

Heathrow Airport Limited

Heathrow's North-West Runway

Biodiversity Assessment



16 June 2014

AMEC Environment & Infrastructure UK Limited

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Non-Technical Summary

This report has been prepared by AMEC Environment & Infrastructure on behalf of Heathrow Airport Limited (HAL). It addresses the potential effects on biodiversity associated with the proposed expansion of Heathrow, including effects on ecosystem services. At this early stage in the development planning process, both of these assessments are at a high level and are based largely upon information that has been obtained from organisations that hold pre-existing biological records and from on-line sources.

Drawing upon the available data, a mitigation strategy has been prepared that outlines the approach that will be taken to ensure compliance with the requirements relating to legally protected species (for which detailed survey work is yet to be undertaken). However, the main focus of the strategy is a habitat creation and enhancement scheme, which will be applied over an extensive area of land to the west and to the north of the area that is covered by the Airport masterplan. These areas have been designed to form an interconnected network of wildlife-rich green space with a multitude of opportunities for access by local communities.

The areas where habitat creation and enhancement works will be focused will include what is being called the enhanced Colne Valley, the 'spine' of which will be a new length of watercourse (the 'River Colne Spur'). This will incorporate a range of habitat features that will attract a wide diversity of wildlife, which could include species such as otter and kingfisher. Alongside the river, extensive flood storage areas will be created, which will support various wetland habitats. Elsewhere along the enhanced Colne Valley, habitats that will be created include wet and dry woodland, scrub and grassland.

Other elements of the mitigation strategy include the enhancement of water bodies within the internationally important South West London Waterbodies Special Protection Area (SPA) and Ramsar site (and waterbodies outside this site that support the duck species that are the interest features of the SPA/Ramsar site). The strategy also seeks to ensure that all habitat creation proposals are designed in such a way as to minimise the risk of bird strike.

Drawing upon information about the mitigation proposals, a high level assessment has been carried out relating to the effects on biodiversity of the proposed Airport masterplan. One of the conclusions of this assessment is that, although changes in noise are not expected to affect the populations of duck for which the SPA/Ramsar site has been designated, there is the potential for the conservation status of these populations to be affected by changes in air quality and also by the loss of part of a wetland area (Old Slade Quarry Local Wildlife Site) that lies outside of the SPA/Ramsar site. Further survey work and assessment (including a Habitats Regulations Assessment) will be needed to robustly assess the potential effects of these changes.

Five other internationally important sites (Windsor Forest and Great Park Special Area of Conservation [SAC], Richmond Park SAC, Burnham Beeches SAC, Thursley, Ash, Pirbright and Chobham SAC and the Thames Basin Heaths SPA) could also be affected by the proposed expansion of the Airport. The only resultant change that could significantly affect these sites is increased atmospheric pollution caused by additional aircraft movements. However, given the distance of these sites from the Airport, it is likely that the change in pollution deposition rates would be so small that there would be no potential for significant ecological effects. Unless future air quality

modelling results in a change to this conclusion, it is considered likely that there will be no need for further assessment of the effects of the Airport on these sites, or for any mitigation measures to be implemented.

The seven Sites of Special Scientific Interest (SSSIs) that could be significantly affected by the expansion of the Airport have been designated for their waterbirds (five sites) and/or vegetation (three sites). The bird interest features of the five sites could be affected by increased nitrogen deposition (as described above for the SPA/Ramsar site of which they form part) as could the vegetation interest features of the three relevant sites. These potential effects will need to be subject to further assessment. However, no SSSIs are expected to be significantly affected by increased noise from the proposed development.

The only other change that has the potential to have a significant effect on SSSIs concerns changes in flows and water quality in the River Colne where it passes through the alluvial meadows that occur alongside the river in the western part of Staines Moor SSSI. Measures have therefore been designed to ensure that flows through the SSSI will maintain and, if appropriate, enhance its biodiversity interest, thereby avoiding an adverse effect on the site's integrity.

Whilst the proposed development will not result in land-take from any SPA, SAC or SSSI, there will be land-take from three non-statutory biodiversity sites. As part of the iterative process of scheme design, there may be scope to modify the development proposals so that the effects on one of these sites are avoided or at least reduced. Irrespective, however, habitat creation and enhancement proposals have been designed to compensate for whatever biodiversity losses occur but also to deliver biodiversity gains over and above what is required for compensation purposes.

The extent of different habitats that would be created to compensate for the expansion of the Airport will be subject to ongoing refinement as the development proposals evolve. To inform this process of refinement, it is proposed to adopt the government's approach to 'biodiversity offsetting' to calculate the precise extent of different habitats that should be created.

The final section of this report sets out an ecosystem services assessment. Ecosystem services are the outputs from ecosystems from which humans derive benefits, which include:

- Resources for basic survival, such as food, clean air and water;
- Contributions to good physical and mental health, for example through access to green spaces, both urban and rural, and genetic resources for medicines;
- Protection from hazards, through the regulation of climate and the water cycle;
- Support for a strong and healthy economy, through raw materials for industry and agriculture, and through tourism and recreation; and
- Social, cultural and educational benefits, and wellbeing and inspiration from interactions with nature.

Using a framework that has been developed by Natural England, a high level assessment has been undertaken to identify the likely losses and gains in ecosystem services' provision associated with Heathrow's expansion, based on the currently available information. As further information becomes available, this assessment will be refined.

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1. Introduction

1.1 Background

This Biodiversity Assessment Report has been prepared by AMEC Environment & Infrastructure on behalf of Heathrow Airport Limited (HAL). To meet the growing need for additional air capacity, HAL has proposed an extension to the existing Heathrow Airport. The proposed development would include:

- A 3,500m runway to the north-west of the existing Airport;
- Two new terminal buildings;
- Aircraft movement areas and taxiways;
- Various aircraft stands (pier-serviced stands and remote stands);
- Car parking; and
- Ancillary uses.

The new development footprint is shown on **Figure 1.1**.

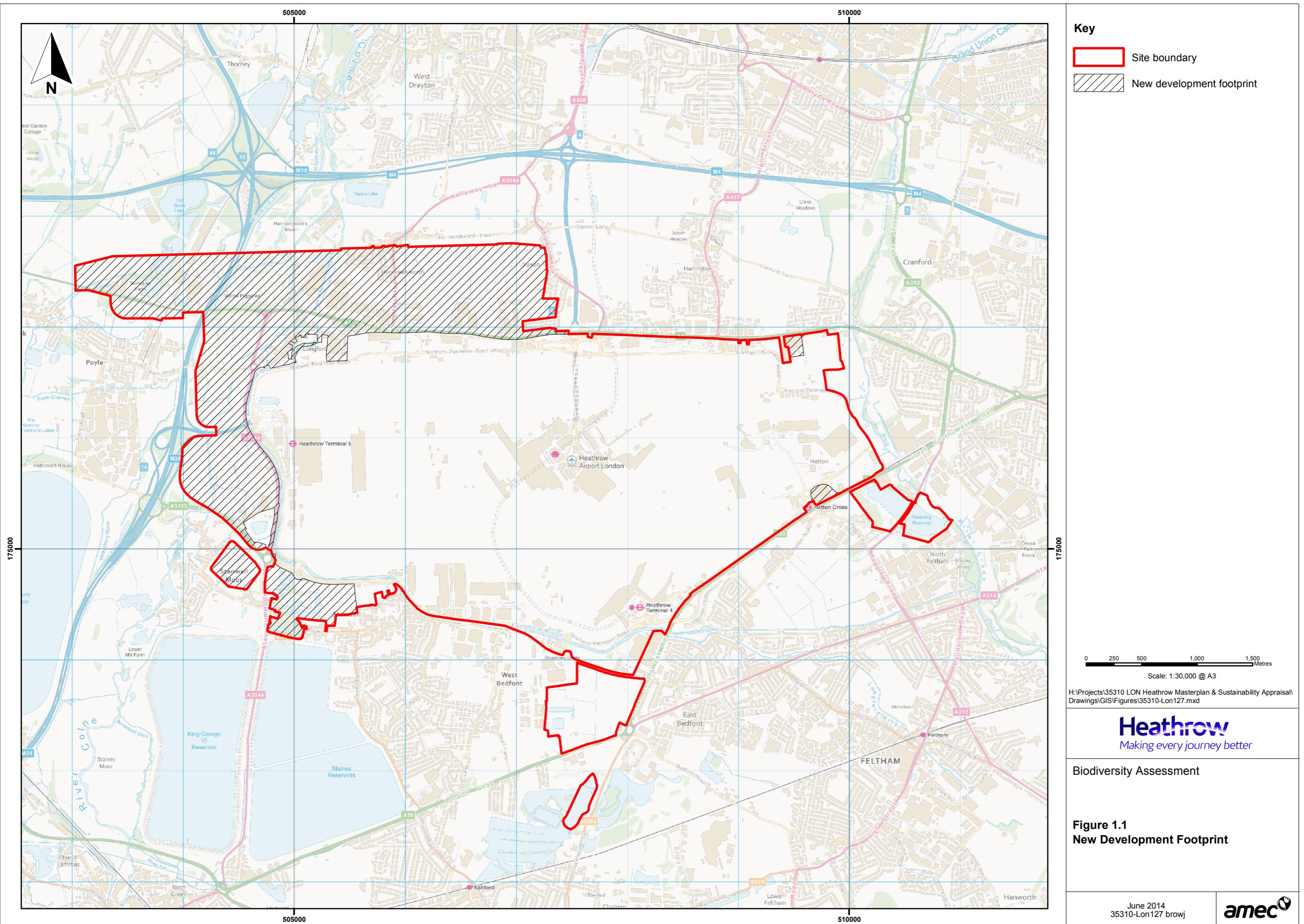
Further details of the development can be found in HAL's masterplan submission to the Airports Commission¹.

This report provides the technical assessment that underlies the biodiversity strategy presented in section 5.5.6 of Volume 1 of HAL's submission to the Airports Commission. The assessment of potential effects with and without mitigation was undertaken in accordance with the Commission's Sustainability Appraisal Framework² as described below.

Section 2 of the report describes the legislative and policy context relevant to the assessment of effects. **Section 3** describes the baseline information with **Section 4** describing the potential effects of the proposed development. The proposed biodiversity strategy is outlined in **Section 5** and an ecosystem services assessment is presented in **Section 6**.

¹ Heathrow (2014). *Taking Britain further – Heathrow's plan for connecting the UK to growth*. Available at <http://your.heathrow.com/britainsheathrow/downloads/>

² Airports Commission (2014). *Appraisal Framework*. April 2014. Available at https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/300223/airports-commission-appraisal-framework.pdf



1.2 Airports Commission Requirements

The Airports Commission's objective for biodiversity is “*to protect and maintain natural habitats and biodiversity*”. The Airports Commission’s Sustainability Appraisal Framework², in Module 7: Biodiversity, requires airport developers to address the following requirements:

- Identify sites of particular biodiversity interest, such as designated sites of international, national and local importance, and protected and priority species and habitats, present within areas around the proposed scheme;
- Assign environmental capital to these resources, correlating to the level of protection they are placed under in international, European or national legislation, or local protection policies;
- Estimate the inherent impact of the scheme at a strategic level;
- Consider the ecological effects of incidences of bird strike, changes to the area’s air quality and changes to the area’s noise environment;
- Document the potential mitigation strategies that fall outside the scheme’s central Environmental Strategy and define post-mitigation impacts - mitigations will be costed, and the achievability of suggested mitigations will be assessed; and
- Consider at a high level the impact on ecosystem services as defined in Natural England’s National Character Areas – effects may be monetised.

