Gatwick Airport Northern Runway Project

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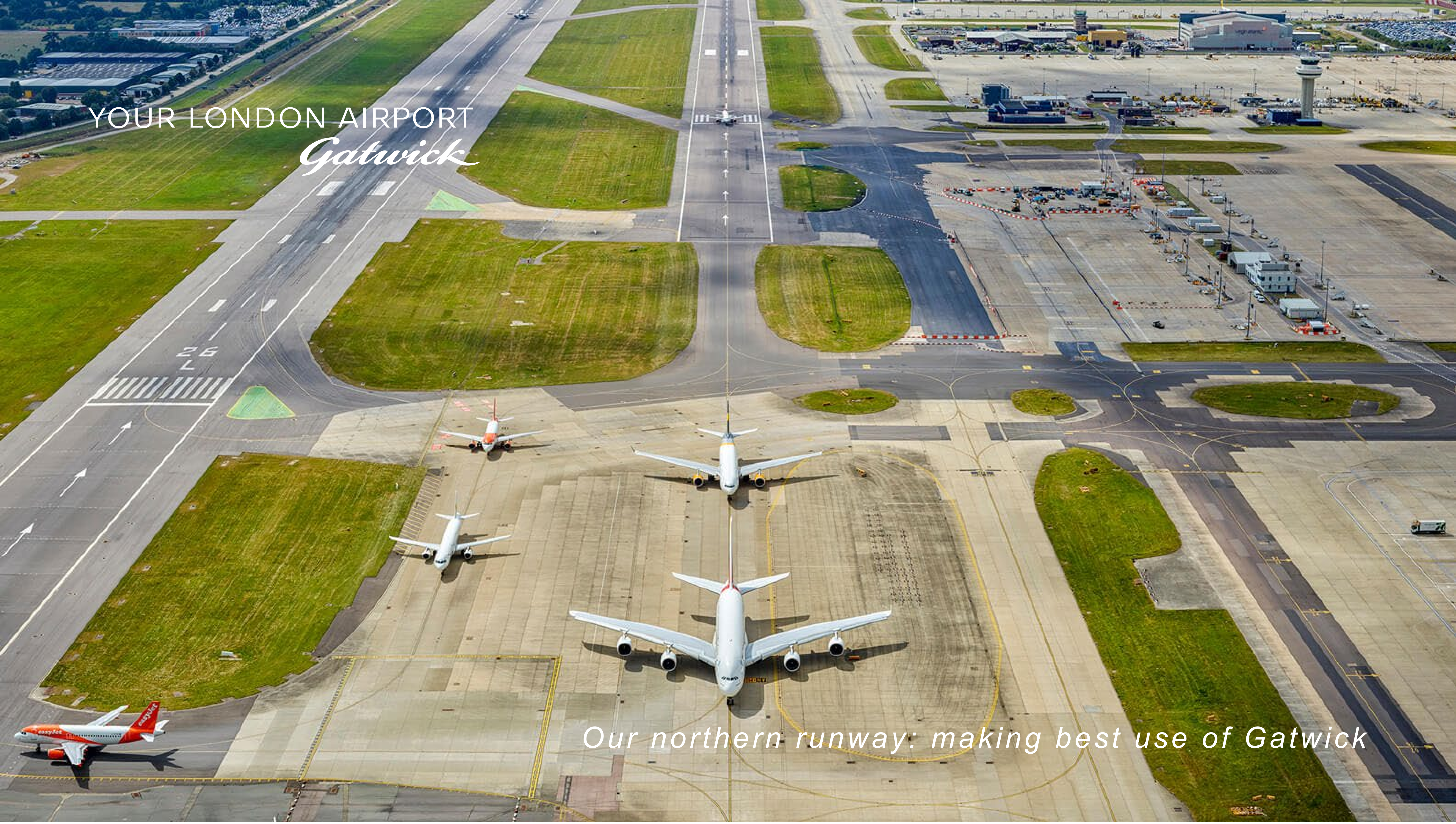
Contents – Part B – Volume 13

Appendix B.16 PEIR Appendices 9.6.1 – 9.6.2



Preliminary Environmental Information Report
Appendix 9.6.1: Ecological Desk Study

September 2021

Table of Contents

1	Introduction	1
2	Methodology	1
3	Results	1
4	Conclusion	19
5	References	19
6	Glossary	19

1 Introduction

1.1 Ecological Desk Study

1.1.1 The document forms Appendix 9.6.1 of the Preliminary Environmental Information Report (PEIR) prepared on behalf of Gatwick Airport Limited (GAL). The PEIR presents the preliminary findings of the Environmental Impact Assessment (EIA) process for the proposal to make best use of Gatwick Airport's existing runways (referred to within this report a 'the Project'). The Project proposes alterations to the existing northern runway which, together with the lifting of the current restrictions on its use, would enable dual runway operations. The Project includes the development of a range of infrastructure and facilities which, with the alterations to the northern runway, would enable the airport passenger and aircraft operations to increase. Further details regarding the components of the Project can be found in Chapter 5: Project Description.

1.1.2 This document provides the ecology desk study for Chapter 9: Ecology and Nature Conservation for the Project.

1.1.3 The site location is shown on Figure 1.1.1.

1.1.4 This desk study forms part of the Preliminary Ecological Appraisal, as per guidance provided by the Chartered Institute of Ecology and Environmental Management (CIEEM) (2017).

1.1.5 The objectives of the desk study were to:

- locate statutory and non-statutory wildlife sites within 5 km of the site, and European designated sites within 20 km;
- locate bat species with 10 km of the site;
- locate records of otters within 10 km of the site; and
- locate records of all other protected and otherwise notable species within 2 km of the site.

1.1.6 This report outlines the methods used (Section 2), presents the results obtained (Section 3), and sets out the conclusions reached (Section 4).

2 Methodology

2.1 Search Area

2.1.1 A search area of 2 km (from the site boundary at the time of search) was used to gather records of most protected and notable species. A wider search area of 5 km was used to gather records of statutory and non-statutory designated sites, extended to 20 km for European designated sites and 10 km to gather records of bats and otters. This accounts for species that cover a wide geographical area and is in accordance with the Bat Conservation Trust guidelines (2016).

2.2 Data Request

2.2.1 A data request for this information was made to the following organisations:

- Sussex Biodiversity Record Centre;
- East Surrey Badger Protection Society;
- West Surrey Badger Group;
- Badger Trust-Sussex;
- Surrey Biodiversity Information Centre;
- R. Bicker, Gatwick Airport Biodiversity Consultant.

2.2.2 The legal and conservation status of the species for which records were received was determined using the Spreadsheet of Conservation Designations for UK Taxa (Joint Nature Conservation Committee (JNCC), 2018).

2.2.3 In addition to these requests, the 'MAGIC' website was consulted for information on any statutory designated sites within 5 km of the site and European designated sites within 20 km. A search was made for details of Local Nature Reserves (LNR), Special Areas of Conservation (SACs), Special Protection Areas (SPAs), Ramsar Sites, National Nature Reserves (NNRs) and Sites of Special Scientific Interest (SSSIs). The Natural England and JNCC websites were also consulted for additional details on these sites.

2.2.4 Data regarding the location and presence of protected or notable species detailed within Gatwick's Annual Biodiversity Review 2018 (Bicker *et al.*, 2019), has also been incorporated into this desk study.

3 Results

3.1 Desk Study

3.1.1 A summary of the data received from the relevant record centres concerning wildlife sites and protected and notable species records is summarised in Table 3.1.1 below.

Table 3.1.1: Table of Consultees

Consultee	Response
Sussex Biodiversity Record Centre	Provided species records within 10 km (bats and otter) and 2 km of the site. Provided records of designated sites within 5 km of the study area.
Surrey Biodiversity Information Centre	Awaiting data.
East Surrey Badger Protection Society	Advised that they did not hold records in this area.
West Surrey Badger Group	Advised that they did not hold records in this area.
Badger Trust-Sussex	Advised that they did not hold records in this area.

3.2 Designated Sites

3.2.1 There are 17 statutory designated sites located within the search area. These are listed in Table 3.2.1 below and shown on Figure 3.2.1. The designated sites consist of two Special Conservation Areas (SAC), one SPA, four SSSIs and seven LNRs and three County Parks (CP). None of the sites fall with the Project site boundary.

3.2.2 In addition, following consultation with Natural England, the following European sites designated for their bat populations beyond 20 km from the Project site boundary have been identified for consideration:

- Ebernoe Common SAC located 29 km to the south west of the site; and
- The Mens SAC located 25 km to the south west of the site.

3.2.3 Further, following consultation with Natural England with respect to the potential impacts of changes in air quality from vehicle emissions on major roads, the following sites have also been included:

- Thames Basin Heaths SPA located 24 km to the north west of the site; and
- Thursley, Ash, Pirbright and Chobham SAC located 33.8 km to the north west of the site.

3.2.4 Further details regarding these sites can be found within Table 3.2.2 and Table 3.2.3.

3.2.5 A number of areas of ancient woodland are present within the search area and four are present within the Project site boundary.

3.2.6 There are 21 non-statutory designated sites within the 5 km search area. These are listed in Table 3.2.1 below and shown on Figure 3.2.2. They consist of 20 Local Wildlife Sites (LWSs) and one Designated Road Verge (DRV). LWSs are designated following criteria and procedures set out by county councils. Of these, one site falls within the Project site boundary, Horleyland Wood LWS.

3.2.7 These totals do not include the records shown in italics in Table 3.2.1, as these records are not up to date, as they were provided by Surrey Biodiversity Information Centre in 2016.

Table 3.2.1: Statutory and Non-statutory Designated Sites within 5 km of the Site, and European Designated Sites within 20 km of the Project Site

Statutory and Non-statutory Designated Sites within 5 km of the Project Site				
Site name	**Type**	**Approximate area (ha)**	**Interest Features**	**Distance from site (metres)**
Statutory Sites				
Willoughby Fields	LNR	20	Includes two streams, two large unimproved meadows and extensive hedgerows. The meadows and hedgerows are particularly important habitats being uncommon within Crawley Borough.	786
Grattons Park	LNR	7.2	The main habitats found here are broadleaved woodland, a stream, ponds and meadows.	1,246
Edolph's Copse	LNR	27.64	Edolph's Copse is a woodland, located in a well wooded part of the Surrey Weald just to the north of Gatwick. Its irregular boundaries are defined by local roads to the west and by grazed fields to the east and south. The wood is well connected to other neighboring habitats via mature hedgerows and a stream.	1,545
Glover's Wood	SSSI	74.49	Glover's Wood is a substantial area of woodland which lies on neutral to slightly acid clays across the incised valley of the Welland Gill. The site consists almost entirely of semi-natural broadleaved woodland, part of which is considered to be primary. The primary woodland areas, situated mainly on the sides of a calcareous gill, support a very rich ground flora.	1,623
Waterlea Meadow	LNR	3.26	Includes flood meadow, wetland, hedgerow and woodland habitats and associated wildlife including good populations of reptiles and amphibians, a variety of wetland plants and many species of birds.	3,488
Worth Way	CP	NP	Since the closure of the railway in the 1960s, much of it has been colonised by trees such as ash and silver birch. Where chalk was used in the construction of the railway, plants such as Guelder Rose, Common Spotted Orchid, Twayblade and wild strawberry can be found. Worth Way offers a green corridor for wildlife, connecting different habitats together. Birds of note include Chiffchaff, Nuthatch and kingfisher. Butterflies include Brimstone, Speckled Wood, Meadow Brown, Ringlet, Skipper and, in June, the White Admiral. Bats, Adders, Grass Snakes and Common Lizards are also found here.	3,727
Tilgate Forest	LNR	6.9	Conifer and broad-leaved woodland plantation within a golf course also supporting heathland, acid grassland and small ponds. The site supports a variety of birds, all four common reptile species and attracts many dragonflies and damselflies.	4,190
House Copse	SSSI	12.48	A small isolated woodland, which is shown on the 1st Edition 1" Ordnance Survey Map (1816) to have much the same shape and extent as at present. There is much to suggest that it is an 'ancient' woodland with continuity of woodland cover since at least the Middle Ages. This type of woodland cover is rare, being a close association of small-leaved lime and hornbeam, previously managed as coppice, under oak standards, and is almost unknown elsewhere in Southern England.	4,345
Hedgecourt	SSSI	33.56	Hedgecourt is the most important wetland site remaining in south-east Surrey. Situated in the upper Eden Brook Valley on alluvial soils overlying Tunbridge Wells sandstones, the site incorporates a range of habitats including woodland, grassland and fen-marginated open water. Hedgecourt lake itself is an ancient mill pond resulting from the damming of the river. These habitats support a wide variety of animal life including several locally distributed beetles (Coleoptera) and a large breeding-bird fauna.	4,460
Buchan Hill Ponds	SSSI	19.49	These three ponds are the best example in West Sussex of Wealden hammer ponds on acid Tunbridge Wells sands. A nationally uncommon woodland type occupies the wetlands around the ponds and the site supports a rich dragonfly fauna which includes two particularly notable species.	4,928
Tilgate Park	CP	100.28	Broad-leaved woodland, with trees such as oak and birch, is important for birds like woodpeckers (all three British species occur in the park), wildflowers, fungi and invertebrates. Heathland is a priority habitat in the Park. This is open land with shrubs such as wild heather and gorse. It supports specialised, and often rare, invertebrates, reptiles and birds. Lakes and ponds provide breeding sites for frogs, toads, newts, dragonflies and damselflies. Stanford Brook which flows along the eastern edge of the golf course harbours wild brown trout, bullheads and lampreys.	4,899

