surveys, a precautionary approach has been taken for assessment and a higher level of importance assigned.

Table 8.27: Summary of roost results for common pipistrelle

<table>
<thead>
<tr>
<th>Roost reference*</th>
<th>Roost type**</th>
<th>Approximate number of bats**</th>
<th>Roost importance***</th>
<th>Predicted effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>B977</td>
<td>Unknown (potential maternity)</td>
<td>Not recorded</td>
<td>County</td>
<td>Retained</td>
</tr>
<tr>
<td>B3261</td>
<td>Unknown (potential maternity)</td>
<td>Not recorded</td>
<td>County</td>
<td>Retained</td>
</tr>
<tr>
<td>B3262</td>
<td>Day</td>
<td>Not recorded</td>
<td>County</td>
<td>Retained</td>
</tr>
<tr>
<td>T2459</td>
<td>Day</td>
<td>2</td>
<td>Local</td>
<td>Retained</td>
</tr>
<tr>
<td>B3272</td>
<td>Maternity</td>
<td>Not recorded</td>
<td>County</td>
<td>Retained</td>
</tr>
<tr>
<td>B3266</td>
<td>Unknown (potential maternity)</td>
<td>&gt;1</td>
<td>County</td>
<td>Retained</td>
</tr>
</tbody>
</table>

*Where the roost was located using radio telemetry, access may have been restricted and the specific tree...
8.2.10 Across the study area, open water, running water courses and their associated bankside vegetation, provide important foraging and commuting habitat with treelines, woodland, hedgerows, scrub also used by common pipistrelle. Common pipistrelle were the second most frequently recorded species during activity transect and passive detector surveys and were widespread being recorded at every survey location. However, common pipistrelle was the fourth most common species caught during trapping with 51 bats caught in comparison to 697 soprano pipistrelle. Whilst there are suitable habitats across the Site to support common pipistrelle and this species is widespread, results indicate the population is much smaller than that of soprano pipistrelle.

8.2.11 Due to the access restrictions to conduct roost counts and further survey at buildings where common pipistrelle have been recorded roosting, the size, status and distribution of colonies cannot be determined with confidence at this stage, the results below are therefore indicative.

8.2.12 Survey results currently indicate there are at least three separate colonies of common pipistrelle, colony 1 has a likely maternity roost in Sipson (B977, Figure

### Table 8.28: Summary of roost results for Pipistrellus species

<table>
<thead>
<tr>
<th>Roost reference*</th>
<th>Roost type**</th>
<th>Approximate number of bats**</th>
<th>Roost importance***</th>
<th>Predicted effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>B131</td>
<td>Day</td>
<td>1</td>
<td>Local</td>
<td>Retained</td>
</tr>
<tr>
<td>B600</td>
<td>Day</td>
<td>1</td>
<td>Local</td>
<td>Loss</td>
</tr>
<tr>
<td>T2197</td>
<td>Hibernation</td>
<td>1</td>
<td>County</td>
<td>Loss</td>
</tr>
<tr>
<td>B667</td>
<td>Night</td>
<td>1</td>
<td>Local</td>
<td>Loss</td>
</tr>
<tr>
<td>T2586</td>
<td>Day</td>
<td>1</td>
<td>Local</td>
<td>Retained</td>
</tr>
<tr>
<td>T2764</td>
<td>Day</td>
<td>1</td>
<td>Local</td>
<td>Retained</td>
</tr>
<tr>
<td>T2459</td>
<td>Day</td>
<td>1</td>
<td>Local</td>
<td>Retained</td>
</tr>
<tr>
<td>T2663</td>
<td>Unknown</td>
<td>Droppings only</td>
<td>Local</td>
<td>Retained</td>
</tr>
</tbody>
</table>

*Where the roost was located using radio telemetry, access may have been restricted and the specific tree not confirmed. B = building roost, and T = tree roost

**Established via further survey where access was granted, and a licence signed by the landowner. Where the status of the roost could not be confirmed, a worst-case scenario has been adopted.

***See Appendix 8.3.
8.11) with foraging areas including Saxon Lake and Harmondsworth Moor. Individuals from this colony have been recorded crossing through the underpasses carrying the River Colne and Wraysbury River under the M4 and foraging in habitats directly north of the M4.

8.10.471 Colony 2 is located in Poyle (roosts B3261 and B3262, Figure 8.11) with foraging areas including Colnbrook West Lake and other areas of the Site west of the M25.

8.10.472 Colony 3 is located outside the study area to the north east with a roost recorded in Southall (B3272) Figure 8.13 and foraging recorded around the retained balancing reservoirs to the south east of the Site. The roost is outside the ZOI where effects would be expected to occur and the extent of the foraging areas within the Site are limited in area and are to be retained as part of the DCO Project, this colony is therefore not considered further.

8.10.473 Further advanced survey work will be undertaken in 2019, including additional radiotracking of common pipistrelle to further understand the distribution of colonies across the study area and seeking to establish colony counts for current and additional roosts.

*Predicted effects and their significance*

*Land take and land cover change (resulting in habitat loss or degradation)*

8.10.474 The construction works would result in the permanent and temporary loss or degradation of waterbodies, copses, scrub, hedgerows, treelines, rivers and ruderal and grassland habitats that offer known foraging habitat for common pipistrelle. This includes the permanent loss of the southern half of Harmondsworth Moor and Colnbrook West Lake and changes to Saxon Lake (associated with wildlife strike risk management, imposition of fire water infrastructure and potential use as a heat store), these areas have been identified as important foraging habitat. Land take and land cover change would largely occur prior to the North West Runway opening in Phases 1 and 2 of the DCO Project.

8.10.475 No confirmed common pipistrelle roosts would be lost, however three roosts which have not been confirmed between pipistrelle species would be lost (B600, T2197, B667).

8.10.476 In the absence of environmental measures, it is predicted there would be a long-term negative effect on common pipistrelle colony 1 due to the permanent and or long-term loss of foraging habitat from within their home range leading to the favourable conservation status of this colony being compromised.
The general environmental measures, phasing and licensing approach for bat populations as detailed in paragraphs 8.10.402 – 8.10.404 would be adopted for common pipistrelle. Measures specifically for common pipistrelle would include the provision of suitable habitats (newly created and enhanced) within the current home range of all colonies identified.

The areas of foraging and commuting habitat which would be retained within the territories of both colony 1 and 2 is considered sufficient to maintain these populations. However, initial habitat losses would be likely cause a reduction in the distribution and abundance of both colonies.

The habitat losses for colony 1 may cause a permanent reduction in the available habitat leading to a reduction in abundance and distribution of this colony. This may lead to the favourable conservation status of this colony being compromised, this is however based on very limited radiotracking data for this species at present. These losses would be temporary for colony 2, and the proposed green infrastructure would result in an increase in suitable habitat over time. In the absence of further information, a worst-case scenario is assumed and the preliminary prediction at this stage of the DCO Project is that the scale of change is high for colony 1 and the likely effect is **Significant** on this ecological feature of regional importance.

At the time of application, the assessment of this likely significant effect will be further informed by additional radio tracking of this species, indicating likely home-range size of the individual colonies, colony counts and the potential identification of further roost sites. Further, the design of newly created and improved roosting, foraging and commuting habitat will have been developed to inform the assessment.

**Fragmentation of habitats (reduction of connectivity)**

Paragraph 8.10.366 outlines the range of the negative effects that fragmentation can cause to bat populations and details the approach to phasing and maintaining connectivity throughout the landscape for all bat populations recorded within the Site.

The status of the common pipistrelle roost in Sipson (B977, Figure 8.11) and the distribution of colony 1 is not currently known, therefore the effect of fragmentation cannot be accurately assessed. It is considered that the extent of temporary construction works between Harmondsworth and Sipson would result in a reduction of connectivity for this colony, although this situation would improve over time as temporary construction compounds become incorporated into the green infrastructure. Connective measures would be provided including underpasses, tree planting providing ‘hop-overs’ and ‘green bridges’ to maintain connectivity for...
this roost to be retained and enhanced areas of habitat north of the North West Runway and east of Sipson. The existing M4 underpasses would be retained and enhanced to support common pipistrelle movement from the areas affected by the North West Runway to retained and enhanced habitats north of the M4.

8.10.483 Colony 2 would be subject to a reduction in connectivity to the north from roosts B3261 and B3262 (Figure 8.11) due to the proposed A4 layout and the location of the North West Runway. North/south connectivity for this colony would be provided along the sections of the new Colne Brook river diversion which would comprise habitats suitable to support commuting bats, alongside the retention and enhancement of the existing Horton Brook river channel and retained Colne Brook river channel through the south of the Site.

8.10.484 Connectivity would be provided for the common pipistrelle colonies throughout the retained, enhanced and newly created habitats within their home range. Connective links would include some new routes, where old links have been lost as part of proposals, which may result in a temporary and short-term negative effect on the population. The preliminary conclusions drawn at this stage of the DCO Project are that the scale of the negative change predicted is low and the likely effect is Not Significant on this ecological feature of regional importance.

8.10.485 At the time of application, the assessment of this likely significant effect will be further informed by additional radio tracking of this species, indicating likely home-range size of the individual colonies, colony counts and the potential identification of further roost sites. Further, the design of newly created and improved roosting, foraging and commuting habitat will have been developed to inform the assessment.

**Increased noise and vibration (resulting in disturbance / displacement)**

8.10.486 As detailed in paragraph 8.10.413 increased noise and vibration levels can cause a range of negative effects on bat populations and may be caused by a number of activities during construction and operation.

8.10.487 As detailed in paragraph 8.10.417 during the construction period sensitive measures and timing will be adopted to control the effects from noise and vibration throughout the construction works.

8.10.488 Based on available information it is not considered there are any common pipistrelle roosts within the ZOI where a likely significant effect from noise or vibration disturbance may occur and the likely effect is therefore Not Significant for this ecological feature of regional importance. This conclusion will be reviewed in light of any new data determined in 2019.
The assessment is however based on limited radiotracking data for this species at present, at the time of application, the assessment of this likely significant effect will be further informed by additional radio tracking alongside a detailed noise and vibration assessment for the DCO Project which will be undertaken and presented at time of application.

**Increased light intensity (resulting in disturbance / displacement)**

8.10.490 As detailed in paragraph 8.10.378 increased light levels can cause a range of negative effects on bat populations and may be caused by a number of activities during construction and operation. Common pipistrelle bats are considered a light-tolerant species being less sensitive to the negative effects of light disturbance.

8.10.491 A sensitive lighting strategy will be designed to ensure construction and operational lighting minimises negative effects on bats, as summarised in paragraph 8.10.379.

8.10.492 In the absence of a detailed lighting assessment, a precautionary approach to the assessment is required at this stage, despite this species being relatively light tolerant. The scale of change is predicted to be medium and the effect **Significant** on this ecological feature of regional importance.

8.10.493 A detailed lighting assessment for the DCO Project alongside a detailed assessment of effects on the bat populations within the study area will be undertaken and presented at the time of application and this will include specific sampling points undertaken at key roosting, foraging and commuting habitats.

**Changes in hydrology (groundwater levels, surface water run-off rates, river flows and lake levels; resulting in habitat change)**

8.10.494 Changes in GWDTE due to an alteration of the water table level could result in the suitability of some habitats that remain in-situ within or outside of the Site reducing for common pipistrelle. For this species the greatest potential effect may be associated with the potential degradation of standing water, river, wet woodland and swamp habitats. As these changes will add to the land take and land cover change described in paragraphs 8.10.475 to 8.10.481 the preliminary conclusions drawn at this stage of the DCO Project are that the scale of change is high and the likely effect is **Significant** on an ecological feature of regional importance.

8.10.495 At the time of application, the assessment of this likely significant effect will be further informed by a quantification of home-range size of the individual colonies, colony counts, the potential identification of further roost sites and refined groundwater modelling outputs. Further, the design of newly created and improved roosting, foraging and commuting habitat will have been developed to inform the assessment.
Wildlife collision rates with aircraft or road traffic (resulting in death or injury of individual animals)

8.10.496 Paragraph 8.10.384 outlines the causes and negative effects of increased vehicle collisions on bats populations. It also provides the general environmental measures which would be incorporated to mitigate vehicle collision risk for all bat populations recorded within the study area.

8.10.497 It is considered the assessment for likely significant effects of wildlife collision rates for soprano pipistrelle (as detailed in paragraph 8.10.461) can be adopted for common pipistrelle, with both species being widely recorded across the Site, with similar flying strategy and tolerance of urban habitats with artificial lighting.

8.10.498 Based on available information the potential for common pipistrelle bats to be frequently struck by vehicles is considered low and is not considered to alter the favourable conservation status of the population. The preliminary conclusions drawn at this stage of the DCO Project are that the scale of change predicted is low and the likely effect is Not Significant on this ecological feature of regional importance.

8.10.499 At the time of application, the assessment of the effect of wildlife collisions will be further informed by a detailed traffic assessment for the DCO Project.

Assessment of biodiversity effects – Bat populations

Detailed baseline

8.10.500 The bat populations assessed in this section are Nathusius’ pipistrelle, noctule, serotine, Leisler’s Bat, Natterer’s, Brandt’s and whiskered bat. This ecological feature is assessed to be of County / metropolitan importance.

8.10.501 Nathusius’ pipistrelle are associated with aquatic and riparian habitats alongside broadleaved and mixed woodland and parkland. Noctule, Leisler’s Bat and serotine are associated with more open habitats such as rivers and lakes, with cattle grazed pasture also being of importance to serotine. Natterer’s, Brandt’s and whiskered bat (to a lesser extent) are associated with broadleaved woodland, woodland edge and tree lined aquatic habitats. The study area supports very little mature woodland, or cattle grazed pasture but supports a large number of lakes and tree-lined rivers.

8.10.502 Desk study records from 2018 identified a historic noctule roost record from 2008 within underpass 8 (as the Colne Brook passes under the M4, Figure 8.11), based on visual ID of droppings found. Extensive surveys in this location across 2017 and 2018 have not identified the presence of a noctule roost. Bedfont Lakes to the south of the Site supports a known Nathusius’ pipistrelle population.
Field survey work has identified four Natterer’s bat roosts, three Nathusius’ pipistrelle roosts, three Brandt’s roosts and one noctule roost. Details of these are provided below in Table 8.29. Locations in relation to the Site are shown in Figures 8.11 and 8.12.

**Table 8.29: Summary of roost results for Natterer’s, Nathusius pipistrelle, Brandt’s and Noctule bat species**

<table>
<thead>
<tr>
<th>Roost reference*</th>
<th>Roost type**</th>
<th>Approximate number of bats**</th>
<th>Roost importance***</th>
<th>Predicted effect</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Natterer’s bat</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>T4009</td>
<td>Maternity</td>
<td>8</td>
<td>Regional</td>
<td>Retained</td>
</tr>
<tr>
<td>T4017</td>
<td>Unknown (potential maternity)</td>
<td>Not recorded</td>
<td>Regional</td>
<td>Retained</td>
</tr>
<tr>
<td>T4018</td>
<td>Unknown (potential maternity)</td>
<td>Not recorded</td>
<td>Regional</td>
<td>Retained</td>
</tr>
<tr>
<td>T4019</td>
<td>Maternity</td>
<td>35</td>
<td>Regional</td>
<td>Retained</td>
</tr>
<tr>
<td><strong>Nathusius’ pipistrelle</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B628</td>
<td>Day</td>
<td>1</td>
<td>County</td>
<td>Loss</td>
</tr>
<tr>
<td>B3274</td>
<td>Unknown (potential maternity)</td>
<td>2</td>
<td>County</td>
<td>Retained</td>
</tr>
<tr>
<td>B129</td>
<td>Day</td>
<td>1</td>
<td>County</td>
<td>Retained</td>
</tr>
<tr>
<td><strong>Brandt’s bat</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B3273</td>
<td>Day</td>
<td>1</td>
<td>County</td>
<td>Retained</td>
</tr>
<tr>
<td>T4013</td>
<td>Night</td>
<td>1</td>
<td>County</td>
<td>Retained</td>
</tr>
<tr>
<td>T4014</td>
<td>Night</td>
<td>1</td>
<td>County</td>
<td>Retained</td>
</tr>
<tr>
<td><strong>Noctule</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tree Area 11</td>
<td>Day</td>
<td>1</td>
<td>County</td>
<td>Retained</td>
</tr>
<tr>
<td><strong>Unidentified bat</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>T2419</td>
<td>Unknown</td>
<td>Unknown</td>
<td>County</td>
<td>Retained</td>
</tr>
<tr>
<td>T2870</td>
<td>Unknown</td>
<td>1</td>
<td>County</td>
<td>Retained</td>
</tr>
</tbody>
</table>

*Where the roost was located using radio telemetry, access may have been restricted and the specific tree not confirmed. B = building roost, and T = tree roost
**Established via further survey where access was granted, and a licence signed by the landowner. Where the status of the roost could not be confirmed, a worst-case scenario has been adopted.
***See Appendix 8.3.
Low levels of activity for Nathusius’ pipistrelle were recorded during active transect and passive detector surveys. During trapping surveys, a total of 27 Nathusius’ pipistrelle bats were captured which is considered low in comparison to trapping rates in suitable habitat across the wider London area. The trapping and radiotracking surveys do not indicate that there is a local breeding colony of Nathusius’ pipistrelle bats, no breeding females having been captured within the study area during the maternity period. Further, no tagged individuals were found to have their core foraging areas on any part of the study area, with one bat tracked to a roost ~12km away from the Site (B3274, Figure 8.12) and one adult female caught and ringed late in October 2017 subsequently found in Barking, approximately 40km east in November 2018.

Low levels of activity for noctule were recorded during active transect and passive detector surveys. All the trapping surveys across the study area have caught a total of 17 noctule bats. This low number of noctule bats caught, along with the absence of breeding females, and only a single juvenile indicate that there is not a maternity colony on or near the Site.

Low levels of activity for Leisler's bat were recorded during active transect and passive detector surveys, with six Leisler’s bats caught during trapping efforts. This very low capture rate (6), along with the absence of any breeding females, strongly indicates that there is not a local breeding population present close to the Site.

Low levels of activity for serotine were recorded during active transect and passive detector surveys. No serotine were caught during trapping surveys which combined with the very low activity levels recorded indicates that there is not a local breeding population present close to the Site.

Myotis species recorded during active transect and passive detector surveys could not be identified to species level. It is considered likely the majority of Myotis activity recorded is from Daubenton’s bats due to widespread availability of suitable aquatic habitat and the results of the trapping and radiotracking for this species which indicates a large and widespread colony.

Nine Natterer’s bats were caught during trapping surveys, with two of these bats were identified as adult females. Radiotracking found that both female bats were roosting some distance from the Site, approximately 5km to the north-west (T4009, T4017, T4018, T4019, Figure 8.12). These roosts were confirmed as maternity roosts. One bat was found to regularly return to Old Wood (just south of the M4) which forms part of the bat’s core foraging area. The second bat did not return to the study area. Given the very low number of Natterer’s bats (particularly
female bats) caught within the study area, it is considered unlikely that there are any maternity roosts close to the Site and the trapping and radiotracking demonstrates that this does not provide important foraging habitat to this colony.

8.10.510 Extensive trapping across the Site has only captured one Brandt's bat and one whiskered bat. The Brandt’s bat identified as a juvenile female, was radio tagged and found using two night roosts in trees (T4013 and T4014) and roosting in a residential property in West Drayton (B3273, Figure 8.11) with surveys indicating that this may not be a maternity roost. Brandt's and whiskered bats are caught relatively easily, and the very low capture rate strongly indicates that there is not a notable population of either species present within the Site with no local breeding populations using the habitats within the Site as core foraging areas.

8.10.511 The level of survey effort conducted for Nathusius' pipistrelle, noctule, serotine, Leisler’s Bat, Natterer’s, Brandt's and whiskered bat is considered to be representative and suitable to inform an assessment of the likely significant effects on these species. No further targeted survey work is to be conducted. Trapping and radiotracking surveys will be ongoing throughout 2019 for other bat species, and if higher numbers of bats or notable individuals (such as breeding females) are caught during this work, then the survey scope will be reviewed and additional radiotracking may be undertaken to ensure that all effects are suitably considered.

Predicted effects and their significance

Land take and land cover change (resulting in habitat loss or degradation)

8.10.512 The construction works would result in the permanent and temporary loss or degradation of waterbodies, copses, scrub, hedgerows, treelines, rivers and ruderal and grassland habitats. These losses would occur within Phase 1 and 2 of the DCO Project (2022 – 2027) and are considered to be being permanent changes within this assessment.

8.10.513 One non-breeding Nathusius’ pipistrelle roost (B628, Figure 8.11), would be lost as part of proposals. For Nathusius’ pipistrelle, noctule, serotine and Leisler’s, habitats would be lost that have either been confirmed or are considered likely foraging habitat for these bats populations. Survey results demonstrate that this habitat does not represent important foraging areas for these species.

8.10.514 Old Wood (south of the M4) shown as a core foraging area for a Natterer’s bat, and where the only whiskered bat was caught, would be retained and enhanced as part of proposals. All habitat where Natterer’s and Brandt’s were recorded would predominantly be subject to temporary and limited habitat degradation associated with creation of flood storage (areas that would be integral parts of the green infrastructure).
8.10.515 The general environmental measures, phasing and licencing approach for bat populations as detailed in paragraphs 8.10.361 to 8.10.363 and paragraphs 8.10.401 to 8.10.404 will also mitigate the effects on Nathusius’ pipistrelle, noctule, serotine, Leisler’s Bat, Natterer’s, Brandt’s and whiskered bat.

8.10.516 Results indicate that there are no notable populations of Nathusius’ pipistrelle, noctule, serotine, Leisler’s Bat, Natterer’s, Brandt’s and whiskered bat within the Site and there are no habitats within the Site being permanently lost which comprise core foraging habitat, with all maternity roosts and the majority of these populations’ home ranges outside the Site. The preliminary conclusions drawn at this stage of the DCO Project are that the scale of the change is very low and the likely effect is **Not Significant** on this ecological feature of County / metropolitan importance.

**Fragmentation of habitats (reduction of connectivity)**

8.10.517 Paragraph 8.10.366 outlines the range of the negative effects fragmentation can cause to bat populations and details the approach to phasing and maintaining connectivity throughout the landscape applicable for all bat populations recorded within the Site.

8.10.518 Nathusius’ pipistrelle, noctule and Leisler’s Bat are generally considered lower risk species with regards to habitat fragmentation as they have a strategy of flying at greater altitudes than other native UK bat species and travelling over large distances within their home range, for example a radio tagged Nathusius’ pipistrelle was recorded approximately 12km north of the Site. The Natterer’s bats recorded within the Site were also recorded roosting approximately 5km north of it.

8.10.519 Environmental measures would include the retention and improvement of the existing M4 and M25 underpasses to support movement of bat populations including the M4 culvert and underpass to Old Wood (south of the M4) which was shown as a core foraging area for a Natterer’s bat and where the one whiskered bat was caught.

8.10.520 The sections of new river diversion (including the River Colne and Colne Brook) would comprise habitats suitable to support commuting bats. Alongside retained and enhanced habitats along the Horton Brook this would maintain the existing north/south connectivity through the Site. Connectivity across the Site would also be provided across any new roads consisting of underpasses, tree planting providing ‘hop-overs’, ‘green bridges’.

8.10.521 Results indicate that there are no notable populations of Nathusius’ pipistrelle, noctule, serotine, Leisler’s Bat, Natterer’s, Brandt’s and whiskered bat within the Site and there are no core foraging habitats or roosting sites within the Site being temporarily or permanently fragmented. It is considered that any temporary
reduction in connectivity to occasional foraging areas would not alter the favourable conservation status of these populations. The preliminary conclusions drawn at this stage of the DCO Project are that the scale of change predicted is very low and the likely effect is **Not Significant** on this ecological feature of County / metropolitan importance.

8.10.522 At the time of application, the assessment of this likely significant effect will be further informed by a quantification of habitat connectivity based on the green infrastructure proposals.

**Increased noise and vibration (resulting in disturbance / displacement)**

8.10.523 As detailed in paragraph 8.10.375 increased noise and vibration levels can cause a range of negative effects on bat populations and may be caused by a number of activities during construction and operation.

8.10.524 There are no roosts recorded for Nathusius' pipistrelle, noctule, serotine, Leisler's Bat, Natterer's, Brandt's and whiskered bats which are within the ZOI where a significant effect from noise or vibration disturbance may occur. It is considered that there would be no effect on the favourable conservation status of these bat populations. The preliminary conclusions drawn at this stage of the DCO Project are that the scale of change is predicted to be negligible and the likely effect is **Not Significant** on this ecological feature of County / metropolitan importance.

**Increased light intensity (resulting in disturbance / displacement)**

8.10.525 As detailed in paragraph 8.10.378 increased light levels can cause a range of negative effects on bat populations and may be caused by a number of activities during construction and operation.

8.10.526 A sensitive lighting strategy will be designed to ensure construction and operational lighting minimises negative effects on bats, as summarised in paragraph 8.10.379.

8.10.527 Results indicate that there are no notable populations of Nathusius' pipistrelle, noctule, serotine, Leisler's Bat, Natterer's, Brandt's and whiskered bat within the Site and there are no core foraging habitats or roosting sites within the Site which would likely be affected by an increase in lighting. Any increase in lighting to occasional foraging areas is not considered to alter the favourable conservation status of these populations. The preliminary conclusions drawn at this stage of the DCO Project are that the scale of change predicted is very low to negligible and the likely effect is **Not Significant** on this ecological feature of County / metropolitan importance.
8.10.528 A detailed lighting assessment for the DCO Project alongside a detailed assessment of effects on the bat populations with the Site will be undertaken and presented at time of application this will include specific sampling points undertaken at key foraging and commuting habitats.

Changes in hydrology (groundwater levels, surface water run-off rates, river flows and lake levels; resulting in habitat change)

8.10.529 Changes in GWDTE due to an alteration of the water table level could result in the suitability of some habitats that remain in-situ within or outside of the Site reducing for bat populations. However, results indicate that there are no notable populations of Nathusius’ pipistrelle, noctule, serotine, Leisler’s Bat, Natterer’s, Brandt’s and whiskered bat within the Site. The preliminary conclusions drawn at this stage of the DCO Project are that the scale of the change is very low and the likely effect is **Not Significant** on this ecological feature of County / metropolitan importance.

8.10.530 At the time of application, the assessment of this likely significant effect will be further informed by further baseline survey information and refined groundwater modelling outputs. Further, the design of newly created and improved roosting, foraging and commuting habitat will have been developed to inform the assessment.

Wildlife collision rates with aircraft or road traffic (resulting in death or injury of individual animals)

8.10.531 **Paragraph 8.10.384** outlines the causes and negative effects of increased vehicle collisions on bat populations. It also notes the general environmental measures which would be embedded to minimise the effects of vehicle collision for all bat populations recorded within the Site.

8.10.532 Results indicate that there are no notable populations of Nathusius’ pipistrelle, noctule, serotine, Leisler’s Bat, Natterer’s, Brandt’s or whiskered bat within the Site. There are no maternity roosts within the Site which is only used occasionally by these species. Based on available information effects on bats resulting from vehicle collision are considered to be very low, and no alteration to their favourable conservation status would result. The preliminary conclusions drawn at this stage of the DCO Project are that the scale of change for these populations is very low to negligible and the likely effect is **Not Significant** on this ecological feature of County / metropolitan importance.

8.10.533 At the time of application, the assessment of the effect of wildlife collisions will be further informed by a detailed traffic assessment for the DCO Project.
Assessment of biodiversity effects – Otter

**Detailed baseline**

8.10.534 Otters, an ecological feature of regional importance, have been recorded within the study area (see **Figure 8.10**). The records have included spraints, feeding signs, couches and holts. Otters have been recorded on the following water bodies and watercourses;

1. Colne Brook
2. Poyle Channel
3. Wraysbury River
4. River Colne
5. River Crane
6. Colne Brook
7. Bigley Ditch
8. Bonehead Ditch
9. Colnbrook West Lake
10. Orlitts Lake
11. Old Slade Lake
12. Hythe Lagoon
13. Colne Mere
14. Wraysbury II (North).

8.10.535 From the survey data available to date, it is not possible to determine whether the otter present in the study area are breeding. Surveys in 2019 will continue to seek to confirm whether or not they are currently breeding in the study area.