1.3 Heathrow’s Objectives

This report responds to the Commission’s requirements, within the context of HAL’s overall aim to increase the amount of green space around the Airport thereby forming an interconnected network of wildlife-rich green space with a multitude of opportunities for access by local communities³.

In delivering this aim, AMEC has sought to meet the following objectives, which have informed the preparation of the scheme proposals:

- To minimise adverse effects on biodiversity – including designated biodiversity sites and important habitats and species;
- To comply with the legal framework that relates to legally protected species and designated sites;
- To compensate for unavoidable losses by creating valuable new areas of habitat and, where possible, improving existing areas of habitat;
- To go beyond compensation to deliver enhancements that will contribute to a net gain for biodiversity;

³ Mitigation costs (see section 1.2) that are required to deliver this overall aim are detailed in HAL’s Masterplan submission to the Airports Commission (Heathrow, 2014) and hence have not been included in this report.

- To protect and maintain, over the long term, the newly created habitats, as well as retain existing habitats that HAL controls;
- In delivering all of the above objectives, to ensure there is no unacceptable increase in the risk of bird strike by aircraft;
- To take a strategic approach that is focused on meeting the principles of ecosystems services; and
- To provide opportunities for people to experience and learn about biodiversity.

The main mechanism for achieving these objectives, over and above the incorporation of mitigation measures into the scheme design, will be through a major habitat creation and enhancement exercise to both the west of the Airport (within what is referred to as the Enhanced Colne Valley) and to the north

2. Legislative and Policy Context

2.1 Legislation

In preparing this report, account has been taken of relevant legislation and regulations, namely:

- *The Conservation of Habitats and Species Regulations 2010* (SI 2010/490) (hereafter referred to as the Habitats Regulations);
- *Wildlife and Countryside Act 1981* (as amended including by *The Countryside and Rights of Way Act 2000*);
- *Protection of Badgers Act 1992*;
- *Natural Environment and Rural Communities Act 2006* (NERC Act); and
- *The Hedgerow Regulations 1997*.

2.2 Policy Context

Table 2.1 lists the issues from planning policy guidance and development plan policies that have been considered in assessing the effects on biodiversity of the proposed Airport expansion.

Table 2.1 Policy Issues relevant to this Report

Policy	Policy Issue
National planning policies	
<i>National Planning Policy Framework</i> section 11	Conserve and enhance biodiversity, including through avoiding developments that result in the loss or damage of irreplaceable habitats.
Regional planning policies	
<i>The London Plan 2011:</i> Policy 7.19 – Biodiversity and Access to Nature	Avoid adversely affecting the integrity of European sites and prevent significant adverse effects on European or nationally designated sites, or on populations of legally protected species, or priority species or habitats. Protect statutory and non-statutory sites of nature conservation importance at a level commensurate with their importance. Enhance or create habitats during development, especially those identified in the London or Borough Biodiversity Action Plan.
Local planning policies	
<i>Ealing Council UDP 2004:</i> Policies 3.8 and 3.9	Protect important features such as ancient habitats, river floodplains, woodland and canals. Prevent development on statutory and non-statutory nature conservation sites. Protect legally protected or priority species.

Table 2.1 (Continued) Policy Issues relevant to this Report

Policy	Policy Issue
<i>London Borough of Hounslow UDP 2003:</i> Policies ENV-N.2.0, ENV-N.2.1, ENV-N.2.2, ENV-N.2.3, EMV-N.2.3A, ENV-N.2.4, ENV-N.2.5, ENV-N.2.6, ENV-N.2.7, ENV-N.2.9 and ENV-N.2.10	Protect statutory and non-statutory sites for nature conservation. Promote nature conservation management on land outside of the local authority's control. Conserve, enhance and create important habitats and features including green corridors and green chains. Protect legally protected and other priority species.
<i>London Borough of Richmond upon Thames Adopted Core Strategy 2009: policy CP4</i> <i>Development Management Plan (DMP) 2011 Policy DM 0S 5</i>	Protect statutory and non-statutory nature conservation sites. Conserve, enhance and create important habitats and features including green corridors and green chains. Protect legally protected and other priority species. Preserve and enhance natural habitats during development.
<i>Royal Borough of Windsor and Maidenhead Local Plan 1991-2006:</i> Saved policies N3, N4, N7 and N9	Protect/enhance/create wildlife habitats including ponds, watercourses, trees and hedgerows.
<i>London Borough of Hillingdon UDP 1998:</i> Saved policies (2007) EC1, EC2, EC3, EC4, EC5 and EC6	Protect statutory and non-statutory nature conservation sites. Retain/create wildlife habitats during development, including on derelict/vacant land.
<i>The Hillingdon Local Plan: Part 1 2012:</i> Policy EM7	Protect and enhance all Sites of Importance for Nature Conservation. Protect and enhance populations of legally protected species as well as priority species and habitats identified within the UK, London and the Hillingdon Biodiversity Action Plans. Enhance Sites of Importance for Nature Conservation in close proximity to developments and deliver/assist in the delivery of actions within the Biodiversity Action Plan. Deliver biodiversity improvements through all development, where feasible. Provide green roofs and living walls which contribute to biodiversity and help tackle climate change.
Other policies	
<i>NERC Act</i>	Section 41 (S41) of the Act requires the Secretary of State to publish a list of habitats and species which are of principal importance for the conservation of biodiversity in England. The S41 list is used to guide decision-makers, including local authorities, in implementing their duty under section 40 of the NERC Act, to have regard to the conservation of biodiversity in England, when carrying out their normal functions.
<i>London Biodiversity Action Plan – see http://www.lbp.org.uk/londonhab spp.html</i>	Consider effects on priority habitats and species listed in the London BAP.
<i>Surrey Biodiversity Action Plan</i>	Consider effects on priority habitats and species listed in the Surrey BAP.
<i>Buckinghamshire Biodiversity Action Plan</i>	Consider effects on priority habitats and species listed in the Buckinghamshire BAP.
<i>Bracknell Forest Council Biodiversity Action Plan</i>	Consider effects on priority habitats and species listed in the Bracknell Forest BAP.

3. Baseline

3.1 Sources of Data

Baseline biodiversity data were obtained from the sources that are listed in **Table 3.1**.

Table 3.1 Sources of Desk Study Data

Topic	Source of Information
Statutory biodiversity sites	Multi-Agency Geographic Information for the Countryside - website www.magic.gov.uk Natural England's website http://www.naturalengland.org.uk/ourwork/conservation/designations/sssi/default.aspx
Non-statutory biodiversity sites	Thames Valley Environmental Records Centre (TVERC) Greenspace Information for Greater London (GIGL) Buckinghamshire and Milton Keynes Environmental Records Centre (BMERC) Surrey Biodiversity Information Centre
Legally protected and notable species	Thames Valley Environmental Records Centre (TVERC) GIGL Buckinghamshire and Milton Keynes Environmental Records Centre Surrey Biodiversity Information Centre Surrey Bat Group West Surrey Badger Group
Information on National Character Areas (NCA), biodiversity trends and Ecosystem Services	Natural England http://www.naturalengland.org.uk/publications/nca/thames_valley.aspx https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/309553/England_Natural_Environment_Indicators_2014.pdf

3.2 Designated Biodiversity Sites

3.2.1 Overview

Drawing upon aviation sensitivity maps that have been prepared for Natural England (NE)⁴, and the findings of the assessments that AMEC undertook as part of the Environmental Impact Assessment (EIA) and Habitats Regulations Assessment (HRA) relating to the works required to enable the ending of the Cranford Agreement⁵,

⁴ Natural England (2013). *Aviation Sensitivity Mapping Tool*. [Includes Nationally and Internationally designated nature conservation sites spatial (GIS) boundaries and buffers, and non-spatial (ENSIS) data.] Released under the Natural England and Ordnance Survey Open Government Licence.

⁵ HAL (2013). *Enabling works to allow implementation of full runway alternation during easterly operations at Heathrow Airport*.

AMEC has identified an area up to 11km from the site of the proposed Airport extension where there is the potential for significant effects to be caused to European wildlife sites (see Box 1). Reflecting the lower level of 'environmental capital' that is associated with sites that are of only national or more local value (see Box 1), AMEC has identified an area up to 5km from the proposed development where there is the potential for significant effects on nationally important sites and up to 1km for non-statutory sites (see Box 1).

Box 1 Designated Biodiversity Sites, Priority Habitats and Species

Statutory biodiversity sites

Internationally important sites: Special Areas of Conservation (SACs) and candidate SACs, Special Protection Areas (SPAs) and proposed SPAs, Sites of Community Importance and Ramsar sites – collectively referred to in this report as European wildlife sites

Nationally important sites: Sites of Special Scientific Interest (SSSIs) that are not subject to international designations and National Nature Reserves (NNRs)

Local Nature Reserves (LNRs) are statutory sites that are of importance for recreation and education as well as biodiversity. Their level of importance is defined by their other statutory or any non-statutory designation (e.g. if an LNR is also a SSSI but is not an internationally important site, it will be of national importance). If an LNR has no other statutory or non-statutory designation it is treated as being of borough/district -level importance for biodiversity (although it may be of greater socio-economic value).

Non-statutory biodiversity sites

Non-statutory biodiversity sites in London are notified as Sites of Importance for Nature Conservation (SINCs). Additionally in London, SINCs are categorised as being of Metropolitan, Borough (Grade I and II) or Local importance. In Surrey, non-statutory sites are referred to as Sites of Nature Conservation Importance (SNCIs) and are of county importance. In Buckinghamshire, non-statutory sites are referred to as Local Wildlife Sites (LWSs) or Biological Notification Sites (BNSs) (BNS preceded LWS as a designation, and BNSs are in the process of being resurveyed and assessed against LWS criteria). In Berkshire, non-statutory sites are referred to as LWSs and are of county importance.

Conservation Target Areas/Biodiversity Opportunity Areas have been identified as landscape-scale areas which support high concentrations of priority habitats and species and offer the potential to restore habitats at a landscape scale.