Statutory and Non-statutory Designated Sites within 5 km of the Project Site

Site name	Type	Approximate area (ha)	Interest Features	Distance from site (metres)
Target Hill Park	LNR	8.98	A mosaic of habitats including wetlands, woodlands, meadow and scrub areas. A pond and several ephemeral scrape ponds have been excavated, creating a range of wetland habitats.	4,916
Buchan	CP	72.31	Buchan Country Park has won the Green Flag Award, which recognises the best green spaces in the UK, every year since 2010. The site contains dragonflies, Nightjar, Great Crested Grebe, Adder and Grass Snake.	4,923
Broadfield Park	LNR	10.47	The reserve includes lakes and ponds, wet woodland, mixed woodland, meadow and parkland. As the grounds of a former country house, the park also contains some formal features and specimen trees.	5,058
Mole Gap to Reigate Escarpment	SAC	892.3	This site hosts the priority habitat type "orchid rich sites". This large but fragmented site on the North Downs escarpment supports a wide range of calcareous grassland types on steep slopes, including *Festuca ovina – Avenula pratensis*, *Bromus erectus, Brachypodium pinnatum*, *Brachypodium pinnatum – Bromus erectus* and *Avenula pubescens* grasslands. It exhibits a wide range of structural conditions ranging from short turf through to scrub margins, and is particularly important for rare vascular plants, including orchids. It is also significant in exhibiting transitions to scarce scrub, woodland and dry heath types, notably Stable xerothermophilous formations with *Buxus sempervirens* on rock slopes, yew *Taxus baccata* woods, and chalk heath. The yew *Taxus baccata* woodland has been formed both by invasion of chalk grassland and from development within beech Fagus sylvatica woodland following destruction of the beech overstorey. Yew occurs here in extensive stands, with, in places, an understorey of box Buxus sempervirens at one of its few native locations.	9,223
Ashdown Forest	SAC	2,715.88	Ashdown Forest contains one of the largest single continuous blocks of lowland heath in south-east England, with both European dry heaths and, in a larger proportion, wet heath. The *Erica tetralix – Sphagnum compactum* wet heath element provides suitable conditions for several species of bog-mosses *Sphagnum spp*., bog asphodel *Narthecium ossifragum*, deergrass *Trichophorum cespitosum*, common cotton-grass *Eriophorum angustifolium*, marsh gentian *Gentiana pneumonanthe* and marsh clubmoss *Lycopodiella inundata*. The site supports important assemblages of beetles, dragonflies, damselflies and butterflies, including the nationally rare silver-studded blue *Plebejus argus*, and birds of European importance, such as European nightjar *Caprimulgus europaeus*, Dartford warbler *Sylvia undata* and Eurasian hobby *Falco subbuteo*. The dry heath in Ashdown Forest is an extensive example of the south-eastern *Calluna vulgaris – Ulex minor* community. This vegetation type is dominated by heather *Calluna vulgaris*, bell heather *Erica cinerea* and dwarf gorse *Ulex minor*, with transitions to other habitats. It supports important lichen assemblages, including species such as *Pycnothelia papillaria*. This site supports the most inland remaining population of hairy greenweed *Genista pilosa* in Britain. The woodlands are also varied, with *Birch Betula sp*. typically establishing first over heath, followed by Oak *Quercus robur*, Willow *Salix sp*. and Pine *Pinus sp*. in places, eventually forming dense and shaded areas with sparse ground flora. Breeding birds of heath, scrub and woodland are associated with the varied mosaic of their respective habitats, distributed over the higher slopes and valleys of the High Weald. Together with the nearby Wealden Heaths SPA and Thames Basin Heath SPA, Ashdown Forest forms part of a complex of heathlands in southern England that support breeding bird populations of European importance. Breeding birds of particular note include Dartford Warbler *Sylvia undata* and Nightjar *Caprimulgus europaeus.*	11,960
	SPA	3,207.08		11,960
Non-Statutory Sites within 5 km of the Project site				
Horleyland Wood	LWS	9.52	Hazel-Oak-Birch wood, carpeted with Bluebells in spring and Bracken in the summer. Crab tree grove and stands of Oaks.	Within Project boundary
Rowley Wood	LWS	22.44	Woodland of note for ship-timber beetle *Lymexylon navale*	691

Statutory and Non-statutory Designated Sites within 5 km of the Project Site

Site name	Type	Approximate area (ha)	Interest Features	Distance from site (metres)
Willoughby Fields	LWS	25.74	Unimproved grasslands with a network of hedgerows, areas of scrub and small copses. The area is a breeding ground for bird, butterfly and damselfly	752
Grattons Pond	LWS	2.62	Can be found within Grattons Park LNR.	1,224
Wood near Lower Prestwood Farm	LWS	14.22	This woodland site is of importance for its mosses and liverworts.	1,298
A264 Copthorne	DRV	1	Not provided.	1,643
Ifield Brook Wood and Meadows	LWS	22.88	Neutral grassland, semi-natural woodland and stream. Species include birds-foot-trefoil, yellow rattle, bluebells, butterflies, damselflies and kingfishers.	1,671
Copthorne Common	LWS	33.28	Not provided.	2,157
Ewhurst Wood	LWS	4.97	Ancient woodland indicator species such as bluebell, wood anemone and goldilocks buttercup can be found here, together with rowan, wild cherry and the uncommon wild service-tree. Dead and decaying wood attracts great spotted-wood peckers and tree creepers. There are old wood banks, ditches and abundant deadwood.	2,170
Orltons Copse	LWS	55.75	An area comprising ancient woodland, streams and hay meadow. It is of importance for several bird species including nightingale, goldcrest and tawny owl.	2,216
Worth Way	LWS	5.17	Since the closure of the railway in the 1960s, much of it has been colonised by trees such as ash and silver birch. Where chalk was used in the construction of the railway, plants such as Guelder Rose, Common Spotted Orchid, Twayblade and wild strawberry can be found. Worth Way offers a green corridor for wildlife, connecting different habitats together. Birds of note include Chiffchaff, Nuthatch and kingfisher.	3,726
Ifield Pond and surroundings	LWS	19.58	Ponds and wetland area, support rich bird community and breeding site. Frogs, toads and newts breed in the pond and during summer, damselflies and the larger dragonflies can be also be found. Greater reed-mace and the true bulrush, together with yellow iris and water mint are seen at the water's edge	3,130
The Hawth	LWS	11.89	Ancient woodland dominated by birch, with a dense shrub layer and rich ground flora.	3,432
Worth Meadows	LWS	5.48	Meadow part of Worth Park, the recently restored 1880s Victorian garden.	3,517
Hyde Hill	LWS	22.75	An area of ancient woodland, stream and neutral grassland. Species include small leaved lime, wild service tree and a wide variety of birds.	3,533
Oaken Wood, Stony Plats & High Lines	LWS	88.38	Most of this site consists of Oak and Hazel woodland with Birch frequent in places. Small-leaved Lime occurs occasionally throughout. Alder occurs alongside the numerous streams. There are a number of large open clearings and several stagnant ponds. The wood supports good numbers of plants, mosses, liverworts, birds and butterflies.	3,591
Woldhurstlea Wood	LWS	4.46	This small block of mixed woodland contains many native trees and shrubs such as oak, ash, hornbeam, hazel, hawthorn and the less common small-leaved lime. The woodland contains a number of ancient woodland indicators	3,717
Tilgate Park	LWS	217.92	Large area of lakes, lawns, woodland and gardens. The area is utilised Tilgate Nature Centre activities and attractions.	4,899
Lobbs Wood & Furnace Pond	LWS	32.17	Lobbs Wood forms part of an ancient woodland complex situated north of Crawley Down. The gill, or steeply incised stream valley is a very valuable feature. Furnace Pond, presumably a hammer pond created for the Wealden iron industry, is a large area of open water surrounded by ancient woodland. Its considerable ornithological importance is well documented.	4,690
Kilnwood Copse	LWS	4.07	An area of woodland and ponds. It also contains the small leaved lime as well as mosses and liverworts.	4,924
Buchan Country Park	LWS	55.97	Please see Buchan Country Park described above.	4,923
The Roughs	*SNCI*	*5.92*	*Ancient Semi-natural Woodland and damp, semi-improved grassland. Selected as Ancient Semi-natural Woodland supporting at least 18 ancient woodland indicator species. Fine-leaved water-dropwort, (Oenanthe aquatica), a species shown as Locally Rare on the Surrey Rare Plant Register is present on the site.*	*82*

Statutory and Non-statutory Designated Sites within 5 km of the Project Site				
Site name	**Type**	**Approximate area (ha)**	**Interest Features**	**Distance from site (metres)**
Withy Gill	*SNCI*	*1.21*	*The site is a wetland habitat, comprising wet meadowland, reedbed and open water. The site contains a typical wetland plant community, characteristic of a habitat type that is diminishing in Surrey, and merits protection and conservation as a valuable feature in the landscape. However, the presence of the nationally rare plant Narrow-leaved Water-dropwort (Oenanthe silaifolia), considerably raises the sites importance and thereby the need for its protection.*	*172*
Dukes copse	*SNCI*	*3.3*	*Ancient Semi-natural Woodland with formerly managed Hornbeam (Carpinus betulus) coppice with Oak (Quercus robur) standards.*	*4,370*
Leg of Mutton Wood, The Jordans and Jordans Wood	*SNCI*	*51.35*	*Ancient Semi-natural Woodland with some conifer plantation. 45 ancient woodland indicator species recorded.*	*3,363*
Brook Wood	*SNCI*	*11.84*	*Selected for the Ancient Semi-natural Woodland habitat which covers 11.5 ha and supports at least 25 ancient woodland indicator species. Wild Daffodil (Narcissus pseudonarcissus subsp. pseudonarcissus) a species shown as Locally Rare on the Surrey Rare Plant Register is present on the site.*	*1,791*
Bridgeham Wood	*SNCI*	*4.48*	*The site is selected for its woodland habitat including 2.9 ha of ancient semi-natural woodland and 0.5 ha of ancient re-planted woodland. 36 ancient woodland indicator species have been recorded on the site since 2004.*	*1,030*
Acorn Wood, Cidermill and The Birches	*SNCI*	*14.62*	*Ancient Semi-natural Woodland, Ash (Fraxinus excelsior) frequent with Oak (Quercus robur), overstood Hornbeam (Carpinus betulus) coppice and Field Maple (Acer campestre).*	*3,210*
Wheatfield Marsh	*SNCI*	*1.16*	*Dry woodland, Willow (Salix sp.) scrub and open fen vegetation with Brown Sedge (Carex disticha) present. Selected for the presence of Brown Sedge, a rare plant in Surrey.*	*1,671*
Copper Coin Pond	*SNCI*	*1.22*	*Mesotrophic pond and broad-leaved semi-natural woodland. Relict Unimproved grassland.*	*1,422*
Copper Coin Paddocks	*SNCI*	*1.01*	*Unimproved mesotrophic grassland with small area of improved grassland.*	*1,399*
Charlwood Stanhill Court Meadow	*SNCI*	*8.49*	*The site is selected for its unimproved neutral grassland habitat. 30 species typical of grassland of conservation interest in Surrey have been recorded on the site including four in the draft Surrey Rare Plant Register*	*2,054*
Langshott Wood	*SNCI*	*6.79*	*More than 5 ha of Ancient Semi-natural Woodland habitat with ten ancient woodland indicator species recorded.*	*1,722*

Abbreviations used in Table 3.2.1: SSSI: Site of Special Scientific Interest; LNR: Local Nature Reserve; CP: County Park; DRV: Designated Road Verge; LWS: Local Wildlife Site; NP: Not provided; ha: hectare; SAC: Special Area of Conservation; SPA: Special Protection Area; SNCI: Site of Nature Conservation Interest. Records in italic are not up to date, as they were provided by Surrey Biodiversity Information Centre in 2016.