8.10.536 Otters are expanding their range at varying rates across the country as identified in **A Review of the Population and Conservation Status of British Mammals: Technical Summary** (Matthews *et al.*, 2018). This increase in numbers has been attributed to a range of factors including; improved water quality, the banning of chemicals such as Polychlorinated biphenyls (PCBs), protection by law ⁸⁰ and the prohibition of hunting. Based on this trend, it is considered that otters will continue to extend their range for the foreseeable future.

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⁸⁰ WCA and the Habitats Regulations
Factors which continue to limit the spread of otters include; prey availability, habitat connectivity, mortality on roads and anthropogenic pressures.

Owing to anthropogenic pressures (human pressure) in the study area, connectivity, land use, and the territorial nature of otters, any increase in range and numbers of otters is likely to be limited (including in the absence of development). Therefore, although numbers and range are assumed to increase within the catchment as a whole, it is considered that this increase is likely to be relatively small across the study area.

Further survey will be carried out in 2019 to increase data on otter activity, and distribution.

**Predicted effects and their significance**

**Land take and land cover change (resulting in habitat loss or degradation)**

There would be permanent loss of habitat supporting otter. This would include the loss of rivers, streams, ditches, lakes and ponds. Land take and land cover change would result in the loss of foraging opportunities as well as resting places. This could result in a reduction in the fitness of individual otters as territories are expanded or abandoned in order for animals to secure sufficient resources. The potential for territories to become unfavourable (and therefore abandoned) or expanded would result in a reduction in the carrying capacity of the Colne Valley for otter. Typically, otter occupy large territories that can extend for many kilometres along river systems (range 3 to 50km (Kruuk, 1993)) or cover large areas if a mixture of freshwater habitats (for example lakes and wetlands) are being used (range 2ha to 50ha – Kruuk 1993). The level of water bodies and watercourses within the footprint of the affected area equates to 67.29km of watercourse and water bodies across the Site (18.75km of which is known to support otter). This scale of effects suggests that individual territories may be lost to the DCO Project. This would include the loss of animals and territories; in a worst-case scenario this would represent a loss of individuals to the population, alongside their ability to reproduce and further boost the re-colonisation of the area by otter. Without timely implementation of environmental measures these effects would negatively affect the favourable conservation status of the regional population of otters.

Environmental measures to account for the losses of habitat in the affected territories, delivered through the green infrastructure design, would include the creation of habitats within which otters can forage, commute and breed. New open
river channels would be created as part of the DCO Project, alongside a range of ponds, lakes and wet ditches. Further, compensation would be provided within the catchments of the River Colne and the River Crane to improve the habitat quality for otter. This may lead to an increase in the carrying capacity of the system, or an increase in the fitness of individual animals. More information on the green infrastructure design is not detailed at this stage, meaning that it is not possible to quantitatively assess the scale of the resulting effects at this stage.

8.10.542 The preliminary conclusions drawn at this stage of the DCO Project are that the scale of the predicted change, due to land take, is medium and the likely effect is **significant** on an ecological feature of regional importance. This is because the carrying capacity of the Colne catchment could be reduced by the proposed alteration to the river system within the Site and the favourable conservation status of the regional population will be affected by this loss of habitat. It is possible that over time the effect would reduce as newly created and improved habitats provide opportunities to aid in the expansion of this species within the Colne and Crane catchments.

8.10.543 At the time of assessment further information will be available on the distribution of the otter population, alongside information on the number of occupied territories in the area and information on relatedness and breeding status. In addition, information on the design of new and improved fresh water habitat will be understood as part of the development of the green infrastructure proposals.

**Fragmentation of habitats (reduction of connectivity)**

8.10.544 Otter occupy large territories and navigate largely via freshwater habitats such as river corridors. The re-routing of the River Colne, Wraysbury River, Duke of Northumberland’s River and the Longford River through the CRC may result in a barrier to movement.

8.10.545 Fragmentation of habitats for otter in this location could reduce the viability of the territories within the area directly affected, reduce the speed or extent of otters moving further north and south in the catchment or reduce the genetic exchange within the local population.

8.10.546 The CRC is being designed to allow for:

1. Penetration of natural light
2. Provision of artificial light (during daytime hours)
3. Natural bank and bed forms
4. Variable water flow
5. Airflow
6. Permanent navigability for otter (in other words opportunities for movement even at times of flood flow).

8.10.547 Further information relating to the CRC is provided in Chapter 21.

8.10.548 Despite the efforts to design a corridor that is still navigable by otter, whilst also providing the conditions that will allow for the presence of prey (fish and amphibians) the design is still being developed and the evidence base is not yet sufficient to conclude that otter would definitely use the CRC to maintain connectivity. Therefore, it is necessary to consider the alternative routes available for animals to move further north within the Colne Valley and south towards the River Thames.

8.10.549 There are three routes (two to be altered or created as part of the DCO Project) that connect the Thames with the upper Colne catchment that would not be affected by the CRC. The first currently exists and is made up of the River Crane and Grand Union Canal. Survey data shows that the River Crane and the Grand Union Canal are both currently used by otter; although the records of the use of the Grand Union Canal are limited. The second link through the Colne Valley will be along the diverted Colne Brook. Currently this watercourse supports otter (including places of shelter) and provides otter with the ability to cross both the M4 and the M25 via underpasses. The diverted channel is designed to allow for a wide riparian zone that provides the opportunity for otter to feed, commute and shelter along this corridor. Whilst this diversion is being created the current course of the Colne Brook would remain in place ensuring that a route north / south in the Colne Valley is maintained at all times. Lastly the green infrastructure proposals provide a terrestrial link (to be characterised by wet ditches and ponds) linking the Horton Brook and the Colne Brook. This would provide alternative corridors of movement for otter in the lower Colne Valley.

8.10.550 At this point within the development of the DCO Project it is not possible to quantify the assessment of habitat connectivity provided by these routes. Therefore, it is reasonable to take a worst-case scenario and assume at this preliminary stage that fragmentation may reduce the carrying capacity of the Colne catchment for otter, or slow the rate of potential future colonisation, thus affecting the populations’ favourable conservation status. The scale of change would therefore be medium, and the likely effect is Significant on an ecological feature of regional importance.

8.10.551 To further inform the assessment habitat connectivity of the baseline situation and the DCO Project (at various stages) will be quantified within the ES. Further, greater detail on the CRC will be known, as will the design of the green infrastructure (which includes fresh water habitat).
Increased noise and vibration (resulting in disturbance / displacement)

8.10.552 Existing and potential (newly created) otter habitat would be exposed to noise and vibration from the DCO Project’s construction and operational activities.

8.10.553 Noise and vibration can be detrimental to otters, and their use of habitat. However, otters can be tolerant to high disturbance situations but will preferentially use habitats with low levels of disturbance (Crawford, 2010).

8.10.554 The type and character of noise is important when considering noise effects on otters. Intermittent or sudden noise may disturb otters whereas otters have been shown to habituate to noise in other situations (Chanin, 2003). The current baseline demonstrates that the character and level of noise of road traffic and air traffic is already tolerated by this species within the study area, as is noise associated with existing industrial facilities such as the Lakeside Energy from Waste (EfW) facility, the Aggregate Industries asphalt mixing plant and various active quarrying activities. These noises include intermittent and sudden noise as well as more persistent noise.

8.10.555 At this point within the development of the DCO Project it is not possible to quantify the assessment of the change in noise, however the noise produced during the operation of the DCO project is unlikely to be dissimilar from the current levels. Therefore, the favourable conservation status of the regional population of otters is unlikely to be negatively affected by noise.

8.10.556 The preliminary conclusions drawn at this stage of the DCO Project are that the scale of change is predicted to be very low and the likely effect is Not Significant on an ecological feature of regional importance.

8.10.557 This assessment will be further informed going forward by more detailed information on noise levels from different individual sources.

Increased light intensity (resulting in disturbance / displacement)

8.10.558 Otters are nocturnal but will often forage or commute in daylight (particularly early mornings and evenings). Their senses are attuned to both light and dark, but they will preferentially forage at night. Where artificial light spills onto habitat suitable for fish and other typical otter prey the activity of prey and consequently reduce associated otter activity.

8.10.559 Thus, increased light intensity may reduce the availability of foraging and commuting habitat for this species. Notwithstanding this, there are examples of otters habituating to lit conditions, such as in cities (Green and Green, 1997). This indirect loss of habitat may result in the reduction of the viability of a home range, resulting in a reduction of fitness for the otter occupying the area. However, it is likely that this loss would represent only a small area on the peripheries of the
temporary or permanent land take that could result from the DCO Project. Otters have large territories, therefore a small reduction in the quality of available habitat is unlikely to affect the favourable conservation status of the regional population of otters.

8.10.560 In order to limit light spill on to adjacent habitats, a lighting design will be produced that would minimise the amount of light needed, ensuring that what is required is suitably directed and that light spill is minimised.

8.10.561 As the lighting strategy would be sensitively designed and newly created habitats would be developed to provide ‘dark’ areas. The provision of an effective lighting strategy is likely to result in minor changes, which are unlikely to affect the favourable conservation status of otters.

8.10.562 The preliminary conclusions drawn at this stage of the DCO Project are that the scale of change is expected to be low and the effect is Not Significant on an ecological feature of regional importance.

8.10.563 At the time of application, the assessment of this likely significant effect will be further informed by a lighting assessment showing both the current baseline and that predicted for the DCO Project, as well as further information on otter distribution and territory location; as well as information on the types and locations of habitat to be created as part of the green infrastructure proposals.

Changes in hydrology (groundwater levels, surface water run-off rates, river flows and lake levels; resulting in habitat change)

8.10.564 Changes in GWDTE due to an alteration of the water table level could result in the suitability of some habitats that remain in-situ within or outside of the Site reducing for otter. For this species the greatest potential effect may be associated with the potential degradation of standing water, river, wet woodland and swamp habitats. As these changes will add to the land take and land cover change described in paragraphs 8.10.541 to 8.10.544 the preliminary conclusions drawn at this stage of the DCO Project are that the scale of change is is medium and the likely effect is Significant on an ecological feature of regional importance.

8.10.565 At the time of application, the assessment of this likely significant effect will be further informed by further baseline survey data and refined groundwater modelling outputs. Further, the design of newly created and improved habitat associated with the green infrastructure will also have been developed to inform the assessment.
Wildlife collision rates with aircraft or road traffic (resulting in death or injury of individual animals)

8.10.566 Otters could be killed or injured following collisions with construction vehicles (on site or surrounding roads) and any traffic accessing or egressing the Airport. Due to the scale of the construction activities and the operational activities at the Airport this change would operate over a full 24-hour period.

8.10.567 Trunk and A roads pose greater risk to otters, particularly on stretches which are straighter with more cars and faster traffic (Hutchison and McCafferty, 2009). Otter mortality is also linked to the proximity of a watercourse to a road and if within 100m, it is significantly higher; particularly where the watercourse did not cross the road (Philcox et al., 1999).

8.10.568 During the construction of new, or changes to existing road layouts there is the potential to improve the current situation for otters by installing specific crossing points for them. Crossing points for otters would be provided as part of the embedded measures and placed within the context of the green infrastructure to maximise connectivity of suitable otter habitat. These crossings would be designed in accordance with the Design Manual for Roads and Bridges (Highways Agency, 1999). In addition to crossing points, otter proof fencing along limited sections of road would be required to further reduce otter mortality.

8.10.569 Changes in traffic levels, at this preliminary stage, are not expected to increase markedly due to the policies set out in the ANPS regarding surface access and air quality. This alongside the commitment to provide fencing and safe crossing points for this species suggests the favourable conservation status of otter would not be affected. The scale of the change to the otter population, at this preliminary assessment stage, is predicted to be very low and the effect Not Significant to an ecological feature of regional importance.

8.10.570 At the time of application, the assessment of this likely significant effect will be further informed by field survey information (providing details of otter distribution and territory location) and the detailed design of the green infrastructure strategy, including details of specific environmental measures such as the location and number of crossings beneath roads.

Assessment of biodiversity effects – Badger

Detailed baseline

8.10.571 Badgers (an ecological feature of local importance, scoped into the assessment due to its legally protected status) have been recorded within the study area. These records have included setts, badger paths, latrines, snuffle holes and
badger hairs (Figure 8.12 shows the location of badger activity signs, other than sett locations that are kept confidential for welfare reasons).

8.10.572 A total of 34 setts have been recorded. These setts comprise six subsidiary setts and 27 outlier setts. No main setts or annex setts have been recorded. Of these setts, two subsidiary setts and six outlier setts occur within areas where active construction works will take place.

8.10.573 The data gathered to date suggests that badger are widespread within the study area, but occur at a low density. This data is in line with the findings of Clark (1988) who found that in areas where foraging resources are scarce the territory of a badger clan can extend to approximately 300ha; as opposed to around 50ha in a richer habitat setting.

8.10.574 Badger numbers across England and Wales were estimated in 2017 as approximately 485,000 individuals, indicating an increase in the badger population since the 1980s (Judge et al., 2017). However, within the study area it is considered likely that anthropogenic factors such as persecution, road traffic collisions (both of which have been recorded) and a fragmented landscape are likely to limit the ability of the local badger population to increase markedly.

8.10.575 Data is not currently available that would determine the number of badger clans currently present within the study area (this to be gathered in 2019). The size of these territories are also unknown, which would provide an insight into the status of the local badger populations. Bait marking surveys and further searches for signs of badger activity will be undertaken in 2019.

Predicted effects and their significance

Land take and land cover change (resulting in habitat loss or degradation)

8.10.576 There would be both temporary and permanent loss of badger habitat, including the loss of broadleaved woodland, scrub, hedgerows, dry ditches and grassland; all of which provide opportunities for foraging and sett construction. This would occur primarily during the period prior to the anticipated opening of the North West Runway in 2027, as this is the period of major land take to provide both temporary construction areas and new infrastructure.

8.10.577 Broadly there are two ways in which loss of habitat can manifest itself. The first is for those badger clans that would lose some or all of their setts due to the land take associated with the DCO Project. The loss of setts and foraging habitats for these badgers is likely to result in the home-ranges being extended to compensate for the loss of resources. This may result in a reduction of fitness as expansion may be limited by the presence of neighbouring badger clans (for example competition for resources or territorial dispute), the presence of barriers to
movement limiting expansion, increased losses from vehicle collision (see paragraphs 8.10.597 to 8.10.600) as individuals navigate the landscape or increased risk of starvation if the lost resources cannot be replaced. For badger clans that may retain some or all of their sett locations, the effects described above would be realised but would be at a reduced scale.

At this stage of the DCO Project the distribution of badger clans and the ways in which they navigate the landscape are unknown (for example badgers are assumed to be using the underpasses carrying the River Colne and Wraysbury River underneath the M4, but no survey information confirming this has yet to be collected). Without this information it is not yet possible to understand the extent of the likely significant effect on this species.

Approximately 891ha of habitat suitable for badger would be lost to development (some of this would be temporary). As well as the loss of foraging habitat, eight setts would need to be closed and destroyed to facilitate the delivery of the DCO Project. The provision of green infrastructure would create or improve substantial areas of habitat for badger, although the design of this is evolving and therefore its extent, make-up and location is unknown. These areas would include the creation of artificial badger setts providing opportunities for clans to relocate. Where necessary the design, timing and delivery of environmental measures would be secured through a licence issued by Natural England. Based on successful design and implementation of green infrastructure, as well as other associated environmental measures the scale of the change is predicted to be low.

The preliminary assessment is that in the short term (5 years from start of construction) the local badger population may be suppressed. However, in the medium (10 years) to long term (10 years +) the creation of extensive, well connected alternative habitat will allow the local badger population to expand, thereby resulting in a likely effect of Not Significant on this ecological feature of local importance.

At the time of application the assessment of this likely effect will be further informed by field survey information providing details of individual badger clan home ranges and design of the green infrastructure, including details of specific environmental measures such as the location and number of artificial setts.

Fragmentation of habitats (reduction of connectivity)

Fragmentation of habitat through the loss of landscape features such as hedgerows and the creation of areas that are unsuitable for badgers (for example active construction sites, hard standings, buildings etc.) have the potential to challenge the viability of home ranges and reduce the fitness of local populations by displacing individuals from key foraging areas or sett locations, increasing their
vulnerability to road traffic collision (Clarke et al., 1998) and reducing the ability of animals to disperse (in other words reducing genetic mixing). Any clan of badgers becoming isolated from the wider surrounds will be more likely to be lost as a result of fragmentation.

In order to maintain habitat connectivity the environmental measures would need to be designed to maintain connectivity through construction areas (to prevent isolation of existing badger clans), as well as newly created and improved green infrastructure to provide a well-connected, expansive area of habitat suitable for this species. Assuming successful design and implementation of green infrastructure and other associated environmental measures (such as badger tunnels beneath roads) the scale of the change on a feature of local importance is predicted to be low during the initial period of construction as the success of transit routes through active construction areas are unlikely to have the same efficacy as undisturbed areas. However, in the longer term the scale of change is likely to become very low or negligible.

The preliminary assessment it is concluded that in the short term (five years from start of construction) the local population is likely to be suppressed. However, in the medium (10 years) to long term (10 years +) the creation of extensive, well connected alternative habitat would allow the local badger population to expand, thereby resulting in a likely effect that is **Not Significant** on an ecological feature of local importance.

At the time of application the assessment of this likely effect will be further informed by field survey information providing details of individual badger clan home ranges and design of the green infrastructure, including details of specific environmental measures such as the location and number of badger tunnels beneath roads.

**Increased noise and vibration (resulting in disturbance / displacement)**

Existing badger habitat would remain during construction and would be retained after the North West Runway and other infrastructure (such as the diverted M25) becomes operational. Badger habitat would also be provided within the green infrastructure elements of the DCO Project, some of which would necessarily be in close proximity to potential sources of disturbance (for example roads, residential areas, industrial premises.).

Noise and vibration can be detrimental to badgers and their use of habitat. Intermittent or sudden noise or vibrations will disturb badgers more frequently than predictable or constant sources that allow individuals to habituate (Natural England, 2009). Disturbance may result in badgers spending less time foraging or
socialising as they respond to stimuli, with potential implications for fitness and their favourable conservation status.

8.10.588 Noise and vibration associated with the DCO Project would mainly be generated by construction activity (including piling), operational activity, road traffic, aircraft movements or recreational users of the green infrastructure. Badgers are well known to use setts and foraging habitats in close proximity to infrastructure including railways, motorways and airports (there are records of badgers in close proximity to Heathrow, Gatwick, Stansted and Manchester airports) suggesting that there is limited potential for disturbance from road or air traffic or industrial activity to be realised. Further, badgers regularly frequent areas used by the public without showing signs of disturbance, except if there is encroachment of the area immediately around sett locations.

8.10.589 Typically disturbance distances for various activities (including forestry operations, development and quarrying activity) are noted as 20, 30 or 100m (Natural England 2011; Cemex and Badger Trust 2012; Forestry Commission 1995) from sett locations. Based on the results gathered to date there would be sett locations within 100m of active construction and operational sites. However, these setts are within territories within which the extent of habitat loss or change will be such that specific measures will need to be provided under licence within the proposed green infrastructure to provide alternative habitats. These actions will provide the affected badger clans with the opportunity to avoid disturbance effectively. Therefore, the preliminary conclusions of the assessment are that the scale of change on a feature of local importance is considered to be very low to negligible and the likely effect is Not Significant on this ecological feature of local importance.

8.10.590 At the time of application the assessment of this likely effect will be further informed by field survey information providing a more extensive understanding of the distribution and status of badger setts through the survey of previously inaccessible areas.

*Increased light intensity (resulting in disturbance / displacement)*

8.10.591 Badgers are nocturnal and will often emerge from their setts soon after sunset to socialise and forage. Their senses are attuned to both light and dark, but they will preferentially forage at night. Where artificial light spills onto habitat suitable for badgers it is likely to reduce activity at night in these locations. Research has also shown that sett emergence time is often recorded later in the evening where the sett entrance is exposed to more light (Neal and Cheeseman, 1998).

8.10.592 Where light spill is directly upon suitable habitat, badgers are likely to be displaced. This may reduce the availability of foraging and commuting habitat for
this species, although there are examples of badgers habituating to lit conditions, such as in cities (Harris 1984, Huck et al., 2008). This indirect loss of habitat may result in the reduction of the viability of a home range, resulting in a reduction of fitness for the badger clan occupying the area. However, this loss would represent only a small area of the losses associated with land take and land use change.

8.10.593 In order to limit light spill on to adjacent habitats a lighting design will be produced that will involve minimising the amount of light needed, ensuring that what is required is suitably directed and that light spill is minimised.

8.10.594 As lighting design will be sensitive and newly created habitats for badger will be located sensitively (in other words away from lit areas), the preliminary conclusions drawn are that the scale of change is low and the likely effect is Not Significant on an ecological feature of local importance.

8.10.595 At the time of application the assessment of this likely effect will be further informed by a lighting assessment showing both the current baseline and that predicted for the DCO Project, as well as further information on badger distribution and home range size; as well as information on the types and locations of habitat to be created as part of the green infrastructure proposals.

Wildlife collision rates with aircraft or road traffic (resulting in death or injury of individual animals)

8.10.596 Badgers are regularly killed through collision with road traffic throughout England, with mortality rates of adults being estimated to range between approximately 1% and 66% (Sleeman et al., 2012, Clarke et al., 1998, Seiler et al., 2004). Road traffic collisions occurred at a greater rate in busy areas with more motorways and dual carriageways (Clarke et al., 1998). This can result in badgers occurring at low densities or being absent in areas with high road densities (Skinner et al., 1991). This, along with other constraints (for example fragmentation) could be one of the reasons that the densities of badger around Heathrow appear to be low.

8.10.597 The diversion of roads and the potential increases in traffic numbers (both from construction vehicles and vehicles accessing/egressing the operational airport) could result in a higher level of collision. However, during the construction of new, or changes to existing, road layouts there is the potential to improve the current situation for badgers by installing specific crossing points for them. The use of ‘badger tunnels’ has proved to be an effective means of providing safe crossing points for badger, with installed tunnels showing a high level of usage (Eldridge & Wynn 2011). Crossing points for badgers would be provided as part of the environmental measures and placed within the context of the green infrastructure to maximise connectivity of suitable badger habitat.
8.10.598 Changes in traffic levels, at this preliminary stage, are not expected to increase markedly due to the policies set out in the ANPS regarding surface access and air quality. This alongside the commitment to provide fencing and safe crossing points for this species suggests the favourable conservation status of badger would not be affected. The scale of the change to the badger population, at this preliminary assessment stage, is predicted to be very low and the effect Not Significant to an ecological feature of local importance.

8.10.599 At the time of application the assessment of this likely effect will be further informed by field survey information providing details of individual badger clan home ranges (thereby identifying likely road crossings) and design of the green infrastructure, including details of specific environmental measures such as the location and number of badger tunnels beneath roads.

Assessment of biodiversity effects – Great crested newt

Detailed baseline

8.10.600 No records of great crested newt within 500m of the Site were returned through the desk study. Field surveys identified sixty-three ponds, lakes and reservoirs and 26 ditches that required further assessment following a desk study and field survey scoping exercise. Of the 89 water bodies identified as having potential for great crested newt, 37 have been surveyed in 2017 or 2018, the remaining 52 water bodies will be subject to survey where accessible and if holding water, in 2019.

8.10.601 Two positive results for great crested newt (an ecological feature of local importance) have been returned; the locations are shown on Figure 8.17, Volume 2. A single pond provided a positive eDNA sample for great crested newt to the west of Harmondsworth. This pond is an artificially created water body that sits within an area of parkland (part of Harmondsworth Moor – created in the late 1990s). It lies adjacent to allotments and the Saxon Way Trading Estate. The area is triangular and is bounded by Moor Lane, Accommodation Lane, the River Colne and the Duke of Northumberland’s River; the area (including the industrial estate and allotments) is approximately 5.7ha in extent. The area of parkland has two ponds present, only one of which provided a positive sample for great crested newt. Any great crested newt population in this area is likely to be isolated from other suitable habitat in the area by the rivers and the road. It is also of note that ponds surveyed elsewhere within Harmondsworth Moor have returned negative results for great crested newts.82

82 In 2019 traditional field surveys will be used to determine the population size of great crested newt. This will also test the potential for a false positive eDNA result to have been achieved.
8.10.602 The second positive result was from a pond located between the M25, close to junction 14, Unit 1 of Staines Moor SSSI (known as Poyle Meadow) and the east of Poyle Meadows SNCI (the supporting information for neither site suggests the presence of great crested newt). The SNCI supports another pond that supports a good fish population and for which eDNA analysis did not return a positive result for any amphibians. An additional pond and a number of ditches in this area are dry for extended periods. The presence of the M25, Horton Road and the Wraysbury River suggest that the great crested newt population in this area is isolated. The only potential linkage to further suitable habitat would be for newts to migrate beneath the M25 (through the culvert through which the Wraysbury River flows) or along the Wraysbury River to suitable habitat north of Horton Road, but in excess of 500m from the identified great crested newt pond. Given the existing culvert under the M25 is in excess of 60m long, and that none of the identified ponds or ditches within 500m of the culvert entrance to the east of the M25 support great crested newts it is assumed that the population present is isolated.

8.10.603 Further survey in 2019 will focus on identifying any further water bodies within the study area that support great crested newts and determining the population size class of the populations already identified.

Predicted effects and their significance

Land take and land cover change (resulting in habitat loss or degradation)

8.10.604 Both ponds with positive results for great crested newt would be lost to the DCO Project. The pond located within Harmondsworth Moor would be lost to the diversion of both the A4 and the Duke of Northumberland’s River, whilst the pond located adjacent to Poyle Meadow would be lost due to changes to junction 14 of the M25. In both instances the working areas required to deliver these infrastructure changes would also result in the loss of areas of suitable, connected terrestrial habitat within the vicinity of these ponds.

8.10.605 The DCO Project would lead to the total loss of these local populations of great crested newt unless suitable environmental measures are put in place as no alternative breeding habitat would remain. Environmental measures would need to be implemented within the framework of a European Protected Species (EPS) licence, and would need to ensure that the favourable conservation status of the local population is maintained. In order to achieve this, it would be necessary to provide alternative breeding ponds and suitable associated terrestrial habitat and translocate any individuals into these areas prior to any construction works commencing. The green infrastructure proposals (see Chapter 6) for the DCO Project are yet to be developed to a level of design where the number and location of breeding ponds is specified. However, it is envisaged that there would be a
considerably larger number of ponds created than lost. These ponds will be
designed to favour amphibian populations, whilst also being generally
unfavourable to wildfowl or gulls. These ponds would be provided within green
infrastructure that is close to the ponds being lost and well connected to other
suitable habitat in close proximity.

8.10.606 Design of suitable habitat and methods for translocation will be based on Natural
England’s ‘Great crested newts: surveys and mitigation for development projects’
(Natural England, 2015).

8.10.607 Without the implementation of environmental measures these isolated populations
would be lost as its breeding pond would be infilled. However, the provision of
better quality and more extensive habitats for great crested newt within areas of
green infrastructure and the translocation of individuals from the areas of loss prior
to any construction works commencing would ensure the favourable conservation
status of these local great crested newt populations, and result in a scale of
change that is low and an effect that is Not Significant on this ecological feature
of local importance. This preliminary assessment will be reviewed at ES stage.

8.10.608 At the time of application the assessment of this likely effect will be further
informed by population assessments of the great crested newts identified, further
survey of water bodies and a description of the extent and location of
compensatory habitat to be created as part of the green infrastructure proposals.

Assessment of biodiversity effects – Reptiles (slow worm and grass snake)

Detailed baseline

8.10.609 The desk study report identified records of all four common reptile species within
2km of the Site. However, only grass snake and slow worm were identified during
field survey (both ecological features of local importance being scoped in to the
assessment due to their legally protected status).

8.10.610 Habitat types that have the potential to support reptiles within the Site comprise
semi-improved and improved grassland, rough grassland, scrub, tall ruderal
vegetation, hedgerows and woodland edge, all of which lie in close proximity to
waterbodies and rivers/streams. The areas where reptile survey has been
undertaken to date are shown on Figure 8.18, Volume 2.