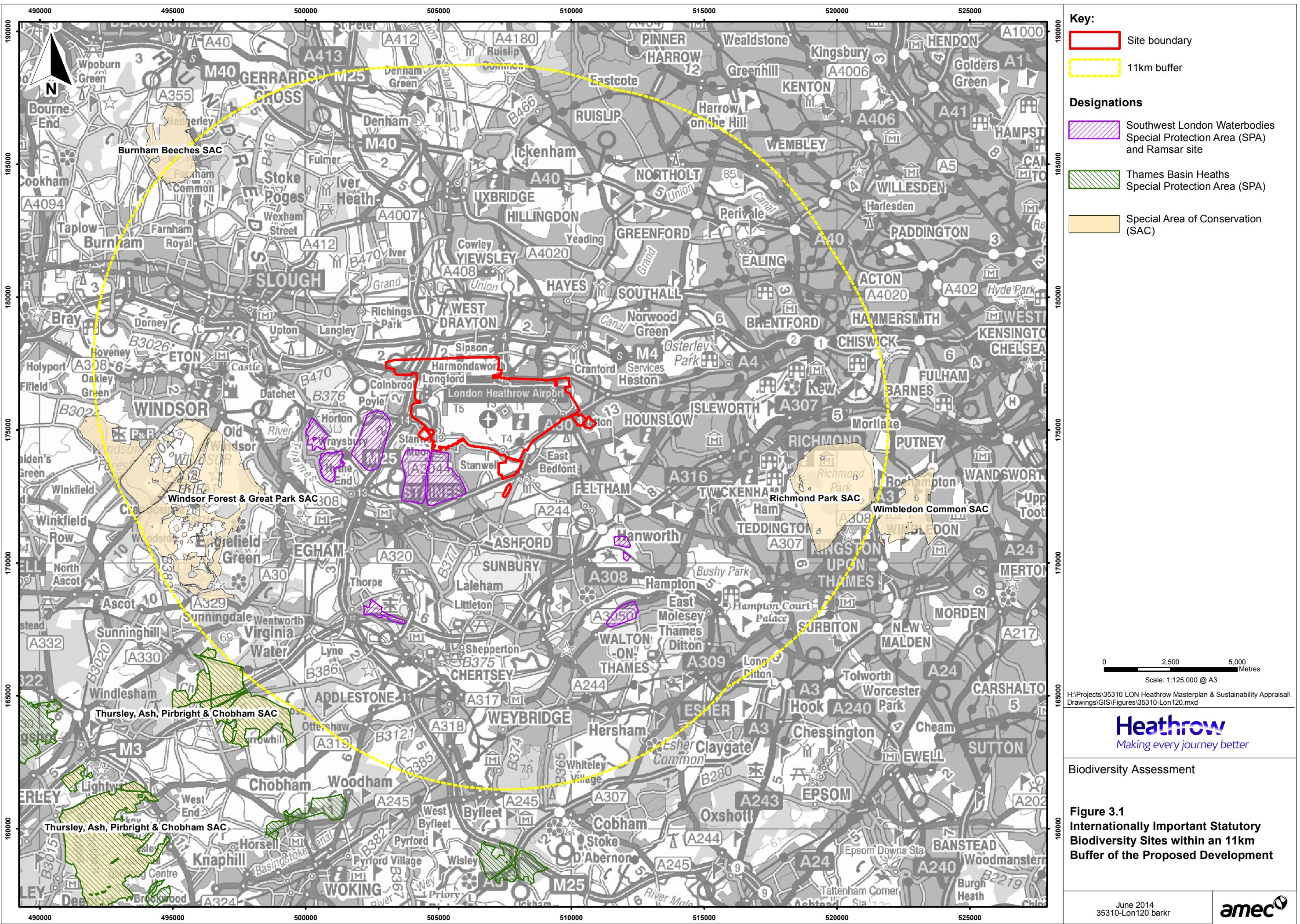
Priority habitats and species

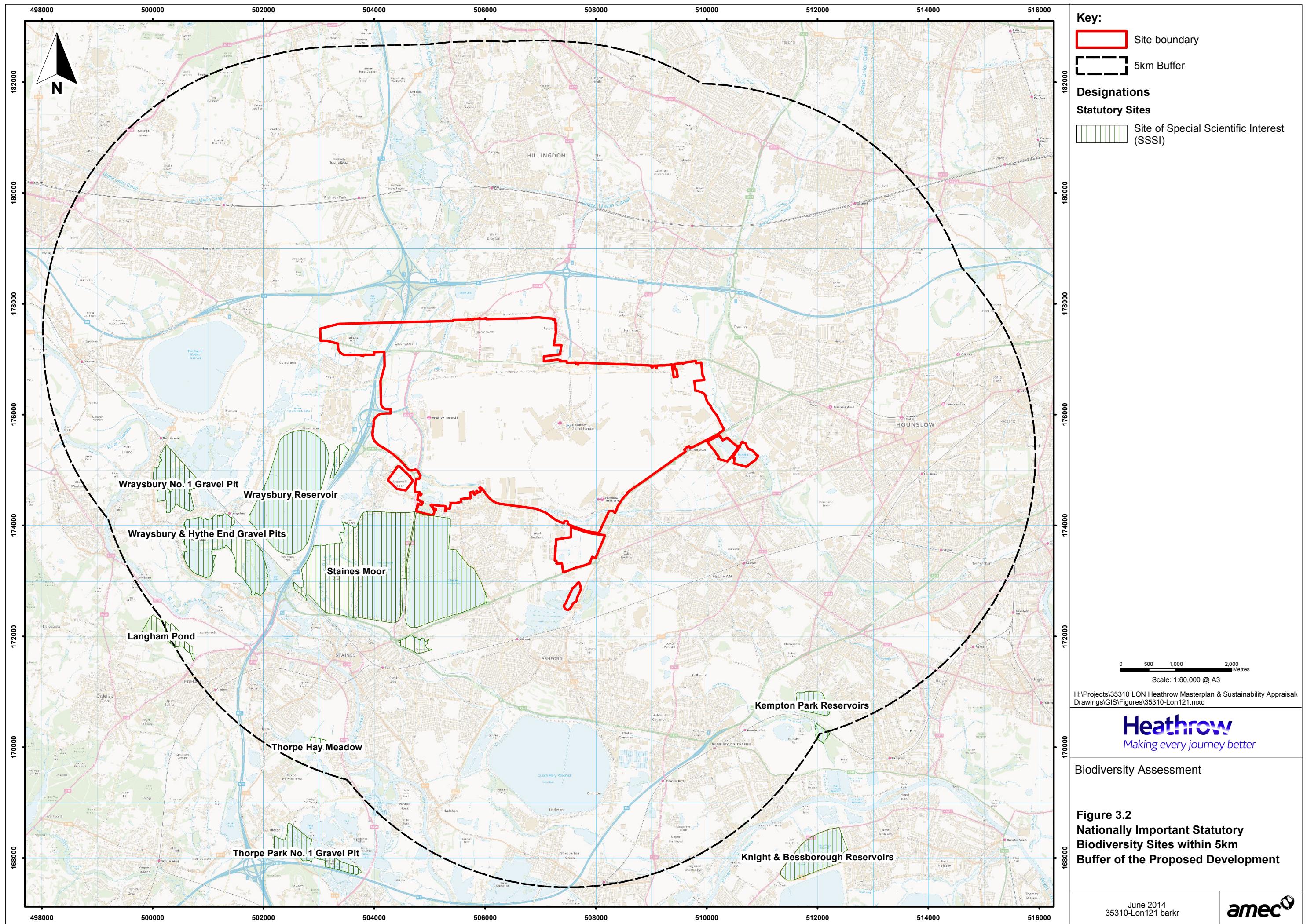
- International importance: populations of species or areas of habitat for which European sites are designated;
- International importance: populations of birds meeting the threshold for European importance (1% of the relevant international population).
- National importance: Habitats and species of principal importance for the conservation of biological diversity in England (under the NERC Act). These are listed on:
<http://www.naturalengland.org.uk/ourwork/conservation/biodiversity/protectandmanage/prioritylist.aspx>.
- National importance: Species listed as being of conservation concern in the relevant UK Red Data Book (RDB) or the Birds of Conservation Concern Red List⁶.
- National importance: Nationally Rare and Nationally Scarce species, which are species recorded from, respectively, 1-15 and 16-100 hectads (10x10km squares of the national grid).
- National importance: Populations of birds comprising at least 1% of the relevant British breeding/wintering population (where data are available).
- Borough/District importance: Habitats and species listed in the Borough/District BAP

3.2.2 Internationally Important Statutory Biodiversity Sites

Although there are no internationally important statutory nature conservation sites within the boundary of the extended Airport, there are six sites within the 11km study area (see **Figures 3.1 and 3.2**). All of these sites are also SSSIs.

⁶ Eaton M.A., Brown A.F., Noble D.G., Musgrove A.J., Hearn R., Aebsicher N.J. Gibbons D.W., Evans A. and Gregory R.D. (2009). Birds of Conservation Concern 3: the population status of birds in the United Kingdom, Channel Islands and the Isle of Man. *British Birds* **102**, pp296-341.





- **The South West London Waterbodies SPA and Ramsar site:** (0.02km south-west). This site, which comprises seven SSSIs or parts of SSSIs (see **Table 3.2**), is designated because of its populations of two duck species - gadwall and shoveler. Some of the SPA's component SSSIs comprise more than one waterbody.

Table 3.2 SWLW SPA – Component SSSIs and Waterbodies

SPA Component SSSIs	Waterbodies within the SSSI	Distance/direction of Waterbody from the Boundary of the Extended Airport
Kempton Park Reservoirs	Kempton Reservoir East	4.2km , south-east
	Distribution (or Redhouse)	4.8km , south-east
Knight & Bessborough Reservoirs	Knight & Bessborough Reservoirs	6.0km , south-east
Staines Moor	King George VI Reservoir	0.0 3km, south-west
	Staines Reservoirs	0.02km , south
Wraysbury No.I Gravel Pit	Wraysbury I (North) Gravel Pit	3.3km , west
	Wraysbury I (South) Gravel Pit	3.2km , west
Thorpe Park Gravel Pit (pit 1)	Thorpe Park Gravel Pit (pit 1)	6.0km , south-west
Wraysbury & Hythe End gravel pits	Wraysbury II (North) Gravel Pit	2.9km , south-west
	Wraysbury II (South) Gravel Pit	3.4km , south-west
Wraysbury Reservoir	Wraysbury Reservoir	0.9km west

- **Windsor Forest & Great Park SAC:** (6.1km to the south-west). This site is classified because of its important oak and beech woodland and the presence of the rare violet click beetle.
- **Richmond Park SAC:** (7.6km to the south-east). This site is designated for its population of stag beetle.
- **Burnham Beeches SAC:** (10.1km to the north-west). This site is designated for its beech woodland.
- **Thursley, Ash, Pirbright and Chobham SAC:** (10.8km to the south-west). This site is designated for its wet and dry heathland vegetation.
- **Thames Basin Heaths SPA:** (10.8km to the south-west). This site is designated for its populations of Dartford warbler, nightjar and woodlark.

3.2.3 Nationally Important Statutory Biodiversity Sites

There are seven SSSIs within the 5km study area for nationally important sites (**Figure 3.2**). Their interest features are described in **Table 3.3**.