Table 3.2.2: European Designated Sites within 30 km of the Project Site, Designated for Bats

Statutory and non-statutory designated sites within 5 km of the Project site				
Site name	**Type**	**Approximate area (ha)**	**Interest Features**	**Distance from site (metres)**
The Mens	SAC	203.28	The site is designated under article 4(4) of the Directive (92/43/EEC) as it hosts barbastelle bat Barbastella barbastellus, which is listed in Annex II.	25,000
Ebernoe Common	SAC	234.93	A maternity colony of barbastelles *Barbastella barbastellus* utilises a range of tree roosts in this area of 91A0 Old sessile oak woods with Ilex and Blechnum in the British Isles, which has a dense understorey of holly *Ilex aquifolium* as well as open glades and open water. Maternity roost sites are usually in dead tree stumps, but the species appears to be present throughout the year, with individuals utilising a range of roost sites in tree holes and under bark.	29,000

Statutory and non-statutory designated sites within 5 km of the Project site				
Site name	**Type**	**Approximate area (ha)**	**Interest Features**	**Distance from site (metres)**
			A maternity colony of bechstein's bat *Myotis bechsteinii* is also associated with this area of 91A0 Old sessile oak woods with *Ilex and Blechnum* in the British Isles. Roosts are mainly in old woodpecker holes in the stems of live mature oak *Quercus petraea* trees.	

Abbreviations used in Table 3.2.2: SAC: Special Area of Conservation

Table 3.2.3: European Designated Sites included in road traffic emissions assessment

Statutory and non-statutory designated sites within 5 km of the Project site				
Site name	**Type**	**Approximate area (ha)**	**Interest Features**	**Distance from site (metres)**
Thames Basin Heaths	SPA	8,274	The site is a composite of remnant heathland and associated habitats spread across Surrey, Hampshire and Berkshire. It is cited for the populations of breeding nightjar *Caprimulgus europaeus*, woodlark *Lullula arborea* and Dartford warbler *Sylvia undata* it supports. The Ockham and Wisley Common SSSI component of the SPA is located directly adjacent to the A3 and J10 of the M25.	24,000
Thursley, Ash, Pirbright and Chobham	SAC	5,154	The site represents a large area of the Annex I habitats Northern Atlantic Wet Heaths with *Erica tetralix*, European Dry Heaths and Depressions on Peat Substrates of the *Rhynchosporion*. It forms part of the Thames Basin Heaths SPA. The Chobham Common SSSI component of this SAC is located adjacent to the M3.	33,800

Abbreviations used in Table 3.2.2: SPA: Special Protection Area; SAC: Special Area of Conservation.

3.3 Records of Protected and Other Notable Species

3.3.1 Protected or notable species refers to any species protected or listed under the following legislation or which is identified as being of nature conservation concern in the lists referred to below.

3.3.2 Protected Species:

- The Conservation of Habitats and Species Regulations 2017, as amended - Schedule 2 (European Protected Species) (Hab Reg Sch2);
- Council Directive 79/409/EEC on the Conservation of Wild Birds (“Birds Directive”) (BDIR) Annex 1;
- Wildlife and Countryside Act 1981 (as amended) (Schedules 1, 5 and 8) (WCA1/WCA5/WCA8); and
- The Protection of Badgers Act 1992 (PBA).

3.3.3 Other Notable Species:

- The Natural Environment and Rural Communities (NERC) Act 2006. Section 41; Habitats and Species of Principal Importance in England (S41);
- UK Biodiversity Acton Plan Priority Species (UKBAP)
- Birds of Conservation Concern 4 UK Red or Amber listed birds (Red or Amber);
- Global Red List (GRL) status – Near Threatened (NT);
- Red listing based on the International Union for Conservation of Nature (IUCN) guidelines – Near threatened (NT), Vulnerable (VU), Endangered (EN), Rare (RA) Critically Rare (CR), Critically Endangered (CE), Possibly Extinct (PE), (excluding Data Deficient and Least Concern); Bird: Breeding (br), non-breeding (nb), Flora: Great Britain (GB), England (ENG);
- rare and scare species not based on IUCN criteria – Nationally Notable (NN), Nationally Notable B (NNB), Nationally Scarce (NS), Nationally Rare (NR);
- Local BAP Species Sussex – LBAP (Sussex);
- Local BAP Species Surrey– LBAP (Surrey);
- local protected species Sussex – Sx PSR; and
- locally rare species Sussex – Sx Rare.

3.3.4 Records of protected and otherwise notable species provided by Sussex Biodiversity Record Centre and Gatwick’s Annual Biodiversity Review 2018 are summarised in the tables below.

3.3.5 Exact locations for species reported as part of Gatwick’s Annual Biodiversity Review, have not been supplied. However, where the report details the area, pond or zone in which the species has been identified, this has been noted in Table 3.3.1. The locations of the areas, ponds and zones detailed within Table 3.3.1 are shown on Figure 3.3.1. All other records are shown on Figures 3.3.2 to 3.3.7. The distances from site reported in Table 3.3.1 are based on grid references with a minimum of six figures. Records with less accurate locations have a ‘X’ for distance within the table. The locations of these records can be seen on Figures 3.3.2 to 3.3.7.

Birds

3.3.6 A total of 51 protected or notable species of bird have been recorded within the search area; these are listed in Table 3.3.1 below and shown on Figure 3.3.2.

3.3.7 The bird records include ten species specially protected under the Wildlife and Countryside Act 1981 (as amended) (WCA) and three protected under the Birds Directive. A total of 12 are listed under Section 41 of the NERC Act (2006) and are UK Biodiversity Action Plan Priority Species.

Mammals

Bats

3.3.8 All bats are European Protected Species and listed under the WCA. Noctule *Nyctalus noctula*, Western Barbastelle *Barbastella barbastellus*, Bechstein’s bat *Myotis bechsteinii*, Soprano Pipistrelle *Pipistrellus pygmaeus* and Brown Long-eared bat *Plecotus auritus* are also Species of Principal Importance in England and UK BAP species.

3.3.9 At least 14 species of bats were recorded within the 10 km search area and a number of records were provided for bats not identified to species level. These could therefore account for other additional species. The bat species recorded are listed in Table 3.3.1 below and shown on Figure 3.3.3.

3.3.10 Common pipistrelle bat species was the most recorded within the search area.

Otter and Dormouse

3.3.11 European otter *Lutra lutra* and hazel dormouse *Muscardinus avellanarius* are European Protected Species, protected under the WCA, listed under Section 41 of the NERC Act (2006) and are UK BAP Priority Species.

3.3.12 There are two records of otter within the 10 km search area. Sussex Biodiversity Record Centre also reported recent reports of otters on a number of nearby river systems including the Arun, Rother, Wey and Medway. Sussex Biodiversity Record Centre advised that otters reported outside of the search area may travel into the search area given the dispersal abilities. The species recorded are listed in Table 3.3.1 below and shown on Figure 3.3.4.

Badger

3.3.13 Badger *Meles meles* and their setts are protected under the PBA 1992 which makes it illegal to kill, injure or take badgers or to interfere with a badger sett.

3.3.14 None of the badger record centres contacted (Table 3.1.1) reported any records of badgers within the 2 km search area. However, the Gatwick’s Annual Biodiversity Review 2018 reports records of badger within the 2 km search area.

Other Mammals

3.3.15 One other protected and notable mammal species was recorded within the 2 km search area. The mammal species recorded are listed in Table 3.3.1 below and shown on Figure 3.3.4.

Herptofauna

3.3.16 Eight herpetofauna species have been recorded within the 2 km search area. The species recorded are listed in Table 3.3.1 below and shown on Figure 3.3.5.

3.3.17 Five amphibian species have been recorded within the 2 km search area including great crested newt.

3.3.18 All amphibian species recorded are protected under the WCA. Common toad and great crested newts are also listed under Section 41 of the NERC Act (2006) and great crested newt is a European Protected Species.

3.3.19 Three reptile species have been recorded within the 2 km search area.

3.3.20 All the reptile species recorded are protected under the WCA, listed under Section 41 of the NERC Act (2006) and are UKBAP Species.

Fish

3.3.21 Three fish species have been recorded within the 2 km search area. The species recorded are listed in Table 3.3.1 below and shown on Figure 3.3.5.

Invertebrates

3.3.22 A total of 88 invertebrate species have been recorded within 2 km of the search area and a number of records were provided for invertebrates not identified to species level. These could therefore account for other additional species. The species recorded are listed in Table 3.3.1 below and shown on Figure 3.3.6.

3.3.23 Of the invertebrate species listed in Table 3.3.1, 29 are listed under Section 41 of the NERC Act (2006) and are UKBAP Species.

Flora

3.3.24 Forty-three plant species have been recorded within the 2 km search area. The species recorded are listed in Table 3.3.1 below and shown on Figure 3.3.7. The plants protected under the WCA were recorded within the Project site boundary; bluebell and pennyroyal.

Table 3.3.1: Summary of Protected and Notable Species Recorded within 2 km and 10 km of the Project Site.

Summary of Protected and Notable Species Recorded within 2 km and 10 km of the Project Site.					
Common name	**Scientific name**	**Year of most recent record**	**Distance from site (metres)**	**Information Source**	**Conservation status**
Birds					
Lesser Redpoll	*Acanthis cabaret*	2017	X	SBRC	UKBAP, NERC S41, Bird: Red,
Common Sandpiper	*Actitis hypoleucos*	2018	Land East of the Railway Line	Gatwick's Annual Biodiversity Review 2018	Bird: Amber, IUCN VU
Skylark	*Alauda arvensis*	2018	North West Zone	SBRC and Gatwick's Annual Biodiversity Review 2018	NERC S41, UKBAP, Bird: Red
Kingfisher	*Alcedo atthis*	2019	0	SBRC	BDIR1, WCA1, Bird: Amber
Teal	*Anas crecca*	2017	North West Zone	Gatwick's Annual Biodiversity Review 2018	Bird: Amber,
Mallard	*Anas platyrhynchos*	2018	Land East of the Railway Line, North West Zone	SBRC and Gatwick's Annual Biodiversity Review 2018	Bird: Amber, IUCN NTnb
Greylag Goose	*Anser anser*	2016	North West Zone	Gatwick's Annual Biodiversity Review 2018	Bird: Amber,
Meadow Pipit	*Anthus pratensis*	2018	Land East of the Railway Line, North West Zone	Gatwick's Annual Biodiversity Review 2018	Bird: Amber,
Swift	*Apus apus*	2018	Land East of the Railway Line, North West Zone	SBRC and Gatwick's Annual Biodiversity Review 2018	Bird: Amber, IUCN ENbr
Linnet	*Carduelis cannabina*	LERL-2016. NWZ-2018	Land East of the Railway Line, North West Zone	Gatwick's Annual Biodiversity Review 2018	Bird: Red
Black-headed Gull	*Chroicocephalus ridibundus*	2018	Land East of the Railway Line	SBRC and Gatwick's Annual Biodiversity Review 2018	Bird: Amber, IUCN VUbr,
Hawfinch	*Coccothraustes coccothraustes*	2017	Land East of the Railway Line	SBRC and Gatwick's Annual Biodiversity Review 2018	UKBAP, NERC S41, Bird: Red, IUCN ENbr
Stock Dove	*Columba oenas*	2018	Land East of the Railway Line, North West Zone	SBRC and Gatwick's Annual Biodiversity Review 2018	Bird: Amber,
Cuckoo	*Cuculus canorus*	2017	North West Zone	SBRC and Gatwick's Annual Biodiversity Review 2018	NERC S41, UKBAP, Bird: Red,
Mute Swan	*Cygnus olor*	2015	X	SBRC	Bird: Amber
House Martin	*Delichon urbicum*	LERL-2016. NWZ-2018	Land East of the Railway Line, North West Zone	SBRC and Gatwick's Annual Biodiversity Review 2018	Bird: Amber, IUCN VUbr
Lesser Spotted Woodpecker	*Dendrocopos minor*	2009	X	SBRC	NERC S41, UKBAP, Bird: Red, IUCN ENbr
Yellowhammer	*Emberiza citrinella*	2011	X	SBRC	NERC S41, UKBAP, Bird: Red
Reed Bunting	*Emberiza schoeniclus*	2018	North West Zone	SBRC and Gatwick's Annual Biodiversity Review 2018	NERC S41, UKBAP, Bird: Amber
Hobby	*Falco subbuteo*	2017	0	SBRC	WCA1
Kestrel	*Falco tinnunculus*	2018	Land East of the Railway Line, North West Zone	SBRC and Gatwick's Annual Biodiversity Review 2018	IUCN VUbr, Bird: Amber

Summary of Protected and Notable Species Recorded within 2 km and 10 km of the Project Site.