8.10.611 Grass snake were recorded as present across most of the areas surveyed; with
slow worms being recorded to the west of the M25 only. The distribution of reptile
records returned from the survey are shown on Figure 8.18, with both juvenile and
sub-adults of both species observed indicating that breeding populations are
present.
8.10.612 The population size class assessment undertaken indicates that a ‘low’ population of grass snakes and a ‘good’ population of slow worms is present within the areas surveyed.

8.10.613 The distribution of slow worm populations identified to date (see Figure 8.18) suggests that this population is already isolated in the study area by the presence of the M4, the A4 and the Colnbrook Logistics Centre, Lakeside Energy from Waste facility and other industrial premises. Grass snakes have been shown to be more widely spread, although the distribution shows strong affiliation with the river corridors moving through the Colne Valley. The greatest density of grass snake is present within Harmondsworth Moor. Grass snakes can have home ranges up to 14ha (Reading & Jofre, 2009) and are therefore likely to use relatively long stretches of riparian and associated habitats as the extent of optimal habitat is relatively constrained.

8.10.614 Further survey work will be undertaken in 2019 in areas of suitable habitat not previously subject to survey to determine whether grass snake, slow worm or other reptile species are present and the distribution and size of any identified populations.

Predicted effects and their significance

Land take and land cover change (resulting in habitat loss or degradation)

8.10.615 Within the study area there is approximately 285ha of habitat known to support reptiles, with a further 728ha of habitat that is potentially suitable but where their presence is unknown at this stage (total of 1,013ha). Approximately 307ha of this habitat (151ha of where reptile presence has been confirmed) is within areas where construction and subsequent operational activities will take place (largely occurring in Phases 1 and 2 of the DCO Project). These areas are mainly located along the western perimeter of the existing airfield, within Harmondsworth Moor and around the Old Slade Lake LWS and neighbouring semi-natural habitats.

8.10.616 The loss of habitats supporting reptiles could result in the death or injury of individual animals, as well as a reduction in the availability of prey resources, loss of sheltering habitat, and breeding and hibernation sites, presenting a challenge to the viability of affected local populations.

8.10.617 Without the implementation of the environmental measures, the scale of losses of both good quality and sub-optimal habitat has the potential to result in the loss of reptile populations in the vicinity of the airfield. As a result, the viability of local slow worm and grass snake populations and their ability to persist following the loss of such large areas of habitat, much of which is already fragmented (see Section 8.5), would be severely challenged.
To ensure that the favourable conservation status of the populations of slow worm and grass snake are maintained, environmental measures would be implemented. These measures would aim to create suitable high quality habitats in close proximity to the construction areas, whilst also translocating those affected individual animals to these new habitats prior to losses of current habitats occurring.

The design of the green infrastructure is yet to progress to a sufficient degree to detail the location and extent of habitats that would be created for reptiles, or to understand in detail the sequencing of the translocation works. However, the principles that would be followed are:

1. Habitats to be created or improved for reptiles would be integrated with the wider green infrastructure, providing large connected and well managed areas for these species

2. The creation or improvement of the sites where reptiles would be released (receptor sites) would take place prior to the loss of the habitats currently supporting reptiles (donor sites). Receptor sites would be of a size and design to ensure that the populations in donor sites can be maintained and enabled to grow in the short and long term


Although considerable areas of habitat supporting reptiles would be lost to the DCO Project, the current status of much of this habitat within the Site (approximately 60% of habitat where access has been available for survey) is sub-optimal. The provision of new and improved habitats, something that can be achieved using tried and tested habitat creation measures, would result in an increase in the availability of optimal reptile habitat occurring in the general vicinity of the DCO Project. This habitat would be better connected than the current habitats for reptiles in the area based on the Preferred Masterplan as described in Chapter 6. This would enable slow worm and grass snake populations to be maintained in the area and provide the opportunity for future expansion. Without the implementation of these environmental measures the scale of change on a feature of local importance would be medium. However, by ensuring the delivery of suitable environmental measures this would reduce the change to low. The preliminary findings of the assessment are that habitat loss or habitat degradation would not alter the favourable conservation status of the local populations of both slow worm and grass snake and would result in a scale of change of very low and an effect that is Not Significant on this ecological feature of local importance.
8.10.621 At the time of application the assessment of this likely effect will be further informed by quantified estimates of occupied habitats to be lost (following further survey), their distribution and the extent and location of compensatory habitat to be created as part of the green infrastructure proposals.

**Fragmentation of habitats (reduction of connectivity)**

8.10.622 The fragmentation of habitats through the creation of unsuitable areas (such as construction sites or built infrastructure) can prevent the interchange of individual animals between patches of suitable habitat. Small and isolated populations are more prone to local extinction events as the ability to move between patches as conditions change (for example at times of flood or as resources are depleted) are compromised. Edge effects occur more frequently in smaller populations, reducing the suitability of habitat (for reptiles transition between different habitat types can also be valuable), and populations may become more genetically isolated reducing the fitness of the population over time.

8.10.623 The degree of habitat fragmentation associated with the DCO Project changes over time, due to the phasing of construction works and the delivery of green infrastructure. Furthermore, the green infrastructure would develop in complexity and condition as it matures, becoming more suitable for reptiles over time. As the construction takes place over an 11 year period and is concurrent with the completion and commissioning of certain pieces of built and green infrastructure, the habitat connectivity would fluctuate until the delivery of the DCO Project is complete. It is also necessary to understand that some routes of potential connectivity would be more valuable than others (for example, river corridors, streams and wet ditches provide good commuting habitats for grass snakes).

8.10.624 At this stage of the DCO Project, the construction programme is high level and considers large blocks of land only. However, the delivery of construction in these areas would be more subtle, with certain areas being actively worked upon at any given time whilst others remain undisturbed. In addition, design of boundary features around individual construction areas that may be key to maintaining connectivity in the short term have not been determined, and nor has the design of adjacent areas of green infrastructure. This means that at this stage of the DCO Project a quantified assessment of habitat connectivity for reptiles is not possible.

8.10.625 With regard to reptiles it is however key to the consideration of habitat connectivity that the individual animals present within the construction areas would be translocated to newly created or improved habitats. These habitats will necessarily be designed to ensure that:

1. They would be of great enough extent and quality to support the animals translocated to them
2. They would be connected to other suitable habitat in the surrounding area at the time of creation (thus connecting different receptor sites)

3. They would be connected to the wider area of green infrastructure proposed (including areas within the developed area) as the DCO Project progresses.

The environmental measures proposed for reptiles would enable the populations in the long term to:

1. Expand in number through the provision of greater extents of optimal habitat types and provision of features within general habitat types specifically aimed at improving opportunities for reptiles (for example the construction of frequent hibernacula and south facing banks)

2. Expand the current distribution of slow worm and grass snake in the area through the provision of higher quality, better connected habitats.

As reptiles would be translocated from the development area, and surrounding habitats would be improved as green infrastructure, the potential for habitat fragmentation to threaten the favourable conservation status of local grass snake and slow worm populations can be discounted. The preliminary conclusions drawn at this stage of the DCO Project are that the scale of change on a feature of local importance would be very low and the likely effect is Not Significant.

At the time of application the assessment of this likely effect will be further informed by a quantification of habitat connectivity based on the green infrastructure proposals, as well as further information on reptile distribution based on field survey undertaken in 2019.

**Assessment of biodiversity effects – Terrestrial invertebrate assemblage associated with short sward and bare ground**

**Detailed baseline**

Short sward and bare ground is found in lowland habitats where areas of bare or sparsely vegetated ground are created through disturbance. Small-scale, patchy disturbance can create particularly good invertebrate habitat. Within the study area the disturbance is largely created as a result of human activity on brownfield land and active quarrying sites. To date, 182 species associated with this habitat have been recorded from field and desk studies, including 32 with the following designations (some species are listed under more than one designation):

1. Four species listed as SPI

2. Five RDB (pre-1994 criteria) or threatened species (post-2001 criteria) (one vulnerable (VU); one near threatened (NT); one RDB2; two RDB3)
3. Thirty-two nationally notable species (eight Na species, 17 Nb, five nationally scarce (NS) and two near threatened (NT)).

8.10.630 Locations where important species of this assemblage have been identified are dispersed throughout the study area (see Figures 8.25 and 8.27 to 8.29, Volume 2). They include active and disused quarry workings near Colnbrook and the Colne Valley Heathrow Biodiversity Site which lies to the west of Heathrow airport and is within the Site.

8.10.631 Further survey work will be undertaken in 2019 to further inform the distribution of this assemblage and its constituent species.

Predicted effects and their significance

Land take and land cover change (resulting in habitat loss or degradation)

8.10.632 Habitat clearance for the establishment of construction sites and supporting infrastructure would lead to the loss of short sward and bare ground habitats. Breeding and foraging habitat for the terrestrial invertebrate assemblage it supports would be reduced, to the detriment of the populations present. Surveys to date have identified this type of habitat and the wider open habitats biotope, and its associated invertebrate assemblage within the Site. This includes an active and disused quarry site in Colnbrook and Colne Valley Heathrow Biodiversity Site to the west of Heathrow airport (see Figure 8.25).

8.10.633 The loss of these habitats would result in the loss or displacement of portions of the local populations of the species represented within this assemblage. However, it is notable that this habitat occurs across the wider area (both within the Site, study area and beyond) and would therefore persist throughout the temporal scope of the assessment. Further, additional areas of compensatory habitat would be provided within the green infrastructure to be delivered as part of the DCO Project.

8.10.634 At this stage of the assessment it is neither possible to quantify the extent of the loss of habitats for this assemblage, as the habitat survey information is incomplete, as is the extent of proposed new habitats to be created, as the green infrastructure design has not been developed to the requisite level of detail. However, based on the principle that sufficient, well connected habitat (much of which can be created using tried and tested methods of habitat creation) would be provided to account for the losses (some of which will be delivered prior to any losses occurring) the preliminary conclusion is that the scale of environmental change on a feature of regional importance would be low and the likely effect of habitat loss or change is **Not Significant**. This is because these populations
would then be able to colonise newly created habitats and also re-colonise some of the areas that have been subject to change following reinstatement.

8.10.635 At the time of application the assessment of this likely effect will be further informed by quantified estimates of the habitats to be lost, their distribution and the extent and location of compensatory habitat to be created as part of the green infrastructure proposals.

**Fragmentation of habitats (reduction of connectivity)**

8.10.636 Fragmentation of habitats through habitat clearance and land use change would lead to a decrease in connectivity between patches of short sward and bare ground. This may cause the restriction of the home ranges and isolation of populations of species within this assemblage. Most species of importance within this assemblage belong to orders which can disperse aerially (e.g. Lepidoptera, Diptera, Hymenoptera), aiding movement and colonisation between habitat fragments. Additionally, most are herbivorous, with lower extinction risk from fragmentation compared to populations at the top of food chains. However, several species have characteristics which increase susceptibility to the effects of fragmentation, such as those with predatory or parasitic life stages.

8.10.637 Based on current data and information, the scale of change on a feature of regional importance is predicted to be low and the likely effect is Not Significant. This is based on the provision of a well-connected habitat to account for the losses and fragmentation.

8.10.638 At the time of application the assessment of this likely effect will be further informed by a quantification of habitat connectivity based on the green infrastructure proposals.

**Increased light intensity (resulting in disturbance / displacement)**

8.10.639 The use of temporary lighting for security purposes or to illuminate construction or operational working areas is likely to cause the displacement of nocturnal invertebrates present in this assemblage which are attracted to artificial light (for example moths). This may lead to the mortality of individuals from exhaustion, collision with the light sources, or increased predation in these areas, with negative effects on species populations. Additionally, artificial light can significantly disrupt the natural light / dark patterns, thereby affecting the physiology or behaviour of species reliant on natural light level changes, resulting in a reduction in their fitness.

8.10.640 At the time of writing detailed lighting information is not available. However, based on the locations of the DCO Project (both temporary and permanent activity) within Harmondsworth, Sipson, Stanwell Moor, Poyle and Colnbrook, it is assumed that
artificial light levels would be increased in some areas where short sward and bare ground is present.

8.10.641 The maximum distance from which moths have been recorded as flying to artificial light sources is 500m. The proportion of this habitat likely to be affected is therefore limited (especially as it would apply to those suitable habitats that are outside of the areas that will be subject to habitat loss). Further, the current baseline night sky brightness in these areas are extremely high based on broad satellite mapping of light pollution across the UK (CPRE 2016) (all areas being within the top two brightest bands).

8.10.642 In order to limit light spill on to adjacent habitats and reduce attractiveness a lighting design would be produced that would involve minimising the amount of light needed, ensuring that what is required is suitably directed and that light spill is minimised.

8.10.643 As lighting design would be sensitive and newly created habitats for this assemblage will be located sensitively the preliminary conclusion is that the scale of change on a feature of regional importance is very low and the likely effect is Not Significant.

8.10.644 At the time of application the assessment of this likely effect will be further informed by a lighting assessment showing both the current baseline and that predicted for the DCO Project, as well as the distribution of tall sward and scrub that both currently occur and those that will be created as part of the green infrastructure proposals.

Assessment of biodiversity effects – Terrestrial invertebrates associated with tall sward and scrub

Detailed baseline

8.10.645 Tall sward and scrub is a habitat type represented by areas of dense herbs creating partial shade and a humid microclimate at ground level. Dominance by woody plants is limited, but they often form an important component of the habitat, such as at woodland edges. Baseline results collected to date have recorded a total of 557 terrestrial invertebrate species associated with this habitat (see Figures 8.25 to 8.29). This assemblage is considered to be of regional importance due to the number of species supported, including 25 species with the following designations (some species are included under more than one designation):

1. Five species listed as SPI
2. Four RDB species (one nationally endangered; three nationally rare)
3. Sixteen Nationally Notable species (including five in category Nb; three unknown)

4. Three potential nationally scarce species.

There are areas of this habitat present throughout the study area, with more significant areas located to the west and north-west of the existing airport, within the Colne Valley.

Further survey work will be undertaken in 2019 to further inform the distribution of this assemblage and its constituent species.

**Predicted effects and their significance**

**Land take and land cover change (resulting in habitat loss or degradation)**

Habitat clearance for the establishment of construction sites and supporting infrastructure would lead to the loss of tall sward and scrub habitat. This would reduce the availability of breeding and foraging habitat for the terrestrial invertebrate assemblage it supports. Surveys to date have identified invertebrate assemblages associated with this habitat and the broader open habitats biotope across the Site, particularly in the areas around Harmondsworth, Sipson, Stanwell Moor and Poyle and Colnbrook (see Figure 8.25).

The loss of these habitats would result in the loss or displacement of portions of the local populations of the species represented within this assemblage. However, it is notable that this habitat occurs across the wider area (both within the Site, study area and beyond) and would therefore persist throughout the temporal scope of the assessment. Further, additional areas of compensatory habitat would be provided within the green infrastructure to be delivered as part of the DCO Project.

At this stage of the assessment it is neither possible to quantify the extent of the loss of habitats for this assemblage, as the habitat survey information is incomplete, as is the extent of proposed new habitats to be created, as the green infrastructure design has not been developed to the requisite level of detail. However, based on the principle that sufficient, well connected habitat (much of which can be created using tried and tested methods of habitat creation) would be provided to account for the losses (some of which will be delivered prior to any losses occurring) the preliminary conclusion is that the scale of environmental change on a feature of regional importance would be low and the likely effect of habitat loss or change is Not Significant. This is because these populations would then be able to colonise newly created habitats and also re-colonise some of the areas that have been subject to change following reinstatement.
At the time of application the assessment of this likely effect will be further informed by quantified estimates of the habitats to be lost, their distribution and the extent and location of compensatory habitat to be created as part of the green infrastructure proposals.

**Fragmentation of habitats (reduction of connectivity)**

Fragmentation of habitats through habitat clearance and land use change would lead to a decrease in connectivity between patches of tall sward and scrub. This may cause the restriction of home ranges and isolation of populations of species within this assemblage. The effect of fragmentation on invertebrates is not well studied and is dependent on many factors, including both the ecology of individual species (for example specialisation, population variability, body size etc.) and the features of fragmentation (for example fragment size, edge effects etc.). Species of note within this assemblage primarily belong to orders which can disperse aerially (for example Lepidoptera, Diptera), aiding movement and colonisation between habitat fragments. However, several species have characteristics which increase susceptibility to the effects of fragmentation. This includes species which have parasitic stages with specific hosts (for example *Blaesoxipha plumicornis*).

Based on current data and information, the preliminary conclusion is that the scale of change would be low and the likely effect of fragmentation is **Not Significant** on this ecological feature of regional importance. This assumes that well-connected habitat would be provided to account for the losses and fragmentation.

At the time of application the assessment of this likely effect will be further informed by a quantification of habitat connectivity based on the green infrastructure proposals.

**Increased light intensity (resulting in disturbance / displacement)**

The use of temporary lighting for security purposes or to illuminate construction or operational working areas is likely to cause the displacement of nocturnal invertebrates present in this assemblage which are attracted to artificial light (for example moths). This may lead to the mortality of individuals from exhaustion, collision with the light sources, or increased predation in these areas, with negative effects on species populations. Additionally, artificial light can significantly disrupt the natural light / dark patterns, thereby affecting the physiology or behaviour of species reliant on natural light level changes, resulting in a reduction in their fitness.

At the time of writing, detailed lighting information is not available. However, based on the locations of the DCO Project (both temporary and permanent activity) within Harmondsworth, Sipson, Stanwell Moor, Poyle and Colnbrook, it is assumed that
artificial light levels would be increased in some areas where tall sward and scrub is present.

8.10.657 The maximum distance from which moths have been recorded as flying to artificial light sources is 500m. The proportion of this habitat likely to be affected is therefore limited (especially as it would apply to those suitable habitats that are outside of the areas that will be subject to habitat loss). Further, the current baseline night sky brightness in these areas are extremely high based on broad satellite mapping of light pollution across the UK (CPRE, 2016) (all areas being within the top two brightest bands).

8.10.658 In order to limit light spill on to adjacent habitats and reduce attractiveness a lighting design would be produced that would involve minimising the amount of light needed, ensuring that what is required is suitably directed and that light spill is minimised.

8.10.659 As lighting design would be sensitive and newly created habitats for this assemblage will be located sensitively the preliminary conclusion is that the scale of change on a feature of regional importance is very low and the likely effect is Not Significant.

8.10.660 At the time of application the assessment of this likely effect will be further informed by a lighting assessment showing both the current baseline and that predicted for the DCO Project, as well as the distribution of tall sward and scrub that both currently occur and those that will be created as part of the green infrastructure proposals.

Assessment of biodiversity effects – Terrestrial invertebrate assemblage associated with arboreal habitat

Detailed baseline

8.10.661 Arboreal habitats include habitats in and on trees, including the canopy, trunks and branches. Field and desk study data to date have recorded a total of 236 species associated with arboreal habitats, of these there are seven species with some form of designation, including:

1. Two species listed as an SPI
2. One species on Schedule 5 of the Wildlife and Countryside Act
3. Three species listed as threatened under post-2001 criteria (two endangered (EN); one data deficient (DD))
4. Three nationally notable species (one Na and two Nb).
Important species of this assemblage and the wider tree-associated biotope have been identified in limited locations from field surveys, including areas both within and outside the Site. Locations within the Site include the habitats within the Old Slade Lake LWS (see Figures 8.25 and 8.27 to 8.29).

Further survey work will be undertaken in 2019 to further inform the distribution of this assemblage and its constituent species.

**Predicted effects and their significance**

**Land take and land cover change (resulting in habitat loss or degradation)**

Habitat clearance for the establishment of construction sites and supporting infrastructure would lead to the loss of arboreal habitats. Breeding and foraging habitat for the terrestrial invertebrate assemblage it supports will be reduced, to the detriment of the populations present. Surveys to date have identified this type of habitat, and its associated invertebrate assemblage, in limited locations within the Site, including lakes surrounded by woodland adjacent to the M25/M4 interchange.

The loss of these habitats would result in the loss or displacement of portions of the local populations of the species represented within this assemblage. However, it is notable that this habitat occurs across the wider area (both within the Site, study area and beyond) and would therefore persist throughout the temporal scope of the assessment. Further, additional areas of compensatory habitat would be provided within the green infrastructure to be delivered as part of the DCO Project.

At this stage of the assessment it is neither possible to quantify the extent of the loss of habitats for this assemblage, as the habitat survey information is incomplete, as is the extent of proposed new habitats to be created (much of which can be created using tried and tested methods of habitat creation), as the green infrastructure design has not been developed to the requisite level of detail. However, based on the principle that sufficient, well connected habitat would be provided to account for the losses (some of which will be delivered prior to any losses occurring) the preliminary conclusion is that the scale of environmental change on a feature of regional importance would be low and the likely effect of habitat loss or change is **Not Significant**. This is because these populations would then be able to colonise newly created habitats and also re-colonise some of the areas that have been subject to change following reinstatement. It is noted that for this assemblage the time taken to recolonise will be longer term as arboreal habitats take time to establish.
At the time of application the assessment of this likely effect will be further informed by quantified estimates of the habitats to be lost, their distribution and the extent and location of compensatory habitat to be created as part of the green infrastructure proposals.

**Fragmentation of habitats (reduction of connectivity)**

Arboreal habitat is already extremely limited and fragmented within the Site, with habitat loss likely to further decrease connectivity. The home range of species associated with these habitats have not been well studied. As described for the assemblage associated with tall sward and scrub, limited data on the effects of habitat fragmentation on invertebrates is available (paragraph 8.10.653). The ZOI of this effect is considered to be 500m from any woodland or tree habitat to be lost during construction, as aerial species within this assemblage may travel significant distances to find suitable foraging and breeding locations. Several species are associated with specific tree species or genera, with the effects of fragmentation having the potential to be significant should distances between patches of these habitats be increased.

Based on current data and information, and that suitable compensatory habitat will be established for any arboreal habitat lost, this scale of change on a feature of regional importance, is expected to be low and the likely effect is *Not Significant*.

At the time of application the assessment of this likely effect will be further informed by a quantification of habitat connectivity based on the green infrastructure proposals.

**Increased light intensity (resulting in disturbance / displacement)**

The use of temporary lighting for security purposes or to illuminate construction or operational working areas is likely to cause the displacement of nocturnal invertebrates present in this assemblage which are attracted to artificial light (for example moths). This may lead to the mortality of individuals from exhaustion, collision with the light sources, or increased predation in these areas, with negative effects on species populations. Additionally, artificial light can significantly disrupt the natural light / dark patterns, thereby affecting the physiology or behaviour of species reliant on natural light level changes, resulting in a reduction in their fitness.

At the time of writing detailed lighting information is not available. However, based on the locations of the DCO Project (both temporary and permanent activity) within Harmondsworth, Sipson, Stanwell Moor, Poyle and Colnbrook, it is assumed that artificial light levels would be increased in some areas where arboreal habitat is present.
8.10.673 The maximum distance from which moths have been recorded as flying to artificial light sources is 500m. The proportion of this habitat likely to be affected is therefore limited (especially as it would apply to those suitable habitats that are outside of the areas that will be subject to habitat loss). Further, the current baseline night sky brightness in these areas are extremely high based on broad satellite mapping of light pollution across the UK (CPRE, 2016) (all areas being within the top two brightest bands).

8.10.674 In order to limit light spill on to adjacent habitats and reduce attractiveness a lighting design would be produced that would involve minimising the amount of light needed, ensuring that what is required is suitably directed and that light spill is minimised.

8.10.675 As lighting design would be sensitive and newly created habitats for this assemblage will be located sensitively the preliminary conclusion is that the scale of change on a feature of regional importance is very low and the likely effect is Not Significant.

8.10.676 At the time of application the assessment of this likely effect will be further informed by a lighting assessment showing both the current baseline and that predicted for the DCO Project, as well as the distribution of tall sward and scrub that both currently occur and those that will be created as part of the green infrastructure proposals.

Changes in hydrology (groundwater levels, surface water run-off rates, river flows and lake levels; resulting in habitat change)

8.10.677 Changes in GWDTE due to an alteration of the water table level could result in the suitability of some habitats that remain in-situ within or outside of the Site reducing for terrestrial invertebrates within this assemblage. For this species the potential effect being associated with the potential degradation of wet woodland. These changes will add to the land take and land cover change described in paragraphs 8.10.665 to 8.10.668.

8.10.678 However, based on the principle that sufficient, well connected habitat would be provided to account for the losses (some of which will be delivered prior to any losses occurring) the preliminary conclusion is that the scale of environmental change on a feature of regional importance would be low and the likely effect of habitat loss or change is Not Significant. This is because these populations would then be able to colonise newly created habitats and also re-colonise some of the areas that have been subject to change following reinstatement. It is noted that for this assemblage the time taken to recolonise will be longer term as arboreal habitats take time to establish.
At the time of application, the assessment of this likely significant effect will be further informed by further baseline survey data and refined groundwater modelling outputs. Further, the design of newly created and improved habitat associated with the green infrastructure will also have been developed to inform the assessment.

**Assessment of biodiversity effects – Terrestrial invertebrate assemblage associated with decaying wood**

**Detailed baseline**

Saproxylic species are those dependent on decaying wood. These species are associated with the decomposition of wood and/or their agents (e.g. fungi) or are predators of other saproxylic species. Desk and field studies to date have identified 135 species within this assemblage, of these species eight are designated. Including the following:

1. Two species listed as SPI
2. One species listed under the Habitats Directive 92/43/EEC (stag beetle) and on Schedule 5 of the Wildlife and Countryside Act (protected from sale only)
3. Four notable species (two Na) and three nationally scarce species (NS))
4. One threatened species under post-2001 criteria (Vulnerable).

The extent of woodland within the study area is limited. However, areas of decaying wood are scattered in various locations throughout it, associated with the presence of arboreal habitat (see Figures 8.25 and 8.27 to 8.29). Species of note have been recorded from several locations during field surveys, including a woodland area adjacent to a lake west of Heathrow airport and Oaks Road Heathrow Biodiversity Site south of the Airport, both within the Site.

Further survey work will be undertaken in 2019 to further inform the distribution of this assemblage and its constituent species.

**Predicted effects and their significance**

**Land take and land cover change (resulting in habitat loss or degradation)**

Habitat clearance for the establishment of construction sites and supporting infrastructure would lead to the loss of decaying wood habitats. Breeding and foraging habitat for the terrestrial invertebrate assemblage it supports would be reduced, to the detriment of the populations present. Surveys to date have identified this type of habitat, and its associated invertebrate assemblage, within...
the Site in the areas around a lake west of Heathrow airport and Oaks Road Heathrow Biodiversity Site.

8.10.684 The loss of decaying wood habitats would result in the loss or displacement of portions of the local populations of the species represented within this assemblage. However, it is notable that this habitat occurs across the wider area (both within the Site, study area and beyond) and would therefore persist throughout the temporal scope of the assessment. Further, additional areas of compensatory habitat would be provided within the green infrastructure to be delivered as part of the DCO Project.

8.10.685 At this stage of the assessment it is neither possible to quantify the extent of the loss of habitats for this assemblage, as the habitat survey information is incomplete, as is the extent of proposed new habitats to be created, as the green infrastructure design has not been developed to the requisite level of detail. However, based on the principle that sufficient, well connected habitat would be provided (for example, log piles and standing dead wood) to account for the losses (some of which will be delivered prior to any losses occurring) the preliminary conclusion is that the scale of environmental change on a feature of regional importance would be low and the likely effect of habitat loss or change is **Not Significant**. This is because these populations would then be able to colonise newly created habitats and also re-colonise some of the areas that have been subject to change following reinstatement.

8.10.686 At the time of application the assessment of this likely effect will be further informed by quantified estimates of the habitats to be lost, their distribution and the extent and location of compensatory habitat to be created as part of the green infrastructure proposals.

**Fragmentation of habitats (reduction of connectivity)**

8.10.687 Decaying wood is strongly associated with arboreal habitat, with the effects associated with habitat fragmentation for this assemblage in keeping with those presented for the assemblage associated with arboreal habitats (see paragraph 8.10.669 to 8.10.871).

8.10.688 Based on current data and information, and that suitable compensatory habitat would be established for any arboreal habitat lost, this scale of change on a feature of regional importance, is expected to be low and the likely effect is **Not Significant**.