Table 3.3 SSSIs within 5km of the Boundary of the Extended Airport

Site Name	Distance and Direction from the Site	Reason for Designation
Staines Moor	0.1km south-west	510ha of the River Colne, adjacent reservoirs and alluvial meadows. Staines Moor reservoirs support over 1% of the total British wintering populations of tufted duck, pochard and goosander; the numbers of shoveler are internationally significant. Staines Moor also represents the largest area of alluvial meadows in Surrey and supports a rich flora. Part of the site is also designated as a Ramsar site/SPA (see above).
Wraysbury Reservoir	0.9km south-west	205ha of open water that supports nationally-important numbers of wintering cormorant, great crested grebe and shoveler. The site is also designated as a Ramsar site/SPA (see above).
Wraysbury & Hythe End Gravel Pits	2.8km south-west	117 ha mosaic of open water, islands, grassland, scrub and woodland that regularly supports more than 1% of the national populations of wintering tufted duck, gadwall and goosander. It is also important for smew, holding a significant percentage of Britain's wintering population. Part of the site is also designated as a Ramsar site/SPA (see above).
Wraysbury No.I Gravel Pit	4.4km west	58ha of open water, woodland, scrub and grassland. The site is of national importance for wintering gadwall. The site is also designated as a Ramsar site/SPA (see above).
Thorpe Hay Meadow	4.4km south-west	6ha of floodplain meadow, which is the last remaining example of a Thames valley hay meadow in Surrey, with characteristic calcicolous flora
Kempton Park Reservoirs	4.4km south-east	26ha of open water that is notified for nationally-important numbers of wintering gadwall. The site are also designated as Ramsar/SPA and LNR
Langham Pond	4.7km south-west	26ha of remnant oxbow lake, surrounded by alluvial meadows, that supports rich aquatic, marginal and meadow floras and several nationally-scarce invertebrates. Woodland on adjacent higher ground supports a rich community of breeding birds.

3.2.4 Other Statutory Biodiversity Sites

There are nine LNRs within 5km of the proposed development (see **Table 3.4**).

Table 3.4 LNRs within 5km of the Boundary of the Extended Airport

Site Name	Distance and Direction from the Site	Reason for Designation
Bedfont Lakes	0.1km south-east	Mosaic of open, wet and dry habitats with records of over 350 plant species, 156 bird species, 24 species of butterfly, 124 species of moth and 20 species of mammal, including two species of bat
Cranebank	0.1km east	Seasonally-flooded meadows and ox-bow lakes with records of 26 species of butterfly, 12 damselflies and dragonflies and locally-uncommon plant species
Hounslow Heath	1.0km south-east	Heathland, acid grassland, hay meadows, scrub/woodland and marsh with heathland flora, reptiles, birds and invertebrates.
Arthur Jacob Nature Reserve	1.4km west	Wetland habitats, created on derelict sludge lagoons, which support a range of butterflies and dragonflies
Pevensey Road	2.0km south-east	Meadow, scrub/woodland and wetlands alongside the River Crane
Crane Park Island	2.9km south-east	Grassland, wet woodland, reedbed and a pond, near the River Crane, with kingfisher and water vole
Kempton Nature Reserves	4.1km south-east	Extensive area of reedbed with associated species such as dragonflies and wading birds
Old Avenue Hampton	4.2km south-east	Native hedgerow and wildflower meadow on site of old greenhouses
Yeading Meadows	5.0km north-east	Wildflower meadow with a rich diversity of locally-uncommon plants and invertebrates

3.2.5 Non-statutory Biodiversity Sites

Two non-statutory biodiversity sites (Old Slade Lake LWS⁷ and the Lower Colne SINC of metropolitan importance) are partly located within the boundary of the proposed development area. A third site (Stanwell II SNCI) is wholly located within the proposed development area (the presence of this site within the development area has been identified since the submission of HAL's masterplan).

- The Lower Colne SINC comprises sections of the Colne, Wraysbury and Frays rivers which support a diverse aquatic and marginal flora including several plants with a restricted London distribution. Associated wet meadows, flooded gravel pits, ponds, alder-willow woodland and an old orchard are included within the site. The site also supports London's only native population of the nationally rare pennyroyal (a plant) as well as water vole, and breeding kingfisher and grey wagtail;
- Old Slade Lake LWS comprises four open water bodies (flooded gravel pits), around which wet woodland has developed. The LWS also includes a stretch of the Colne Brook;

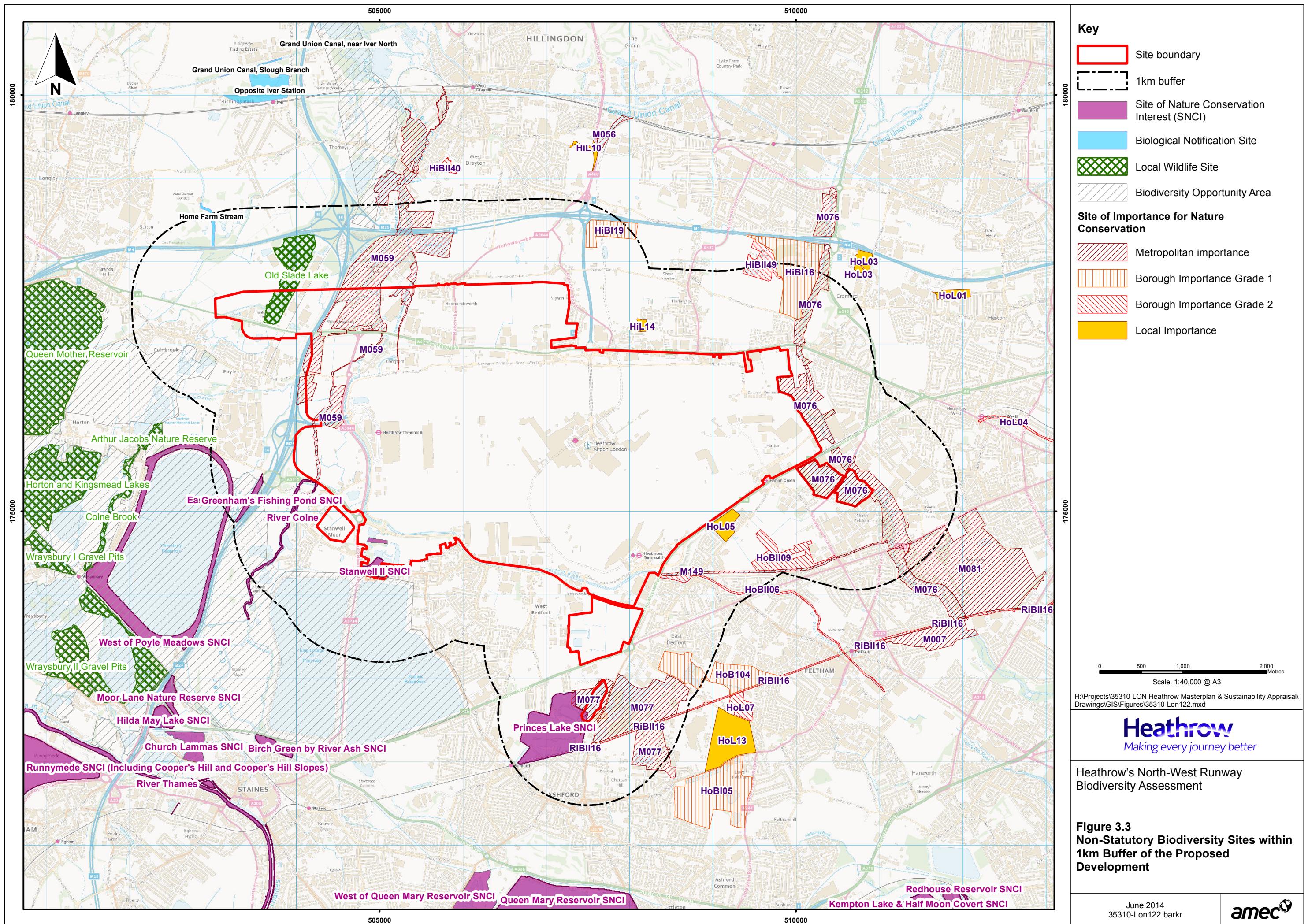
⁷ See Box 1 for details of different types of non-statutory biodiversity sites.

- Stanwell II SNCI comprises gravel pits, ditches, reedbed and fen habitats, which support a wide range of wetland species.

Twenty two other non-statutory biodiversity sites are located within the 1km study area (see **Figure 3.3** and **Table 3.5**). Six of these are located at least partly within the habitat creation and enhancement area (see **Section 4**), where it is envisaged that they will be retained and, where appropriate, enhanced.

Table 3.5 Non-Statutory Biodiversity Sites within the 1km Study Area

Reference no. for Sites (see Figure 3.3)	Name of Site	Designation
Located (wholly or in part) within the Extended Airport's Boundary		
TQ07J02	Old Slade Lake	Local Wildlife Site
M059	Lower Colne	SINC (Metropolitan)
4092	Stanwell II	SNCI
Located within 1km of the Extended Airport's Boundary		
M076	Crane Corridor	SINC (Metropolitan)
M077	Bedfont Lakes Country Park	SINC (Metropolitan)
3172	Princes Lake	SNCI
3337	East of Poyle Meadows	SNCI
4129	Greenham's Fishing Pond	SNCI
4132	River Colne/Stanwell Moor	SNCI
3336	West of Poyle Meadows	SNCI
TQ07H01	Arthur Jacobs Nature Reserve	Local Wildlife Site
O7JO1	Home Farm Stream	Biological Notification Site
HiBI16	Cranford Countryside Park and Open Space	SINC (Borough Grade I)
HiBI19	Wall Garden Farm Sand Heaps	SINC (Borough Grade I)
HiBII49	Cranford Land Gravel Workings	SINC (Borough Grade II)
HiL14	Field close Open Space roughs	SINC (Local)
HoB104	Bedfont Pits	SINC (Metropolitan)
HoBII06	Longford River at Feltham	SINC (Borough Grade II)
HoBII09	Hatton Meadows	SINC (Borough Grade II)
HoL05	Cains Lane (proposed site)	SINC (Local)
M007	Feltham Marshalling Yards	SINC (Metropolitan)
M056	Carp Ponds and Broads Dock	SINC (Metropolitan)
M081	Hounslow Heath	SINC (Metropolitan)
M149	Duke of Northumberland's River at Bedfont	SINC (Borough Grade II)
RiBII16	Hounslow, Feltham and Whitton junctions	SINC (Borough Grade II)



3.3 Habitats

The proposed development site comprises a landscape that has been highly modified and now supports a mixture of agricultural (chiefly arable) land, horse-grazed pasture, secondary woodland, sand and gravel quarries, parks and settlements.

The area surrounding the land that would be occupied by the extended Airport, which includes the land to the north and west of the extended Airport where major habitat creation and enhancement works are proposed (see **Section 4**) is characterised by a landscape that has also been highly modified. This has come about through various types of development including sand and gravel extraction, land-filling, the construction of reservoirs and urban development. Many of the former sand and gravel quarries now support open water habitats, which, together with the reservoirs, form a complex of water bodies that provides an important resource for a range of wildfowl and other wetland species. Other quarries have been land-filled, with some now supporting extensive areas of grassland. There are also areas of agricultural land and less modified habitats (e.g. flower-rich grassland), particularly further away from the Airport.

3.4 Species

The land that would be occupied by the extended Airport and the areas where habitat creation and enhancement works would take place to the west and north of the extended Airport supports a wide range of priority species (see Box 1), and legally protected and controlled species (see Box 2).

Box 2 Legally Protected and Controlled Species

Legal protection

Many species of animal and plant receive some degree of legal protection. For the purposes of this ES, legal protection refers to:

- Species included on Schedules 1, 5 and 8 of the *Wildlife and Countryside Act 1981* (as amended), excluding:
 - Species that are only protected in relation to their sale (see Section 9[5] and 13[2]), given that the proposed development does not include any proposals relating to the sale of species; and
 - Species that are listed on Schedule 1 but that are not likely to breed on or near the site, given that this schedule is only applicable whilst birds are breeding.
- Species included on Schedules 2 and 5 of the *Habitats Regulations 2010*;
- Badgers, which are protected under the *Protection of Badgers Act 1992*; and
- Hedgerows, some of which are protected under *The Hedgerow Regulations 1997*.