Common name	Scientific name	Year of most recent record	Distance from site (metres)	Information Source	Conservation status
Common Snipe	*Gallinago gallinago*	2018	Land East of the Railway Line, North West Zone	Gatwick's Annual Biodiversity Review 2018	Bird: Amber
Herring Gull	*Larus argentatus*	LERL-2015. NWZ-2017	Land East of the Railway Line, North West Zone	SBRC and Gatwick's Annual Biodiversity Review 2018	Bird: Red, IUCN ENnb
Common Gull	*Larus canus*	2018	0	SBRC	Bird: Amber
Lesser Black-backed Gull	*Larus fuscus*	2017	Land East of the Railway Line	SBRC and Gatwick's Annual Biodiversity Review 2018	Bird: Amber
Nightingale	*Luscinia megarhynchos*	LERL-2018. NWZ-2016	Horleyland Wood, Land East of the Railway Line, North West Zone	SBRC and Gatwick's Annual Biodiversity Review 2018	Bird: Red, IUCN VUbr
Red Kite	*Milvus milvus*	2019	0	SBRC	BDIR1, WCA1, GRL NT
Grey Wagtail	*Motacilla cinerea*	LERL-2018. NWZ-2016	Land East of the Railway Line, North West Zone	SBRC and Gatwick's Annual Biodiversity Review 2018	Bird: Red, IUCN NTbr
Curlew	*Numenius arquata*	2010	1881.580	SBRC	NERC S41, UKBAP, GRL NT, Bird: Red, IUCN EN
House Sparrow	*Passer domesticus*	2016	0	SBRC	NERC S41, UKBAP, Bird: Red
Black Redstart	*Phoenicurus ochruros*	2012	0	SBRC	WCA1, Bird: Red, IUCN ENbr/NTnb
Common Redstart	*Phoenicurus phoenicurus*	2016	Land East of the Railway Line	SBRC and Gatwick's Annual Biodiversity Review 2018	Bird: Amber,
Willow Warbler	*Phylloscopus trochilus*	LERL-2017. NWZ-2018	Land East of the Railway Line, North West Zone	SBRC and Gatwick's Annual Biodiversity Review 2018	Bird:Amber
Marsh Tit	*Poecile palustris*	2018	Land East of the Railway Line, North West Zone	SBRC and Gatwick's Annual Biodiversity Review 2018	Bird: Red, IUCN VUbr
Dunnock	*Prunella modularis*	2018	Land East of the Railway Line, North West Zone	SBRC and Gatwick's Annual Biodiversity Review 2018	Bird: Amber
Bullfinch	*Pyrrhula pyrrhula*	2018	Land East of the Railway Line, North West Zone	SBRC and Gatwick's Annual Biodiversity Review 2018	Bird: Amber
Firecrest	*Regulus ignicapilla*	2017	616.940	SBRC	WCA1
Whinchat	*Saxicola rubetra*	2017	Land East of the Railway Line, North West Zone	Gatwick's Annual Biodiversity Review 2018	Bird: Red, IUCN NTbr
Woodcock	*Scolopax rusticola*	2018	Land East of the Railway Line, North West Zone	SBRC and Gatwick's Annual Biodiversity Review 2018	Bird: Red, IUCN VUbr,
Turtle Dove	*Streptopelia turtur*	2017	North West Zone	SBRC and Gatwick's Annual Biodiversity Review 2018	UKBAP, NERC S41, Bird: Red, IUCN CEbr
Tawny Owl	*Strix aluco*	2018	Land East of the Railway Line, North West Zone	SBRC and Gatwick's Annual Biodiversity Review 2018	Bird: Amber, IUCN NTbr
Starling	*Sturnus vulgaris*	LERL-2018. NWZ-2017	Land East of the Railway Line, North West Zone	SBRC and Gatwick's Annual Biodiversity Review 2018	Bird: Red, IUCN VUbr, UKBAP
Dartford Warbler	*Sylvia undata*	2017	Land East of the Railway Line	Gatwick's Annual Biodiversity Review 2018	BDIR1, WCA1, GRL NT, Bird: Amber, IUCN VUbr

Summary of Protected and Notable Species Recorded within 2 km and 10 km of the Project Site.					
Common name	**Scientific name**	**Year of most recent record**	**Distance from site (metres)**	**Information Source**	**Conservation status**
Greenshank	*Tringa nebularia*	2018	Crawley Sewage Works	Gatwick's Annual Biodiversity Review 2018	WCA1, Bird: Amber
Green Sandpiper	*Tringa ochropus*	2018	Land East of the Railway Line	Gatwick's Annual Biodiversity Review 2018	WCA1, Bird: Amber, IUCN ENbr, IUCN ENnb
Redwing	*Turdus iliacus*	2018	Land East of the Railway Line, North West Zone	Gatwick's Annual Biodiversity Review 2018	WCA1, IUCN CEbr
Song Thrush	*Turdus philomelos*	2018	Land East of the Railway Line, North West Zone	SBRC and Gatwick's Annual Biodiversity Review 2018	UKBAP, NERC S41, Bird: Red
Fieldfare	*Turdus pilaris*	2017	Land East of the Railway Line, North West Zone	Gatwick's Annual Biodiversity Review 2018	WCA1, Bird: Red, IUCN CR(PE)br,
Mistle Thrush	*Turdus viscivorus*	LERL-2018. NWZ-2016	Land East of the Railway Line, North West Zone	SBRC and Gatwick's Annual Biodiversity Review 2018	Bird: Red, IUCN VUbr
Barn Owl	*Tyto alba*	2018	0	SBRC	WCA1
Mammals (Bats)					
Western Barbastelle	*Barbastella barbastellus*	2011	9394.17	SBRC	Hab Reg Sch2, WCA5, NERC S41, UKBAP, GRL NT
Bat sp.	*Chiroptera*	2018	0	SBRC	Hab Reg Sch2, WCA5, NERC S41, UKBAP, GRL NT
Serotine	*Eptesicus serotinus*	2018	Y Lagoon	SBRC and Gatwick's Annual Biodiversity Review 2018	Hab Reg Sch2, WCA5
Myotis Bat	*Myotis*	2018	0	SBRC	Hab Reg Sch2, WCA5, NERC S41, UKBAP, GRL NT
Alcathoe Bat	*Myotis alcathoe*	2016	9394.17	SBRC	Hab Reg Sch2, WCA5
Bechstein's Bat	*Myotis bechsteinii*	2015	0	SBRC	Hab Reg Sch2, WCA5, NERC S41, UKBAP, GRL NT
Brandt's Bat	*Myotis brandtii*	2016	0	SBRC	Hab Reg Sch2, WCA5
Daubenton's Bat	*Myotis daubentonii*	2017	0	SBRC	Hab Reg Sch2, WCA5
Whiskered Bat	*Myotis mystacinus*	2018	Charlwood Park Farmhouse	SBRC and Gatwick's Annual Biodiversity Review 2018	Hab Reg Sch2, WCA5
Natterer's Bat	*Myotis nattereri*	2014	0	SBRC	Hab Reg Sch2, WCA5
Lesser Noctule	*Nyctalus leisleri*	2018	970.99	SBRC and Gatwick's Annual Biodiversity Review 2018	Hab Reg Sch2, WCA5
Noctule Bat	*Nyctalus noctula*	2018	River Mole and/or Rolls Farm, Y Lagoon	SBRC and Gatwick's Annual Biodiversity Review 2018	Hab Reg Sch2, WCA5, NERC S41, UKBAP
Pipistrelle	*Pipistrellus sp.*	2018	0	SBRC	Hab Reg Sch2, NERC S41, WCA5, UKBAP
Nathusius's Pipistrelle	*Pipistrellus nathusii*	2018	0	SBRC	Hab Reg Sch2, WCA5
Common Pipistrelle	*Pipistrellus pipistrellus*	2018	River Mole and/or Rolls Farm	SBRC and Gatwick's Annual Biodiversity Review 2018	Hab Reg Sch2, NERC S41, WCA5
Soprano Pipstrelle	*Pipistrellus pygmaeus*	2018	River Mole and/or Rolls Farm, Brockley Wood, River Mole Corridor	SBRC and Gatwick's Annual Biodiversity Review 2018	Hab Reg Sch2, WCA5, NERC S41, UKBAP
Long-eared sp.	*Plecotus*	2018	1442.86	SBRC	Hab Reg Sch2, WCA5, NERC S41, UKBAP

Summary of Protected and Notable Species Recorded within 2 km and 10 km of the Project Site.

Common name	Scientific name	Year of most recent record	Distance from site (metres)	Information Source	Conservation status
Brown Long-eared Bat	*Plecotus auritus*	2018	River Mole and/or Rolls Farm, Lower Picketts Wood	SBRC and Gatwick's Annual Biodiversity Review 2018	Hab Reg Sch2, WCA5, NERC S41, UKBAP
Mammals					
West European Hedgehog	*Erinaceus europaeus*	2017	0	SBRC	NERC S41, UKBAP
Otter	*Lutra lutra*	2012	0	SBRC	Hab Reg Sch2, WCA5, UKBAP, NERC S41, Sx BAP, Sx PSR
Badger	*Meles meles*	2018	Confidential	Gatwick's Annual Biodiversity Review 2018	PBA
Harvest Mouse	*Micromys minutus*	2016	0	SBRC	NERC S41, UKBAP
Hazel Dormouse	*Muscardinus avellanarius*	2016	0	SBRC	Hab Reg Sch2, WCA5, NERC S41, UKBAP
Amphibians					
Common Toad	*Bufo bufo*	2018	Land East of the Railway Line, North West Zone	SBRC and Gatwick's Annual Biodiversity Review 2018	WCA5, UKBAP, NERC S41
Palmate Newt	*Lissotriton helveticus*	2018	Land East of the Railway Line	SBRC and Gatwick's Annual Biodiversity Review 2018	WCA5
Smooth Newt	*Lissotriton vulgaris*	LERL-2018. NWZ-2014	Land East of the Railway Line, North West Zone	SBRC and Gatwick's Annual Biodiversity Review 2018	WCA5
Common Frog	*Rana temporaria*	2017	Land East of the Railway Line, North West Zone	SBRC and Gatwick's Annual Biodiversity Review 2018	WCA5
Great Crested Newt	*Triturus cristatus*	2018	Pond 3, Pond 4, Charlwood 1	SBRC and Gatwick's Annual Biodiversity Review 2018	Hab Reg Sch2, WCA5, NERC S41,
Fish					
Bullhead	*Cottus gobio*	2015	0	SBRC	Sx Rare
Brown/Sea Trout	*Salmo trutta*	2016	0	SBRC	NERC S41, UKBAP
Brown Trout	*Salmo trutta subsp. fario*	2016	0	SBRC	NERC S41, UKBAP
Reptiles					
Slow-worm	*Anguis fragilis*	2017	Land East of the Railway Line	SBRC and Gatwick's Annual Biodiversity Review 2018	WCA5, NERC S41, UKBAP
Grass snake	*Natrix helvetica*	2018	Land East of the Railway Line, North West Zone	SBRC and Gatwick's Annual Biodiversity Review 2018	WCA5, NERC S41, UKBAP
Common lizard	*Zootoca vivipara*	2015	1526.71	SBRC	WCA5, NERC S41, UKBAP
Invertebrates					
Knot Grass	*Acronicta rumicis*	2016	0	SBRC	NERC S41, UKBAP
A Beetle	*Agabus*	2011	0	SBRC	NNB
A ground beetle	*Anthracus consputus*	2018	Pond 5	SBRC and Gatwick's Annual Biodiversity Review 2018	NNB, NS

Summary of Protected and Notable Species Recorded within 2 km and 10 km of the Project Site.					
Common name	**Scientific name**	**Year of most recent record**	**Distance from site (metres)**	**Information Source**	**Conservation status**
Purple Emperor	*Apatura iris*	2016	North West Zone	SBRC and Gatwick's Annual Biodiversity Review 2018	WCA5, IUCN NT
Lake Pondskater	*Aquarius paludum*	2018	Pond 2	Gatwick's Annual Biodiversity Review 2018	NNB, NS
A Spider	*Araneus angulatus*	2015	0	SBRC	NS
Centre-barred Sallow	*Atethmia centrago*	2014	0	SBRC	NERC S41, UKBAP
An Ant, Bee, Sawfly or Wasp	*Auplopus carbonarius*	2014	0	SBRC	NNB
Dotted Bee-fly	*Bombylius discolor*	2019	0	SBRC	NN, NS
Bulrush Veneer	*Calamotropha paludella*	2013	0	SBRC	NNB
A True Fly	*Callicera aurata*	2018	0	SBRC	IUCN RA, NS
A Beetle	*Cantharis fusca*	2018	0	SBRC	NS
Mottled Rustic	*Caradrina morpheus*	2018	0	SBRC	NERC S41, UKBAP
A True Fly	*Cephalops pannonicus*	2018	X	SBRC	NS
Little Carpenter Bee	*Ceratina cyanea*	2018	Grass slope adjacent to the River Mole, south-west of Brockley Wood	Gatwick's Annual Biodiversity Review 2018	IUCN RA
A True Fly	*Cistogaster globosa*	2018	X	SBRC	IUCN EN
Small Heath	*Coenonympha pamphilus*	2019	Land East of the Railway Line, North West Zone	SBRC and Gatwick's Annual Biodiversity Review 2018	NERC S41, UKBAP, IUCN NT, Sx Rare
Long-winged Cone-head	*Conocephalus fuscus*	2018	0	SBRC	Sx Rare
Downy Emerald	*Cordulia aenea*	2019	0	SBRC	Sx Rare
A True Bug	*Corizus hyoscyami*	2015	0	SBRC	Sx Rare
Oak Lutestring	*Cymatophorina diluta*	2017	0	SBRC	NERC S41, UKBAP, Sx Rare
Small Square-spot	*Diarsia rubi*	2016	0	SBRC	NERC S41, UKBAP, Sx Rare
Small Phoenix	*Ecliptopera silaceata*	2015	0	SBRC	NERC S41, UKBAP, Sx Rare
Dusky Thorn	*Ennomos fuscantaria*	2015	0	SBRC	NERC S41, UKBAP, Sx Rare
Galium Carpet	*Epirrhoe galiata*	2015	0	SBRC	NERC S41, UKBAP, Sx Rare
Dingy Skipper	*Erynnis tages*	LERL-2016. NWZ-2018	NWZ and LERL	SBRC and Gatwick's Annual Biodiversity Review 2018	NERC S41, UKBAP, IUCN VU
Small Red-eyed Damselfly	*Erythromma viridulum*	2013	0	SBRC	Sx Rare
Long-horned Bee	*Eucera (Eucera) longicornis*	2019	Grass slope adjacent to the River Mole, south-west of Brockley Wood	SBRC and Gatwick's Annual Biodiversity Review 2018	NERC S41, UKBAP, NNA
Marsh Grey	*Eudonia pallida*	2018	0	SBRC	Sx Rare
A rove beetle	*Gnypeta ripicola*	2018	Goat Meadow Scrape	Gatwick's Annual Biodiversity Review 2018	NN, Sx Rare
Brimstone	*Gonepteryx rhamni*	2018	Grass slope adjacent to the River Mole, south-west of Brockley Wood	Gatwick's Annual Biodiversity Review 2018	Sx Rare

Summary of Protected and Notable Species Recorded within 2 km and 10 km of the Project Site.