8.10.689 At the time of application the assessment of this likely effect will be further informed by a quantification of habitat connectivity based on the green infrastructure proposals.
**Increased light intensity (resulting in disturbance / displacement)**

8.10.690 The use of temporary lighting for security purposes or to illuminate construction or operational working areas is likely to cause the displacement of nocturnal invertebrates present in this assemblage which are attracted to artificial light (for example moths). This may lead to the mortality of individuals from exhaustion, collision with the light sources, or increased predation in these areas, with negative effects on species populations. Additionally, artificial light can significantly disrupt the natural light / dark patterns, thereby affecting the physiology or behaviour of species reliant on natural light level changes, resulting in a reduction in their fitness.

8.10.691 At the time of writing detailed lighting information is not available. However, based on the locations of the DCO Project (both temporary and permanent activity) within Harmondsworth, Sipson, Stanwell Moor, Poyle and Colnbrook, it is assumed that artificial light levels would be increased in some areas where arboreal habitat is present.

8.10.692 The maximum distance from which moths have been recorded as flying to artificial light sources is 500m. The proportion of this habitat likely to be affected is therefore limited (especially as it would apply to those suitable habitats that are outside of the areas that will be subject to habitat loss). Further, the current baseline night sky brightness in these areas are extremely high based on broad satellite mapping of light pollution across the UK (all areas being within the top two brightest bands).

8.10.693 In order to limit light spill on to adjacent habitats and reduce attractiveness a lighting design would be produced that would involve minimising the amount of light needed, ensuring that what is required is suitably directed and that light spill is minimised.

8.10.694 As lighting design would be sensitive and newly created habitats for this assemblage will be located sensitively the preliminary conclusion is that the scale of change on a feature of regional importance is very low and the likely effect is **Not Significant**.

8.10.695 At the time of application the assessment of this likely effect will be further informed by a lighting assessment showing both the current baseline and that predicted for the DCO Project, as well as the distribution of tall sward and scrub that both currently occur and those that will be created as part of the green infrastructure proposals.
Assessment of biodiversity effects – Terrestrial invertebrate assemblage associated with shaded woodland floor

**Detailed baseline**

8.10.696 Shaded woodland floor occurs in closed canopy woodland with scrub and is vertically separated from arboreal assemblage types. It is associated with low levels of disturbance and many species of this assemblage are saprophagous (associated with decaying organic matter) or predatory. A total of 157 species of this assemblage have been recorded from field and desk studies to date, including nine species with a conservation designation, including:

1. Three RDB species including *Dichetophora finlandica*, a snail-killing fly listed as rare

2. Six notable species including *Sapromyza quadricincta*, a lauxaniid fly.

8.10.697 The extent of woodland within the study area is limited, and so therefore, the extent of closed canopy woodland with a scrub under-layer is also limited. This, by extension limits the extent of shaded woodland floor habitat available to species associated with this habitat type. Its presence is linked to that of the wider tree-associated biotope (see Figures 8.25 and 8.27 to 8.29).

8.10.698 Further survey work will be undertaken in 2019 to further inform the distribution of this assemblage and its constituent species.

**Predicted effects and their significance**

*Land take and land cover change (resulting in habitat loss or degradation)*

8.10.699 Habitat clearance for the establishment of construction sites and supporting infrastructure would lead to the loss of shaded woodland floor habitats. Breeding and foraging habitat for the terrestrial invertebrate assemblage it supports would be reduced, to the detriment of the populations present. Surveys to date have identified this type of habitat, and its associated invertebrate assemblage, within the Site in the areas around Harmondsworth and Colnebrook.

8.10.700 The loss of shaded woodland floor habitats would result in the loss or displacement of portions of the local populations of the species represented within this assemblage. However, it is notable that this habitat occurs across the wider area (both within the Site, study area and beyond) and would therefore persist throughout the temporal scope of the assessment. Further, additional areas of compensatory habitat would be provided within the green infrastructure to be delivered as part of the DCO Project.
At this stage of the assessment it is neither possible to quantify the extent of the loss of habitats for this assemblage, as the habitat survey information is incomplete, as is the extent of proposed new habitats to be created, as the green infrastructure design has not been developed to the requisite level of detail. However, based on the principle that sufficient, well connected habitat (much of which can be created using tried and tested methods of habitat creation) would be provided to account for the losses (some of which will be delivered prior to any losses occurring) the preliminary conclusion is that the scale of environmental change on a feature of County / metropolitan importance would be low and the likely effect of habitat loss or change is **Not Significant**. This is because these populations would then be able to colonise newly created habitats and also re-colonise some of the areas that have been subject to change following reinstatement.

At the time of application the assessment of this likely effect will be further informed by quantified estimates of the habitats to be lost, their distribution and the extent and location of compensatory habitat to be created as part of the green infrastructure proposals.

**Fragmentation of habitats (reduction of connectivity)**

Shaded woodland floor is strongly associated with arboreal habitats, with the effects associated with habitat fragmentation for this assemblage in keeping with those presented for the assemblage associated with arboreal habitats (see paragraph 8.10.669 to 8.10.671).

**Increased light intensity (disturbance / displacement)**

The likely significant effects associated with increased light intensity for the assemblage associated with shaded woodland floor habitats are in keeping with those presented for the assemblage associated with arboreal habitats (see paragraphs 8.10.672 to 8.10.677).

Based on current data and information, and that suitable compensatory habitat will be established for any arboreal habitat lost, this scale of change on a feature of County / metropolitan importance, is expected to be low and the likely effect is **Not Significant**.

At the time of application the assessment of this likely effect will be further informed by a quantification of habitat connectivity based on the green infrastructure proposals.
Changes in hydrology (groundwater levels, surface water run-off rates, river flows and lake levels; resulting in habitat change)

8.10.707 Changes in GWDTE due to an alteration of the water table level could result in the suitability of some habitats that remain in-situ within or outside of the Site reducing for terrestrial invertebrates within this assemblage. For this species the potential effect being associated with the potential degradation of wet woodland. These changes will add to the land take and land cover change described in paragraphs 8.10.700 to 8.10.703.

8.10.708 However, based on the principle that sufficient, well connected habitat would be provided to account for the losses (some of which will be delivered prior to any losses occurring) the preliminary conclusion is that the scale of environmental change on a feature of county/metropolitan importance would be low and the likely effect of habitat loss or change is Not Significant. This is because these populations would then be able to colonise newly created habitats and also re-colonise some of the areas that have been subject to change following reinstatement. It is noted that for this assemblage the time taken to recolonise will be longer term as arboreal habitats take time to establish.

8.10.709 At the time of application, the assessment of this likely significant effect will be further informed by further baseline survey data and refined groundwater modelling outputs. Further, the design of newly created and improved habitat associated with the green infrastructure will also have been developed to inform the assessment.

Assessment of biodiversity effects – Terrestrial invertebrate assemblage associated with wetland biotopes

Detailed baseline

8.10.710 The wetland biotope includes open water habitats and vegetated wet habitats such as marshland and peatland habitats. Marshland habitat is defined by Pantheon as being associated with still open water bodies and littoral areas that may be subject to repeated disturbance, such as by flooding or grazing. Some species within this assemblage are associated with other wet habitat such as running water and lakes. Meanwhile, peatland habitat consists of wetlands where disturbance is limited. Water level fluctuations are not usually significant or if they do occur, the substrate rarely dries out. A total of 268 species associated with this habitat have been recorded from desk and field studies to date, including 16 species with a conservation designation:

1. One species listed as an SPI (also RDB3), *Dichetophora finlandica*, a snail-killing fly was identified during field surveys to the west of the existing airport within the Colne Valley
2. Ten nationally notable species, including one found in fewer than 100 ten kilometre squares (Nb species)

3. Five Nationally Scarce species, including *Elodes elongata* (a marsh beetle), which was recorded during field surveys. It is associated with the broad biotope of wetland. It was found in an area north-west of the existing airfield within the Site.

Areas of marshland and peatland are limited in extent within the study area and generally occur on the edge of water bodies and water courses. Areas of open water are more widespread, including lakes and rivers (see Figures 8.25 and 8.27 to 8.29).

Further survey work will be undertaken in to further inform the distribution of this assemblage and its constituent species.

**Predicted effects and their significance**

**Land take and land cover change (resulting in habitat loss or degradation)**

Habitat clearance for the establishment of construction sites and supporting infrastructure will lead to the loss of wetland habitats. Breeding and foraging habitat for the terrestrial invertebrate assemblage it supports will be reduced, to the detriment of the populations present. Surveys to date have identified this type of habitat, and its associated invertebrate assemblage, on the edge of water bodies and water courses within the Site (see Figure 8.25).

The loss of these habitats would result in the loss or displacement of portions of the local populations of the species represented within this assemblage. However, it is notable that this habitat occurs across the wider area (both within the Site, study area and beyond) and would therefore persist throughout the temporal scope of the assessment. Further, additional areas of compensatory habitat would be provided within the green infrastructure to be delivered as part of the DCO Project.

At this stage of the assessment it is neither possible to quantify the extent of the loss of habitats for this assemblage, as the habitat survey information is incomplete, as is the extent of proposed new habitats to be created, as the green infrastructure design has not been developed to the requisite level of detail. However, based on the principle that sufficient, well connected habitat (much of which can be created using tried and tested methods of habitat creation) would be provided to account for the losses (some of which will be delivered prior to any losses occurring) the preliminary conclusion is that the scale of environmental change on a feature of County / metropolitan importance would be low and the likely effect of habitat loss or change is **Not Significant**. This is because these
populations would then be able to colonise newly created habitats and also re-colonise some of the areas that have been subject to change following reinstatement.

8.10.716 At the time of application the assessment of this likely effect will be further informed by quantified estimates of the habitats to be lost, their distribution and the extent and location of compensatory habitat to be created as part of the green infrastructure proposals.

Fragmentation of habitats (reduction of connectivity)

8.10.717 Areas supporting assemblages associated with wetland habitats are already limited in extent and fragmented within the study area. Species are largely of high fidelity to their supporting wetland habitat, with the ZOI of this effect assumed to be 500m from wetland habitats to be lost during the construction phase. The effect of fragmentation is likely to be of particular note for species with aquatic larval stages. These often travel large distances from wetland habitats as adults (e.g. Odonata).

8.10.718 At the time of application the assessment of this likely significant effect will be further informed by a quantification of habitat connectivity based on the green infrastructure proposals. Based on current data and information, the scale of change is predicted to be low and the effect Not Significant. This assumes that well-connected habitat will be provided to account for the losses and fragmentation.

Increased light intensity (resulting in disturbance / displacement)

8.10.719 The use of temporary lighting for security purposes or to illuminate construction or operational working areas is likely to cause the displacement of nocturnal invertebrates present in this assemblage which are attracted to artificial light (for example moths). This may lead to the mortality of individuals from exhaustion, collision with the light sources, or increased predation in these areas, with negative effects on species populations. Additionally, artificial light can significantly disrupt the natural light / dark patterns, thereby affecting the physiology or behaviour of species reliant on natural light level changes, resulting in a reduction in their fitness.

8.10.720 At the time of writing, detailed lighting information is not available. However, based on the locations of the DCO Project (both temporary and permanent activity) within Harmondsworth, Sipson, Stanwell Moor, Poyle and Colnbrook, it is assumed that artificial light levels would be increased in some areas where wetland habitat is present.
The maximum distance from which moths have been recorded as flying to artificial light sources is 500m. The proportion of this habitat likely to be affected is therefore limited (especially as it would apply to those suitable habitats that are outside of the areas that will be subject to habitat loss). Further, the current baseline night sky brightness in these areas are extremely high based on broad satellite mapping of light pollution across the UK (all areas being within the top two brightest bands).

In order to limit light spill on to adjacent habitats and reduce attractiveness a lighting design would be produced that would involve minimising the amount of light needed, ensuring that what is required is suitably directed and that light spill is minimised.

As lighting design would be sensitive and newly created habitats for this assemblage will be located sensitively the preliminary conclusion is that the scale of change on a feature of County / metropolitan importance is very low and the likely effect is Not Significant.

At the time of application the assessment of this likely effect will be further informed by a lighting assessment showing both the current baseline and that predicted for the DCO Project, as well as the distribution of tall sward and scrub that both currently occur and those that will be created as part of the green infrastructure proposals.

Changes in hydrology (groundwater levels, surface water run-off rates, river flows and lake levels; resulting in habitat change)

Changes in GWDTE due to an alteration of the water table level could result in the suitability of some habitats that remain in-situ within or outside of the Site reducing for terrestrial invertebrates within this assemblage. For this species the potential effect being associated with the potential degradation of swamp. These changes will add to the land take and land cover change described in paragraphs 8.10.714 to 8.10.717.

However, based on the principle that sufficient, well connected habitat would be provided to account for the losses (some of which will be delivered prior to any losses occurring) the preliminary conclusion is that the scale of environmental change on a feature of county / metropolitan importance would be low and the likely effect of habitat loss or change is Not Significant. This is because these populations would then be able to colonise newly created habitats and also re-colonise some of the areas that have been subject to change following reinstatement.

At the time of application, the assessment of this likely significant effect will be further informed by further baseline survey data and refined groundwater
modelling outputs. Further, the design of newly created and improved habitat associated with the green infrastructure will also have been developed to inform the assessment.

**Assessment of biodiversity effects – Wintering waterbird assemblage – regionally important species**

**Detailed baseline**

8.10.728 Data collected between 2012 and 2017 for the Wetland Bird Survey (WeBS) (Frost *et al.*, 2018) from sites in Greater London, Essex, Kent, Surrey, Berkshire, Buckinghamshire and Hertfordshire has been compiled and used to generate estimates of regional wildfowl populations. These have been compared to local population estimates of waterbird species calculated using monitoring data collected between 2014/15 - 2017/2018. A threshold of 1% has been applied to the regional estimates to indicate those species occurring within the study area in regionally significant numbers.

8.10.729 The analysis has shown that the water bodies (including both those that are within nature conservation designations and those that are not) support regionally important (>1% of regional population) non-breeding populations of two waterbird species; mallard and little grebe.

8.10.730 **Table 8.30** shows the compiled data for mallard and little grebe and the calculated threshold applied for each species.

**Table 8.30: Compiled Wetland Bird Survey (WeBS) data used to generate regional population estimates of little grebe and mallard**

<table>
<thead>
<tr>
<th>SPECIES</th>
<th>Berk</th>
<th>Bucks</th>
<th>Essex</th>
<th>Gt Ldn</th>
<th>Hert</th>
<th>Kent</th>
<th>Surrey</th>
<th>Total</th>
<th>1% Threshold</th>
</tr>
</thead>
<tbody>
<tr>
<td>Little Grebe</td>
<td>24</td>
<td>79</td>
<td>629</td>
<td>561</td>
<td>104</td>
<td>400</td>
<td>215</td>
<td>20,12</td>
<td>20</td>
</tr>
<tr>
<td>Mallard</td>
<td>923</td>
<td>2,183</td>
<td>5,567</td>
<td>6,355</td>
<td>1,773</td>
<td>4,078</td>
<td>3,714</td>
<td>24,594</td>
<td>246</td>
</tr>
</tbody>
</table>

8.10.731 **Table 8.31** shows the peak counts of little grebe and mallard recorded between 2015/16 and 2017/18 within the 25 waterbodies that make up the Wraysbury Complex (see **Figure 8.26**). Figures in bold indicate total counts that exceeded the thresholds for regional importance.
### Table 8.31: Peak counts of mallard and little grebe recorded in the Wraysbury Complex (waterbodies 1-25) 2015-2018

<table>
<thead>
<tr>
<th>Species</th>
<th>2015/16</th>
<th>2016/17</th>
<th>2017/18</th>
<th>Mean-peak</th>
</tr>
</thead>
<tbody>
<tr>
<td>Little Grebe</td>
<td>25</td>
<td>35</td>
<td>27</td>
<td>29</td>
</tr>
<tr>
<td>Mallard</td>
<td>590</td>
<td>293</td>
<td>337</td>
<td>406</td>
</tr>
</tbody>
</table>

Regional and national trends for little grebe show a long term increase in numbers having increased by 104% between 1990/91-2015/16. Conversely numbers of mallard have decreased by 38% over the same period (Frost *et al.*, 2018).

No further surveys of non-breeding waterbirds have been completed in 2018/19.

**Predicted effects and their significance**

**Land take and land cover change (resulting in habitat loss or degradation)**

The DCO Project would result in the permanent habitat loss of 26.7ha of open water habitat. This loss of habitat would displace mallard and little grebe and may result in individual birds losing condition as competition for resources (including food and refuge) increases. The losses would occur during the construction period, prior to the anticipated opening of the North West Runway (between 2022 and 2027); however, the loss would be permanent.

A total of five lakes would be lost to mallard and little grebe due to land take or land use change with a sixth, Saxon Lake, likely to be subject to significant changes that would make it unsuitable for large numbers of waterbirds.

Table 8.32 shows (from the six waterbodies) peak and mean counts for little grebe and mallard for each the four years of monitoring. Monitoring at Saxon Lake was only completed in 2016/17 and 2017/18 and at Swan Lake in 2017/18.
### Table 8.32: Peak and mean counts for little grebe and mallard at the six water bodies to be lost to development

<table>
<thead>
<tr>
<th>Species</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Little grebe</td>
<td>Old Slade Lake</td>
<td>4</td>
<td>1.19</td>
<td>4</td>
<td>1.8</td>
<td>3</td>
<td>0.64</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Colnbrook North</td>
<td>&lt;1</td>
<td>0.05</td>
<td>2</td>
<td>0.2</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Orlitts Lake</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Colnbrook West</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Saxon Lake</td>
<td>7</td>
<td>2.76</td>
<td>Not Counted (NC)</td>
<td>NC</td>
<td>NC</td>
<td>NC</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>Swan Lake</td>
<td>-</td>
<td>-</td>
<td>NC</td>
<td>NC</td>
<td>NC</td>
<td>NC</td>
<td>NC</td>
</tr>
<tr>
<td>Mallard</td>
<td>Old Slade Lake</td>
<td>8</td>
<td>1.5</td>
<td>3</td>
<td>0.4</td>
<td>13</td>
<td>2.3</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Colnbrook North</td>
<td>8</td>
<td>1.5</td>
<td>6</td>
<td>1.4</td>
<td>2</td>
<td>3.1</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>Orlitts Lake</td>
<td>13</td>
<td>3.4</td>
<td>23</td>
<td>5.4</td>
<td>12</td>
<td>3.8</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>Colnbrook West</td>
<td>6</td>
<td>1.8</td>
<td>9</td>
<td>1.5</td>
<td>7</td>
<td>2.4</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Saxon Lake</td>
<td>9</td>
<td>1.8</td>
<td>NC</td>
<td>NC</td>
<td>NC</td>
<td>NC</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>Swan Lake</td>
<td>-</td>
<td>-</td>
<td>NC</td>
<td>NC</td>
<td>NC</td>
<td>NC</td>
<td>NC</td>
</tr>
</tbody>
</table>
8.10.737 Saxon Lake was counted on 25 occasions in the two non-breeding seasons between September 2016 and March 2018, with 4 occasions returning zero counts of little grebe and 7 occasions returning zero counts of mallard. The peak count of seven little grebe and 12 mallard compared to mean counts of 2.76 little grebe and 2 mallard suggests that this water body is regularly used by small numbers of both species. Peak-mean counts calculated for 2016-18 indicate that the water body supports up to 24% of the baseline population of little grebe and up to 2.2% of the baseline population of mallard.

8.10.738 Swan Lake was counted on 14 occasions between September 2017 and March 2018, with 1 occasion returning zero counts of little grebe and 2 occasions returning zero counts of mallard. The peak count of 3 little grebe and 25 mallard compared to mean counts of 1.3 little grebe and 7 mallard suggest that this water body is regularly used by small numbers of both species. The peak counts recorded in 2017/18 indicate that the water body can support up to 10% of the baseline population of little grebe and up to 6.2% of the baseline population of mallard.

8.10.739 Old Slade Lake was counted on 55 occasions in the four non-breeding seasons between September 2014 and March 2018, with 29 occasions returning zero counts for little grebe and 30 returning zero counts for mallard. The peak count of 6 little grebe and 13 mallard compared to mean counts of 1.19 little grebe and 1.5 mallard suggests that this water body is only used infrequently by small numbers of both species. Peak-mean counts calculated for 2014-18 indicate that the water body supports up to 13.8% of the baseline population of little grebe and up to 2% of the baseline population of mallard.

8.10.740 Colnbrook North was counted on 55 occasions in the four non-breeding seasons between September 2014 and March 2018, with 50 occasions returning zero counts for little grebe and 33 returning zero counts for mallard. The peak count of 2 little grebe and 15 mallard compared to mean counts of 0.05 little grebe and 1.5 mallard suggest that this water body is only used infrequently by small numbers of both species. Peak-mean counts calculated for 2014-18 indicate that the water body supports up to 0.9% of the baseline population of little grebe and up to 2% of the baseline population of mallard.

8.10.741 Orlitts Lake was counted on 55 occasions in the four non-breeding seasons between September 2014 and March 2018, with 55 occasions returning zero counts for little grebe and 17 returning zero counts for mallard. The peak of 23 mallard compared to mean counts of 3.4 birds suggesting that this water body is only used infrequently by small numbers of mallard. Peak-mean counts calculated for 2014-18 indicate that the water body supports up to 3.2% of the baseline population of mallard.
8.10.742 Colnbrook West was counted on 55 occasions in the four non-breeding seasons between September 2014 and March 2018, with 55 occasions returning zero counts for little grebe and 25 returning zero counts for mallard. The peak count of 9 mallard compared to a mean count of 1.8 birds suggests that this water body is only used infrequently by small numbers of mallard. Peak-mean counts calculated for 2014-18 indicate that the water body supports up to 1.5% of the baseline population of mallard.

8.10.743 It is likely that birds displaced from the four lakes making up the Old Slade Lake LWS, Swan Lake and Saxon Lake would seek refuge locally with numerous potential waterbodies and watercourses offering alternative feeding or roosting locations. However, potential physiological effects on individual birds (loss of fitness, reduced survival/breeding rates) as a result of increased energy expenditure and reduced feeding opportunities mean that a negative effect could still occur as a result of the habitat loss.

8.10.744 The current landscape that supports the populations of little grebe and mallard is dynamic and subject to regular change and disturbance as described in paragraph 8.10.18.

8.10.745 Suitable replacement habitat would be delivered within the green infrastructure that is an integral part of the DCO Project. Although the exact locations, extent and number of water bodies is yet to be determined the general principle that applies is to ensure that the provision provides good quality habitats that can support the same or greater numbers of these birds in the long-term. Details of the provision of newly created or improved habitats would be provided at application for development consent including details of locations, water body design.

8.10.746 The provision of alternative and connected habitat within the green infrastructure that is integral to the DCO Project, within a system that demonstrates that both little grebe and mallard readily adapt to changing conditions. The scale of change on a feature of regional importance, is low as a result of habitat loss and habitat change, and the likely effect is \textbf{Not Significant}. This conclusion is preliminary and will be reviewed at ES stage.

8.10.747 At the time of application the assessment of this likely effect will be further informed by a detailed understanding of the extent and location of new and improved habitat to be created as part of the green infrastructure proposals.

\textit{Increased noise and vibration (resulting in disturbance / displacement)}

8.10.748 Noise and vibration created by construction activity, ground based operations, road vehicles accessing and egressing the Airport and aircraft during the take-off and landing cycle could disturb mallard and little grebe. The timing and location of the sources of noise and vibration would change over time depending on the
activities taking place. It is likely that the activities most likely to disturb these species are associated with the early construction phases (Phase 1 and 2), the release of further aircraft capacity on the existing northern and southern runways in 2024 and additional flights associated with the anticipated opening of the North West Runway in 2026.

8.10.749 Construction activities are proposed within 1km of several water bodies that support little grebe and mallard. Little grebe is generally found in small numbers with peak counts over 10 (highest peak count was of 30 birds in Kempton Park Nature Reserve) only being registered on one lake within 1km of the construction area; namely Princes Lake (peak count of 18). Mallard are well distributed across the area with 32 of 37 water bodies visited supporting numbers, at peak, of between 10 and 410 (highest number recorded on Staines North Reservoir).

8.10.750 Works would take place approximately 250m north of Princes Lake at the closest point, with the A30 London Road separating the two areas. At this distance it is unlikely that any construction noise above the 70dB(A) threshold for disturbance will be realised. Princes Lake is also a large complex of open water that at its furthest point is around 850m from any proposed construction. The ability of little grebe to relocate within this area should any disturbance be caused by construction activity further ensures that changes to the fitness of individuals is unlikely.

8.10.751 Mallard are a species that are so widespread within the area that the potential for birds to re-distribute themselves across the area due to any disturbance caused is high. However, as a species that are generally considered to be tolerant of disturbance the potential for levels of fitness to be compromised are low, especially as the majority of water bodies are at distances where sound levels above the 70dB(A) threshold (taken from the waterbird disturbance mitigation toolkit) would not be expected due to the construction activity at Heathrow.

8.10.752 During operation it is only aircraft movements that could result in disturbance of mallard or little grebe.

8.10.753 In the non-breeding seasons of 2016/17 and 2017/18 monitoring of the behavioural responses of waterbirds to aircraft was completed on 12 water bodies that are currently overflown. A total of 9,240 planes were recorded either directly overflying or flying adjacent to the water bodies during the survey. No disturbance of little grebe or mallard was recorded in either season of monitoring, however these were not the target species.
Considering the disturbance responses of all species, 82 aircraft caused disturbance responses meaning that only 0.89% of aircraft overflights resulted in any response from the waterbirds listed. It is therefore concluded that the wider waterbird assemblage associated with the waterbodies adjacent to the Airport are habituated to aircraft in this area and a negative effect on them can be discounted. The preliminary conclusions drawn are that the scale of change on a feature of regional importance is predicted to be negligible and the likely effect is Not Significant.

At the time of application the assessment of this likely effect will be informed by a better understanding of the locations, types and levels of noise to be produced and a detailed understanding of the extent and location of new and improved habitat to be created as part of the green infrastructure proposals.

Assessment of biodiversity effects – Wintering waterbird assemblage - county important species

Detailed baseline

Data collected between 2012 and 2017 for the Wetland Bird Survey (WeBS) (Frost et al., 2018) from sites in Greater London has been compiled and used to generate estimates of county wildfowl populations and compared to local population estimates of waterbird species calculated using monitoring data collected between 2014/15-2017/18. A threshold of 1% has been applied to the county estimates to indicate those species occurring within the study area in significant numbers. The analysis has shown that the water bodies (including both those that are within nature conservation designations and those that are not) support county important (>1% of county population) non-breeding populations of two waterbird species; teal and wigeon.

Table 8.33 shows the compiled data for teal and wigeon and the calculated threshold applied for each species.

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83 The following species were recorded responding to aircraft overflight: cormorant, gadwall, goosander, great crested grebe, pochard, shoveler and tufted duck. Ad hoc records of disturbance in coot and grey heron were also made, however these were not included in the list of target species.
Table 8.33: Compiled data for teal and wigeon and the calculated threshold applied for each species

<table>
<thead>
<tr>
<th>SPECIES</th>
<th>GT LON</th>
<th>1% Threshold</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teal</td>
<td>4,478</td>
<td>45</td>
</tr>
<tr>
<td>Wigeon</td>
<td>5,562</td>
<td>55</td>
</tr>
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Table 8.34 shows the peak counts of teal and wigeon recorded between 2015/16 and 2017/18 within the 25 waterbodies that make up the Wraysbury Complex (see Figure 8.26). Figures in bold indicate total counts that exceeded the thresholds for regional importance.

Table 8.34: Peak counts of teal and wigeon recorded in the Wraysbury Complex (waterbodies 1-25) 2015-2018.

<table>
<thead>
<tr>
<th>Species</th>
<th>2015/16</th>
<th>2016/17</th>
<th>2017/18</th>
<th>Mean-peak</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teal</td>
<td>103</td>
<td>69</td>
<td>507</td>
<td>226</td>
</tr>
<tr>
<td>Wigeon</td>
<td>609</td>
<td>308</td>
<td>214</td>
<td>377</td>
</tr>
</tbody>
</table>

Regional and national trends for teal and wigeon show a long term increase in numbers. Numbers of teal and wigeon have increased by 40% and 29% respectively, from 1990/91-2015/16 (Frost et al., 2018).