Legal control

Schedule 9 of the *Wildlife and Countryside Act 1981* (as amended) lists species of animal that it is an offence to release or allow to escape into the wild and species of plant that it is an offence to plant or otherwise cause to grow in the wild.

No species surveys have yet been undertaken in relation to the proposed development. However, an indication of the species that may occur within both the site of the extended Airport and the habitat creation/enhancement areas has been obtained from pre-existing species records (see Appendix A).

4. Mitigation Strategy

4.1 Legally Protected Species

The development proposals will incorporate mitigation measures that will ensure that the proposals comply with all species-related legal requirements. For some legally protected species, there will be a need to translocate populations from land located within the area that will be affected by the Airport extension. There may also be a need to translocate animals from locations outside the masterplan area, where it is proposed to undertake the habitat creation works that are described below. This applies especially to land where there is a need for major earthmoving work to create flood storage areas. The ‘receptor sites’ to which translocated animals would be transferred could be located in habitat creation areas where major earthmoving is not required. Where necessary, habitat creation and management works will be undertaken in advance of translocation in order to ensure that the chosen locations are sufficiently mature to be effective as receptor sites.

Trapping of animals that will need to be translocated will typically take place over a period of up to six months during the time when the species are active. Only after this will site preparation works within the trapped-out area be able to be started. For some species such as the water vole, it may be appropriate to implement a two-stage translocation programme that involves animals being moved to a temporary area of suitable habitat, with subsequent translocation to their permanent home once this has been created (e.g. along a newly created section of watercourse). However, such double handling will be avoided where possible.

Mitigation related to protected species will be designed using good practice guidelines and be carried out under a Natural England licence where required. Tried and tested methods will be used and thus there will be confidence that the mitigation proposed will be successful.

4.2 Habitat Creation and Enhancement

Beyond the species-related measures that are described above, there are limited opportunities to avoid or reduce the potential adverse effects of the proposed Airport expansion on biodiversity. In view of this, the approach that has been adopted is to ensure that the scheme incorporates extensive habitat creation measures that will compensate for the limited areas of wildlife-rich habitat that will be lost. The illustrative habitat proposals (which are shown in **Figure 4.1**) cover parts of two Biodiversity Opportunity Areas (BOAs – see **Figure 3.3**)⁸. These areas have been identified as offering significant potential for the management, restoration and creation of wetland, woodland and other habitats. HAL’s habitat creation and enhancement proposals will be designed to contribute to meeting the targets for these BOAs

⁸ The Colne Valley Gravel Pits and Reservoirs BOA in Berkshire (see <http://berkshirelnp.org/index.php/homepage/16-boas>) and the Colne Valley BOA in Buckinghamshire (see http://www.buckinghamshirepartnership.co.uk/media/1022573/colne_valley_boa_%20statement_dec_2010.pdf).



Key

Site boundary

1

Drawing notes (see below)

1. Diverted river channel with waterside planting.
2. Flood storage area managed for biodiversity. Footpaths provide public access.
3. Diverted river and Colne Valley Way through enhanced existing woodland.
4. Flood storage area with wet meadow and footpath access.
5. New river channel and park enhancements.
6. Food growing area and allotments.
7. Visitor centre, sports pitches, play areas and formal gardens.
8. Mountain bike trail.

9. Landforms, pasture and hedgerows.
10. Wildlife ponds and wetland habitats with educational visitor centre, boardwalks and dipping platforms.
11. Natural swimming pond.
12. Enhanced Poyle Channel with new riverside planting and footpath.
13. Riding stables and cross country course through meadows.
14. Flood storage area with ponds, wetland and boardwalks for public access.
15. Flood storage area with wet meadow habitat.
16. Children's play area.
17. Allotments.
18. Community centre, sports pitches, play area and formal gardens at Sipson.
19. New footpaths and biodiversity enhancements.
20. River Crane corridor access and biodiversity enhancements.

Heathrow
Making every journey better

Biodiversity Assessment

Figure 4.1

Illustrative Landscape/Habitat Proposals

Not to scale

May 2014
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Recognising the government's objective that developments should result in net biodiversity gain, a wide range of habitat creation measures is proposed that goes beyond simply compensating for what would be lost. Opportunities will also be taken to enhance existing valued habitats that are currently in sub-optimal condition, or that could otherwise be improved.

The main focus for the provision of compensatory habitats will be the area that is being called the enhanced Colne Valley. This will become a high-quality area of open space that, as well as supporting a wide range of species and habitats, will provide an attractive landscape incorporating a well-designed access network. These attributes will make the area into what is expected will become a regionally important recreational resource for the residents of west London and adjoining counties, whether for walking, cycling, horse-riding or other activities. Because of its rich wildlife, the area will provide valuable opportunities for people to experience and learn about nature, whether informally or more formally – for example, through use by local schools and bird-watching or other special interest groups.

The ‘spine’ of the enhanced Colne Valley will be a new length of watercourse that, at this stage, is being called the River Colne Spur. Drawing upon leading best practice techniques, this new river, which will replace a shorter section of the River Colne, will be designed to include habitat features that will attract a wide diversity of wildlife. These would include, for example:

- A meandering and varied river channel structure with pools, riffles and other features, providing habitats for a wide range of fish and invertebrate species, and for otters, for which artificial holts will be constructed for laying-up and breeding;
- Banks that include shallow cliffs, which are suitable for breeding kingfishers and sand martins, as well as berms that will support marginal emergent plants, providing a habitat for water voles and other species;
- Willow pollards, which are a characteristic feature of the local area.

The retained part of the existing River Colne that lies within the enhanced Colne Valley already includes some features that are valuable for wildlife. These will be conserved and, where appropriate, enhanced. In addition, new valuable habitat features will be created where appropriate. Further details of habitat creation and enhancement within the watercourses can be found in the water quality and hydro-ecology assessment⁹.

Alongside the rivers, extensive areas will be set aside as floodplains. These flood storage areas will also provide valuable areas of green space, much of which will be of high value for wildlife. Some other large areas that are not required for flood control will become purpose-designed wildlife habitats.

The rivers, with their riparian habitats, will provide movement corridors that will enable species to move between the larger blocks of newly created habitats, and from and to sections of the existing Colne Valley to the north and south. This movement will be aided by smaller areas of habitat alongside some sections of the rivers that will act as ‘stepping stones’, facilitating the movement of species between the larger habitat blocks. This connectivity will

⁹ AMEC (2014). *Heathrow's North-West Runway - Water Quality and Hydro-ecology Assessment*. Report to HAL

help wide-ranging species, such as the otter, to establish a presence within the enhanced Colne Valley. It will assist many other species to establish and maintain populations in a way that would be more difficult to achieve within an environment where blocks of wildlife-rich habitats are isolated from one another.

The large habitat blocks and smaller stepping stone areas will include a variety of habitats of principal importance for biodiversity, including reedbeds, wet woodland, lowland mixed deciduous woodland, traditional orchards, hedgerows, lowland meadows, eutrophic standing water bodies and ponds. As with the new rivers, these habitats will be designed with reference to best practice which will also inform the way in which they are managed.

Wetland habitats will be designed to attract a wide range of species including birds – although careful attention will be paid to ensuring that ducks, geese and gulls are not attracted to areas where they could present an unacceptable bird strike risk (see **Section 4.3** for further information). Marginal habitats around open water bodies, together with areas of reedbed that will be created elsewhere within the floodplain, will attract a variety of warblers, reed buntings and other bird species. Different bird species will make use of areas of wildflower-rich wet and dry grasslands. These will be designed and managed to attract species of principal importance for biodiversity for example lapwing, yellow wagtail and skylark. The grasslands will also be managed to attract a wide variety of butterflies and other species, such as slow worms and other reptiles.

Elsewhere along the enhanced Colne Valley, areas of wet and dry woodland together with areas of scrub, will provide habitats for a range of other species. Birds that will be targeted will include species of principal importance for biodiversity such as song thrush, dunnock and bullfinch, and possibly scarcer species such as nightingale. The woodland and scrub habitats will also be designed to attract a diversity of invertebrates, including numerous moths that are species of principal importance for biodiversity.

To the north of the Airport, other flood storage areas will be created within an area that is being called North Harmondsworth Moor. This will provide the opportunity to create further wetland habitats, together with meadows and woodlands. These areas will also be designed to attract a wide diversity of wildlife, with connectivity to the more extensive semi-natural habitats within the enhanced Colne Valley. Further habitat connectivity will be achieved to the east of North Harmondsworth Moor – where what is being called the Cranford Park Link will incorporate areas of grassland and, in places, woodland, which will connect to Cranford Park, thereby further enhancing the habitat network around the Airport.

South of the enhanced Colne Valley, the focus will be on enhancing existing areas of habitat, particularly open water bodies within the South West London Waterbodies SPA/Ramsar site where Natural England has identified areas that are in unfavourable condition or that offer scope for enhancement. Where appropriate, waterbodies outside the SPA/Ramsar site that play a role in supporting its gadwall and shoveler populations will also be enhanced. Enhancements will be designed to benefit the populations of these two duck species, thereby mitigating the adverse effects of the proposed Airport expansion on Old Slade Lake LWS and potentially other waterbodies. There may also be opportunities to enhance other interest features of some of the SSSIs that are located within, as well as outside, the SPA/Ramsar site.

4.3 Bird Strike Risk

Annex 14 of the Convention on International Civil Aviation (1944) states that “*when a birdstrike hazard is identified at an aerodrome, the appropriate authority shall take action to decrease the number of birds constituting a potential hazard to aircraft operations by adopting measures for discouraging their presence on, or in the vicinity of, an aerodrome*”.

In the UK: “*the aerodrome licence holder shall take all reasonable steps to secure that the aerodrome and the airspace within which its visual traffic pattern is normally contained are safe at all times for use by aircraft*”¹⁰. The licence holder is therefore responsible for the development and implementation of birdstrike risk control measures.

There is a need to consider the potential for enhanced bird strike risk as a result of the creation of new wetlands as part of the enhanced Colne Valley habitat creation and enhancement proposals. To minimise this risk, careful attention will be paid to ensuring that ducks, geese and gulls are not attracted to areas where they could present an unacceptable bird strike risk (e.g. by only creating small waterbodies except outside aircraft flight tracks where bird strike is less of a concern i.e. to the south of the Airport). In such areas, open water habitats will be designed to attract only those bird species that do not present such a risk (e.g. moorhen, and warblers and other perching birds) together with other groups of species such as dragonflies and amphibians.

All planting and other aspects of habitat design will be undertaken in accordance with the Civil Aviation Authority’s (CAA) guidelines in its CAP 772 birdstrike guidelines¹¹. The CAA will act as an important consultee in finalising the detailed proposals.

¹⁰ Article 128(5) of the Air Navigation Order (2005) within Civil Aviation Authority (2008). *CAP 772 Birdstrike Risk Management for Aerodromes*.