Common name	Scientific name	Year of most recent record	Distance from site (metres)	Information Source	Conservation status
A True Bug	*Grypocoris (Lophyromiris) stysi*	2019	0	SBRC	Sx Rare
Brooklime Weevil	*Gymnetron veronicae*	2018	Pond 4 and Pond 7	Gatwick's Annual Biodiversity Review 2018	NNB
A True Fly	*Gymnosoma rotundatum*	2015	X	SBRC	IUCN RA
A Beetle	*Gyrinus minutus*	2012	0	SBRC	NS
A Beetle	*Gyrinus urinator*	2012	0	SBRC	Sx Rare
Ghost Moth	*Hepialus humuli*	2017	0	SBRC	NERC S41, UKBAP
Adonis' Ladybird	*Hippodamia (Adonia) variegata*	2018	0	SBRC	NNB, Sx Rare
Rustic	*Hoplodrina blanda*	2018	0	SBRC	NERC S41, UKBAP, Sx Rare
Rosy Rustic	*Hydraecia micacea*	2014	0	SBRC	NERC S41, UKBAP, Sx Rare
Lobe-spurred Furrow Bee	*Lasioglossum pauxillum*	2018	Grass slope adjacent to the River Mole, south-west of Brockley Wood	Gatwick's Annual Biodiversity Review 2018	NNA, Sx Rare
Ridge-cheeked Furrow Bee	*Lasioglossum puncticolle*	2018	Grass slope adjacent to the River Mole, south-west of Brockley Wood	Gatwick's Annual Biodiversity Review 2018	NNB, Sx Rare
Brown Tree Ant	*Lasius brunneus*	2015	0	SBRC	NNA, Sx Rare
Shoulder-striped Wainscot	*Leucania comma*	2016	0	SBRC	NERC S41, UKBAP, Sx Rare
White Admiral	*Limenitis camilla*	LERL-2018. NWZ-2017	Land East of the Railway Line, North West Zone	SBRC and Gatwick's Annual Biodiversity Review 2018	NERC S41, UKBAP, IUNC VU, Sx Rare
A Caddis Fly	*Limnephilus binotatus*	2015	0	SBRC	NS, Sx Rare
A True Bug	*Lygus pratensis*	2018	1250.84	SBRC	IUCN RA, NNB
A Caddis Fly	*Lype phaeopa*	2016	0	SBRC	Sx Rare
Loosestrife Flea Beetle	*Lythraria salicariae*	2011	1743.68	SBRC	NNB, NS
Lackey	*Malacosoma neustria*	2018	0	SBRC	NERC S41, UKBAP, Sx Rare
A Spider	*Marpissa muscosa*	2014	0	SBRC	NS
A True Fly	*Merzomyia westermanni*	2018	X	SBRC	NN, Sx Rare
Wainscot Neb	*Monochroa palustrellus*	2018	0	SBRC	NNB
Variegated Mordellid Beetle	*Mordellistena variegata*	2018	Pond 4	Gatwick's Annual Biodiversity Review 2018	NS, Sx Rare
A True Fly	*Myopites inulaedyssentericae*	2018	0	SBRC	IUCN RA, Sx Rare
A hoverfly	*Neoascia interrupta*	2018	Pond 3	Gatwick's Annual Biodiversity Review 2018	NS, NN, Sx Rare
Painted Nomad Bee	*Nomada fucata*	2018	Grass slope adjacent to the River Mole, south-west of Brockley Wood	Gatwick's Annual Biodiversity Review 2018	NNA, Sx Rare
Black-headed Mason Wasp	*Odynerus (Odynerus) melanocephalus*	2014	0	SBRC	NERC S41, UKBAP, NNA

Summary of Protected and Notable Species Recorded within 2 km and 10 km of the Project Site.					
Common name	**Scientific name**	**Year of most recent record**	**Distance from site (metres)**	**Information Source**	**Conservation status**
Black-tailed Skimmer	*Orthetrum cancellatum*	2018	Not provided	Gatwick's Annual Biodiversity Review 2018	Sx Rare
Orange-vented Mason Bee	*Osmia (Chalcosmia) leaiana*	2014	0	SBRC	Sx Rare
Water-pepper Weevil	*Pelenomus waltoni*	2018	Pond 7 and Goat Meadow Scrape	Gatwick's Annual Biodiversity Review 2018	NNB, Sx Rare
A Beetle	*Peltodytes caesus*	2016	0	SBRC	NS, Sx Rare
A Beetle	*Pilemostoma fastuosa*	2018	0	SBRC	NNA, IUCN NT, IUNC RA, Sx Rare
A Beetle	*Platystomos albinus*	2018	0	SBRC	NNB, Sx Rare
Mallow Flea Beetle	*Podagrica fuscicornis*	2018	0	SBRC	NNB, NS
A Beetle	*Polydrusus (Chrysophis) formosus*	2014	1093.90	SBRC	NNA, Sx Rare
A Beetle	*Polydrusus (Eustolus) flavipes*	2013	X	SBRC	NNB, Sx Rare
Grizzled Skipper	*Pyrgus malvae*	2016	North West Zone	SBRC and Gatwick's Annual Biodiversity Review 2018	NERC S41, UKBAP, IUCN VU
Black-headed Cardinal Beetle	*Pyrochroa coccinea*	2014	0	SBRC	NNB, Sx Rare
A Beetle	*Rhantus (Rhantus) frontalis*	2011	0	SBRC	NNB, NS, Sx Rare
A Beetle	*Rhinocyllus conicus*	2013	X	SBRC	NNA, Sx Rare
A True Fly	*Sarcophaga villeneuvei*	2018	X	SBRC	IUCN RA, Sx Rare
White-letter Hairstreak	*Satyrium w-album*	2018	Land East of the Railway Line, North West Zone	Gatwick's Annual Biodiversity Review 2018	WCA5, NERC S41, UKBAP, IUCN EN, Sx Rare
Shaded Broad-bar	*Scotopteryx chenopodiata*	2017	0	SBRC	NERC S41, UKBAP
The Shining Ram's-horn	*Segmentina nitida*	2013	0	SBRC	NERC S41, UKBAP, NS
A True Bug	*Sigara (Sigara) striata*	2017	0	SBRC	NNB, NS
Brilliant Emerald	*Somatochlora metallica*	2014	0	SBRC	IUCN VU, Sx Rare
White Ermine	*Spilosoma lubricipeda*	2016	0	SBRC	NERC S41, UKBAP, Sx Rare
Buff Ermine	*Spilosoma lutea*	2017	0	SBRC	NERC S41, UKBAP, Sx Rare
Long-horned General	*Stratiomys longicornis*	2015	0	SBRC	NS
A Beetle	*Synchita humeralis*	2013	X	SBRC	NNB, NS, Sx Rare
Brown Hairstreak	*Thecla betulae*	2018	Land East of the Railway Line, North West Zone	SBRC and Gatwick's Annual Biodiversity Review 2018	WCA5, NERC S41, UKBAP, IUNC VU, Sx Rare
Feathered Gothic	*Tholera decimalis*	2013	0	SBRC	NERC S41, UKBAP, Sx Rare
Blood Vein Moth	*Timandra comae*	2018	Pond 7	SBRC, Gatwick's Annual Biodiversity Review 2018	NERC S41, UKBAP
Cinnabar	*Tyria jacobaeae*	2018	0	SBRC	NERC S41, UKBAP
A True Fly	*Volucella inanis*	2016	0	SBRC	Sx Rare
Oak Hook-tip	*Watsonalla binaria*	2017	0	SBRC	NERC S41, UKBAP
A Spider	*Zilla diodia*	2013	X	SBRC	Sx Rare
Flora					
Blushing Wood Mushroom	*Agaricus sylvaticus*	2018	1565.42	SBRC	Sx Rare

Summary of Protected and Notable Species Recorded within 2 km and 10 km of the Project Site.

Common name	Scientific name	Year of most recent record	Distance from site (metres)	Information Source	Conservation status
Chives	*Allium schoenoprasum*	2009	1986.89	SBRC	NS
Rooting Bolete	*Boletus radicans*	2016	1774.92	SBRC	Sx Rare
Box	*Buxus sempervirens*	2013	1631.72	SBRC	Sx Rare
Heather	*Calluna vulgaris*	2011	X	SBRC	IUCN NT
Cornflower	*Centaurea cyanus*	2015	0	SBRC	UKBAP, Sx Rare, NERC S41
Crosswort	*Cruciata laevipes*	2014	0	SBRC	IUCN NT
A Fungus	*Entoleuca mammata*	2015	0	SBRC	Sx Rare
Narrow-lipped Helleborine	*Epipactis leptochila*	2009	334.28	SBRC	NS
Broad-leaved Spurge	*Euphorbia platyphyllos*	2011	0	SBRC	Sx Rare
Common Cudweed	*Filago vulgaris*	2009	279.70	SBRC	IUCN NT
Wild Strawberry	*Fragaria vesca*	2013	246.76	SBRC	IUCN NT
A Fungus	*Ganoderma resinaceum*	2018	1662.93	SBRC	Sx Rare
Stinking Hellebore	*Helleborus foetidus*	2009	1234.12	SBRC	NS, Sx Rare
Green Hellebore	*Helleborus viridis*	2011	1994.47	SBRC	Sx Rare
Hawkweed	*Hieracium calcaricola*	2014	1813.15	SBRC	Sx Rare
Yellow-glandular Hawkweed	*Hieracium sabaudum*	2009	1613.03	SBRC	IUCN EN, IUCN NT
Bluebell	*Hyacinthoides non-scripta*	2016	0	SBRC	WCA8
Spangle Waxcap	*Hygrocybe insipida*	2016	1507.39	SBRC	Sx Rare
Crimson Wax-Cap	*Hygrocybe punicea*	2015	1591.25	SBRC	Sx Rare
False Chanterelle	*Hygrophoropsis aurantiaca*	2016	0	SBRC	Sx Rare
Field Pepperwort	*Lepidium campestre*	2016	0	SBRC	IUCN NT
White Dapperling	*Leucoagaricus leucothites*	2014	0	SBRC	Sx Rare
Pipe Club	*Macrotyphula fistulosa var. fistulosa*	2016	0	SBRC	Sx Rare
Welsh Poppy	*Meconopsis cambrica*	2011	X	SBRC	NS, Sx Rare
Alder Bracket	*Mensularia radiata*	2018	1179.55	SBRC	Sx Rare
Corn Mint	*Mentha arvensis*	2014	0	SBRC	IUCN NT
Pennyroyal	*Mentha pulegium*	2010	0	SBRC	UKBAP, IUCN EN, IUCN CR, NS, Sx Rare, WCA8, NERC S41
A Lichen	*Nectriopsis rubefaciens*	2016	0	SBRC	NR
Ivy Broomrape	*Orobanche hederae*	2009	1750.48	SBRC	Sx Rare
Wood-sorrel	*Oxalis acetosella*	2017	0	SBRC	IUCN NT
Oak Toothcrust	*Radulomyces molaris*	2013	X	SBRC	Sx Rare
Lesser Spearwort	*Ranunculus flammula*	2018	0	SBRC	IUCN VU
Creeping Willow	*Salix repens*	2009	1474.44	SBRC	IUCN NT
Sanicle	*Sanicula europaea*	2013	X	SBRC	IUCN NT
Meadow Saxifrage	*Saxifraga granulata*	2016	1881.58	SBRC	Sx Rare
Splitgill	*Schizophyllum commune*	2016	0	SBRC	Sx Rare
Marsh Ragwort	*Senecio aquaticus*	2010	198.76	SBRC	IUCN NT