Predicted effects and their significance

Land take and land cover change (resulting in habitat loss or degradation)

The DCO Project would result in the permanent habitat loss of 26.7ha of open water habitat. This loss of habitat would displace wigeon and teal and may result in individual birds losing condition as competition for resources (including food and refuge) increases. The losses would occur during the construction period, prior to the anticipated opening of the North West Runway; however the loss would be permanent.

A total of five lakes would be lost to wigeon and teal due to land take or land use change with a sixth, Saxon Lake, likely to be subject to significant changes that would make it unsuitable for large numbers of waterbirds. These water bodies would be lost in phases 1 and 2 of the DCO Project between 2022 and 2026.

Table 8.35 shows peak and mean counts of from the six waterbodies for wigeon in the four years of monitoring completed between 2014/15 and 2017/18. Monitoring
at Saxon Lake was only completed in 2016/17 and 2017/18 and at Swan Lake in 2017/18.

8.10.763 Teal were not recorded on any of the six waterbodies during the monitoring completed between 2014/15 and 2017/18. It is therefore concluded that the loss of these waterbodies would have a no effect on the local and county populations of teal.
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</tr>
</thead>
<tbody>
<tr>
<td>Wigeon Old Slade Lake</td>
<td>&lt;1</td>
<td>0.03</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>0.1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Wigeon Colnbrook North</td>
<td>26</td>
<td>6.1</td>
<td>23</td>
<td>6.6</td>
<td>2</td>
<td>0.1</td>
<td>39</td>
<td>14.1</td>
</tr>
<tr>
<td>Wigeon Orlitts Lake</td>
<td>12</td>
<td>1.2</td>
<td>45</td>
<td>4.8</td>
<td>2</td>
<td>0.1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Wigeon Colnbrook West</td>
<td>&lt;1</td>
<td>0.03</td>
<td>2</td>
<td>0.1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Wigeon Saxon Lake</td>
<td>1</td>
<td>0.08</td>
<td>Not counted (NC)</td>
<td>NC</td>
<td>NC</td>
<td>NC</td>
<td>2</td>
<td>0.1</td>
</tr>
<tr>
<td>Wigeon Swan Lake</td>
<td>-</td>
<td>-</td>
<td>NC</td>
<td>NC</td>
<td>NC</td>
<td>NC</td>
<td>NC</td>
<td>NC</td>
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</table>

Table 8.35: Peak and mean counts for little grebe and mallard at the six water bodies to be lost to development.
Old Slade Lake, Colnbrook West, Saxon Lake and Swan Lake had peak mean counts of one wigeon or less. This suggests that none of these water bodies provides habitat that is used frequently or plays a role in the maintenance of the local population. Orlitt’s Lake can also be discounted as playing a role in maintenance of the local population, as although there was a peak count of 45, 52 of 55 survey visits to this water body over four non-breeding seasons provided counts of zero.

Colnbrook North was counted on 55 occasions in the four non-breeding seasons between September 2014 and March 2018, with 31 occasions returning zero counts of wigeon. Counts of wigeon were sporadic at this water body with regular counts only recorded in 2014/15 and 2016/17. The variation between the peak of 39 birds and the average count of 6.1 birds reflects this further indicating that the water body is infrequently used by wigeon. The peak-mean calculated for this water body suggests that it could support 6.9% of the baseline population of wigeon.

Of the waterbodies to be lost, wigeon are only found infrequently in any number on Colnbrook North. The birds displaced from here would likely seek refuge locally with numerous potential waterbodies and watercourses offering alternative feeding or roosting locations. The infrequent use of Colnbrook North and the other waterbodies to be lost by wigeon suggests that they are not reliant on these waterbodies and that the landscape provides enough capacity for the local population. Therefore, the preliminary conclusions drawn at this stage of the DCO Project are that the loss of these waterbodies is a scale of change of low on a feature of County / metropolitan importance and the likely effect is Not Significant.

Suitable replacement habitat that would be delivered within the green infrastructure is an integral part of the DCO Project and would provide water bodies and other habitats that are suitable for both teal and wigeon.

At the time of application the assessment of this likely effect will be further informed by a detailed understanding of the extent and location of new and improved habitat to be created as part of the green infrastructure proposals.

Increased noise and vibration (resulting in disturbance / disturbance)

Noise and vibration created by construction activity, ground based operations, road vehicles accessing and egressing the Airport and aircraft during the take-off and landing cycle could disturb wigeon and teal. The timing and location of the sources of noise and vibration will change over time depending on the activities taking place. It is likely that the activities most likely to disturb these species are
associated with the early construction phases (Phase 1 and 2), the release of further aircraft capacity on the existing northern and southern runways in 2024 and additional flights associated with the anticipated opening of the North West Runway.

8.10.770 Construction activities are proposed within 1km of several water bodies that support teal and wigeon. The highest numbers of these species are present on the large reservoirs to the south of the Airport, namely King George VI Reservoir, Staines North Reservoir and Staines South Reservoir.

8.10.771 These large reservoirs have high banks that will act to deflect noise created by construction activity and visually screen the presence of plant and workforce. The 70dB(A) threshold (taken from the waterbird disturbance mitigation toolkit) is already regularly exceeded by the proximity to the flight activity associated with the operational airport. Both King George VI and Staines North are over 200m from proposed construction and operational activities (with the exception of the installation of a cycle path as part of the green loop (see Chapter 6). At this distance it is unlikely that any construction noise above the 70dB(A) threshold for disturbance will be realised. Also given the opportunity for any birds disturbed to redistribute quickly to avoid any noise generated from construction sites (due to the very large extent of these water bodies) the potential for an effect to be realised on the fitness of individual wigeon and teal is negligible.

8.10.772 During operation it is only aircraft movements that could result in disturbance of wigeon and teal. In the non-breeding seasons of 2016/17 and 2017/18 monitoring of the behavioural responses of waterbirds to aircraft was completed on 12 water bodies that are currently overflown. A total of 9,240 planes were recorded either directly overflying or flying adjacent to the water bodies during the survey. No disturbance of wigeon or teal was recorded in either season of monitoring, however these were not the target species. Considering the disturbance responses of all species\(^{84}\), 82 aircraft caused disturbance responses meaning that only 0.89% of aircraft overflights resulted in any response from the waterbirds listed. It is therefore concluded that the wider waterbird assemblage associated with the waterbodies adjacent to the Airport are habituated to aircraft in this area and a negative effect on them can be discounted. The preliminary conclusions drawn are that the scale of change on a feature of county importance is negligible, and the likely effect is Not Significant.

8.10.773 At the time of application the assessment of this likely effect will be informed by a better understanding of the locations, types and levels of noise to be produced and

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\(^{84}\) The following species were recorded responding to aircraft overflight: cormorant, gadwall, goosander, great crested grebe, pochard, shoveler and tufted duck. Ad hoc records of disturbance in coot and grey heron were also made, however these were not included in the list of target species.
a detailed understanding of the extent and location of new and improved habitat to be created as part of the green infrastructure proposals.

Assessment of biodiversity effects – Barn owl

Detailed baseline

8.10.774 The UK barn owl population was estimated at almost 4,000 pairs in 1995-1997 (Toms et al., 2001) and is still considered the most reliable estimate of the national population size. Barn owls are listed as a Schedule 1 species on the Wildlife and Countryside Act (1981) (as amended) and as such receive additional legal protection preventing the destruction and disturbance of nest sites. In the most recent Birds of Conservation Concern publication (Eaton et al., 2015) barn owl were green listed.

8.10.775 The most recent results of the BTO Breeding Bird Survey (up to 2016) suggest a long-term increase in recording of Barn Owl with a 256% increase in records over the period 1995-2016. However, 10 and 5-year trends both suggest falling numbers with decreases in incidents of recording of 17% and 11% respectively. The results of the BTO Breeding Bird Survey for barn owl are heavily caveated with the Breeding Bird Survey limited to daytime survey effort.

8.10.776 Barn owl are a rare breeding resident in London, no breeding pairs were confirmed in 2015 though there were reports of 7 probable breeding pairs recorded in 2014. (London Natural History Society 2017). Barn owls are only typically found in green space habitats in the outer fringes of London, avoiding residential areas. Reports from neighbouring counties, Surrey and Buckinghamshire have estimated barn owls populations of 34 (Wheatley 2007) and 200 (Ferguson 2012) pairs respectively.

8.10.777 Incidental sightings of barn owl recorded during ecological surveys in 2017 led to the instigation of dedicated barn owl surveys in 2018.

8.10.778 Surveys during 2018 found no evidence of nesting barn owl in the areas surveyed. The scoping stage of the barn owl survey found that the assessment area is dominated by habitats of low and intermediate value for barn owls with only small areas of optimal habitat. However, regular incidental and survey sightings as shown in Figure 8.22 along with historical bird strikes, suggest that barn owl use the assessment area for foraging and it is highly likely that they breed locally. Further surveys will be completed during 2019 to try and locate any established breeding locations.
8.10.779 Taking into account all of the incidental/anecdotal sightings and the provisional findings of the survey programme, it is estimated that there are between 3-5 breeding home ranges\(^{85}\) within the study area. As a precautionary approach the upper estimate of five home ranges will be used as the baseline for use in the assessment which would equate to 10 adult birds. On this basis the barn owl population has been determined to be of County / metropolitan importance.

**Predicted effects and their significance**

**Land take and land cover change (resulting in habitat loss or degradation)**

8.10.780 The DCO Project would result in the permanent loss of at least 205.4ha of grassland, 36.42ha of woodland and 37.6ha scrub habitat within the study area which would result in the loss of foraging, roosting and nesting habitat for barn owl. Barn owls are site faithful and remain within their home range throughout their lifetime. Changes within the habitats could lead to abandonment which can result in increased stress and often death of a barn owl (Barn Owl Trust 2012).

8.10.781 The baseline surveys have found that the study area is dominated by habitats of low and intermediate value for barn owls with only small areas of optimal habitat. However, it is apparent that barn owl has adapted to the sub-optimal conditions within the study area and have been recorded foraging in arable fields and also on the grassland areas within the existing airfield, benefiting from management methods employed that have created large areas of tall grassland.

8.10.782 Baseline surveys have yet to confirm precise locations of nest or roosting locations and it is therefore not possible to estimate accurately the scale of change and thus effect on the baseline population. However, given the pattern of sightings (see Figure 8.18) it is assumed that the proposed land use change would intersect with multiple home ranges that overlap both the current airfield and the areas of land included in the Preferred Masterplan.

8.10.783 Suitable environmental measures for barn owl would include the replacement of habitat and the installation of nest boxes or towers which would provide alternative nesting and/or roosting opportunities. The environmental measures would be delivered in part within the green infrastructure that is an integral part of the DCO Project. Although the exact locations and extent of habitat, and the number nesting boxes or towers is yet to be determined the general principle that applies is to ensure that the provision provides good quality habitat that can support the same or greater numbers of these birds in the long term.

\(^{85}\) A typical barn owl home range during the breeding season in 350ha – equating to a radius of 1km around the nest site.
The provision of alternative and connected habitat within the green infrastructure that is integral to the DCO Project, within a system that demonstrates that barn owls adapt to sub-optimal conditions may serve to mitigate the effect of habitat loss and change. However, given the uncertainty over the location of nest sites and the size of the baseline population a precautionary approach has been taken within this assessment. The preliminary scale of change is predicted to be medium and the effect Significant on an ecological feature of County / metropolitan importance.

At the time of application, the assessment of this likely significant effect will be further informed by a detailed understanding of the extent and location of new and improved habitat to be created as part of the green infrastructure proposals and also supplemented by further survey work to be completed in 2019.

**Fragmentation of habitats (resulting in a reduction of connectivity)**

The barn owl population has adapted to a landscape of sub-optimal habitat that is already fragmented. However, further land use change associated with the construction and operation of a North West Runway would result in the loss of foraging, nesting and roosting habitat that would increase levels of fragmentation and lead to further stress within multiple barn owl home ranges.

Barn owls are not reliant on continuous linear habitat features within their home ranges and have been shown to commute across large areas of unsuitable habitat between roosting and feeding locations (Barn Owl Trust 2012).

However, increased pressure to cross large areas of unsuitable habitat and potentially hazardous features such as roads and the Airport (collision with aircraft and road traffic is dealt with as a separate effect) could have a negative effect on the population.

Suitable environmental measures, including the provision of replacement habitat and roosting/nesting locations, would be embedded within the DCO Project. Effects on barn owl should be minimised by ensuring that the provisioned areas of foraging and roosting habitat overlap with existing home ranges. The provision of newly created or improved habitat 1-3km from the DCO Project should also encourage the dispersal of young barn owls into the local area.

However, given the uncertainty over the location of nest sites and the size of the baseline population a precautionary approach has been taken within this assessment. The preliminary scale of change is predicted to be medium and the effect Significant on an ecological feature of County / metropolitan importance.

At the time of application, the assessment of this likely significant effect will be further informed by a detailed understanding of the extent and location of new and improved habitat.
improved habitat to be created as part of the green infrastructure proposals and also supplemented by further survey work to be completed in 2019.

*Increased noise and vibration (resulting in disturbance / displacement)*

8.10.792 Noise and vibration created by construction activity, ground based operations, road vehicles accessing and egressing the Airport and aircraft during the take-off and landing cycle could disturb barn owl.

8.10.793 Given that barn owl are regularly recorded both on and adjacent to the existing runway, the most likely source of disturbance that will have a negative effect on barn owl will be the noise and vibration created by construction activity (in other words the disturbance they do not currently experience), and also the presence of site operatives adjacent to roosting and nesting locations.

8.10.794 Barn owls are very site faithful and remain within their home range throughout their lifetime. Disturbance within these areas could lead to abandonment which can result in increased stress and often death of individual barn owls (Barn Owl Trust 2012).

8.10.795 Construction activity within 100m (Ruddock and Whitfield 2007) of identified barn owl nest and roost locations should be avoided, however, due to the broad geographic scale of the DCO Project, it is assumed that construction related disturbance will overlap with multiple barn owl home ranges.

8.10.796 Environmental measures applied to the construction activity, such as the use of visual and aural barriers and the application of buffers around active nest and roost sites would serve to minimise direct effects on barn owl. Additional measures to encourage birds into areas away from construction activity such as the provision of nest boxes and the creation of foraging habitat would also be used.

8.10.797 The application of appropriate environmental measures during the construction phase should minimise the risk of construction related disturbance. However, given the uncertainty over the location of nest sites and the size of the baseline population a precautionary approach has been taken within this assessment. The preliminary scale of change is predicted to be medium and the effect *Significant* on an ecological feature of County / metropolitan importance.

8.10.798 At the time of application, the assessment of this likely significant effect will be further informed by a detailed understanding of the extent and location of construction activities and also supplemented by further survey work to be completed in 2019.
Wildlife collision rates with aircraft or road traffic (resulting in death or injury of individual animals)

8.10.799 Barn owl could be killed or injured following collisions with construction vehicles (on site or surrounding roads), traffic accessing or egressing the Airport and aircraft off and landing cycle. Due to the scale of the construction activities and the operational activities at the Airport the risk would operate over a full 24 hour period. However, it is assumed that during the night the traffic levels would be reduced lowering the risk of collision.

8.10.800 Immature barn owl are particularly susceptible to collision with road traffic. It estimated that between 25% and 40% of all fledgling barn owls are killed on roads each year (Barn Owl Trust 2012).

8.10.801 During construction it is assumed that there would be an increase in freight movement and other vehicles moving around the site connected to the construction. Detailed modelling of construction related traffic is not yet available but will be used at application to assess the likely effect.

8.10.802 It is also assumed that following completion of the DCO Project infrastructure, that there would be a change in the distribution of both operational and passenger related vehicle movements. Detailed modelling of operational levels of traffic is not yet available but would be used at application to assess the likely effect.

8.10.803 Barn owls are regularly recorded foraging on the apron of the existing airfield also making them susceptible to collision with aircraft.

8.10.804 Mandatory bird strike reporting and data gathering has been used to identify the current levels of bird strike rates within the Airport.

8.10.805 Table 8.36 shows the number of barn owls killed by aircraft from 2006 – 2017.

Table 8.36: Number of barns owls killed by aircraft at Heathrow from 2006-2017

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<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>No. barn owls killed</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>12</td>
<td>6</td>
<td>5</td>
<td>2</td>
<td>7</td>
<td></td>
</tr>
</tbody>
</table>

8.10.806 In the past eleven years an average of three barn owls per year have been recorded as struck by aircraft with a peak count of 12 birds recorded in 2012/13. There is a strong bias for aircraft collisions with birds to occur in mid to late
summer suggesting that post fledging birds are more susceptible to aircraft collisions in the same way that they are more susceptible to road traffic collisions

8.10.807 Detailed environmental measures to minimise the risk of collision with road traffic and/or aircraft will be confirmed following assessment of road traffic modelling. It is likely to include measures to reduce road collisions, such as the use of low flight prevention screens or sunken roads and measures to encourage barn owl to forage away from the airfield such as the provision of habitat and nesting locations in areas overlapping known home ranges. Given the absence of supporting data at this stage a precautionary approach to the assessment has been taken. A scale of change of medium has been predicted and an effect that is **Significant** effect for an ecological feature of County / metropolitan importance.

8.10.808 At the time of application, the assessment of this likely significant effect will be further informed by a detailed understanding of the predicted traffic levels and also supplemented by further survey work to be completed in 2019.

**Assessment of biodiversity effects – Kingfisher**

**Detailed baseline**

8.10.809 The UK Kingfisher population was estimated to be between 3,600 and 6,100 pairs (Musgrove *et al*., 2013) based on the results of the Waterways Bird Survey (WBS) which ran between 1974 to 2007 and the Waterways Breeding Bird Survey (WBBS) which has continued from 2008 onwards. Kingfisher are listed as a Schedule 1 species on the Wildlife and Countryside Act (1981) (as amended) and as such receive additional legal protection preventing the destruction and disturbance of nest sites. In the most recent Birds of Conservation Concern publication (Eaton *et al*., 2015) kingfisher were amber listed.

8.10.810 The results of the WBS and WBBS indicate an increasing population trend of 13% over the 25-year period between 1989 and 2014 though more recent results have shown mid and short term decreases of 16% and 10% over 10 and 5 years respectively.

8.10.811 Kingfisher are considered a locally common breeding resident in London, 14 pairs (9 confirmed, 5 probable) reported in 2015 though there were reports of 23 confirmed breeding pairs in 2014. (London Natural History Society 2017). Reports from neighbouring counties, Surrey and Buckinghamshire have recorded kingfisher populations of 60 (Wheatley 2007) and 140 (Ferguson 2012) pairs respectively.

8.10.812 Kingfisher surveys were completed in 2017 and 2018. No further dedicated kingfisher surveys are planned for 2019.
Kingfisher were recorded on all of the surveyed watercourses during the survey periods. Key areas of activity have been identified on the River Colne, Wraysbury River, Duke of Northumberland’s River, Colne Brook and River Crane. In these areas, activities associated with breeding have been recorded, such as adult birds carrying fish, adult birds calling loudly to one another and the presence of juvenile birds. In 2018, two confirmed nest locations were identified on the River Colne with a third assumed territory identified within Harmondsworth Moor.

Despite the general absence of favourable nesting habitat within the Study Area the presence of multiple watercourses and water bodies support a breeding population of kingfisher that is considered to be of County / metropolitan importance. Three nest locations have been confirmed to date, however the high levels of activity recorded suggest that the Site could intersect with as many as five kingfisher territories.

**Predicted effects and their significance**

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**Land take and land cover change (resulting in habitat loss or degradation)**

Changes in land use to facilitate the construction of the DCO Project would result in the permanent loss of large areas of habitat which currently support kingfisher. This includes areas of 17.8ha of running water, 45.3ha of standing water, 0.7ha of wetland habitat and 27.9km of ditches. These habitats will largely be lost during Phases 1 and 2 of the DCO Project. For the purposes of this assessment these habitats are assumed to be permanently lost.

The loss of these habitats could lead to temporary and permanent displacement of kingfisher from all locations within areas that are subject to land use change.

Displacement of these birds could lead to increased stress and energy expenditure as birds would be forced to seek alternative locations, which could lead to a decrease in condition and ultimately survival rates and productivity. The loss and adaptation of watercourses and water bodies within a landscape that is already subject to high levels of development may also result in the wider area having a reduced capacity, making it unable to support the current levels of kingfisher.

Environmental measures would be delivered in part, within the green infrastructure that is an integral part of the DCO Project. Although the exact locations and extent of the various habitat is yet to be determined the general principle that applies is to ensure that newly created or improved habitats provide good quality resources that can support the same or greater numbers of kingfisher in the long term. More information on green infrastructure design will be provided at application for development consent including details of locations and extents of habitat.
8.10.819 The provision of alternative and connected habitat within the green infrastructure that is integral to the DCO Project make it likely that habitat loss and habitat change would result in the kingfisher population having opportunities for population expansion in the future. However, without sufficient certainty regarding green infrastructure design (particularly new river channels) a precautionary approach is taken in this assessment. On a preliminary basis the scale of change on this ecological feature of County / metropolitan importance is predicted to be medium and the likely effect **Significant**.

8.10.820 At the time of application, the assessment of this likely significant effect will be further informed by further design information regarding new river channels, water bodies and green infrastructure.

**Fragmentation of habitats (resulting in a reduction of connectivity)**

8.10.821 Habitat loss and habitat change may result in fragmentation of the landscape for kingfisher. This could be as a result of the loss or re-direction of watercourses or due to the presence of physical infrastructure such as the North West Runway, covered sections. Given the location of the North West Runway and the associated loss of linked habitat, the loss of habitat connectivity is most likely on a north-south axis along the Colne Valley.

8.10.822 Kingfisher occupy large territory ranges with birds foraging up to 3km from nest sites (RSPB, 2018).

8.10.823 Kingfisher have been recorded on all of the main watercourses within the study area. Confirmed nest locations have been recorded on the River Colne in two locations, the closest approximately 600m from the current airfield. High levels of activity suggest that further nests could also be located on the Wraysbury River, Duke of Northumberland’s River and Colne Brook, all less than 1km from the location of the North West Runway.

8.10.824 The diversion of the River Colne, Wraysbury River and Duke of Northumberland’s River would limit opportunities for kingfisher to traverse the North West Runway creating a physical barrier.

8.10.825 The severance of riparian habitats could affect up to four kingfisher territories within the study area having a negative effect on foraging, dispersal of young and local movements between nesting and preferred feeding sites. The loss of ecological connectivity could displace birds from the area or force birds to seek alternative commuting routes that could result in increased energy expenditure as birds have to fly further. This could lead to reduced condition of individuals and ultimately reduced productivity and/or survival rates.
8.10.826 Kingfishers have adapted to the current conditions in the study area and have been observed crossing the M25 and using sections of underpass to commute between foraging and nesting sites. Kingfisher will also readily cross terrestrial habitats and can nest up to 250m from watercourses or water bodies (Land Use Consultants, 2008).

8.10.827 Environmental measures to reduce the effect of lost connectivity would include the creation of a new north-south connection through the Colne Brook and Horton Brook Corridor and also habitat creation and replacement measures as described in Section 8.7.

8.10.828 The provision of alternative and connected habitat within the green infrastructure that is integral to the DCO Project could minimise the effects of a loss of ecological connectivity. However, the design of the habitats suitable for kingfisher, and an understanding of how these may provide connectivity are not suitably evolved to provide a detailed assessment. Therefore a preliminary and precautionary conclusion is drawn in this assessment. The predicted scale of change is medium and the effect **Significant** on this ecological feature of County / metropolitan importance.

8.10.829 At the time of application, the assessment of this likely significant effect will be further informed by further design information regarding new river channels, water bodies and green infrastructure.

*Increased noise and vibration (resulting in disturbance / displacement)*

8.10.830 Noise and vibration created by construction activity, ground based operations, road vehicles accessing and egressing the Airport and aircraft during the take-off and landing cycle could disturb kingfisher.

8.10.831 The kingfisher population already exists in a highly disturbed environment with overflying aircraft, major roads and residential areas all close to locations that provide feeding and foraging habitat for this species.

8.10.832 Given that kingfisher have been recorded within 600m of the airfield and directly underneath departure and arrival routes the most likely source of disturbance that would have a negative effect would be the noise and vibration created by construction activity and the presence of site operatives adjacent to breeding and foraging locations.

8.10.833 Kingfisher are highly susceptible to disturbance and activity at or near nest sites can lead to abandonment of nests. Though kingfisher typically nest in river banks of around the margins of water bodies, nest sites can be up to 250m from watercourses or water bodies (Land Use Consultants 2008).
8.10.834 Direct effects of disturbance can be mitigated using visual and aural barriers around construction sites and the implementation of disturbance buffers around known nest locations. However, given the geographic scale of the construction associated the DCO Project, disturbance is likely to be unavoidable in areas where foraging or commuting may be taking place. This could lead to displacement of this species from certain areas.

8.10.835 The provision of alternative and connected habitat within the green infrastructure that is integral to the DCO Project could minimise the effects of disturbance. However, the design of the habitats suitable for kingfisher, and an understanding of how these may provide opportunities for this species are not suitably evolved to provide a detailed assessment. Therefore, a preliminary and precautionary conclusion is drawn in this assessment. The predicted scale of change is medium and the effect Significant on this ecological feature of County / metropolitan importance.

8.10.836 At the time of application, the assessment of this likely significant effect will be further informed by detailed information on construction activities and their location and design information regarding new river channels, water bodies and green infrastructure.

Assessment of biodiversity effects – Breeding bird assemblage – county notable species

Detailed Baseline

8.10.837 Breeding bird surveys have been carried out within the study area during 2017 and 2018. This has included surveys following the Common Bird Census methodology designed to assess the species present and location and density of breeding territories within the study area.

8.10.838 During the surveys, 61 different species were identified as holding territories within the study area. This includes seven species that have been recorded in numbers of county importance when compared to population estimates for neighbouring counties, Buckinghamshire (Ferguson 2012) and Surrey (Wheatley 2007) and where appropriate for Greater London (London Natural History Society 2017).

8.10.839 Two of the species are protected species under Schedule 1 of the Wildlife and Countryside Act 1981 (as amended); Cetti’s warbler and little ringed plover with the remaining five species, house sparrow, lapwing, skylark, starling and song thrush all listed as SPI and included on the BoCC red list.

86 Kingfisher is dealt with separately in paragraphs 8.484 to 8.512.
Table 8.37 shows the estimated number of territories for these species alongside summaries of the conservation status of each of these species and estimates of county population and the baseline levels that have been used in the assessment.

**Table 8.37: Conservation status and population levels of notable species**

<table>
<thead>
<tr>
<th>Species</th>
<th>No. of Territories</th>
<th>Conservation Status</th>
<th>County Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cetti’s Warbler</td>
<td>24</td>
<td>WCA Sch 1; BoCC Green</td>
<td>Minimum of 20 territories in Buckinghamshire (Ferguson). London Bird Report identified a 40% increase in territories</td>
</tr>
<tr>
<td>House Sparrow</td>
<td>52</td>
<td>NERC Sect 41.; BoCC Red</td>
<td>Estimated 14,000 pairs in Buckinghamshire and 16,000-18,000 in Surrey. London BAP species</td>
</tr>
<tr>
<td>Lapwing</td>
<td>13</td>
<td>NERC Sect 41.; BoCC Red</td>
<td>138 territories reported in London Bird Report 2015</td>
</tr>
<tr>
<td>Little Ringed Plover</td>
<td>2</td>
<td>WCA Sch 1; BoCC Green</td>
<td>30 pairs estimated in Buckinghamshire, 5-15 in Surrey and 16-35 pairs in Greater London.</td>
</tr>
<tr>
<td>Skylark</td>
<td>88</td>
<td>NERC Sect 41.; BoCC Red</td>
<td>(237 territories reported in London Bird Report 2015)</td>
</tr>
<tr>
<td>Starling</td>
<td>55</td>
<td>NERC Sect 41.; BoCC Red</td>
<td>Estimated 18,000 pairs in Buckinghamshire and 12,000-41,000 in Surrey.</td>
</tr>
<tr>
<td>Song Thrush</td>
<td>75</td>
<td>NERC Sect 41.; BoCC Red</td>
<td>Lower estimate of 3,500 pairs in Surrey</td>
</tr>
</tbody>
</table>

The numbers of territories recorded during 2017 and 2018 will be used as the baseline, allowing provisional assessment of effects. Further surveys will be completed in 2019 and detailed assessment will be provided on application incorporating the results from all three survey seasons.