¹¹ Civil Aviation Authority (2008). *CAP 772 Birdstrike Risk Management for Aerodromes*. CAA

5. Assessment of Effects

5.1 Approach

This assessment addresses the effects on biodiversity of the Airport masterplan together with the habitat creation and enhancement works that are planned outside the boundary of the extended Airport (as described in **Section 4.2**). The assessment has been undertaken at a strategic level drawing upon pre-existing data (i.e. no detailed survey work has been carried out).

The biodiversity resources that could be affected by the proposed development for which most information is available are European wildlife sites. Partly for this reason but also because effects on European wildlife sites have the potential to be of greatest concern (reflecting the sites' high level of 'environmental capital'), these sites are the main focus of the assessment. Effects on other sites and on habitats and species are also considered.

5.2 European Wildlife Sites

5.2.1 Approach to the Assessment

Drawing upon aviation sensitivity maps that have been prepared for Natural England, AMEC has identified a zone of up to 11km from the Airport within which consideration needs to be given to the potential for Airport expansion to result in potentially significant noise disturbance and air quality effects on European wildlife sites. AMEC has undertaken a high level assessment of these effects, drawing upon the findings of noise and air quality assessments for the proposed expansion of the Airport^{12 13} and the assessment that AMEC undertook as part of the EIA and HRA relating to the enabling works required to facilitate the ending of the Cranford Agreement¹⁴.

5.2.2 Findings of the Assessment

The South West London Waterbodies SPA and Ramsar site

Noise

There is a need to consider whether the South West London Waterbodies SPA/Ramsar site could be adversely affected as a result of the gadwall and shoveler populations for which the site has been designated being disturbed by increased noise levels as a result of additional air traffic movements (ATMs) associated with the extended

¹² AMEC (2014). *Heathrow's North-West Runway – Air and Ground Noise Assessment*. Report to HAL

¹³ AMEC (2014). *Heathrow's North-West Runway – Air Quality Assessment*. Report to HAL

¹⁴ HAL (2013). *Enabling works to allow implementation of full runway alternation during easterly operations at Heathrow Airport*.

Airport. The noise modelling¹⁵ indicates that the parts of the SPA that are most likely to be affected are Wraysbury Reservoir SSSI and Wraysbury No. 1 Gravel Pit SSSI – see **Figure 3.2**). These SSIS would be overflowed more often than at present (they would not be overflowed 25% of the time compared with 50% at present) but the intensity of flights during this additional overflowed period would be lower than is the case currently¹². The ongoing introduction of quieter aircraft is another factor that will influence noise levels –this would cause the level of noise to reduce.

Existing disturbance from departures overflying Wraysbury Reservoir and Wraysbury Gravel Pits is likely to have already led to habituation by birdlife to air traffic noise, as a result of which it is expected that the predicted changes in ATMs would not affect the populations of gadwall and shoveler that use the waterbodies. This conclusion is supported by studies of disturbance on the South West London Waterbodies SPA/Ramsar site^{16 17 18}, which found no evidence to suggest that overflying aircraft are affecting the integrity of the SPA. The studies did, however, find that a variety of recreational disturbance activities (e.g. angling, waterskiing, sailing and dog-walking) appear to be contributing to a decline in the numbers of gadwall and shoveler.

Air quality

Changes in air quality caused by the proposed development could affect water chemistry, with potential implications for the aquatic plants and invertebrates upon which gadwall and shoveler feed. Air quality modelling that was undertaken for the expanded Airport in 2030 and 2040¹⁹ indicates that there will be an increase in nitrogen deposition at nearby SPA waterbodies in both assessment years.

- The maximum increase in nitrogen deposition in 2030 at a modelled waterbody is $0.54\text{kg ha}^{-1} \text{yr}^{-1}$ at Wraysbury Reservoir (from a baseline in the absence of the proposed development of $18.37\text{kg ha}^{-1} \text{yr}^{-1}$);
- The maximum increase in nitrogen deposition in 2040 at a modelled waterbody was $0.95\text{kg ha}^{-1} \text{yr}^{-1}$ at Staines Moor (from a baseline of $18.76\text{kg ha}^{-1} \text{yr}^{-1}$).

Increased nitrogen deposition could lead to changes in plant communities and aquatic invertebrate populations. Aquatic invertebrates are the main food source for shoveler, whilst both shoveler and gadwall feed on aquatic plants. Consequently any changes in plant and invertebrate populations could result in a change in the

¹⁵ AMEC (2014). *Heathrow's North-West Runway – Air and Ground Noise Assessment*. Report to HAL

¹⁶ Banks, A.N., Austin, G.E., & Rehfisch, M.M. (2004). South West London Waterbodies SPA Wildfowl Population Analysis. In BTO Research Report No.361. British Trust for Ornithology.

¹⁷ Briggs, B.D.J., Hill, D.A. & Gosler, A.G. (2012). Habitat selection and waterbody-complex use by wintering Gadwall and Shoveler in South West London: Implications for the designation and management of multi-site protected areas. *Journal of Nature Conservation: Volume 20*, Issue 4, pp 200–210

¹⁸ Briggs, B.D.J. (2007). *The use of waterbodies in South-West London by gadwall and shoveler; implications for nature conservation*. Thesis submitted for the Degree of Doctor in Philosophy in Biological Sciences University of Oxford Department of Zoology.

¹⁹ The modelling methodology is provided in AMEC (2014). Heathrow's North-West Runway – Air Quality Assessment.

overwintering populations of these two duck species. Given this possibility, further ecological assessment is required to determine what changes are likely to occur and how these are likely to affect shoveler and gadwall.

Habitat Availability

The integrity of the South West London Waterbodies SPA/Ramsar site could also be affected as a result of changes to waterbodies that, although not part of the SPA, are used by the SPA populations of gadwall and shoveler. The water bodies that are most relevant in this regard are those within Old Slade Lake LWS. The proposed development would result in the loss of some of these waterbodies, whilst others would be likely to require measures to be adopted to decrease their attractiveness to waterbirds, including gadwall and shoveler (in order to reduce the risk of bird strike). Whilst neither species is likely to use these waterbodies in large enough numbers that there could be a significant effect on the SPA, this can only be determined by undertaking survey work in order to inform further assessment.

Conclusions

The combination of the changes relating to Old Slade Lake LWS, and noise and air quality changes could affect the conservation status of the gadwall and shoveler populations within the SPA. To provide a robust assessment of these potential effects, which will be required for the purposes of EIA and HRA (the latter being needed to meet the requirements of the Habitats Regulations), it will be necessary to undertake winter bird survey work within the SPA and on associated water bodies (notably in Old Slade Quarry LWS), and further assessment on the ecological effects of changes in nitrogen deposition. Additional noise assessment will also be needed to inform the EIA and HRA.

Even if there is no requirement for mitigation (because there are no likely significant effects on the SPA), enhancement measures will be implemented, as outlined in **Section 4**, with the objective of increasing the populations of gadwall and shoveler within the SPA.

Other European wildlife sites

The interest features of Windsor Forest and Great Park, Richmond Park, Burnham Beeches and Thursley, Ash, Pirbright and Chobham SACs (which are vegetation and/or invertebrates – see **Section 3.2.2**) are not sensitive to noise disturbance from aircraft but could be adversely affected by increased atmospheric pollution caused by additional ATMs associated with the expanded Airport. However, when overflying the SACs, aircraft would be at a higher altitude than they would be over the South West London Waterbodies SPA/Ramsar site. This will lead to NOx emissions being dissipated over a wider area, resulting in lower net concentrations per unit area at ground level than would be the case within the SPA. As a consequence, it is likely that the change in deposition rates would be so small that there would be no potential for the conservation status of the SACs to be adversely affected. Unless future air quality modelling results in a change to this conclusion, it is considered likely there will be no need for further assessment of the effects of the Airport on these four sites, nor for any mitigation measures to be implemented.

The bird interest features of the Thames Basin Heaths SPA are sensitive to noise disturbance but given the distance of this SPA from the Airport, noise is not likely to affect the site's integrity.

5.3 SSSIs

The seven SSSIs that are located within 5km of the extended Airport have been designated for their wildfowl and/or their vegetation (see **Table 3.3**). Of these, all or parts of the five SSSIs that are designated for their wildfowl are also part of the South West London Waterbodies SPA/Ramsar site. These could be affected by increased nitrogen deposition as described above for the SPA/Ramsar site. Vegetation that is an interest feature of three SSSIs could also be affected and, as with waterfowl, these potential effects will need to be subject to further assessment.

Of the interest features for which the SSSIs have been notified, only wildfowl are sensitive to changes in noise. However, there is no reason to believe that the conclusions pertaining to gadwall and shoveler (in the context of the SPA/Ramsar site) will not be applicable to the other wildfowl species for which these sites have been designated. On this basis, it is not likely that the conservation status of wildfowl within the SSSIs would be affected by increases in noise from the operation of the proposed development.

Other than changes in noise and air quality, the only other change that has been identified as having the potential to have a significant effect on the SSSIs is a change in flows and water quality in the River Colne, where it flows through the alluvial meadows that occur alongside the river in the western part of Staines Moor SSSI. Such changes could arise as a result of the construction of the new runway requiring the modification of a number of watercourses including the River Colne, Wraysbury River, Colne Brook, Longford River and the Duke of Northumberland's River. To mitigate this potential as well as to address other issues relating to river flows (including flood risk management), AMEC has prepared a water strategy that involves major changes in how water moves through the Colne Valley (e.g. through incorporating river diversions, the creation of new channels and new floodplain storage etc.²⁰).

The habitat creation and enhancement proposals that are described in **Section 4.2** have been designed to ensure that flows through the SSSI will maintain and, where appropriate, enhance its biodiversity interest. With these measures in place, it is therefore likely that there would be no adverse effect on the integrity of Staines Moor SSSI as a result of changes in flows and water quality.

5.4 Lower Colne SMINC, Old Slade Lake LWS and Stanwell II SNCI

Construction of the expanded Airport would involve 51ha of land-take from the Lower Colne SMINC and 8ha from Old Slade Lakes LWS. These losses could have adverse effects on the integrity of these non-statutory biodiversity sites. The proposed development would also result in the loss of all of Stanwell II SNCI (6ha).

As part of the iterative process of scheme design, there may be scope to modify the development proposals so that the effects on Stanwell II SNCI are avoided or at least reduced. However, on a precautionary basis, it is assumed that this is not possible. Consequently, the habitat creation and enhancement proposals that are described in

²⁰ AMEC (2014). *Heathrow's North-West Runway - Water Quality and Hydro-ecology Assessment*. Report to HAL

Section 4.2 have been designed to compensate for the loss of this site as well as the parts of the other two sites that would be lost. They are also intended to compensate for other biodiversity losses and to deliver biodiversity gains over and above what is required for compensation purposes.

The extent of different habitats that would be created to compensate for the expansion of the Airport (see **Section 4.2**) will be subject to ongoing refinement as the development proposals evolve. To inform this process of refinement, it is proposed to adopt a biodiversity offsetting approach in order to calculate the extent of different habitats that should be created. The approach to offsetting will be that developed by the Department for Environment, Food and Rural Affairs (Defra) based upon its review of the results of the offsetting pilots that it has supported (assuming that Defra's methodology has been finalised by the time that the offsetting exercise needs to be carried out – otherwise it may be appropriate to use one of the pilot methodologies). The application of offsetting will involve collecting detailed data about habitat areas that will be lost.