Summary of Protected and Notable Species Recorded within 2 km and 10 km of the Project Site.					
Common name	**Scientific name**	**Year of most recent record**	**Distance from site (metres)**	**Information Source**	**Conservation status**
Rusty Crust	*Skeletocutis amorpha*	2013	X	SBRC	Sx Rare
Devil's-bit Scabious	*Succisa pratensis*	2013	X	SBRC	IUCN NT
Leafy Brain	*Tremella foliacea*	2017	0	SBRC	Sx Rare
White Knight	*Tricholoma album*	2013	X	SBRC	Sx Rare
Heath Speedwell	*Veronica officinalis*	2012	246.76	SBRC	IUCN NT

All species records provided by Sussex Biodiversity Record Centre (SBRC) are shown on Figures 3.3.1 – 3.3.6. As reported within Gatwick's Annual Biodiversity Review 2018, the areas in which species were reported is shown on Figure 3.3. Abbreviations used in Table 3.3: WCA1 : Wildlife & Countryside Act Schedule 1, part 1; WCA5: Wildlife & Countryside Act Schedule 5; WCA8: Wildlife & Countryside Act Schedule 8; NR: Nationally Rare; NS: Nationally Scarce; NNB: Nationally Notable B; NN: Nationally Notable; NERC S41: Natural Environment & Rural Communities Act Species of Principal Importance; UKBAP: UK Biodiversity Action Plan priority species; Hab Reg Sch2: Conservation of Habitats and Species Regulations 2017 Scheule 2 (European Protected Species); PBA: Protection of Badgers Act 1992; IUCN NT/VU/EN/RA/CR/CE: Red listing based on IUCN guidelines – Near threatened/Vulnerable/ Endangered/Rare/Critically Rare/Critically Endangered; IUCN NT/VU/EN/RA/CR/CE nb/br: Red listing based on IUCN guidelines – Near threatened/Vulnerable/ Endangered/Rare/Critically Rare/Critically Endangered non-breeding/breeding; GRL NT: Global Red List (GRL) status – Near Threatened; BDIR1: Council Directive 2009/147/EC on the Conservation of Wild Birds ("Birds Directive") Annex 1; Birds:Red: Birds of Conservation Concern 4 UK Red listed birds; Birds:Amber: Birds of Conservation Concern 4 UK Amber listed birds; Sx BAP: Sussex Biodiversity Action Plan priority species; Sx PSR: Sussex Protected Species Register; Sx Rare: Locally Rare Sussex; SBRC: Sussex Biodiversity Record Centre.

4 Conclusion

4.1.1 The desk study identified 17 statutory site designations and 21 non-statutory site designations within the search area. They consist of two SACs, one SPA, four SSSIs, seven LNRs, three CPs, 20 LWSs, and one DRV. One LWS was present within the Project site boundary. Two statutory sites of note for their bat populations were also identified beyond the search area, but within 30 km of the site.

4.1.2 The desk study also identified a number of records of protected and notable species. Records were provided for 15 bat species within 10 km of the site.

4.1.3 Two otter records were provided within the 10 km search area. Other mammals including Eurasian badger and hazel dormouse were also recorded within 2 km of the site.

4.1.4 A total of 51 bird species, eight herpetofauna, 56 invertebrate, three fish species and 46 plant species were recorded within the search areas.

4.1.5 Records of protected and notable birds, bats, fish, mammals, herpetofauna, invertebrates and plant species were identified during the desk study from within the Project site boundary.

5 References

Bat Conservation Trust (2016) Bat Surveys for Professional Ecologists: Good Practice Guidelines.

Bicker, R. (2019) Gatwick's Annual Biodiversity Review 2018. Gatwick Airport, Gatwick

Chartered Institute of Ecology and Environmental Management (CIEEM) (2017) *Guidelines for Preliminary Ecological Assessment*. Chartered Institute of Ecology and Environmental Management, Winchester.

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Eaton, M., Aebischer, N., Brown, A., Hearn, R., Lock, L., Musgrove A., Noble D., Stroud, D. and Gregory, R. (2015) Birds of Conservation Concern 4. The population status of birds in the United Kingdom, Channel Islands and Isle of Man. British Birds 108: 708-746.

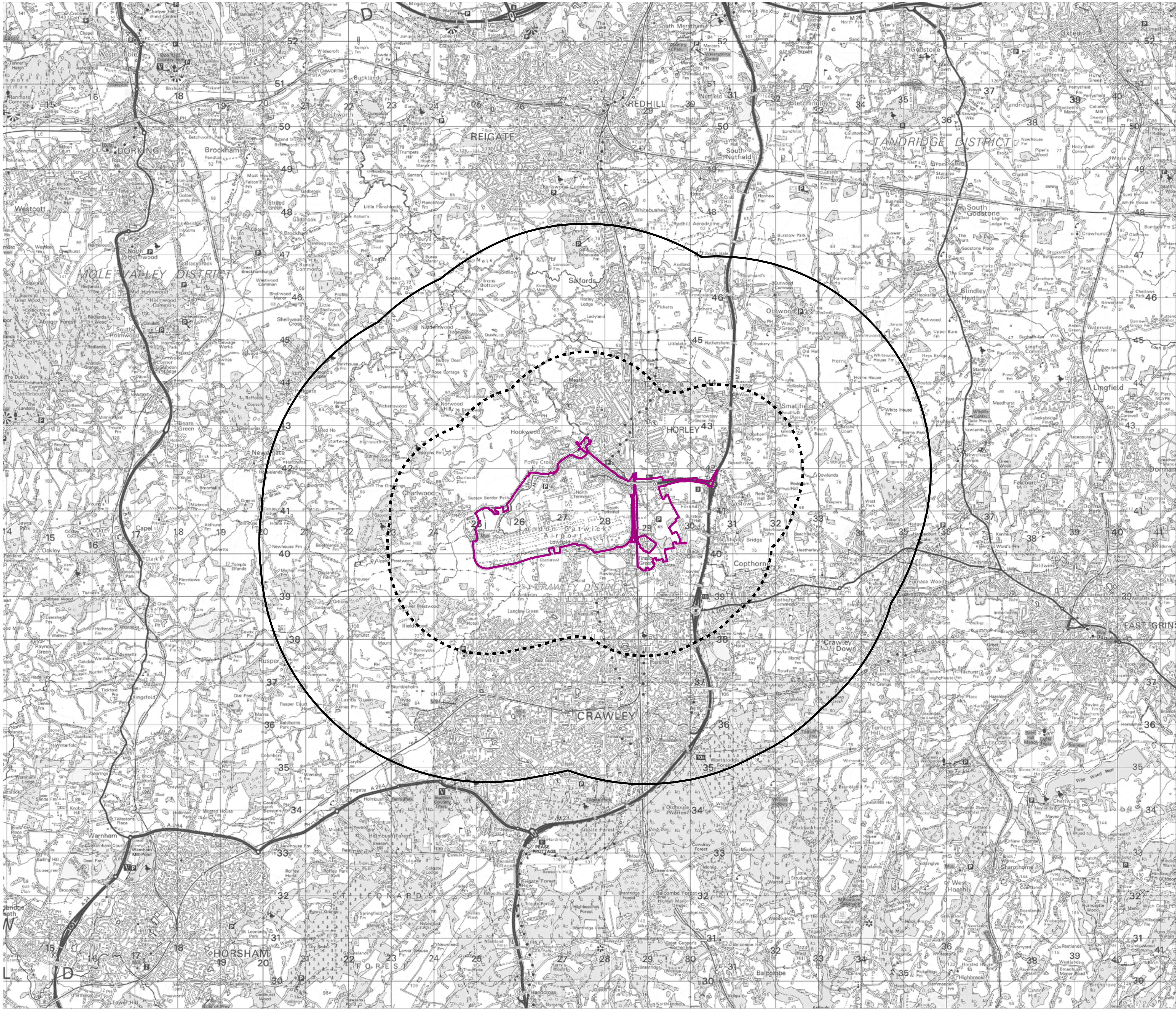
Joint Nature Conservation Committee (JNCC) (2018) Taxon Designations 20180725 Spreadsheet. Joint Nature Conservation Committee, Peterborough.

6 Glossary

6.1 Glossary of Terms

Table 6.1.1: Glossary of Terms

Term	Description
BAP	Biodiversity Action Plan
CE	Critically Endangered
CIEEM	Chartered Institute of Ecology and Environmental Management
CP	County Parks
CR	Critically Rare
DRV	Designated Road Verge
EIA	Environmental Impact Assessment
EN	Endangered
ENG	England
GAL	Gatwick Airport Limited
GB	Great Britain
IUCN	International Union for Conservation of Nature
JNCC	Joint Nature Conservation Committee
LNR	Local Nature Reserve
LWS	Local Wildlife Sites
NERC	Natural Environment and Rural Communities
NN	Nationally Notable
NNB	Nationally Notable B
NNR	National Nature Reserve
NR	Nationally Rare
NS	Nationally Scarce
NT	Near Threatened
PE	Possibly Extinct
PEIR	Preliminary Environmental Information Report
RA	Rare
SAC	Special Area of Conservation
SNCI	Sites of Nature Conservation Importance
SPA	Special Protection Area
SSSI	Site of Special Scientific Interest
UKBAP	United Kingdom Biodiversity Action Plan
VU	Vulnerable
WCA	Wildlife and Country Act



YOUR LONDON AIRPORT
Gatwick

KEY

- Project Site Boundary (PEIR)
- 2km buffer from Project Site Boundary
- 5km buffer from Project Site Boundary

DOCUMENT
Preliminary Environmental Information Report Appendix 9.6.1

DRAWING TITLE
Site Location Plan

DATE
September 2021

ORIENTATION	DRAWING NO.	REVISION
N	FIGURE 1.1.1	For PEIR Issue
	DRAWN BY	PM / CHECKED BY
	CR	AR

SCALE @ A3 1:85,000

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YOUR LONDON AIRPORT
Gatwick

KEY

- Project Site Boundary (PEIR)
- 15km buffer from Project Site Boundary
- 5km buffer from Project Site Boundary
- Site of Special Scientific Interest
- Special Protection Area
- Special Area of Conservation
- Local Nature Reserve
- Ancient Woodland
- Country Park

Source:
Natural England

DOCUMENT
Preliminary Environmental Information Report
Appendix 9.6.1

DRAWING TITLE
Statutory Designated Sites

DATE
September 2021

ORIENTATION	DRAWING NO.	REVISION
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	DRAWN BY	PM / CHECKED BY
	CR	LM

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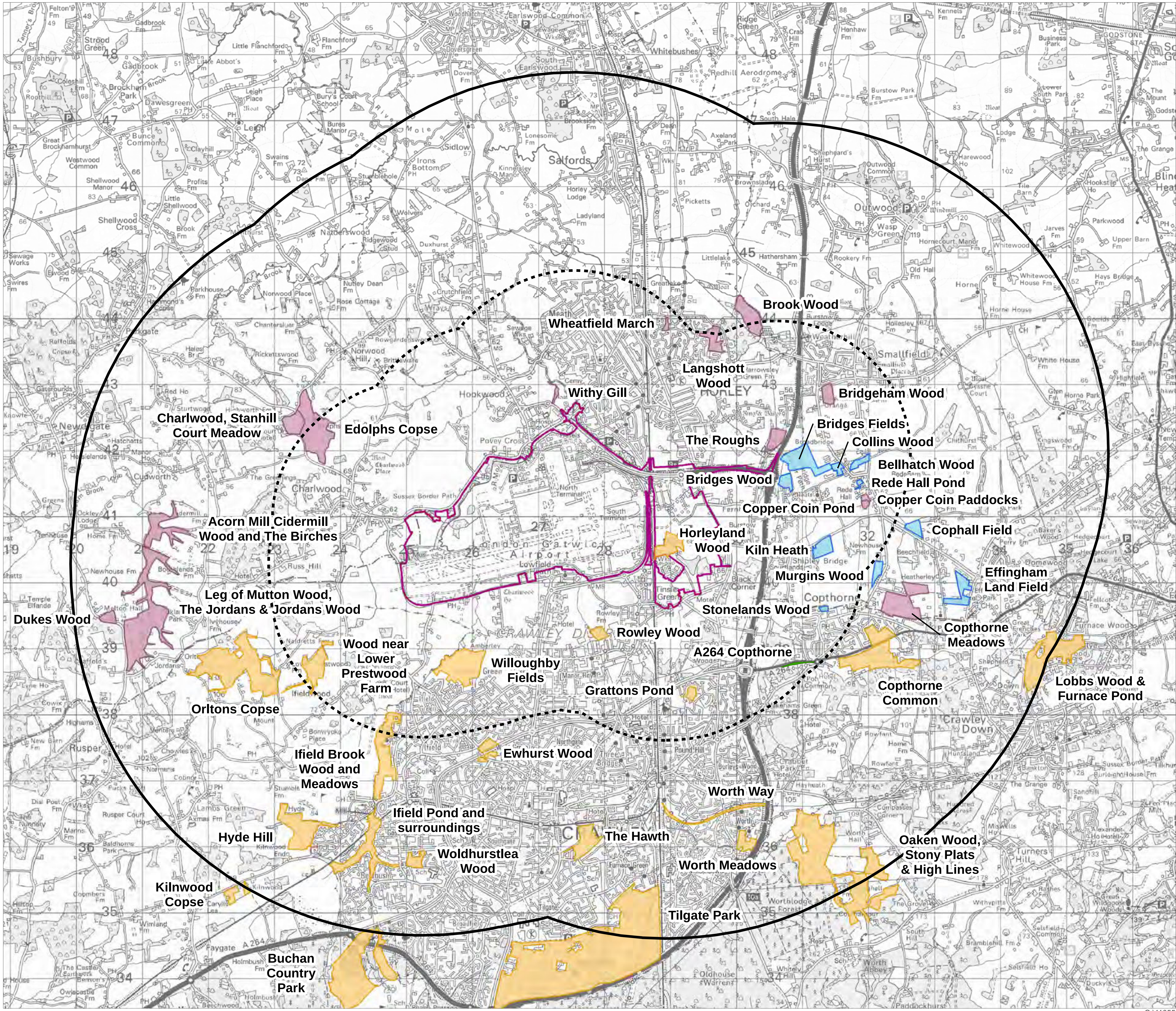