Table 8.38 shows national, regional and county population trends for the species listed as published following analysis of the BTO Breeding Bird Survey.

**Table 8.38: National, regional and county population trends for the species listed as published following analysis of the BTO Breeding Bird Survey**

<table>
<thead>
<tr>
<th>Species</th>
<th>England trend (10 year)</th>
<th>Regional trend (10 year)</th>
<th>Greater London trend (10 year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cetti’s Warbler</td>
<td>↑ 180%</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>House Sparrow</td>
<td>-0%</td>
<td>↑ 3%</td>
<td>↓ 18%</td>
</tr>
<tr>
<td>Lapwing</td>
<td>↓ 30%</td>
<td>↓ 42%</td>
<td>-</td>
</tr>
<tr>
<td>Little Ringed Plover</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Skylark</td>
<td>↓ 11%</td>
<td>↓ 11%</td>
<td>-</td>
</tr>
</tbody>
</table>
8.10.843 Trends for England suggest a significant increase in Cetti’s Warbler in the past 10 years, stable populations of house sparrow and song thrush and decreasing populations of lapwing, skylark and starling. Trends for Greater London are only available for house sparrow, starling and song thrush and all suggest a decrease in populations (Harris et al., 2017).

Land take and land cover change (resulting in habitat loss or degradation)

8.10.844 Changes in land use to facilitate the construction of the DCO Project would result in the permanent loss of large areas of habitat which currently support the breeding bird assemblage. This includes areas of grassland, scrub, woodland, riparian habitat, open water, wetland, arable fields, hedgerows and residential properties and gardens. These habitats would largely be lost during Phases 1 and 2 of the DCO Project. For the purposes of this assessment these habitats are assumed to be permanently lost.

8.10.845 The loss of these habitats could lead to temporary and permanent displacement of breeding birds from all locations within areas that are subject to land use change.

8.10.846 Table 8.39 details the number of observed territories identified during breeding bird surveys that coincide with areas where land use change is expected.

Table 8.39: Number of observed territories identified during breeding bird surveys

<table>
<thead>
<tr>
<th>Species</th>
<th>Number of territories</th>
<th>Distribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cetti’s Warbler</td>
<td>8</td>
<td>Concentrated in wetland/riparian areas within the Colne Valley (alongside the River Colne)</td>
</tr>
<tr>
<td>House Sparrow</td>
<td>43</td>
<td>Concentrated in residential areas of Harmondsworth and Longford</td>
</tr>
<tr>
<td>Lapwing</td>
<td>5</td>
<td>Restricted to large, open areas of grassland/grazing pasture</td>
</tr>
<tr>
<td>Little Ringed Plover</td>
<td>2</td>
<td>Restricted to quarry lakes, recorded in area north of Staines Moor SSSI</td>
</tr>
<tr>
<td>Skylark</td>
<td>42</td>
<td>Recorded in arable and grassland areas around Harmondsworth and also within the Colne Valley</td>
</tr>
<tr>
<td>Starling</td>
<td>47</td>
<td>Concentrated in residential areas of Harmondsworth and Longford</td>
</tr>
</tbody>
</table>
### 8.10.847 Displacement of these birds could lead to increased stress and energy expenditure as birds would be forced to seek alternative locations, which could lead to a decrease in condition and ultimately survival rates and productivity. The loss of existing green space areas within a landscape that is already subject to high levels of development may also result in the wider area having a reduced capacity, making it unable to support the current levels of breeding birds.

### 8.10.848 The species included in the assemblage are restricted in distribution, occupying habitat niches and locations within the study area. Environmental measures to minimise the loss of habitat would need to reflect the diverse range of habitats being lost and where appropriate include species specific measures. This could include the provision of artificial nesting islands for little ringed plover or the inclusion of cavities or nest boxes in buildings for communal species such as house sparrow or starling. Some areas of newly created or improved habitat would need to be created prior to construction to ensure vegetation and other habitat features (such as areas of open water) have had a chance to establish prior to losses being incurred.

### 8.10.849 Environmental measures would be delivered in part within the green infrastructure that is an integral part of the DCO Project. Although the exact locations and extent of the various habitat is yet to be determined the general principle that applies is to ensure that newly created or improved habitats provide good quality resources that can support the same or greater numbers of these birds in the long term. More information on green infrastructure design will be provided at application for development consent including details of locations and extents of habitat.

### 8.10.850 The provision of alternative and connected habitat within the green infrastructure that is integral to the DCO Project make it likely that habitat loss and habitat change will result in a scale of change that is low and an effect that is Not Significant on this ecological feature of County / metropolitan importance.

### 8.10.851 At the time of application, the assessment of this likely significant effect will be further informed by details of the location and design information regarding new and improved green infrastructure.
Increased noise and vibration (resulting in disturbance / displacement)

8.10.852 Noise and vibration created by construction activity, ground based operations, road vehicles accessing and egressing the Airport and aircraft during the take-off and landing cycle could disturb the breeding bird assemblage.

8.10.853 The breeding bird assemblage already exists in a highly disturbed environment with overflying aircraft, major roads and residential areas all close to areas that provide feeding and foraging habitat for the listed species.

8.10.854 Given that some of the species included have been recorded both on (in the case of skylark and starling) and adjacent to the existing airfield (house sparrow and Cetti's warbler), the most likely source of disturbance that would have a negative effect on the assemblage would be the noise and vibration created by construction activity and the presence of site operatives adjacent to breeding and foraging locations.

8.10.855 All of the species listed under Schedule 1 of the Wildlife and Countryside Act are legal protected from disturbance during the breeding season. Measures to avoid disturbance would need to be implemented at any location that could affect known Cetti's warbler or little ringed plover nest sites. Where disturbance of such nest sites is unavoidable, works would only be able to be completed under licence from Natural England. However, it is likely that environmental measures, largely focused on scheduling of construction activity, would avoid the need for licensing.

8.10.856 Cetti's warbler is a species that favours dense vegetation in wetland and riparian habitats. Typical buffer distances applied to known territories and nest sites for this species range between 25m-50m. However, territory sizes for this species can be up to 400m long and nest sites are difficult to locate. In some cases, protection from disturbance may need to be applied across a wider area to minimise the risk to nest sites.

8.10.857 Lapwing and skylark, both ground nesting birds that favour grassland and arable habitats, can be susceptible to disturbance. Lapwing favour grassland with a short sward height and will take flight in response to disturbance and have a recorded flight initiation distance of 40m (Moller, 2008). Skylark favour a longer sward height and as a result may be less susceptible to visual disturbance, however flight initiation distances ranging between 14m-41m have been recorded for this species (Cooke, 1980, Moller, 2008).

8.10.858 Some of the species included in the assemblage are tolerant to human disturbance. House sparrow and starling are both found in the highest densities in the residential areas of Longford and Harmondsworth, nesting in houses and commercial buildings close to busy roads and come into regular, close contact with humans and vehicles. Little ringed plover territories were recorded at two
active sand and gravel quarries, close to access tracks use by heavy machinery. This species shows a preference for nesting in active quarries and sand or gravel pits (Conway et al., 2008), however as a Schedule 1 species, disturbance buffers can still be required, even in working environments.

8.10.859 Direct effects of disturbance can be mitigated using visual and aural barriers around construction sites and activities and the implementation of disturbance buffers around known nest locations could further minimise the risk. However, given the geographic scale of the construction associated the DCO Project, disturbance is likely to be unavoidable which could lead to displacement of species included within the breeding bird assemblage.

8.10.860 The potential effects of displacement are described in paragraph 8.10.848 and could lead to direct effects on birds displaced and indirect effects on bird populations in surrounding areas through increased competition.

8.10.861 Environmental measures as described in paragraph 8.10.849, providing replacement habitat should encourage the species included in the assemblage away from construction areas and offer alternative nesting and foraging habitat for displaced birds. In addition, the management of disturbance through habitat manipulation and timing, as is common on construction sites across the UK, would reduce the number of potential conflicts.

8.10.862 The provision of alternative and connected habitat within the green infrastructure, and the more localised methods for managing disturbance should enable the scale of change to be restricted to low and the likely effect is Not Significant on this ecological feature of County / metropolitan importance. This preliminary assessment will be reviewed at the ES stage.

8.10.863 At the time of application, the assessment of this likely significant effect will be further informed by details of the location and design information regarding new and improved green infrastructure.

*Increased light levels (resulting in disturbance / displacement)*

8.10.864 Artificial lighting can affect behaviour of birds and in some cases can be advantageous. For example, robins have been recorded feeding under artificial light87. However other studies (Ouyang 2015) have shown that white artificial light can result in increased levels of corticosterone, a stress hormone that can result in decreased levels of productivity.

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It is assumed that intensive lighting may be used for security purposes and also to enable works to continue during hours of darkness in both construction and operational sites. This has the potential to increase amounts of light pollution within all of the areas subject to construction activity, but also working and residential compounds.

A sensitive lighting strategy would be designed to ensure construction and operational lighting minimises negative effects on birds, this would include measures such as minimum essential lighting only, using directional lighting aimed only where necessary, preventing light spill onto key retained foraging or nesting habitats and where reasonably practicable, the selection of least detrimental lighting types such as narrow spectrum light sources, that emit minimal ultra-violet light and avoid white and blue wavelengths of the light spectrum.

In the absence of a detailed lighting assessment, a precautionary approach to the assessment is required. The scale of change is predicted to be medium and the effect Significant on this ecological feature of County / metropolitan importance.

At the time of application the assessment of this likely significant effect will be further informed by a lighting assessment showing both the current baseline and that predicted for the DCO Project and will be compared the distribution of nest locations for breeding birds.

Changes in hydrology (groundwater levels, surface water run-off rates, river flows and lake levels; resulting in habitat change)

Changes in land use and the diversion of main watercourses to facilitate the construction and ultimate operation of the DCO project would result in permanent changes to the water table. This could result in changes of habitat within and adjacent to the Site that support breeding bird species included within the assemblage of county importance.

Further habitat change, in addition to that described in paragraphs 8.10.842 to 8.10.848 could result in further displacement of birds leading to increased stress and energy expenditure as individuals would be forced to seek alternative locations, which could lead to a decrease in condition and ultimately survival rates and productivity.

Environmental measures would be delivered within the green infrastructure that is an integral part of the DCO Project. Although the exact locations and extent of the various habitats is yet to be determined, the general principle that applies is to ensure that newly created or improved habitats provide good quality resources that can support the same or greater numbers of these birds in the long term.

More information on green infrastructure design will be provided at application for development consent including details of locations and extents of habitat.
The provision of alternative and connected habitat within the green infrastructure that is integral to the DCO Project make it likely that changes in hydrology and the associated habitat changes will result in a scale of change that is low and an effect that is \textbf{Not Significant} on this ecological feature of County / metropolitan importance.

At the time of application the assessment of this likely significant effect will be further informed by refined groundwater model outputs and further information on the design of green infrastructure.

\textit{Assessment of biodiversity effects – Breeding bird assemblage – borough notable species}

\textit{Detailed baseline}

Breeding bird surveys have been carried out within the study area during 2017 and 2018. This has included surveys following the Common Bird Census methodology, designed to assess the species and densities of breeding territories within the study area.

During the surveys 61 different species were identified as holding territories within the study area. This includes six notable species that are listed as SPIs and/or are BoCC Red List Species. They have been recorded in numbers below levels to make them of importance at a county level (when compared to estimates for Greater London, Buckinghamshire and Surrey) but are considered important on a borough basis because of their conservation status.

Four of the species are listed as SPI species; bullfinch (4 territories recorded during field surveys), dunnock (168 territories), linnet (10 territories) and reed bunting (15 territories). Linnet is the only SPI species included here which is also a BoCC Red List species.

The other two species included in assemblage are; grey wagtail (3 territories) and mistle thrush (5 territories), both of which are BoCC Red List Species.

The numbers of territories recorded during 2017 and 2018 will be used as the baseline, allowing provisional assessment of effects. Further surveys will be completed in 2019 and detailed assessment will be provided on application incorporating the results from all three survey seasons.

\textbf{Table 8.40} shows national, regional and county population trends for the species listed as published following analysis of the BTO Breeding Bird Survey.
Dunnock, the most numerous of the species included in the assemblage, have a stable national and regional population, while bullfinch is the only species in the assemblage currently showing an increasing trend both nationally and regionally. Trends for reed bunting and linnet suggest that while the national population of both species is increasing, regionally (within the south east) the species has seen reductions of 16% and 24% respectively. Mistle thrush and grey wagtail have both seen national numbers reduce in the last 10 years by 24% and 16% respectively, resulting in them being included on the BoCC Red List having previously been Amber List species (Harris et al., 2017).

### Land take and land cover change (resulting in habitat loss or degradation)

Changes in land use to facilitate the construction of the DCO Project would result in the permanent loss of large areas of habitat which currently support the breeding bird assemblage. This includes areas of grassland, scrub, woodland, riparian habitat, open water, wetland, arable fields, hedgerows and residential properties and gardens. The majority of these habitats would be lost in Phases 1 and 2 of the DCO Project. These losses are assumed for the purposes of assessment to be permanently lost.

The loss of these habitats could lead to temporary and permanent displacement of breeding birds from all locations within the areas that are subject to land use change.

### Table 8.41

<table>
<thead>
<tr>
<th>Species</th>
<th>England trend (10 year)</th>
<th>Regional trend (10 year)</th>
<th>Greater London trend (10 year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dunnock</td>
<td>↑ 2%</td>
<td>↑ 1%</td>
<td>↑ 5%</td>
</tr>
<tr>
<td>Bullfinch</td>
<td>↑ 30%</td>
<td>↑ 21%</td>
<td>-</td>
</tr>
<tr>
<td>Reed Bunting</td>
<td>↑ 19%</td>
<td>↓ 16%</td>
<td>-</td>
</tr>
<tr>
<td>Linnet</td>
<td>↑ 16%</td>
<td>↓ 24%</td>
<td>-</td>
</tr>
<tr>
<td>Mistle Thrush</td>
<td>↓ 24%</td>
<td>↓ 24%</td>
<td>-</td>
</tr>
<tr>
<td>Grey Wagtail</td>
<td>↓ 16%</td>
<td>0%</td>
<td>-</td>
</tr>
</tbody>
</table>

Table 8.40: National, regional and county population trends for the assemblage species (BTO Breeding Bird Survey)
Table 8.41: Number of observed territories identified during breeding bird surveys

<table>
<thead>
<tr>
<th>Species</th>
<th>Number of territories</th>
<th>Distribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dunnock</td>
<td>103</td>
<td>Widespread – favouring hedgerows, scrub and immature woodland</td>
</tr>
<tr>
<td>Bullfinch</td>
<td>3</td>
<td>Restricted to areas of woodland and mature scrub</td>
</tr>
<tr>
<td>Reed Bunting</td>
<td>4</td>
<td>Restricted to wetland and wet grassland habitats adjacent to watercourses and waterbodies</td>
</tr>
<tr>
<td>Linnet</td>
<td>7</td>
<td>Predominantly found in areas of scrub habitat</td>
</tr>
<tr>
<td>Mistle Thrush</td>
<td>4</td>
<td>Restricted to areas of woodland/parkland with mature trees</td>
</tr>
<tr>
<td>Grey Wagtail</td>
<td>3</td>
<td>Restricted to watercourses breeding in adjacent terrestrial habitat</td>
</tr>
</tbody>
</table>

8.10.884 The majority of the species included in the assemblage have been recorded in low numbers. While displacement could have a negative effect on individual birds, because of the low number of territories effected, the effect on the population will be negligible.

8.10.885 The only species that occurs in notable numbers is dunnock with over 100 territories identified to date. Dunnock are an adaptable species occupying a range of different habitats. They will also colonise relatively young habitat and favour immature areas of scrub and transitional habitats.

8.10.886 The species included in the assemblage would benefit from the provision of newly created or improved habitat as part of the green infrastructure proposals as described in Chapter 6.

8.10.887 The provision of alternative and connected habitat within the green infrastructure that is integral to the DCO Project make it likely that the scale of habitat loss and habitat change is low, and the likely effects is Not Significant on this ecological feature of borough importance. This is a preliminary conclusion that will be reviewed in the ES.

8.10.888 At the time of application the assessment of this likely significant effect will be further informed by an evolving design (including with regard to the requirements for construction) and further information on the design of green infrastructure.

*Increased noise and vibration (resulting in disturbance / displacement)*

8.10.889 Noise and vibration created by construction activity, ground based operations, road vehicles accessing and egressing the Airport and aircraft during the take-off and landing cycle could disturb the breeding bird assemblage.
The breeding bird assemblage already exists in a highly disturbed environment with overflying aircraft, major roads and residential areas all close to areas that provide feeding and foraging habitat for the species included. Therefore, the most likely source of disturbance that would have a negative effect on the assemblage would be the noise and vibration created by construction activity and the presence of site operatives adjacent to breeding and foraging locations.

The majority of the species included in the assemblage have been recorded in low numbers. Whilst disturbance could have a negative effect on individual birds, because of the low number of territories effected, the effect on the population is not likely to be significant.

Environmental measures as described in Section 8.7, will provide replacement habitat, encouraging the species included in the assemblage away from construction areas and offer alternative nesting and foraging habitat for displaced birds.

The provision of alternative and connected habitat within the green infrastructure that is integral to the DCO Project, within a system that demonstrates that the breeding bird assemblage already exists in a highly disturbed environment, means that the scale of change of disturbance on an ecological feature of borough importance is low, and the likely effect is Not Significant. This is a preliminary conclusion that will be reviewed in the ES.

At the time of application the assessment of this likely significant effect will be further informed by information on noise sources and sound levels and details of the design of green infrastructure.

**Increased light levels (resulting in disturbance / displacement)**

Artificial lighting can affect behaviour of birds and in some cases can be advantageous. For example, robins have been recorded feeding under artificial light (Hollingsworth, 2009). However other studies (Ouyang, 2015) have shown that white artificial light can result in increased levels of corticosterone, a stress hormone that can result in decreased levels of productivity.

It is assumed that intensive lighting may be used for security purposes and also to enable works to continue during hours of darkness in both construction and operational sites. This has the potential to increase amounts of light pollution within all of the areas subject to construction activity, but also working and residential compounds.

A sensitive lighting strategy would be designed to ensure construction and operational lighting minimises negative effects on birds, this would include measures such as minimum essential lighting only, using directional lighting aimed
only where necessary, preventing light spill onto key retained foraging or nesting habitats and where reasonably practicable, the selection of least detrimental lighting types such as narrow spectrum light sources, that emit minimal ultra-violet light and avoid white and blue wavelengths of the light spectrum.

8.10.898 In the absence of a detailed lighting assessment, a precautionary approach to the assessment is required. The scale of change is predicted to be medium and the effect Significant on this ecological feature of borough importance.

8.10.899 At the time of application the assessment of this likely significant effect will be further informed by a lighting assessment showing both the current baseline and that predicted for the DCO Project and will be compared the distribution of nest locations for breeding birds.

**Changes in hydrology (groundwater levels, surface water run-off rates, river flows and lake levels resulting in habitat change)**

8.10.900 Changes in land use and the diversion of main watercourses to facilitate the construction and ultimate operation of the DCO project would result in permanent changes to the water table. This could result in changes of habitat within and adjacent to the Site that support breeding bird species included within the assemblage of county importance.

8.10.901 Further habitat change, in addition to that described in paragraphs 8.10.876 to 8.10.882 could result in further displacement of birds leading to increased stress and energy expenditure as individuals would be forced to seek alternative locations, which could lead to a decrease in condition and ultimately survival rates and productivity.

8.10.902 Environmental measures would be delivered within the green infrastructure that is an integral part of the DCO Project. Although the exact locations and extent of the various habitats is yet to be determined, the general principle that applies is to ensure that newly created or improved habitats provide good quality resources that can support the same or greater numbers of these birds in the long term. More information on green infrastructure design will be provided at application for development consent including details of locations and extents of habitat.

8.10.903 The provision of alternative and connected habitat within the green infrastructure that is integral to the DCO Project make it likely that changes in hydrology and the associated habitat changes will result in a scale of change that is low and an effect that is Not Significant on this ecological feature of borough importance.

8.10.904 At the time of application the assessment of this likely significant effect will be further informed by refined groundwater model outputs and further information on the design of green infrastructure.
Assessment of biodiversity effects – Terrestrial wintering bird assemblage – county notable species

Detailed baseline

Walkover surveys were completed between September 2017 and March 2018 to assess the use of terrestrial habitats by migratory and wintering birds.

Wintering and migratory bird flocks are highly variable and transient in nature, however, fieldfare, linnet, redwing, skylark and starling have all been identified as occurring at notable levels when compared to peak counts and estimates of typical wintering numbers from other sites in Greater London (London Natural History Society, 2017). National and regional estimates for the populations of wintering birds are not available with the most recent dedicated monitoring programme the Wintering Bird Atlas (Lack, 1986) now considered to be out of date.

Numbers of wintering birds can fluctuate significantly in relation to a wide range of outside factors such as weather conditions, wind direction and strength, food resource and disturbance, therefore using the survey results from 2017/18 baseline estimates are provided as an upper and lower range to allow for variations between and within seasons.

Table 8.42 shows these estimates along with their conservation status and the county levels against which they have been assessed.

<table>
<thead>
<tr>
<th>Species</th>
<th>Baseline Estimate for peak numbers</th>
<th>County threshold/notable levels</th>
<th>Conservation Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fieldfare</td>
<td>250-300</td>
<td>Flocks of 200 birds or more</td>
<td>WCA Sch 188, BoCC Red</td>
</tr>
<tr>
<td>Linnet</td>
<td>100-200</td>
<td>Flocks of 100 birds or more</td>
<td>NERC Sec41 SPI, BoCC Red</td>
</tr>
<tr>
<td>Redwing</td>
<td>500-650</td>
<td>Flocks of 200 birds or more</td>
<td>WCA Sch 188, BoCC Red</td>
</tr>
<tr>
<td>Skylark</td>
<td>75-150</td>
<td>Flocks of 50 birds or more</td>
<td>NERC Sec41 SPI, BoCC Red</td>
</tr>
<tr>
<td>Starling</td>
<td>800-1,200</td>
<td>Flocks of 1000 birds or more</td>
<td>NERC Sec41 SPI, BoCC Red</td>
</tr>
</tbody>
</table>

Fieldfare and Redwing are both protected species under Schedule 1 of the Wildlife and Countryside Act 1981 (as amended). Schedule 1 is only applicable to birds that are breeding and as neither species is likely to breed on or near the study area and only occurs as a wintering species, they are not subject to the same legal protection when around Heathrow.
Predicted effects and their significance

Land take and land cover change (resulting in habitat loss or degradation)

8.10.909 Changes in land use to facilitate the delivery of the DCO Project would result in the permanent loss of a range of habitat types used by this assemblage, including woodland, grassland and arable fields. The wintering bird assemblage uses a range of different habitats for feeding and roosting and the loss of these habitats could lead to temporary and permanent displacement of wintering bird flocks from numerous locations within the Site (those in which construction and operational activities are proposed). The land take and land cover change would mainly occur during Phases 1 and 2 of the DCO Project (c:2022 to late 2026).

8.10.910 Displacement could lead to increased stress and energy expenditure as birds would be forced to seek alternative locations, which could further lead to a decrease in condition, survival rates and ultimately productivity. The loss of existing green space areas within a landscape that is already subject to high levels of development may also result in the wider area having a reduced capacity, making it unable to support the current levels of wintering birds.

8.10.911 The species listed are highly mobile and transient, with the majority showing no site fidelity within and between years occupying habitats ranging from back gardens to large arable fields. Skylark are the exception to this and have been recorded as showing a preference for fields larger than 7.5ha (Gillings and Fuller 2001).

8.10.912 Environmental measures would be delivered in part within the green infrastructure that is an integral part of the DCO Project. Although the exact locations and extent of habitat is yet to be determined the general principle that applies is to ensure that the provision provides good quality habitat that can support the same or greater numbers of these birds in the long term. Important habitat features for wintering birds would include areas of grassland, hedgerows and scrub that provide feeding and roosting opportunities. Details of the provision of newly created and improved habitat would be provided at application for development consent including details of locations and designs of habitat.

8.10.913 The provision of alternative and connected habitat within the green infrastructure that is integral to the DCO Project, within a system that demonstrates that the wintering bird assemblage is highly mobile, able to adapt to changing conditions and utilise a range of habitats and locations make it likely that the scale of habitat loss and habitat change, on an ecological feature of borough importance is low, and the likely effect is Not Significant. This is a preliminary conclusion that will be reviewed in the ES.
At the time of application, the assessment of this likely significant effect will be further informed by details of the location and design information regarding new and improved green infrastructure.

**Increased noise and vibration (resulting in disturbance / displacement)**

- **8.10.915** Noise and vibration created by construction activity, ground based operations, road vehicles accessing and egressing the Airport and aircraft during the take-off and landing cycle could disturb the wintering bird assemblage.

- **8.10.916** Given that the species listed are regularly recorded both on and adjacent to the existing runway, the most likely source of disturbance that will have a negative effect on the assemblage will be the noise and vibration created by construction activity and the presence of site operatives adjacent to feeding and roosting locations.

- **8.10.917** The species listed have been recorded initiating flight at varying distances in response to human disturbance, ranging from 9m – 41m (Moller, 2008a, Moller, 2008b). Construction or operational activities within these distances of suitable feeding or roosting sites could result in displacement.

- **8.10.918** Direct effects of disturbance could be mitigated using visual and aural barriers around construction sites and operational activities. The implementation of disturbance buffers around known feeding and roosting locations could also minimise risk of disturbance. However, given the geographic scale of the construction associated the DCO Project, disturbance is likely to be unavoidable.

- **8.10.919** Environmental measures as described in Section 8.7, would provide alternative habitat which should encourage wintering birds away from construction areas and offer alternative habitat for displaced birds.

- **8.10.920** The provision of alternative and connected habitat within the green infrastructure that is integral to the DCO Project, within a system that demonstrates that the wintering bird assemblage is highly mobile, able to adapt to changing conditions and utilise a range of habitats and locations make it likely that disturbance caused by construction activities will result in a scale of change on an ecological feature of borough importance that is very low and the likely effect is **Not Significant**. This is a preliminary conclusion that will be reviewed in the ES.

- **8.10.921** At the time of application, the assessment of this likely significant effect will be further informed by detailed information on construction activities and their location and design information regarding new river channels, water bodies and green infrastructure.
Increased light levels (resulting in disturbance / displacement)

8.10.922 Artificial lighting can have a negative effect on migratory bird species, in particular birds which migrate at night (such as redwing) which can become attracted to or disorientated by bright source of artificial lighting (McLaren et al., 2018). Records of mass collisions of migratory birds with sources of light have been recorded (Mclaren et al., 2018, Gauthreaux & Belser 2006, Jones and Francis 2003) along with potential for physiological effects (Ouyang et al., 2015, Legagneux et al., 2012).

8.10.923 It is assumed that intensive lighting may be used for security purposes and also to enable works to continue during hours of darkness in both construction and operational sites. This has the potential to increase amounts of light pollution within all of the areas subject to construction activity, but also working and residential compounds.

8.10.924 A sensitive lighting strategy would be designed to ensure construction and operational lighting minimises negative effects on birds, this would include measures such as minimum essential lighting only, using directional lighting aimed only where necessary, preventing light spill onto key retained foraging or nesting habitats and where reasonably practicable, the selection of least detrimental lighting types such as narrow spectrum light sources, that emit minimal ultra-violet light and avoid white and blue wavelengths of the light spectrum.

8.10.925 In the absence of a detailed lighting assessment, a precautionary approach to the assessment is required. The scale of change is predicted to be medium and the effect Significant on this ecological feature of borough importance.

8.10.926 At the time of application the assessment of this likely significant effect will be further informed by a lighting assessment showing both the current baseline and that predicted for the DCO Project and will be compared the distribution of nest locations for breeding birds.

8.11 Assessment of cumulative effects

Overview

8.11.1 The cumulative effects assessment (CEA) presented in this section reflects Stage 3 in the CEA process set out in Section 5.8 of Chapter 5.