5.5 Priority Habitats and Legally Protected/Notable Species

Habitats of principal²¹ importance for biodiversity that would be lost as a result of land-take for the Airport extension include rivers (13km), mixed deciduous woodland (34ha) and 'traditional orchard' (1.5ha). The extension of the Airport is also likely to affect a number of legally protected or otherwise notable species (e.g. species of principal importance for biodiversity). Legally protected or otherwise notable species and, potentially, some areas of habitats of principal importance for biodiversity could also be affected by the habitat creation works that are described in **Section 4.2** (e.g. in areas where there is a need for major earthmoving work to create flood storage areas).

Where there is the potential for contravention of the legislation that relates to species or for other species to be significantly affected by the proposed development, detailed survey work will be carried out to inform the EIA and HRA processes. Based on these surveys, specific mitigation proposals will be designed to ensure compliance with all legal requirements (see **Section 4.1**).

²¹ See Box 1.

6. Ecosystem Services Assessment

6.1 Ecosystem Services Framework

Ecosystem services have been defined as the outputs from ecosystems from which humans derive benefits²². These benefits include:

- Resources for basic survival, such as food, clean air and water;
- Contributions to good physical and mental health, for example through access to green spaces, both urban and rural, and genetic resources for medicines;
- Protection from hazards, through the regulation of climate and the water cycle;
- Support for a strong and healthy economy, through raw materials for industry and agriculture, and through tourism and recreation; and
- Social, cultural and educational benefits, and wellbeing and inspiration from interactions with nature.

The assessment of ecosystem services therefore differs from the biodiversity assessment that is covered in the remainder of this report; the latter considers impacts on biodiversity ‘for its own sake’, whilst ecosystem services include the services that biodiversity can provide to society as well as a wide range of other services. The identification and categorisation of individual ecosystem services provides a framework which can be used for systematically assessing the potential effects of large infrastructure projects on ecosystems and human welfare.

A generic framework for ecosystem services has been adopted by the UK Government, which has begun to incorporate an ecosystem approach into policy appraisal and guidance, as identified in Defra (2007)²³ and studies such as the UK National Ecosystem Assessment (UKNEA)²². The categories of ecosystem services outlined in Defra (2007)²³ but also in the UN Millennium Ecosystem Assessment²⁴ and the new Green Book Supplementary Guidance²⁵ are:

- **Provisioning services** – which include food provision, biomass production for energy generation, water resources and genetic diversity.

²² UK National Ecosystem Assessment (2011). *The UK National Ecosystem Assessment: Synthesis of the Key Findings*. UNEP-WCMC, Cambridge

²³ Defra (2007). *An introductory guide to valuing ecosystem services*. Defra.

²⁴ Millennium Ecosystem Assessment (2005). *Ecosystem and Human Wellbeing: General Synthesis*. Island Press, Vancouver.

²⁵ Dunn, H. (2012). *Accounting for environmental impacts: Supplementary Green Book guidance*. HM Treasury

- **Regulating services** – benefits obtained from the regulation function provided by ecosystem processes, such as the regulation of water quality and water flow, the maintenance of air quality and contributions to the management of climate change.
- **Cultural services** – non-material benefits that people obtain from ecosystems, for example a sense of place/inspiration and of history, and recreational benefits:

(The services in the latter three categories are used and valued by human populations, even if they cannot always be denominated in monetary terms.)

- **Supporting services** – these include those services that are necessary for the production of all other ecosystem services. They include biodiversity and geodiversity. For example, pollinating insects provide a supporting service that contributes to the delivery of provisioning services (i.e. food).

Within the context of the generic framework, the list of ecosystem services that has been used in this report is that developed by Natural England for use in its National Character Area (NCA) profiles. This is the approach that has been proposed by the Airports Commission².

6.2 Assessing Impacts on Ecosystem Services

6.2.1 Methodology

Heathrow is located within an area that Natural England has classified as the Thames Valley National Character Area (NCA). Natural England has prepared a descriptive profile for this NCA, which incorporates an ecosystem services analysis²⁶. This details the ‘key assets’ that are the main contributors to each of the services that is identified as being relevant to the NCA. For example, for the service of ‘Food provision’, the relevant assets are defined as mixed agriculture, the availability of water, fertility of soils, and rivers and gravel beds.

In addition to drawing upon Natural England’s NCA analysis, the methodology that has been used for the ecosystems services assessment of Heathrow’s expansion was informed by a review of the checklist of ecosystem services in the Millennium Ecosystem Assessment categorisation in Everard and Waters (2013)²⁷. This review identified two further ecosystem services that are relevant to Heathrow, namely noise quality regulation and air quality regulation. These have therefore also been included in the assessment.

The assessment considers, at a high level, the impact of the proposed Airport expansion on each key asset that has been identified together with those that are relevant to noise and air quality regulation. Effects have been assessed in terms of the two key drivers of ecosystem change relating to aviation projects:

- Land-use change, resulting from the construction of infrastructure (Airport and surface access); and

²⁶ See <http://publications.naturalengland.org.uk/publication/3865943>

²⁷ Everard, M. & Waters, R. (2013). *Ecosystem Services Assessment: How to do one in practice*. Institute of Environmental Services. London

- Hydrological change and pollution, resulting from changes in surface access and air traffic.

The assessment methodology that has been adopted (drawing upon guidance from the UKNEA²², Everard and Waters [2013]²⁶, HM Treasury's Green Book²⁸, Defra [2007]²³ and the Department for Transport [DfT, 2013]²⁹), involves an analysis of the implications of the proposed development for each of the key assets. This is done using information about the baseline conditions pertaining to each key asset in the context of a defined area (a ‘zone of influence’) where there is the potential for this asset to be adversely affected or to be enhanced or expanded as a result of the development.

For the purpose of the assessment, the following information has been assembled for each key asset:

- The broad habitat type³⁰ (see Box 3) that is the best fit for the asset and its importance in terms of the ability to deliver each ecosystem service (e.g. the ‘Grade 1 and 2 agricultural land’ asset relates to the ‘Arable And Horticulture’ broad habitat and is considered ‘important’ in terms of the delivery of the Food Provision service);
- The relevant zone of influence based on the predicted sensitivity of each asset to perform/deliver its function/service, dependent on the pathway that is identified for an effect to occur; and
- The current extent (area or length) of the asset or the number of units of the asset that are present (i.e. the ‘environmental stock’).

Box 3	Broad Habitat Types
<p>Broadleaved, mixed and yew woodland</p> <ul style="list-style-type: none"> • Coniferous Woodland • Boundary and Linear Features • Arable and Horticulture • Improved Grassland • Neutral Grassland • Acid Grassland • Bracken • Fen, Marsh and Swamp • Standing Water and Canals • Rivers and Streams • Built-up Areas and Gardens 	

The next stage in the assessment process is to determine a magnitude value relating to the extent or number of units of each asset that would be lost or that would be adversely affected through other pathways (pollution, disturbance

²⁸ HM Treasury Green Book (*Appraisal and Evaluation in Central Government*). HM Treasury

²⁹ Department for Transport (2013). *Applying an Ecosystem Services Framework to Transport Appraisal*

³⁰ See <http://jncc.defra.gov.uk/page-2433#1401>

etc.) as a result of the Airport masterplan development, in the absence of any mitigation. Using an approach for applying an ecosystem services framework that was developed by the DfT, this magnitude is scored using a three point scale. Again using the DfT's approach, a judgement is then made, for each key asset, about the importance for people of the ecosystem service that is affected by the change in the extent/number of units of the asset. Importance is also scored using a three point scale. Importance and magnitude are then combined through the use of a matrix to determine the significance of the effect using a five point scale (increase/ slight increase/no change/ slight decrease/increase); a value is added for the degree of confidence in the prediction (high/medium/low).

The equivalent exercise is then carried out relating to the land that would be affected by the mitigation strategy, recognising that this strategy would involve the loss of some assets (e.g. the loss of a large area of arable land) but also the creation of new assets (e.g. fen/marsh/swamp). The land use change is evaluated on the same basis as described above for the masterplan development, but factoring in the post-mitigation situation (e.g. a gain in the extent of [unimproved] neutral grassland or fen/marsh/swamp habitats).

Information about the effects of the proposed development on key assets associated with the footprint of the extended Airport together with effects resulting from the mitigation strategy can then be combined to calculate a net overall gain/loss pertaining to each asset and hence, in turn, to the relevant ecosystem service.

6.2.2 Results

At this stage in the scheme design process, there is insufficient information available to undertake an accurate ecosystem services assessment. However, by making a number of assumptions about the extent of key assets that will be lost or gained, a preliminary set of indicative findings has been derived as set out in **Table 6.1**.

A further, more detailed assessment should be carried out once more information is available about gains and losses to key assets. It is likely to be beneficial for this to be undertaken using the methodology that is described above, incorporating appropriate amendments that would be discussed with Natural England. The potential need for amendments reflects the ongoing development work that is taking place on ecosystem services, which reflects the recent development of this concept.

Table 6.1 Results of Assessing the Impacts of Heathrow's Expansion on Ecosystem Services

Ecosystem Service	Key Asset	Post-Mitigation overall Gain/loss (see key below)
Food provision	Grade 1 and 2 agricultural land – Arable	--
	Grade 3 agricultural land – Grazing	-
	Fruit/vegetable production	+
	Rivers and gravel beds	0
Timber provision	Broad leaved woodland	+
	Coniferous woodland	0
Biomass energy	Existing woodland cover	+
Water availability	Reservoirs	0
	Rivers	0
	Chilterns chalk aquifer	0
Genetic diversity	Royal Botanic Gardens at Kew	0
	Historic orchards	-
	Historic parkland	0
	Ancient woodland	0
	Heathland	0
Regulating climate change	Heathland	0
	Wet and ancient semi-natural woodland	+
	Fens/reedbeds	+
	Water meadows	+
	Peaty soils/soils with high levels of organic matter	0

Table 6.1 (continued) Results of Assessing the Impacts of Heathrow's Expansion on Ecosystem Services

Ecosystem Service	Key Asset	Post-Mitigation overall Gain/loss (see key below)
Regulating soil erosion	Woodland	+
	Permanent pasture	0
	Hedgerows	+
	Freely draining loamy soils	--
	Freely draining base rich soils	0
	Wet acid sand and loamy soils	0
Regulating soil quality	Low grade agricultural land - Arable	--
Regulating water quality	Rivers	0
	Reservoirs	0
	Water meadows and flood plain grazing	+
Regulating water flow	Rivers	+
	Reservoirs and other waterbodies	0
	Floodplains	+
Regulating air quality³¹	Broadleaved woodland	+
	Wet woodland	+
	Parkland and wood pasture	+
Regulating noise quality³²	Broadleaved woodland	+
	Wet woodland	+
	Parkland and wood pasture	+

³¹ The proposed Airport development will affect air quality [this is assessed in AMEC (2014). *Heathrow's North-West Runway – Air Quality Assessment*. Report to HAL]. The beneficial effects reported here relate to the increased extent of key assets, which will help better regulate air quality.