YOUR LONDON AIRPORT
Gatwick

KEY

- Project Site Boundary (PEIR)
- 2km buffer from Project Site Boundary
- 5km buffer from Project Site Boundary
- Sussex Local Wildlife Site
- A264 Copthorne Designated Road Verge
- Surrey Wildlife Trust SNCI
- Surrey Wildlife Trust pSNCI

Source:
Sussex Biodiversity Record Centre
Surrey Wildlife Trust

DOCUMENT
Preliminary Environmental Information Report Appendix 9.6.1

DRAWING TITLE
Non-statutory Designated Sites

DATE
September 2021

ORIENTATION	DRAWING NO.	REVISION
N	FIGURE 3.2.2	For PEIR Issue
	DRAWN BY	PM / CHECKED BY
	CR/BG	NB

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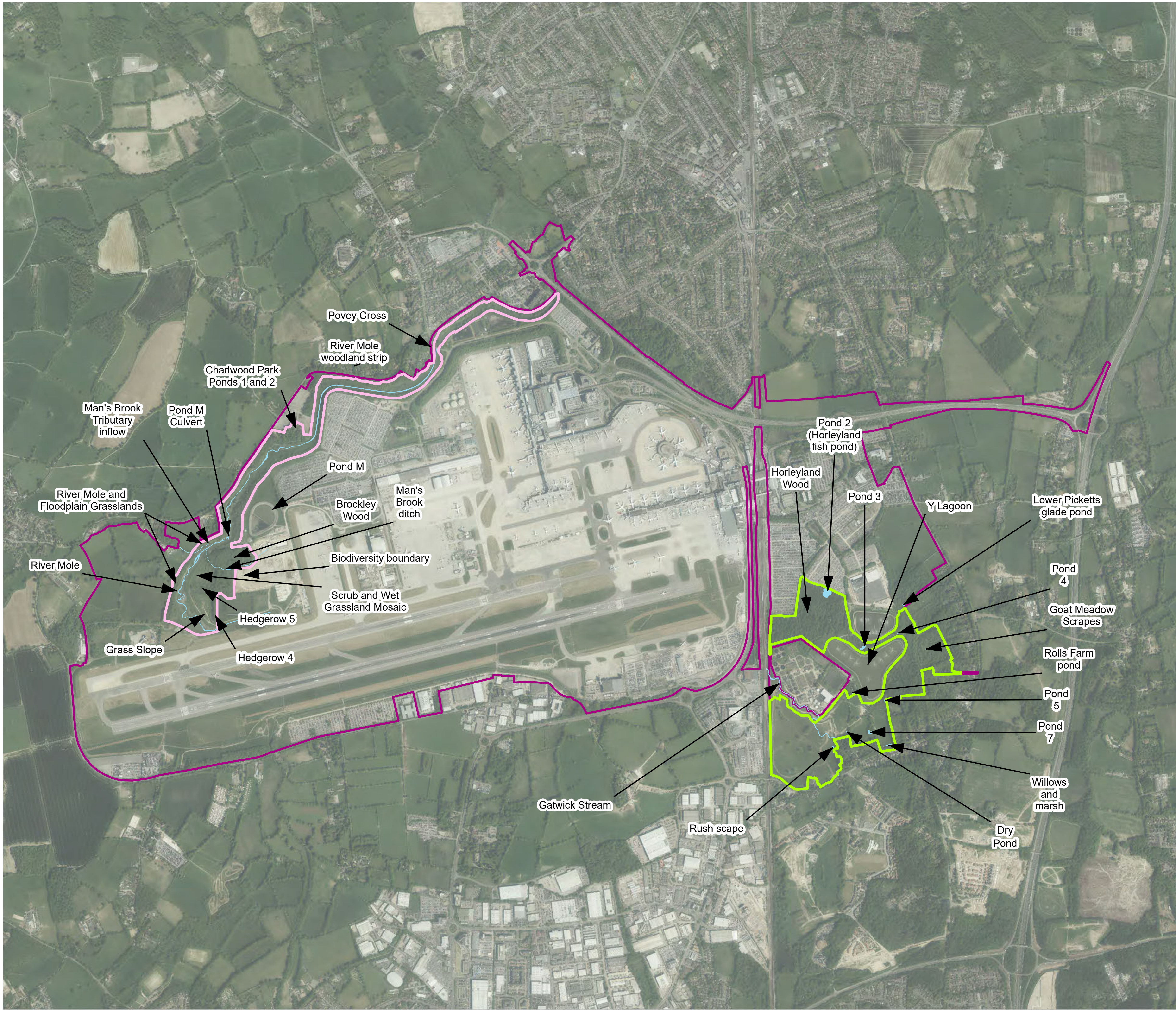

YOUR LONDON AIRPORT
Gatwick

KEY

- Project Site Boundary (PEIR)
- Land East of the Railway Line (LERL)
- North West Zone (NWZ)
- Water Bodies

DOCUMENT
Preliminary Environmental Information Report
Appendix 9.6.1

DRAWING TITLE
Areas Referenced within the Gatwick Annual Biodiversity Review

DATE
September 2021

ORIENTATION	DRAWING NO.	REVISION
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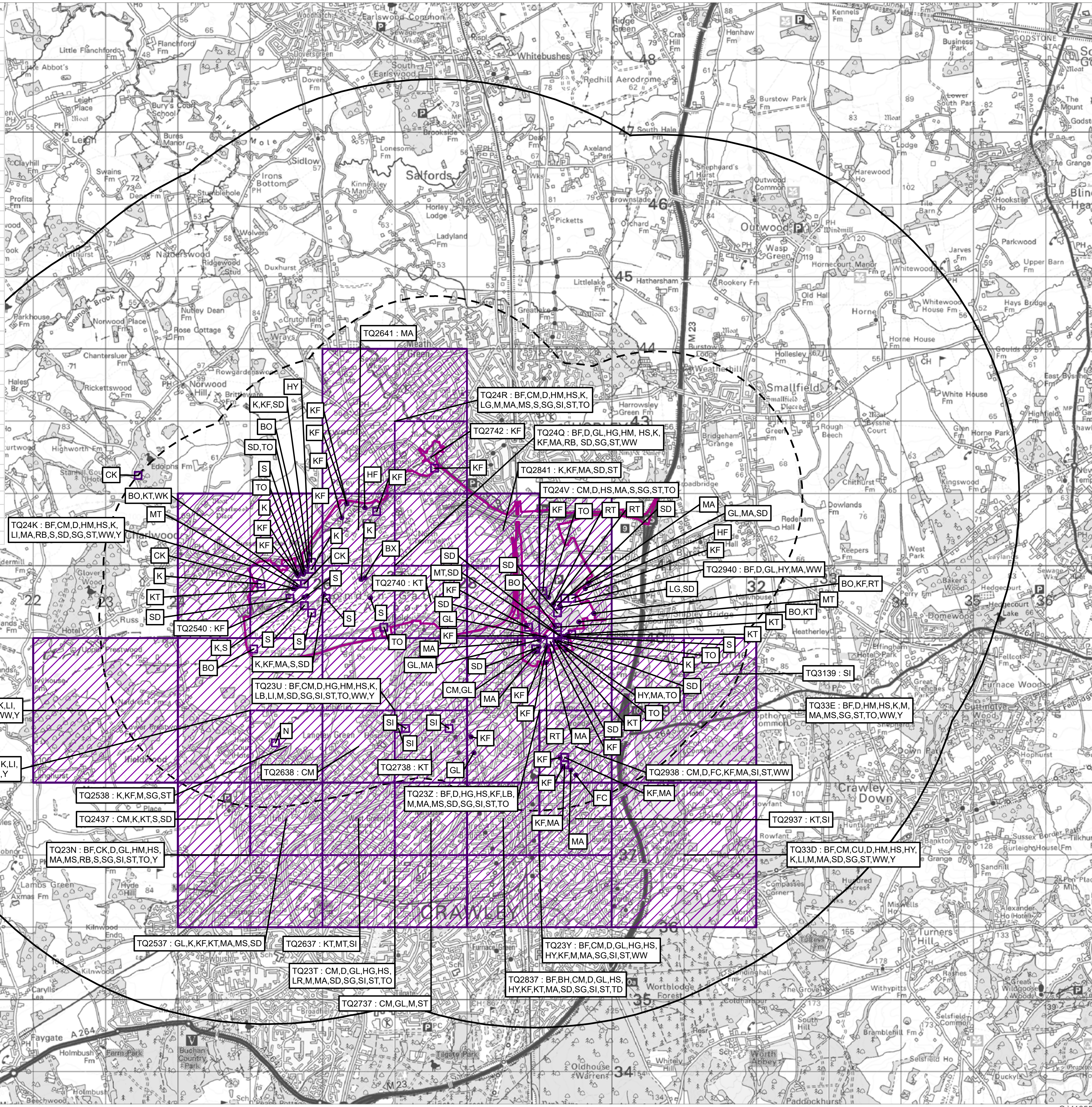

Barn Owl	BO
Black Redstart	BX
Black-headed Gull	BH
Bullfinch	BF
Common Gull	CM
Cuckoo	CK
Curlew	CU
Dunnock	D
Firecrest	FC
Grey Wagtail	GL
Hawfinch	HF
Herring Gull	HG
Hobby	HY
House Martin	HM
House Sparrow	HS
Kestrel	K
Kingfisher	KF
Lesser Black-backed Gull	LB
Lesser Redpoll	LR
Lesser Spotted Woodpecker	LS
Linnet	LI
Little Grebe	LG
Mallard	MA
Marsh Tit	MT
Mistle Thrush	M
Mute Swan	MS
Nightingale	N
Red Kite	KT
Redstart	RT
Reed Bunting	RB
Skylark	S
Song Thrush	ST
Starling	SG
Stock Dove	SD
Swift	SI
Tawny Owl	TO
Turtle Dove	TD
Willow Warbler	WW
Woodcock	WK
Yellowhammer	Y

YOUR LONDON AIRPORT
Gatwick

KEY
- Project Site Boundary (PEIR)
- 2km buffer from Project Site Boundary
- 5km buffer from Project Site Boundary
- Bird records <50m accuracy
- Bird records >50m accuracy

Source:
Sussex Biodiversity Record Centre

DOCUMENT
Preliminary Environmental Information Report
Appendix 9.6.1

DRAWING TITLE
Bird Records

DATE
September 2021

ORIENTATION	DRAWING NO.	REVISION
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	DRAWN BY: CR/BG	PM / CHECKED BY: LM