8.11.2 The assessment of cumulative biodiversity effects is based on professional judgement, taking into account the levels of significance identified in the primary or ‘stand-alone’ assessment, and identifying whether effects could be different when ‘other development’ are considered.
8.11.3 A CEA is only undertaken for those ecological features that are likely to experience a scale of change of low or greater in the primary assessment. This is because changes beneath this threshold are unlikely to result in any discernible positive or negative effects on an ecological feature. It is considered that they are extremely unlikely to result in a significant cumulative effect, even if multiple effects of a similar significance are considered.

8.11.4 The following sections present the assessment of the cumulative effects of the DCO Project and other developments on biodiversity. Effects are described for each phase of the DCO Project where relevant.

8.11.5 The other developments to be considered in the CEA of the PEIR are those on the ‘assessment list’ provided in Chapter 5, Section 5.8.

8.11.6 Only those developments in the assessment list that fall within the ZOIs for biodiversity have the potential to result in cumulative effects with the DCO Project. The biodiversity ZOIs are shown in Chapter 5, Figure 5.1, Volume 2. All developments on the assessment list falling outside the biodiversity ZOIs are excluded from this assessment as follows:

1. Bat ZOI: O750 Land at Watersplash Farm, O751 Slough Heat & Power Station and O811 High Speed 2 (London - West Midlands)
2. Protected/Notable Species ZOI: as per Bat ZOI, plus O615 Southall Gas Works
3. European Sites/SSSI ZOI: as per Bat ZOI, plus O591 Rectory Lane and O615 Southall Gas Works.

8.11.7 An additional screening stage for biodiversity has been employed to further screen developments in the assessment list. This has ensured that only developments of a scale and nature that could result in likely significant cumulative effects related to biodiversity are included in the assessment. Projects were screened out of further assessment following a review of relevant planning documentation if:

1. Variations to existing mineral extraction or processing consents were implicitly included within the assessment through baseline survey (see Section 8.4) and the intended inclusion of restoration plans within the baseline at later stages of the DCO Project (see Sections 8.5 and 8.12)
2. The habitats and legally protected and notable species present were not common or unconnected between the DCO Project and those identified during the CEA
3. The legally protected and notable species recorded for projects identified through the CEA did not rely on the project sites to maintain favourable conservation status. For example a common pipistrelle bat may occasionally be
recorded within the vicinity of the development site, but no roosting or foraging opportunities were provided.

8.11.8 The following developments were screened out:

4. O109 Land at Harmondsworth, Holloway Close
5. O591 Rectory Lane, Cranford Lane
6. O595 Stanwell Recycling, Stanwell Quarry
7. O596 Stanwell Recycling, Stanwell Quarry
8. O608 Cemex Datchet Quarry, Land At Riding Court Farm
9. O609 Land East of Horton Road
10. O615 Southall Gas Works
11. O745 Land at Milton Park Farm
12. O810 M4 Junctions 3 to 12 Smart Motorway
13. A2 T5+ (T5A)
14. A3 T5+ (T5B)
15. A4 T5+ (T5C)
16. A5 Perry Oaks Fuel Farm

8.11.9 This screening stage will also be applied to the ES CEA, in order to screen the shortlist of developments and identify those that have the potential to result in likely significant cumulative effects and therefore require assessment in the biodiversity chapter.

8.11.10 Following application of the biodiversity CEA screening criteria, the following developments contained within Chapter 5, Appendix 5.3: Development schedule, Volume 3 have been brought forward for consideration in the CEA:

1. O601 Queen Mary Reservoir and land west of Queen Mary Reservoir
2. O732 Queen Mary Reservoir and land west of Queen Mary Reservoir
3. O812 Western Rail Link to Heathrow
4. O813 Southampton to London Pipeline Project.

8.11.11 It should be noted that effects of emissions related to road-traffic considered within the primary assessment in Section 8.10 are inherently cumulative and no additional CEA associated with road traffic is required. This is because the traffic model on which the air quality assessments are based use modelled traffic data
that has been adjusted to account for growth in future traffic flows. The modelling takes account of employment and housing projections, future infrastructure projects, and development in both Development Plans and in the planning process.

8.11.12 Nonetheless, the modelled traffic data has not been adjusted to account for changes that may occur as a result of the O812 Western Rail Link to Heathrow project. As such, potential cumulative effects associated with road traffic changes as a result of this development, are not inherently included in the assessment in Section 8.10. As set out in Section 7.11 in Chapter 7, major infrastructure schemes not currently included for in the traffic model, such as the Western Rail to Heathrow project, would reduce the use of and improve the operation of the strategic road network around Heathrow. It is therefore considered that long-term adverse cumulative effects are unlikely. Cumulative effects as a result of construction activities will be considered in the assessment carried out for the ES.

Assessment

8.11.13 The developments O601 and O732 have the potential to result in a cumulative effect in tandem with the DCO Project as both have the potential to result in effects on the SWLW SPA / Ramsar site. This is through the temporary disturbance or displacement of gadwall and shoveler due to time limited mineral extraction and processing works.

8.11.14 Sand and gravel extraction has and continues to occur within Queen Mary Reservoir under existing permissions and the water body is used extensively by the Queen Mary Sailing Club. This suggests that the current conditions are not optimal for either gadwall or shoveler due to high baseline levels of disturbance. Monitoring of the water body between October 2011 and March 2016 suggests that it does not provide habitat used regularly by these species. Further, the current proposals would see cessation of works within Queen Mary Reservoir prior to Phase 1 of the DCO Project beginning; thereby negating any cumulative effects.

8.11.15 Therefore, cumulative effects associated with O601 and O732 with the DCO Project can be discounted.

8.11.16 The Western Rail Link to Heathrow project (O812), in areas where surface activity will take place, include areas within the Site of the DCO Project. Where this occurs any potential cumulative effects are dealt with intrinsically within the assessment through consideration of land take and disturbance in Section 8.10. This is because the location and timing of the construction of an air shaft within the Site of the DCO Project mean that the disturbance or displacement of species is synonymous. Cumulative

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89 This is because the location and timing of the construction of an air shaft within the Site of the DCO Project mean that the disturbance or displacement of species is synonymous. Cumulative
the Site the potential cumulative effects are largely positive as the Western Rail Link to Heathrow project is focused in habitats that are not supporting large numbers of legally protected or notable species from the populations also using the Site. This is because the types of habitats that would be subject to development are generally not important (mainly intensively managed arable land). Therefore, the proposed improvements for biodiversity in adjacent areas will complement the green infrastructure proposed as part of the DCO Project. Although positive, the cumulative effect of adjoining habitat creation is not expected to result in an uplift great enough to be deemed significant, thereby negating any cumulative effects.

8.11.17 The Southampton to London Pipeline Project (O813) has the potential for cumulative effects as it will result in loss of habitat, including for legally protected and notable species. However, the extent of the working corridor is relatively narrow (at 30m) and can be narrowed in sensitive locations (as described in the Scoping Report for the project (Jacobs, 2018)) and the works are largely temporary (in other words habitats will be established over the pipeline once installed). Given the narrow corridor, its location when within the biodiversity study area and its temporary nature the potential for cumulative effects can be discounted.

8.12 Preliminary assessment of significance

Overview

8.12.1 The significant effects remaining once all environmental measures have been taken into consideration are presented in Table 8.43.

8.12.2 This section summarises the outcome of the assessment (including the cumulative effects assessment) and any remaining significant effects in a final table.

effects of habitat loss are scoped out as the improved pasture in question has limited biodiversity value.
### Table 8.43: Summary of significance of adverse and beneficial effects

<table>
<thead>
<tr>
<th>Ecological feature and effect</th>
<th>Importance</th>
<th>Scale of change</th>
<th>Significance</th>
<th>Summary rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>South West London Waterbodies SPA / Ramsar site</strong>&lt;br&gt;Land take and land cover change (resulting in habitat loss or degradation)</td>
<td>International</td>
<td>Very low</td>
<td>Not Significant</td>
<td>Little or no change to the populations of gadwall or shoveler is expected.</td>
</tr>
<tr>
<td>Fragmentation of habitats (reduction of connectivity)</td>
<td>International</td>
<td>Very low</td>
<td>Not Significant</td>
<td>Little or no change to movements between water bodies is expected.</td>
</tr>
<tr>
<td>Increased noise and vibration (resulting in disturbance / displacement)</td>
<td>International</td>
<td>Negligible</td>
<td>Not Significant</td>
<td>As gadwall and shoveler (combined) only reacted to &lt;0.1% of the aircraft observed a negative effects on them can be discounted.</td>
</tr>
<tr>
<td>Emission events (changes in concentrations and deposition rates of nitrogen; resulting in habitat degradation)</td>
<td>International</td>
<td>Medium</td>
<td>Significant</td>
<td>Further increases in the concentrations of NOx could result in harmful effects on gadwall and shoveler through habitat degradation, resulting in damage to food plants within the water bodies used for foraging.</td>
</tr>
<tr>
<td>Changes in patterns of recreational activity (resulting in disturbance / displacement and habitat degradation)</td>
<td>International</td>
<td>Negligible</td>
<td>Not Significant</td>
<td>There are limited opportunities for people to actively disturb gadwall and shoveler, due partly to the provision of alternative areas of public open space.</td>
</tr>
<tr>
<td><strong>All European sites (other than the South West London Waterbodies SPA/Ramsar site)</strong>&lt;br&gt;Emission events (changes in concentrations and deposition rates of nitrogen; resulting in habitat degradation)</td>
<td>International</td>
<td>Medium</td>
<td>Significant</td>
<td>A precautionary assumption is made that there may be increasing emissions of nitrogen that could result in habitat degradation within this site.</td>
</tr>
<tr>
<td>Ecological feature and effect</td>
<td>Importance</td>
<td>Scale of change</td>
<td>Significance</td>
<td>Summary rationale</td>
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<tr>
<td>-------------------------------</td>
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</tr>
<tr>
<td>degradation)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Staines Moor SSSI</strong></td>
<td>National</td>
<td>High</td>
<td>Significant</td>
<td>Predicted loss of pockets of habitat that resemble the single notified feature that occurs in this unit.</td>
</tr>
<tr>
<td>Land take and land cover change (resulting in habitat loss or degradation)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Increased noise and vibration (resulting in disturbance / displacement)</strong></td>
<td>National</td>
<td>Negligible</td>
<td>Not Significant</td>
<td>As goosander, pochard and tufted duck (combined) only reacted to 0.2% of the aircraft recorded a negative effect on them can be discounted.</td>
</tr>
<tr>
<td><strong>Emission events (changes in concentrations and deposition rates of nitrogen; resulting in habitat degradation)</strong></td>
<td>National</td>
<td>Medium</td>
<td>Significant</td>
<td>A precautionary assumption is made that there may be increasing emissions of nitrogen that could result in habitat degradation within this site.</td>
</tr>
<tr>
<td><strong>Changes in patterns of recreational activity (resulting in disturbance / displacement and habitat degradation)</strong></td>
<td>National</td>
<td>Negligible</td>
<td>Not Significant</td>
<td>There are limited opportunities for people to actively disturb duck species, due partly to the provision of alternative areas of public open space.</td>
</tr>
<tr>
<td><strong>Wraysbury Reservoir SSSI</strong></td>
<td>National</td>
<td>Negligible</td>
<td>Not Significant</td>
<td>Cormorant and great crested grebe (combined) reacted to less than 0.1% of the aircraft monitored over Wraysbury Reservoir, so it is concluded that they are habituated to aircraft in this area.</td>
</tr>
<tr>
<td>Increased noise and vibration (resulting in disturbance / displacement)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Emission events (changes in concentrations and deposition rates of nitrogen; resulting in habitat degradation)</strong></td>
<td>National</td>
<td>Medium</td>
<td>Significant</td>
<td>A precautionary assumption is made that there may be increasing emissions of nitrogen that could result in habitat degradation within this site.</td>
</tr>
<tr>
<td><strong>Wraysbury No 1 Gravel Pit SSSI</strong></td>
<td>National</td>
<td>See SWLW SPA / Ramsar site</td>
<td>See SWLW SPA / Ramsar site</td>
<td>See SWLW SPA / Ramsar site</td>
</tr>
<tr>
<td>See SWLW SPA/Ramsar site</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ecological feature and effect</td>
<td>Importance</td>
<td>Scale of change</td>
<td>Significance</td>
<td>Summary rationale</td>
</tr>
<tr>
<td>------------------------------</td>
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</tr>
<tr>
<td>Wraysbury and Hythe End Gravel Pits SSSI</td>
<td>National</td>
<td>Negligible</td>
<td>Not Significant</td>
<td>Goosander and tufted duck (combined) only reacted to 1.2% of the aircraft monitored over this SSSI, so it is concluded that they are habituated to aircraft in this area.</td>
</tr>
<tr>
<td>Emission events (changes in concentrations and deposition rates of nitrogen; resulting in habitat degradation)</td>
<td>National</td>
<td>Medium</td>
<td>Significant</td>
<td>A precautionary assumption is made that there may be increasing emissions of nitrogen that could result in habitat degradation within this site.</td>
</tr>
<tr>
<td>All SSSIs</td>
<td>National</td>
<td>Medium</td>
<td>Significant</td>
<td>A precautionary assumption is made that there may be increasing emissions of nitrogen that could result in habitat degradation within this site.</td>
</tr>
<tr>
<td>Local Wildlife Sites and Local Nature Reserves</td>
<td>County, Metropolitan or Borough</td>
<td>High</td>
<td>Significant</td>
<td>The potential total of partial loss of land from these sites is a negative effect.</td>
</tr>
<tr>
<td>Veteran Trees</td>
<td>National</td>
<td>Medium</td>
<td>Significant</td>
<td>The desk-study information suggests that the occurrence of veteran trees in the vicinity of the Site is limited. However, the loss of even a small number of veteran trees is likely to result in a Significant adverse effect.</td>
</tr>
<tr>
<td>Semi-natural Woodland (HPI)</td>
<td>County / Metropolitan</td>
<td>Medium</td>
<td>Significant</td>
<td>The area of habitat lost, compared to the time taken for replacement habitat to become established, means that a Significant adverse effect is predicted.</td>
</tr>
<tr>
<td>Changes in hydrology (groundwater levels, surface water run-off rates, river</td>
<td>County / Metropolitan</td>
<td>Medium</td>
<td>Significant</td>
<td>Wet woodland is a groundwater dependent terrestrial ecosystem which is</td>
</tr>
<tr>
<td>Ecological feature and effect</td>
<td>Importance</td>
<td>Scale of change</td>
<td>Significance</td>
<td>Summary rationale</td>
</tr>
<tr>
<td>------------------------------</td>
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<td>-------------</td>
<td>-------------------</td>
</tr>
<tr>
<td><strong>flows and lake levels; resulting in habitat change)</strong></td>
<td>Borough</td>
<td>Medium</td>
<td>Significant</td>
<td>likely to be affected by changes in the groundwater level</td>
</tr>
<tr>
<td><strong>Semi-natural Woodland (non-HPI)</strong></td>
<td>Borough</td>
<td>Medium</td>
<td>Significant</td>
<td>The area of habitat lost, compared to the time taken for replacement habitat to become established, means that a Significant adverse effect is predicted.</td>
</tr>
<tr>
<td><strong>Plantation Woodland</strong></td>
<td>Borough</td>
<td>Medium</td>
<td>Significant</td>
<td>The extent of the loss of this habitat means that a Significant adverse effect is predicted.</td>
</tr>
<tr>
<td><strong>Native, species-rich hedgerow (HPI)</strong></td>
<td>County / Metropolitan</td>
<td>Low</td>
<td>Not Significant</td>
<td>The total length of hedgerows lost, compared to the short establishment time for replacement hedgerows, means that no significant adverse effects are predicted.</td>
</tr>
<tr>
<td><strong>Native, species-poor hedgerow (HPI)</strong></td>
<td>Borough</td>
<td>Low</td>
<td>Not Significant</td>
<td>The total length of hedgerows lost, compared to the short establishment time for replacement hedgerows, means that no significant adverse effects are predicted.</td>
</tr>
<tr>
<td><strong>Swamps (non-HPI)</strong></td>
<td>Borough</td>
<td>Very Low</td>
<td>Not Significant</td>
<td>The total area of swamp habitat lost, compared to the areas to be provided, means that no significant adverse effects are predicted.</td>
</tr>
<tr>
<td><strong>Changes in hydrology (groundwater levels, surface water run-off rates, river flows and lake levels; resulting in habitat change)</strong></td>
<td>Borough</td>
<td>Very Low</td>
<td>Not Significant</td>
<td>The total area of swamp habitat to be affected by changes in hydrology, compared to the areas to be provided, means that no significant adverse effects are predicted.</td>
</tr>
<tr>
<td><strong>Ditches (non-HPI)</strong></td>
<td>Borough</td>
<td>Low</td>
<td>Not Significant</td>
<td>The total length of ditches lost, compared to the length of replacement ditches</td>
</tr>
<tr>
<td>Ecological feature and effect</td>
<td>Importance</td>
<td>Scale of change</td>
<td>Significance</td>
<td>Summary rationale</td>
</tr>
<tr>
<td>-------------------------------</td>
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<td>--------------</td>
<td>-------------------</td>
</tr>
<tr>
<td>loss or degradation)</td>
<td></td>
<td></td>
<td></td>
<td>proposed and the short establishment time for replacement ditch habitats, means that no significant adverse effects are predicted.</td>
</tr>
<tr>
<td>Changes in hydrology (groundwater levels, surface water run-off rates, river flows and lake levels; resulting in habitat change)</td>
<td>Borough</td>
<td>Low</td>
<td>Not Significant</td>
<td>The total number of ditches to be affected by changes in hydrology, compared to the areas to be provided, means that no significant adverse effects are predicted</td>
</tr>
<tr>
<td>Standing water (ponds) (HPI)</td>
<td>Borough</td>
<td>Low</td>
<td>Not Significant</td>
<td>The number of ponds to be lost is low.</td>
</tr>
<tr>
<td>Standing water (lakes) (HPI)</td>
<td>County / Metropolitan</td>
<td>Medium</td>
<td>Significant</td>
<td>The loss of, and permanent changes to lakes means that Significant adverse effects are predicted.</td>
</tr>
<tr>
<td>Changes in hydrology (groundwater levels, surface water run-off rates, river flows and lake levels; resulting in habitat change)</td>
<td>Borough</td>
<td>Low</td>
<td>Not Significant</td>
<td>The total number of ponds to be affected by changes in hydrology, compared to the number to be provided, means that no significant adverse effects are predicted.</td>
</tr>
<tr>
<td>Standing water (lakes) (HPI)</td>
<td>Regional</td>
<td>High</td>
<td>Significant</td>
<td>The loss of existing river corridors, and the time for new river corridors to become established, means that Significant adverse effects are predicted.</td>
</tr>
</tbody>
</table>
## Changes in hydrology (groundwater levels, surface water run-off rates, river flows and lake levels; resulting in habitat change)

<table>
<thead>
<tr>
<th>Importance</th>
<th>Scale of change</th>
<th>Significance</th>
<th>Summary rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regional</td>
<td>Medium</td>
<td>Significant</td>
<td>Predicted local changes to the water table may affect a number of Rivers. Although flows are not expected to change upstream and downstream of the Site, local changes to river habitats may result due to alterations to water table.</td>
</tr>
</tbody>
</table>

### Pointed Stonewort

Land take and land cover change (resulting in habitat loss or degradation)

<table>
<thead>
<tr>
<th>Importance</th>
<th>Scale of change</th>
<th>Significance</th>
<th>Summary rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>County / Metropolitan</td>
<td>High</td>
<td>Significant</td>
<td>The loss of this nationally rare species, and the time taken for suitable replacement habitats to form, within which it could re-establish, mean that Significant adverse effects are predicted.</td>
</tr>
</tbody>
</table>

### Changes in hydrology (groundwater levels, surface water run-off rates, river flows and lake levels; resulting in habitat change)

<table>
<thead>
<tr>
<th>Importance</th>
<th>Scale of change</th>
<th>Significance</th>
<th>Summary rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>County / Metropolitan</td>
<td>High</td>
<td>Significant</td>
<td>Potential changes to hydrology and hydrogeology may result in changes to groundwater levels and groundwater-surface water interaction which could lead to changes Saxon Lake, the one location in the study area where this species exists.</td>
</tr>
</tbody>
</table>

### European eel

Land take and land cover change (resulting in habitat loss or degradation)

<table>
<thead>
<tr>
<th>Importance</th>
<th>Scale of change</th>
<th>Significance</th>
<th>Summary rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regional</td>
<td>High</td>
<td>Significant</td>
<td>The scale of loss of suitable habitat for European eel, and the time taken for suitable replacement habitats to form, within which it could re-establish, mean that Significant adverse effects are predicted.</td>
</tr>
</tbody>
</table>

### Fragmentation of habitats (reduction of connectivity)

<table>
<thead>
<tr>
<th>Importance</th>
<th>Scale of change</th>
<th>Significance</th>
<th>Summary rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regional</td>
<td>Medium</td>
<td>Significant</td>
<td>The loss of connectivity, and the potential effects on the movement of eels through the Study area, mean that Significant adverse effects are predicted.</td>
</tr>
</tbody>
</table>

### Increased noise and vibration (resulting in disturbance and displacement)

<table>
<thead>
<tr>
<th>Importance</th>
<th>Scale of change</th>
<th>Significance</th>
<th>Summary rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regional</td>
<td>Medium</td>
<td>Significant</td>
<td>Noise and vibration generated during construction have the potential to disturb and displace European eel, so</td>
</tr>
<tr>
<td>Ecological feature and effect</td>
<td>Importance</td>
<td>Scale of change</td>
<td>Significance</td>
</tr>
<tr>
<td>-------------------------------</td>
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<td>--------------</td>
</tr>
<tr>
<td>Increased light intensity (resulting in disturbance / displacement)</td>
<td>Regional</td>
<td>Medium</td>
<td>Significant</td>
</tr>
<tr>
<td>Changes in hydrology (groundwater levels, surface water run-off rates, river flows and lake levels; resulting in habitat change)</td>
<td>Regional</td>
<td>Medium</td>
<td>Significant</td>
</tr>
<tr>
<td><strong>European bullhead</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Land take and land cover change (resulting in habitat loss or degradation)</td>
<td>Regional</td>
<td>High</td>
<td>Significant</td>
</tr>
<tr>
<td>Fragmentation of habitats (reduction of connectivity)</td>
<td>Regional</td>
<td>Medium</td>
<td>Significant</td>
</tr>
<tr>
<td>Increased noise and vibration (resulting in disturbance / displacement)</td>
<td>Regional</td>
<td>Medium</td>
<td>Significant</td>
</tr>
<tr>
<td>Changes in hydrology (groundwater levels, surface water run-off rates, river flows and lake levels; resulting in habitat change)</td>
<td>Regional</td>
<td>Medium</td>
<td>Significant</td>
</tr>
<tr>
<td>Ecological feature and effect</td>
<td>Importance</td>
<td>Scale of change</td>
<td>Significance</td>
</tr>
<tr>
<td>------------------------------------------------------------------</td>
<td>------------------------</td>
<td>-----------------</td>
<td>--------------</td>
</tr>
<tr>
<td><strong>Barbel</strong></td>
<td>County / Metropolitan</td>
<td>Medium</td>
<td>Significant</td>
</tr>
<tr>
<td>Land take and land cover change (resulting in habitat loss or degradation)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Fragmentation of habitats (reduction of connectivity)</strong></td>
<td>County / Metropolitan</td>
<td>High</td>
<td>Significant</td>
</tr>
<tr>
<td><strong>Increased noise and vibration (resulting in disturbance / displacement)</strong></td>
<td>County / Metropolitan</td>
<td>Medium</td>
<td>Significant</td>
</tr>
<tr>
<td><strong>Changes in hydrology (groundwater levels, surface water run-off rates, river flows and lake levels; resulting in habitat change)</strong></td>
<td>Regional</td>
<td>Medium</td>
<td>Significant</td>
</tr>
<tr>
<td><strong>Fish assemblage</strong></td>
<td>Borough</td>
<td>Medium</td>
<td>Significant</td>
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<tr>
<td>Land take and land cover change (resulting in habitat loss or degradation)</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td><strong>Fragmentation of habitats (reduction of connectivity)</strong></td>
<td>Borough</td>
<td>Medium</td>
<td>Significant</td>
</tr>
<tr>
<td><strong>Increased noise and vibration (resulting in disturbance / displacement)</strong></td>
<td>Borough</td>
<td>Medium</td>
<td>Significant</td>
</tr>
<tr>
<td>Ecological feature and effect</td>
<td>Importance</td>
<td>Scale of change</td>
<td>Significance</td>
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<tr>
<td>------------------------------</td>
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<td>--------------</td>
</tr>
<tr>
<td>Changes in hydrology</td>
<td>Borough</td>
<td>Medium</td>
<td>Significant</td>
</tr>
<tr>
<td></td>
<td>County / Metropolitan</td>
<td>High</td>
<td>Significant</td>
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<tr>
<td></td>
<td>County / Metropolitan</td>
<td>Low</td>
<td>Not Significant</td>
</tr>
<tr>
<td>Increased noise and vibration</td>
<td>County / Metropolitan</td>
<td>Very low to negligible</td>
<td>Not Significant</td>
</tr>
<tr>
<td></td>
<td>County / Metropolitan</td>
<td>Medium</td>
<td>Significant</td>
</tr>
<tr>
<td>Changes in hydrology</td>
<td>County / Metropolitan</td>
<td>High</td>
<td>Significant</td>
</tr>
<tr>
<td>Ecological feature and effect</td>
<td>Importance</td>
<td>Scale of change</td>
<td>Significance</td>
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</tr>
<tr>
<td>Wildlife collision rates with aircraft or road traffic (resulting in death or injury of individual animals)</td>
<td>County / Metropolitan</td>
<td>Low</td>
<td>Not Significant</td>
</tr>
<tr>
<td>Daubenton’s bats</td>
<td>Regional</td>
<td>Low</td>
<td>Not Significant</td>
</tr>
<tr>
<td>Fragmentation of habitats (reduction of connectivity)</td>
<td>Regional</td>
<td>Low</td>
<td>Not Significant</td>
</tr>
<tr>
<td>Increased noise and vibration (resulting in disturbance / displacement)</td>
<td>Regional</td>
<td>Low</td>
<td>Not Significant</td>
</tr>
<tr>
<td>Increased light intensity (resulting in disturbance / displacement)</td>
<td>Regional</td>
<td>Medium</td>
<td>Significant</td>
</tr>
<tr>
<td>Changes in hydrology (groundwater levels, surface water run-off rates, river flows and lake levels;</td>
<td>Regional</td>
<td>Low</td>
<td>Not Significant</td>
</tr>
<tr>
<td>Ecological feature and effect</td>
<td>Importance</td>
<td>Scale of change</td>
<td>Significance</td>
</tr>
<tr>
<td>-------------------------------------------------------------------</td>
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</tr>
<tr>
<td>resulting in habitat change</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Wildlife collision rates with aircraft or road traffic (resulting in death or injury of individual animals)</td>
<td>Regional</td>
<td>Very Low</td>
<td>Not Significant</td>
</tr>
<tr>
<td><strong>Soprano pipistrelle</strong></td>
<td>Regional</td>
<td>Low</td>
<td>Not Significant</td>
</tr>
<tr>
<td>Land take and land cover change (resulting in habitat loss or degradation)</td>
<td>Regional</td>
<td>Low</td>
<td>Not Significant</td>
</tr>
<tr>
<td>Fragmentation of habitats (reduction of connectivity)</td>
<td>Regional</td>
<td>Low</td>
<td>Not Significant</td>
</tr>
</tbody>
</table>
### Ecological feature and effect