³² The proposed Airport development will affect noise levels [this is assessed in AMEC (2014). *Heathrow's North-West Runway – Air and Ground Noise Assessment*. Report to HAL]. The beneficial effects reported here relate to the increased extent of key assets, which will help better regulate noise quality.

Table 6.1 (continued) Results of Assessing the Impacts of Heathrow's Expansion on Ecosystem Services

Ecosystem Service	Key Asset	Post-Mitigation overall Gain/loss (see key below)
Pollination	Heathland	0
	Woodland	+
	Parks and gardens	+
	Hedgerows	+
	Orchards	+
Pest regulation	Agricultural fields margins	--
	Hedgerows	++
	Small scale mixed farming	--
	Woodland	+
	Historic parkland and wood pasture	0
Sense of place/inspiration	Historic buildings	-
	Famous views	0
	River Thames	0
	Views of Chilterns AONB	0
	Waterbodies	+
Sense of history	Historic buildings	0
	Famous views	0
	River Thames	0
	Towns and settlement	--
	More recent historic elements i.e. airport	0

Table 6.1 (continued) Results of Assessing the Impacts of Heathrow's Expansion on Ecosystem Services

Ecosystem Service	Key Asset	Post-Mitigation overall Gain/loss (see key below)
Tranquillity³³	Parkland	0
	Waterbodies and rivers	+
Recreation	Rivers	+
	Lakes and reservoirs	0
Wild species diversity	Commons	+
	Public Rights of Way	+
	Parkland	++
	Historic houses	--
	Village greens	0
	Broadleaved woodland	+
	Wet woodland	+
	Parkland and wood pasture	++
	Ancient woodland	0
	Hedgerows	++
	Heathland	0
	Dry acid grassland	0
	Commons	0
	Rivers	• ++
	Reservoirs	0
	Open water	+
	Canals	0
	Wet meadows	++

³³ In some areas, the proposed Airport development will affect tranquillity [this is assessed in AMEC (2014). *Heathrow's North-West Runway –Landscape and Visual Impact Assessment*. Report to HAL]. The beneficial effect reported here relates to the role of an increase in the extent of specified key assets in improving tranquillity.

Table 6.1 (continued) Results of Assessing the Impacts of Heathrow's Expansion on Ecosystem Services

Ecosystem Service	Key Asset	Post-Mitigation overall Gain/loss (see key below)
Geodiversity	Geological SSSIs	0
	Local Geological Sites	0

Key: **++** = increase; **+** = slight increase; **0** = no change; **-** = slight decrease; **--** = decrease

6.3 Valuing Changes in Ecosystem Services Provision

In order to value individual ecosystem services and marginal changes in their provision there is a need to accurately quantify the magnitude of anticipated environmental changes and their effects on the provision of different ecosystem services. Once appropriate quantification has been carried out (e.g. in terms of the size of the affected population, areas of land, number of properties or other receptors), monetary valuation can be applied.

At this stage in the assessment process for the proposed expansion of Heathrow, the data that are required for the valuation of effects on ecosystem services are not available and hence it is not feasible to carry out a robust monetisation exercise relating to these effects. However, at a later stage in the assessment process it is recognised that there may be scope to undertake monetisation of changes in some ecosystem services.

Appendix A

Records of Legally Protected and other Notable Species

Excluding confidential records (see below), there are records of 31 legally-protected and/or otherwise notable species occurring within the footprint of the proposed Airport extension and records of 23 such species recorded from within the boundaries of the habitat creation and enhancement areas as shown on **Figure 4.1** (see **Table A.1**). Records of red-listed birds of conservation concern³⁴ have only been included in **Table A.1** where the species is included in the red list for reasons relating to its:

- Breeding population, but only if the species might (on the basis of adopting a precautionary approach) be regularly breeding within the footprint of the proposed Airport extension or the habitat creation/enhancement areas; and
- Wintering population, but only if there might (on the basis of adopting a precautionary approach) be a regular wintering population within the footprint of the proposed Airport extension or the habitat creation/enhancement areas.

Records of Schedule 1 birds under the *Wildlife and Countryside Act 1981* (as amended) have only been included where the species could have been breeding within the footprint of the proposed Airport extension or habitat creation/enhancement areas.

Further to the species listed above, GiGL also provided a list of “confidential records” of legally-protected and/or otherwise notable species, recorded from within 2km of the current footprint of the Airport (see **Table A.2**³⁵). It is not known whether these species have been recorded from within the footprint of the proposed Airport extension or habitat creation/enhancement areas, but they have the potential to be present where suitable habitat is available.

³⁴ Eaton M.A., Brown A.F., Noble D.G., Musgrove A.J., Hearn R., Aebsicher N.J. Gibbons D.W., Evans A. and Gregory R.D. (2009). Birds of Conservation Concern 3: the population status of birds in the United Kingdom, Channel Islands and the Isle of Man. *British Birds* 102, pp296-341.

³⁵ In Table A.2 the same approach is taken to red-list and Schedule 1 birds as has been taken in Table A.1.

Table A.1 Legally-Protected and/or Priority Species recorded within the Footprint of the Proposed Airport Extension and Habitat Creation/Enhancement Areas

Common Name	Scientific Name	Reason for Inclusion in this Table	Within Airport Extension Footprint	Within Habitat Creation/Enhancement Areas
Mammals				
Common pipistrelle	<i>Pipistrellus pipistrellus</i>	HD, WCA	✓	
Noctule	<i>Nyctalus noctula</i>	HD, WCA, S41, LBAP	✓	
Soprano pipistrelle	<i>Pipistrellus pygmaeus</i>	HD, WCA, S41, LBAP	✓	✓
Unidentified bat	Vespertilionidae sp.	HD, WCA	✓	
Water vole	<i>Arvicola terrestris</i>	WCA, S41, LBAP	✓	
Birds				
Black redstart	<i>Phoenicurus ochruros</i>	WCA, Sch.1	✓	
Bullfinch	<i>Pyrrhula pyrrhula</i>	S41, LBAP		✓
Cuckoo	<i>Cuculus canorus</i>	S41, BoCC, LBAP	✓	✓
Starling	<i>Sturnus vulgaris</i>	S41, BoCC, LBAP	✓	✓
Dunnock	<i>Prunella modularis</i>	S41, LBAP	✓	✓
Grasshopper warbler	<i>Locustella naevia</i>	S41, BoCC, LBAP	✓	
Grey partridge	<i>Perdix perdix</i>	S41, BoCC, LBAP	✓	
Hobby	<i>Falco subbuteo</i>	WCA Sch.1		✓
Herring gull	<i>Larus argentatus</i>	S41, BoCC		✓
House sparrow	<i>Passer domesticus</i>	S41, BoCC, LBAP	✓	✓
Kingfisher	<i>Alcedo atthis</i>	WCA Sch.1	✓	✓
Lesser spotted woodpecker	<i>Dendrocopos minor</i>	BoCC, LBAP	✓	
Linnet	<i>Carduelis cannabina</i>	BoCC, LBAP	✓	✓
Little ringed plover	<i>Charadrius dubius</i>	WCA Sch.1		
Lapwing	<i>Vanellus vanellus</i>	S41, BoCC, LBAP	✓	
Reed bunting	<i>Emberiza schoeniclus</i>	S41, LBAP	✓	✓
Sand martin	<i>Riparia riparia</i>	LBAP	✓	
Skylark	<i>Alauda arvensis</i>	S41, BoCC, LBAP	✓	✓
Song thrush	<i>Turdus philomelos</i>	S41, BoCC, LBAP	✓	✓
Spotted flycatcher	<i>Muscicapa striata</i>	S41, BoCC, LBAP	✓	
Tree sparrow	<i>Passer montanus</i>	S41, BoCC, LBAP	✓	
Turtle dove	<i>Streptopelia turtur</i>	S41, BoCC, LBAP	✓	

Table A.1 (continued) Legally-Protected and/or Priority Species recorded within the Footprint of the Proposed Airport Extension and Habitat Creation/Enhancement Areas

Common Name	Scientific Name	Reason for Inclusion in this Table	Within Airport Extension Footprint	Within Habitat Creation/ Enhancement Areas
Yellow wagtail	<i>Motacilla flava</i>	BoCC, LBAP	✓	
Yellow-legged Gull	<i>Larus michahellis</i>	LBAP	✓	✓
Invertebrates				
Small heath	<i>Coenonympha pamphilus</i>	S41, RDB, LBAP	✓	✓
Stag beetle	<i>Lucanus cervus</i>	HD, WCA, S41, RDB		✓
Plants and fungi				
Darnel	<i>Lolium temulentum</i>	S41	✓	
Caraway	<i>Carum carvi</i>	S41	✓	
River water-dropwort	<i>Oenanthe fluviatilis</i>	S41, LBAP	✓	✓
Black poplar	<i>Populus nigra</i> subsp. <i>betulifolia</i>	LBAP	✓	
Cornflower	<i>Centaurea cyanus</i>	S41, LS		✓
Golden dock	<i>Rumex maritimus</i>	LS		✓
Hairy buttercup	<i>Ranunculus sardous</i>	LS		✓
Marsh stitchwort	<i>Stellaria palustris</i>	S41, RDB		✓
Round-fruited rush	<i>Juncus compressus</i>	RDB		✓
Mistletoe	<i>Viscum album</i>	LBAP		✓

Key³⁶

HD – Legally protected under *The Conservation (Natural Habitats, & c.) Regulations 2010*

WCA – Legally protected under Schedules (Sch) 1, 5 or 8 of *The Wildlife & Countryside Act 1981*

LBAP – Local Biodiversity Action Plan priority species

S41 – Species of principal importance in England under the NERC Act

RDB – listed in the relevant Red Data Book/UK Red List

BoCC – Birds of conservation concern (Red List)

NS – Nationally scarce

LS – Locally/regionally scarce or otherwise notable

³⁶ See Boxes 1 and 2 for definitions

Table A.2 Confidential Records of Legally-protected and/or Priority Species recorded within 2km of the Current Airport Footprint

Common Name	Scientific Name	Reason for Inclusion in this Table
Mammals		
Badger	<i>Meles meles</i>	Protection of Badgers Act 1992
Reptiles		
Adder	<i>Vipera berus</i>	WCA, S41, LBAP
Birds		
Marsh tit	<i>Poecile palustris</i>	LBAP
Corn bunting	<i>Emberiza calandra</i>	LBAP
Peregrine falcon	<i>Falco peregrinus</i>	WCA Sch.1, LBAP
Barn owl	<i>Tyto alba</i>	WCA Sch.1
Cetti's Warbler	<i>Cettia cetti</i>	WCA Sch.1

Key³⁷

- HD – Legally protected under *The Conservation (Natural Habitats, & c.) Regulations 2010*
 WCA – Legally protected under Schedules (Sch) 1, 5 or 8 of *The Wildlife & Countryside Act 1981*
 LBAP – Local Biodiversity Action Plan priority species
 S41 – Species of principal importance in England under the NERC Act
 RDB – listed in the relevant Red Data Book/UK Red List
 BoCC – Birds of conservation concern (Red List)
 NS – Nationally scarce
 LS – Locally/regionally scarce or otherwise notable

³⁷ See Boxes 1 and 2 for definitions