<table>
<thead>
<tr>
<th>Ecological feature and effect</th>
<th>Importance</th>
<th>Scale of change</th>
<th>Significance</th>
<th>Summary rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increased light intensity (resulting in disturbance / displacement)</td>
<td>Regional</td>
<td>Medium</td>
<td>Significant</td>
<td>Soprano pipistrelles are considered to be a light-tolerant species being less sensitive to the negative effects of light disturbance. Despite this, Significant adverse effects are predicted as no detailed lighting assessment is currently available.</td>
</tr>
<tr>
<td>Changes in hydrology (groundwater levels, surface water run-off rates, river flows and lake levels; resulting in habitat change)</td>
<td>Regional</td>
<td>Low</td>
<td>Not Significant</td>
<td>Although there may be changes in groundwater dependent habitats due to an alteration of the water table level, the additional effects (beyond those listed above) on soprano pipistrelles are predicted to be minimal.</td>
</tr>
<tr>
<td>Wildlife collision rates with aircraft or road traffic (resulting in death or injury of individual animals)</td>
<td>Regional</td>
<td>Very Low</td>
<td>Not Significant</td>
<td>Soprano pipistrelles are at risk of vehicle collision mortality due to their relatively low flying height. Where known flight routes are crossed by new roads, environmental measures will be included to minimise strike risk. The potential collision rate is predicted to be low, so no Significant adverse effects are predicted.</td>
</tr>
<tr>
<td>Common pipistrelle Land take and land cover change (resulting in habitat loss or degradation)</td>
<td>Regional</td>
<td>High</td>
<td>Significant</td>
<td>Habitat losses may cause a permanent reduction in the available habitat leading to a reduction in abundance and distribution of this colony. This may lead to the favourable conservation status of the affected colony being compromised, with a Significant adverse effects therefore predicted.</td>
</tr>
<tr>
<td>Fragmentation of habitats (reduction of connectivity)</td>
<td>Regional</td>
<td>Low</td>
<td>Not Significant</td>
<td>Connectivity would be provided for the common pipistrelle colonies throughout the retained, enhanced and</td>
</tr>
</tbody>
</table>

**Note:** All information is based on the preliminary environmental information report for Heathrow Expansion.
### Ecological feature and effect

<table>
<thead>
<tr>
<th>Importance</th>
<th>Scale of change</th>
<th>Significance</th>
<th>Summary rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regional</td>
<td>None</td>
<td>Not Significant</td>
<td>newly created habitats within their home range, so no Significant adverse effects are predicted.</td>
</tr>
<tr>
<td>Regional</td>
<td>Moderate</td>
<td>Significant</td>
<td>There are no common pipistrelle roosts within sufficient distance of construction and new operational areas where a likely significant effect from noise or vibration disturbance may occur.</td>
</tr>
<tr>
<td>Regional</td>
<td>High</td>
<td>Significant</td>
<td>Common pipistrelles are considered to be a light-tolerant species being less sensitive to the negative effects of light disturbance. Despite this, Significant adverse effects are predicted as no detailed lighting assessment is currently available.</td>
</tr>
<tr>
<td>Regional</td>
<td>Low</td>
<td>Not Significant</td>
<td>Changes in groundwater dependent habitats due to an alteration of the water table level could result in the suitability of some habitats that remain in-situ within or outside of the Site being reduced for common pipistrelle.</td>
</tr>
<tr>
<td>Regional</td>
<td>Low</td>
<td>Not Significant</td>
<td>Common pipistrelles are at risk of vehicle collision mortality due to their relatively low flying height. Where known flight routes are crossed by new roads, environmental measures will be included to minimise strike risk. The potential collision rate is predicted to be low, so no Significant adverse effects are predicted.</td>
</tr>
<tr>
<td>Ecological feature and effect</td>
<td>Importance</td>
<td>Scale of change</td>
<td>Significance</td>
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<tr>
<td>-------------------------------</td>
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<td>--------------</td>
</tr>
<tr>
<td><strong>Bat populations</strong>&lt;br&gt;L Land take and land cover change (resulting in habitat loss or degradation)</td>
<td>County / Metropolitan</td>
<td>Low</td>
<td>Not Significant</td>
</tr>
<tr>
<td><strong>Fragmentation of habitats</strong>&lt;br&gt;(reduction of connectivity)</td>
<td>County / Metropolitan</td>
<td>Very low</td>
<td>Not Significant</td>
</tr>
<tr>
<td><strong>Increased noise and vibration</strong>&lt;br&gt;(resulting in disturbance / displacement)</td>
<td>County / Metropolitan</td>
<td>Very low to negligible</td>
<td>Not Significant</td>
</tr>
<tr>
<td><strong>Increased light intensity</strong>&lt;br&gt;(resulting in disturbance / displacement)</td>
<td>County / Metropolitan</td>
<td>Very low to negligible</td>
<td>Not Significant</td>
</tr>
<tr>
<td>Ecological feature and effect</td>
<td>Importance</td>
<td>Scale of change</td>
<td>Significance</td>
</tr>
<tr>
<td>------------------------------</td>
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<td>--------------</td>
</tr>
<tr>
<td>Changes in hydrology (groundwater levels, surface water run-off rates, river flows and lake levels; resulting in habitat change)</td>
<td>County / Metropolitan</td>
<td>Very low to negligible</td>
<td>Not Significant</td>
</tr>
<tr>
<td>Wildlife collision rates with aircraft or road traffic (resulting in death or injury of individual animals)</td>
<td>County / Metropolitan</td>
<td>Very low to negligible</td>
<td>Not Significant</td>
</tr>
<tr>
<td>Otter</td>
<td>Regional</td>
<td>Medium</td>
<td>Significant</td>
</tr>
<tr>
<td>Fragmentation of habitats (reduction of connectivity)</td>
<td>Regional</td>
<td>Medium</td>
<td>Significant</td>
</tr>
<tr>
<td>Increased noise and vibration (resulting in disturbance / displacement)</td>
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<td>Very low</td>
<td>Not Significant</td>
</tr>
<tr>
<td>Ecological feature and effect</td>
<td>Importance</td>
<td>Scale of change</td>
<td>Significance</td>
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</tr>
<tr>
<td>Increased light intensity (resulting in disturbance / displacement)</td>
<td>Regional</td>
<td>Low</td>
<td>Not Significant</td>
</tr>
<tr>
<td>Changes in hydrology (groundwater levels, surface water run-off rates, river flows and lake levels; resulting in habitat change)</td>
<td>Regional</td>
<td>Medium</td>
<td>Significant</td>
</tr>
<tr>
<td>Wildlife collision rates with aircraft or road traffic (resulting in death or injury of individual animals)</td>
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<td>Very low</td>
<td>Not Significant</td>
</tr>
<tr>
<td>Badger</td>
<td>Local</td>
<td>Low</td>
<td>Not</td>
</tr>
<tr>
<td>Ecological feature and effect</td>
<td>Importance</td>
<td>Scale of change</td>
<td>Significance</td>
</tr>
<tr>
<td>-------------------------------</td>
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</tr>
<tr>
<td>Land take and land cover change (resulting in habitat loss or degradation)</td>
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<td></td>
<td>Significant</td>
</tr>
<tr>
<td>Fragmentation of habitats (reduction of connectivity)</td>
<td>Local</td>
<td>Very low to negligible</td>
<td>Not Significant</td>
</tr>
<tr>
<td>Increased noise and vibration (resulting in disturbance / displacement)</td>
<td>Local</td>
<td>Very low to negligible</td>
<td>Not Significant</td>
</tr>
<tr>
<td>Increased light intensity (resulting in disturbance / displacement)</td>
<td>Local</td>
<td>Low</td>
<td>Not Significant</td>
</tr>
<tr>
<td>Wildlife collision rates with aircraft or road traffic (resulting in death or injury of individual animals)</td>
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<td>Very low</td>
<td>Not Significant</td>
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<td>Ecological feature and effect</td>
<td>Importance</td>
<td>Scale of change</td>
<td>Significance</td>
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<tr>
<td>--------------------------------------------------------</td>
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</tr>
<tr>
<td><strong>Great Crested Newts</strong></td>
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<td>Low</td>
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<td>Land take and land cover change (resulting in habitat loss or degradation)</td>
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<td></td>
<td></td>
</tr>
<tr>
<td><strong>Reptiles</strong></td>
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<td>Very low</td>
<td>Not Significant</td>
</tr>
<tr>
<td>Land take and land cover change (resulting in habitat loss or degradation)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Fragmentation of habitats (reduction of connectivity)</strong></td>
<td>Local</td>
<td>Very low</td>
<td>Not Significant</td>
</tr>
<tr>
<td><strong>Terrestrial invertebrates associated with tall sward and scrub</strong></td>
<td>Regional</td>
<td>Low</td>
<td>Not Significant</td>
</tr>
<tr>
<td>Land take and land cover change (resulting in habitat loss or degradation)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ecological feature and effect</td>
<td>Importance</td>
<td>Scale of change</td>
<td>Significance</td>
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<td>------------------------------------------------------------------------------------------------</td>
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<td>-----------------------</td>
</tr>
<tr>
<td>Fragmentation of habitats (reduction of connectivity)</td>
<td>Regional</td>
<td>Low</td>
<td>Not Significant</td>
</tr>
<tr>
<td>Increased light intensity (resulting in disturbance / displacement)</td>
<td>Regional</td>
<td>Very low</td>
<td>Not Significant</td>
</tr>
<tr>
<td>Terrestrial invertebrate assemblage associated with short sward and bare ground</td>
<td>Regional</td>
<td>Low</td>
<td>Not Significant</td>
</tr>
<tr>
<td>Land take and land cover change (resulting in habitat loss or degradation)</td>
<td>Regional</td>
<td>Low</td>
<td>Not Significant</td>
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<td>Fragmentation of habitats (reduction of connectivity)</td>
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</tr>
<tr>
<td><strong>Increased light intensity</strong> (resulting in disturbance / displacement)</td>
<td>Regional</td>
<td>Very low</td>
<td>Not Significant</td>
</tr>
<tr>
<td><strong>Terrestrial invertebrate assemblage associated with arboreal habitat</strong></td>
<td>Regional</td>
<td>Low</td>
<td>Not Significant</td>
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<tr>
<td><strong>Fragmentation of habitats</strong> (reduction of connectivity)</td>
<td>Regional</td>
<td>Low</td>
<td>Not Significant</td>
</tr>
<tr>
<td><strong>Increased light intensity</strong> (resulting in disturbance / displacement)</td>
<td>Regional</td>
<td>Very low</td>
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<td>Importance</td>
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<td>Significance</td>
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<td>--------------</td>
</tr>
<tr>
<td>Changes in hydrology (groundwater levels, surface water run-off rates, river flows and lake levels; resulting in habitat change)</td>
<td>Regional</td>
<td>Low</td>
<td>Not Significant</td>
</tr>
<tr>
<td>Terrestrial invertebrate assemblage associated with decaying wood</td>
<td>Regional</td>
<td>Low</td>
<td>Not Significant</td>
</tr>
<tr>
<td>Land take and land cover change (resulting in habitat loss or degradation)</td>
<td>Regional</td>
<td>Low</td>
<td>Not Significant</td>
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<tr>
<td>Fragmentation of habitats (reduction of connectivity)</td>
<td>Regional</td>
<td>Low</td>
<td>Not Significant</td>
</tr>
<tr>
<td>Increased light intensity (resulting in disturbance / displacement)</td>
<td>Regional</td>
<td>Very low</td>
<td>Not Significant</td>
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</table>
### Ecological feature and effect

<table>
<thead>
<tr>
<th>Ecological feature and effect</th>
<th>Importance</th>
<th>Scale of change</th>
<th>Significance</th>
<th>Summary rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terrestrial invertebrate assemblage associated with shaded woodland floor</td>
<td>Regional</td>
<td>Low</td>
<td>Not Significant</td>
<td>New areas of habitat would be provided within the green infrastructure to be delivered as part of the DCO Project for this assemblage. The scale of change is such that no significant adverse effects are predicted.</td>
</tr>
<tr>
<td>Land take and land cover change (resulting in habitat loss or degradation)</td>
<td>Regional</td>
<td>Low</td>
<td>Not Significant</td>
<td>No significant adverse effects are predicted.</td>
</tr>
<tr>
<td>Fragmentation of habitats (reduction of connectivity)</td>
<td>Regional</td>
<td>Low</td>
<td>Not Significant</td>
<td>Fragmentation of habitats through habitat clearance and land use change would lead to a decrease in connectivity between patches of tall sward and scrub. This may cause the restriction of home ranges and isolation of populations of species within this assemblage. However, well-connected compensatory habitat will be provided. No significant adverse effects are therefore predicted.</td>
</tr>
<tr>
<td>Increased light intensity (resulting in disturbance / displacement)</td>
<td>Regional</td>
<td>Very low</td>
<td>Not Significant</td>
<td>The proportion of retained habitat where the adverse effects of lighting are predicted is comparatively small. No significant adverse effects are predicted.</td>
</tr>
<tr>
<td>Changes in hydrology (groundwater levels, surface water run-off rates, river flows and lake levels; resulting in habitat change)</td>
<td>Regional</td>
<td>Low</td>
<td>Not Significant</td>
<td>Changes in groundwater dependent habitats due to an alteration of the water table level could result in the suitability of some habitats being reduced for this assemblage, most notably wet woodland. However, the provision of new habitats is predicted to mean that no</td>
</tr>
<tr>
<td>Ecological feature and effect</td>
<td>Importance</td>
<td>Scale of change</td>
<td>Significance</td>
<td>Summary rationale</td>
</tr>
<tr>
<td>-----------------------------------------------------------------------------------------------</td>
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</tr>
<tr>
<td><strong>Terrestrial invertebrate assemblage associated with wetland biotopes</strong></td>
<td>Regional</td>
<td>Low</td>
<td>Not Significant</td>
<td>New areas of habitat would be provided within the green infrastructure to be delivered as part of the DCO Project for this assemblage. The scale of change is such that no significant adverse effects are predicted.</td>
</tr>
<tr>
<td>Land take and land cover change (resulting in habitat loss or degradation)</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td><strong>Fragmentation of habitats (reduction of connectivity)</strong></td>
<td>Regional</td>
<td>Low</td>
<td>Not Significant</td>
<td>Fragmentation of habitats through habitat clearance and land use change would lead to a decrease in connectivity between patches of tall sward and scrub. This may cause the restriction of home ranges and isolation of populations of species within this assemblage. However, well-connected compensatory habitat will be provided. No significant adverse effects are therefore predicted.</td>
</tr>
<tr>
<td><strong>Increased light intensity (resulting in disturbance / displacement)</strong></td>
<td>Regional</td>
<td>Very low</td>
<td>Not Significant</td>
<td>The proportion of retained habitat where the adverse effects of lighting are predicted is comparatively small. No significant adverse effects are predicted.</td>
</tr>
<tr>
<td><strong>Changes in hydrology (groundwater levels, surface water run-off rates, river flows and lake levels; resulting in habitat change)</strong></td>
<td>Regional</td>
<td>Low</td>
<td>Not Significant</td>
<td>Changes in groundwater dependent habitats due to an alteration of the water table level could result in the suitability of some habitats being reduced for this assemblage, most notably wet woodland. However, the provision of new habitats means that no adverse effects are predicted.</td>
</tr>
<tr>
<td>Ecological feature and effect</td>
<td>Importance</td>
<td>Scale of change</td>
<td>Significance</td>
<td>Summary rationale</td>
</tr>
<tr>
<td>------------------------------</td>
<td>------------</td>
<td>----------------</td>
<td>-------------</td>
<td>------------------</td>
</tr>
<tr>
<td>Wintering waterbird assemblage - regionally important species</td>
<td>Regional</td>
<td>Low</td>
<td>Not Significant</td>
<td>Local populations of mallard and little grebe would be displaced. However, the provision of suitable replacement habitat within the Project’s green infrastructure would support the same or greater numbers of these birds in the long-term. No significant adverse effects are therefore predicted.</td>
</tr>
<tr>
<td>Increased noise and vibration (resulting in disturbance / displacement)</td>
<td>Regional</td>
<td>Negligible</td>
<td>Not Significant</td>
<td>Although noise effects are likely on mallard and little grebe, their ability, and the opportunity to relocate to alternative habitats means that no significant adverse effects are predicted.</td>
</tr>
<tr>
<td>Wintering waterbird assemblage - county important species</td>
<td>County / Metropolitan</td>
<td>Low</td>
<td>Not Significant</td>
<td>Teal and wigeon are found infrequently in the Study Area. Displacement would be to other waterbodies in the wider landscape, so no significant adverse effects are predicted.</td>
</tr>
<tr>
<td>Increased noise and vibration (resulting in disturbance / disturbance)</td>
<td>County / Metropolitan</td>
<td>Negligible</td>
<td>Not Significant</td>
<td>Teal and wigeon are generally found in areas outside the areas where the effects of excessive noise are likely to be felt. Further, it has been demonstrated that both teal and wigeon do not react to disturbance from aircraft. It is therefore predicted that there would be no significant adverse effects associated with noise and vibration.</td>
</tr>
<tr>
<td>Barn owl</td>
<td>County / Metropolitan</td>
<td>Medium</td>
<td>Significant</td>
<td>Barn owl are known to be faithful to their home ranges. The project will directly affect</td>
</tr>
</tbody>
</table>

*Ecological feature and effect* are predicted.
### Ecological feature and effect

<table>
<thead>
<tr>
<th>Ecological feature and effect</th>
<th>Importance</th>
<th>Scale of change</th>
<th>Significance</th>
<th>Summary rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>change (resulting in habitat loss or degradation)</td>
<td></td>
<td></td>
<td></td>
<td>a number of potential barn owl ranges, so Significant adverse effects are therefore predicted.</td>
</tr>
<tr>
<td>Fragmentation of habitats (reduction of connectivity)</td>
<td>County / Metropolitan</td>
<td>Medium</td>
<td>Significant</td>
<td>The loss of foraging, nesting and roosting habitat would increase levels of fragmentation and lead to further stress within a number of barn owl home ranges. Significant adverse effects are therefore predicted.</td>
</tr>
<tr>
<td>Increased noise and vibration (resulting in disturbance / displacement)</td>
<td>County / Metropolitan</td>
<td>Medium</td>
<td>Significant</td>
<td>Noise and vibration caused by construction have the potential to disturb barn owls. It is likely that construction activities will take place close to barn owl roosting locations, and even with environmental measures in place Significant adverse effects are predicted.</td>
</tr>
<tr>
<td>Wildlife collision rates with aircraft or road traffic (resulting in death or injury of individual animals)</td>
<td>County / Metropolitan</td>
<td>Medium</td>
<td>Significant</td>
<td>Vehicle and aircraft collisions occur currently, and are likely to continue in the future. It is therefore predicted that Significant adverse effects are likely.</td>
</tr>
<tr>
<td><strong>Kingfisher</strong></td>
<td></td>
<td></td>
<td></td>
<td>The Project will require the loss of habitat which currently support kingfisher, including areas of riparian habitat, open water, wetland and ditches. Newly provided or improved habitat would be provided within the green infrastructure. In the long term these habitats would be able to support the same or greater numbers of kingfisher in the long term. It is therefore predicted that there are no significant adverse effects.</td>
</tr>
<tr>
<td>Ecological feature and effect</td>
<td>Importance</td>
<td>Scale of change</td>
<td>Significance</td>
<td>Summary rationale</td>
</tr>
<tr>
<td>------------------------------------------------------------------</td>
<td>---------------------------------</td>
<td>-----------------</td>
<td>------------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Fragmentation of habitats (reduction of connectivity)</td>
<td>County / Metropolitan</td>
<td>Medium</td>
<td>Significant</td>
<td>Disruption to existing river corridors could affect up to four kingfisher territories within the study area. It is therefore predicted that significant adverse effects are likely.</td>
</tr>
<tr>
<td>Increased noise and vibration (resulting in disturbance / displacement)</td>
<td>County / Metropolitan</td>
<td>Low</td>
<td>Not Significant</td>
<td>The kingfisher population already exists in a highly disturbed environment with overflying aircraft, major roads and residential areas all close to areas that provide feeding and foraging habitat. It is therefore predicted that no significant adverse effects are likely.</td>
</tr>
<tr>
<td>Breeding bird assemblage – county notable species</td>
<td>County / Metropolitan</td>
<td>Low</td>
<td>Not Significant</td>
<td>The permanent loss of large areas of habitat which currently support the breeding bird assemblage is likely to result in the displacement of these birds. However, the species included in the assemblage are restricted in distribution, occupying habitat niches and locations within the study area. The provision of alternative and connected habitat within the green infrastructure means that it is therefore predicted that no significant adverse effects are likely.</td>
</tr>
<tr>
<td>Increased noise and vibration (resulting in disturbance / displacement)</td>
<td>County / Metropolitan</td>
<td>Low</td>
<td>Not Significant</td>
<td>The assemblage already exists in a highly disturbed environment with overflying aircraft, major roads and residential areas all close to areas that provide feeding and foraging habitat.</td>
</tr>
</tbody>
</table>
The provision of alternative and connected habitat within the green infrastructure, and the more localised methods for managing disturbance means that it is therefore predicted that no significant adverse effects are likely.

### Increased light levels (resulting in disturbance / displacement)

**Importance**

County / Metropolitan

**Scale of change**

Medium

**Significance**

Significant

The adverse effect associated with excess levels of lighting cannot be ruled out at this stage; It is therefore predicted that Significant adverse effects are likely.

### Breeding bird assemblage – borough notable species

**Importance**

Borough

**Scale of change**

Low

**Significance**

Not Significant

The permanent loss of large areas of habitat which currently support the breeding bird assemblage is likely to result in the displacement of these birds.

However, the species included in the assemblage are restricted in distribution, occupying habitat niches and locations within the study area.

The provision of alternative and connected habitat within the green infrastructure means that it is therefore predicted that no significant adverse effects are likely.

### Increased noise and vibration (resulting in disturbance / displacement)

**Importance**

Borough

**Scale of change**

Low

**Significance**

Not Significant

The assemblage already exists in a highly disturbed environment with overflying aircraft, major roads and residential areas all close to areas that provide feeding and foraging habitat.

The provision of alternative and connected habitat within the green infrastructure, and the more localised methods for managing disturbance...
<table>
<thead>
<tr>
<th>Ecological feature and effect</th>
<th>Importance</th>
<th>Scale of change</th>
<th>Significance</th>
<th>Summary rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increased light levels (resulting in disturbance / displacement)</td>
<td>Borough</td>
<td>Medium</td>
<td>Significant</td>
<td>The adverse effect associated with excess levels of lighting cannot be ruled out at this stage; It is therefore predicted that Significant adverse effects are likely.</td>
</tr>
<tr>
<td>Changes in hydrology (groundwater levels, surface water run-off rates, river flows and lake levels; resulting in habitat change)</td>
<td>Borough</td>
<td>Low</td>
<td>Not Significant</td>
<td>Changes in groundwater dependent habitats due to an alteration of the water table level could result in the suitability of some habitats being reduced for this breeding bird assemblage. However, the provision of new habitats means that no adverse effects are predicted.</td>
</tr>
<tr>
<td>Terrestrial wintering bird assemblage – county notable species</td>
<td>County / Metropolitan</td>
<td>Low</td>
<td>Not Significant</td>
<td>The permanent loss of large areas of habitat which currently support the breeding bird assemblage is likely to result in the displacement of these birds. However, the species included in the assemblage are restricted in distribution, occupying habitat niches and locations within the study area. The provision of alternative and connected habitat within the green infrastructure means that it is therefore predicted that no significant adverse effects are likely.</td>
</tr>
<tr>
<td>Increased noise and vibration (resulting in disturbance / displacement)</td>
<td>County / Metropolitan</td>
<td>Very low</td>
<td>Not Significant</td>
<td>The assemblage already exists in a highly disturbed environment with overflying aircraft, major roads and residential areas all close to areas that provide feeding</td>
</tr>
</tbody>
</table>
### 8.13 Consideration of additional environmental measures and compensation

8.13.1 The ANPS encourages the enhancement and conservation of biodiversity (see paragraph 5.94 of the ANPS). Heathrow has committed to providing a net gain to biodiversity, calculated through the use of a biodiversity offsetting metric. The biodiversity offsetting metric developed for the DCO Project is closely aligned with that published by Defra (2012), and has been agreed as appropriate with Natural England and the Environment Agency. The biodiversity offsetting metric and the principles associated with its implementation are provided in Appendix 8.6.

8.13.2 Biodiversity offsetting metrics provide a transparent, quantifiable and auditable method for calculating the losses and gains to biodiversity. As the metric accounts for all habitat types identified, it ensures that residual effects on biodiversity, even those for ecological features that are scoped out of the assessment, are accounted for (in other words it is considered outside the structure of the EcIA). The gains to biodiversity (for example through the design of the green infrastructure integral to the DCO Project) are measured using the metric to account for conclusions of net gain. The biodiversity offsetting metric also provides a useful tool for informing the design of hard
infrastructure (for example identifying areas to be avoided as they are the most valuable) and green infrastructure (identifying areas and designing habitats with the highest biodiversity values).

8.13.3 At this stage of the DCO Project it is not possible to calculate the gains to biodiversity as the design of the green infrastructure is not yet developed enough to enable this. At the time of the application for development consent the gains to biodiversity will be calculated and presented, thereby demonstrating the delivery of a biodiversity net gain.

8.13.4 However, the losses associated with the DCO Project can be calculated, albeit with the use of data extrapolated from satellite imagery and field survey data, for areas where access for survey has not yet been made available. Further a precautionary approach has been taken with an assumption that all land coverage within any areas that may be subject to permanent or temporary construction activity will be completely cleared of vegetation. This is unlikely as current field boundaries and specific areas of valuable habitat will be retained in order to mitigate for various effects associated with both biodiversity and the local population (for example for screening purposes). Table 8.44 and Table 8.45 provide the areas and lengths respectively, of the habitats that would be lost to development (they are within areas where construction and operation activities will take place). The tables below do not include the values of those habitats that could be improved as part of the green infrastructure proposals.

### Table 8.44: Calculation results of biodiversity offsets for habitats measured by area

<table>
<thead>
<tr>
<th>Habitat</th>
<th>Area to be lost</th>
<th>Biodiversity unit value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Semi-natural woodland (HPI)</td>
<td>17.47</td>
<td>314.37</td>
</tr>
<tr>
<td>Semi-natural woodland (non-HPI)</td>
<td>8.07</td>
<td>96.87</td>
</tr>
<tr>
<td>Plantation woodland</td>
<td>52.47</td>
<td>419.76</td>
</tr>
<tr>
<td>Scrub</td>
<td>45.40</td>
<td>363.16</td>
</tr>
<tr>
<td>Semi-improved grassland - neutral</td>
<td>23.87</td>
<td>190.96</td>
</tr>
<tr>
<td>Semi-improved grassland –</td>
<td>82.47</td>
<td>164.95</td>
</tr>
</tbody>
</table>

90 Area to be lost in Table 8.43 considers habitats with biodiversity offsetting value only (in otherwords hardstanding etc. is not included).
Table 8.45: Calculation results of biodiversity offsets for habitats measured by length

<table>
<thead>
<tr>
<th>Habitat</th>
<th>Length to be lost (/100m)</th>
<th>Biodiversity unit value (per 100m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Native Species Rich Hedgerow</td>
<td>20.22</td>
<td>363.96</td>
</tr>
<tr>
<td>Native species poor hedgerow</td>
<td>143.00</td>
<td>1,144.05</td>
</tr>
<tr>
<td>Non-Native Hedgerow</td>
<td>1.71</td>
<td>3.42</td>
</tr>
<tr>
<td>Ditches of High Distinctiveness</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Ditches of Moderate Distinctiveness</td>
<td>26.69</td>
<td>213.49</td>
</tr>
<tr>
<td>Ditches of Low Distinctiveness</td>
<td>177.05</td>
<td>354.11</td>
</tr>
<tr>
<td>Tree Lines - Native</td>
<td>72.15</td>
<td>577.19</td>
</tr>
<tr>
<td>TOTAL</td>
<td>440.82</td>
<td>2,656.22</td>
</tr>
</tbody>
</table>
8.13.5 The levels of loss will be refined as the DCO Project progresses following the gathering of further data and the evolution of the design. However, the information in Table 8.44 and Table 8.45 will be used to inform the development of the green infrastructure design.

8.13.6 The gains will be calculated on the basis of the green infrastructure design and the phasing associated both with habitat loss and the provision of newly created or improved habitat.

8.14 Next steps

Overview

8.14.1 The next steps for the biodiversity assessment are to:

1. Complete further baseline surveys to complement the current understanding of the ecological features present
2. Complete exercise using LiDAR data to determine habitat types within areas where land access has not been made available
3. Complete exercise to further quantify habitat connectivity
4. Aid the development of the design of green infrastructure and other related environmental measures
5. Complete an assessment of the losses and gains associated with the DCO Project using the biodiversity offsetting metric
6. Continue stakeholder engagement with a focus on green infrastructure design, approach to EPS licensing and HRA.