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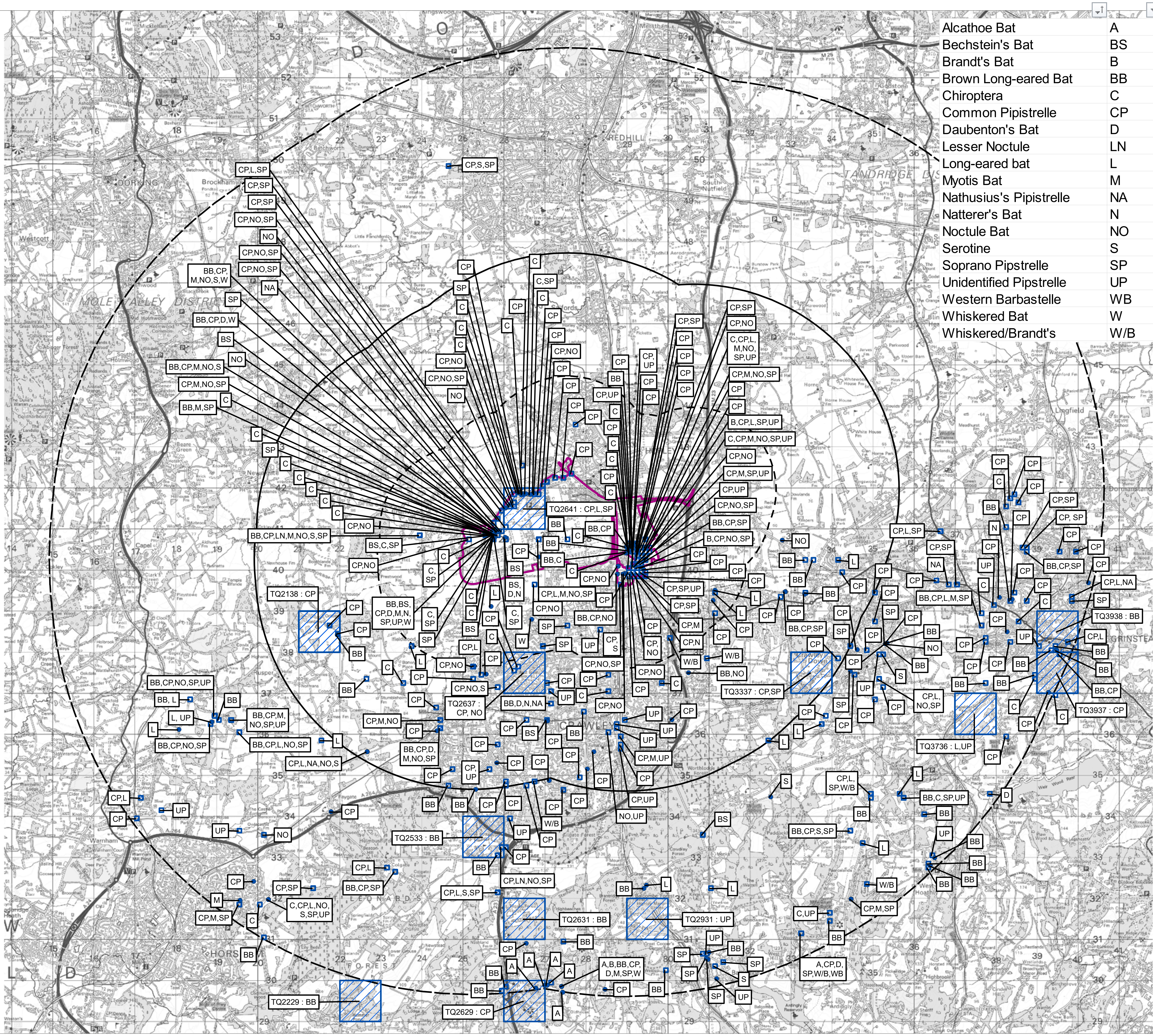

Alcathoe Bat	A
Bechstein's Bat	BS
Brandt's Bat	B
Brown Long-eared Bat	BB
Chiroptera	C
Common Pipistrelle	CP
Daubenton's Bat	D
Lesser Noctule	LN
Long-eared bat	L
Myotis Bat	M
Nathusius's Pipistrelle	NA
Natterer's Bat	N
Noctule Bat	NO
Serotine	S
Soprano Pipstrelle	SP
Unidentified Pipstrelle	UP
Western Barbastelle	WB
Whiskered Bat	W
Whiskered/Brandt's	W/B

YOUR LONDON AIRPORT
Gatwick

KEY

- Project Site Boundary (PEIR)
- 10km buffer from Project Site Boundary
- 5km buffer from Project Site Boundary
- 2km buffer from Project Site Boundary
- Bat Records <50m accuracy
- Bat Records >50m accuracy

Source:
Sussex Biodiversity Record Centre

DOCUMENT
Preliminary Environmental Information Report
Appendix 9.6.1

DRAWING TITLE
Bat Records

DATE
September 2021

ORIENTATION	DRAWING NO.	REVISION
N	FIGURE 3.3.3	For PEIR Issue
	DRAWN BY	PM / CHECKED BY
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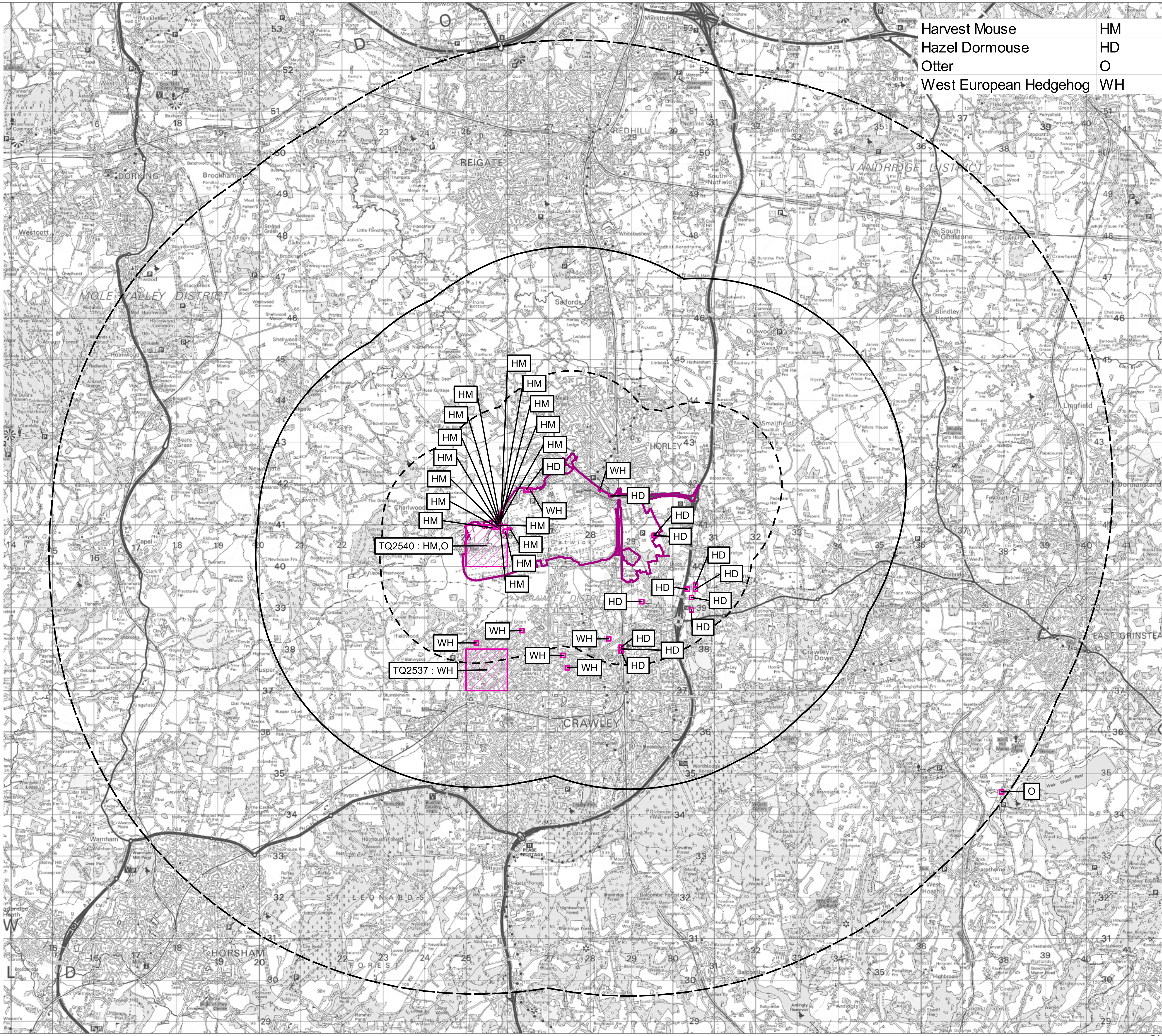

YOUR LONDON AIRPORT
Gatwick

KEY

- Project Site Boundary (PEIR)
- 10km buffer from Project Site Boundary
- 5km buffer from Project Site Boundary
- 2km buffer from Project Site Boundary
- Mammal records <50m accuracy
- Mammal records >50m accuracy

Source:
Sussex Biodiversity Record Centre

DOCUMENT
Preliminary Environmental Information Report Appendix 9.6.1

DRAWING TITLE
Otter, Dormouse and Other Mammal Records

DATE
September 2021

ORIENTATION	DRAWING NO.	REVISION
N	FIGURE 3.3.4	For PEIR Issue
	DRAWN BY: CR	PM / CHECKED BY: LM

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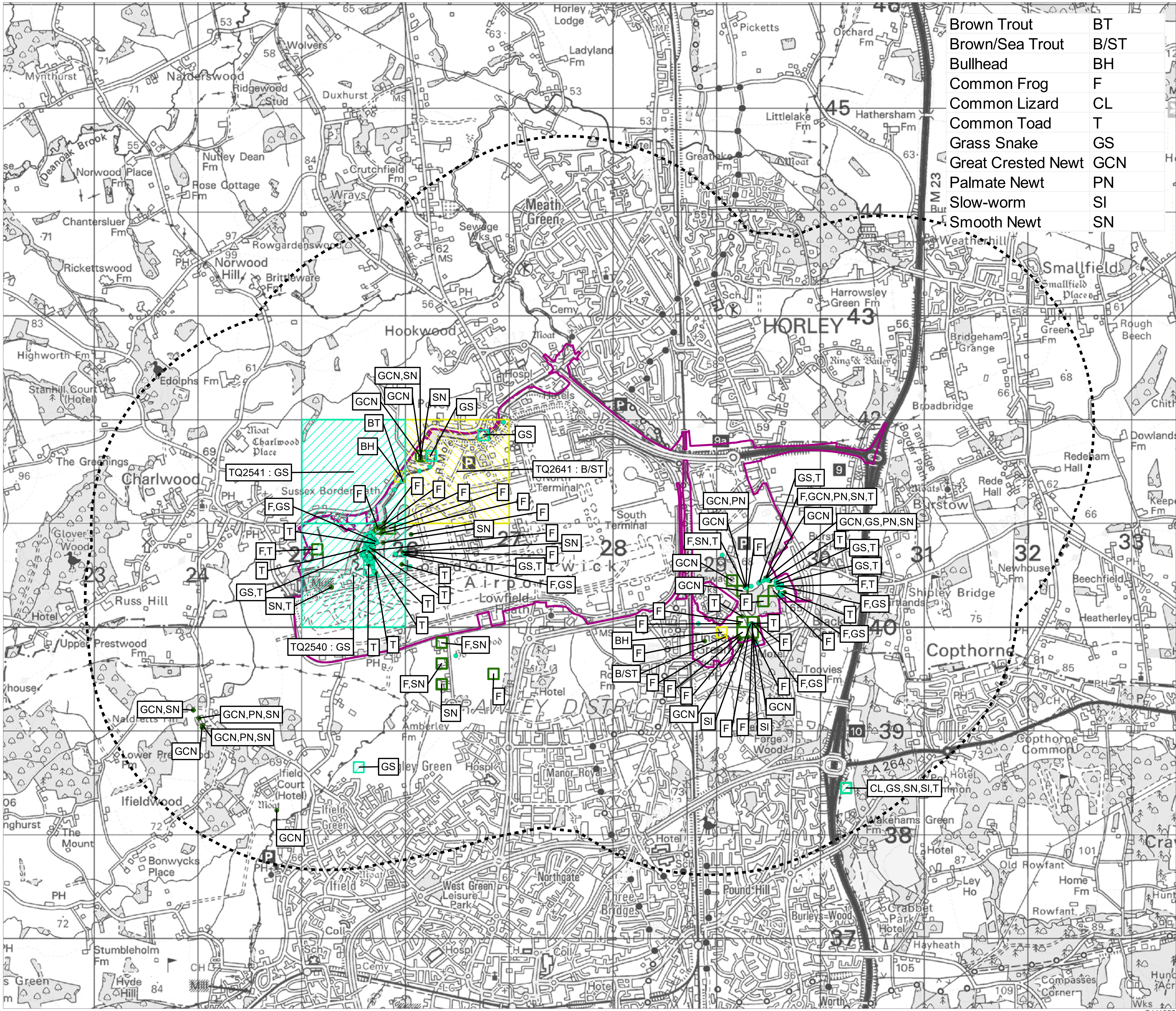

YOUR LONDON AIRPORT
Gatwick

KEY
- Project Site Boundary (PEIR)
- 2km buffer from Project Site Boundary
- Amphibian records <50m accuracy
- Fish - Bony records <50m accuracy
- Reptiles records <50m accuracy
- Amphibian records >50m accuracy
- Fish - Bony records >50m accuracy
- Reptile Species records >50m accuracy

Note:
Individual grass snake records <50m accuracy have not been labelled due to sheer quantity

Source:
Sussex Biodiversity Record Centre

DOCUMENT
Preliminary Environmental Information Report Appendix 9.6.1

DRAWING TITLE
Fish and Herpetofauna

DATE
September 2021

ORIENTATION	DRAWING NO.	REVISION
N	FIGURE 3.3.5	For PEIR Issue
	DRAWN BY	PM / CHECKED BY
	CR	LM

SCALE @ A3 1:35,000
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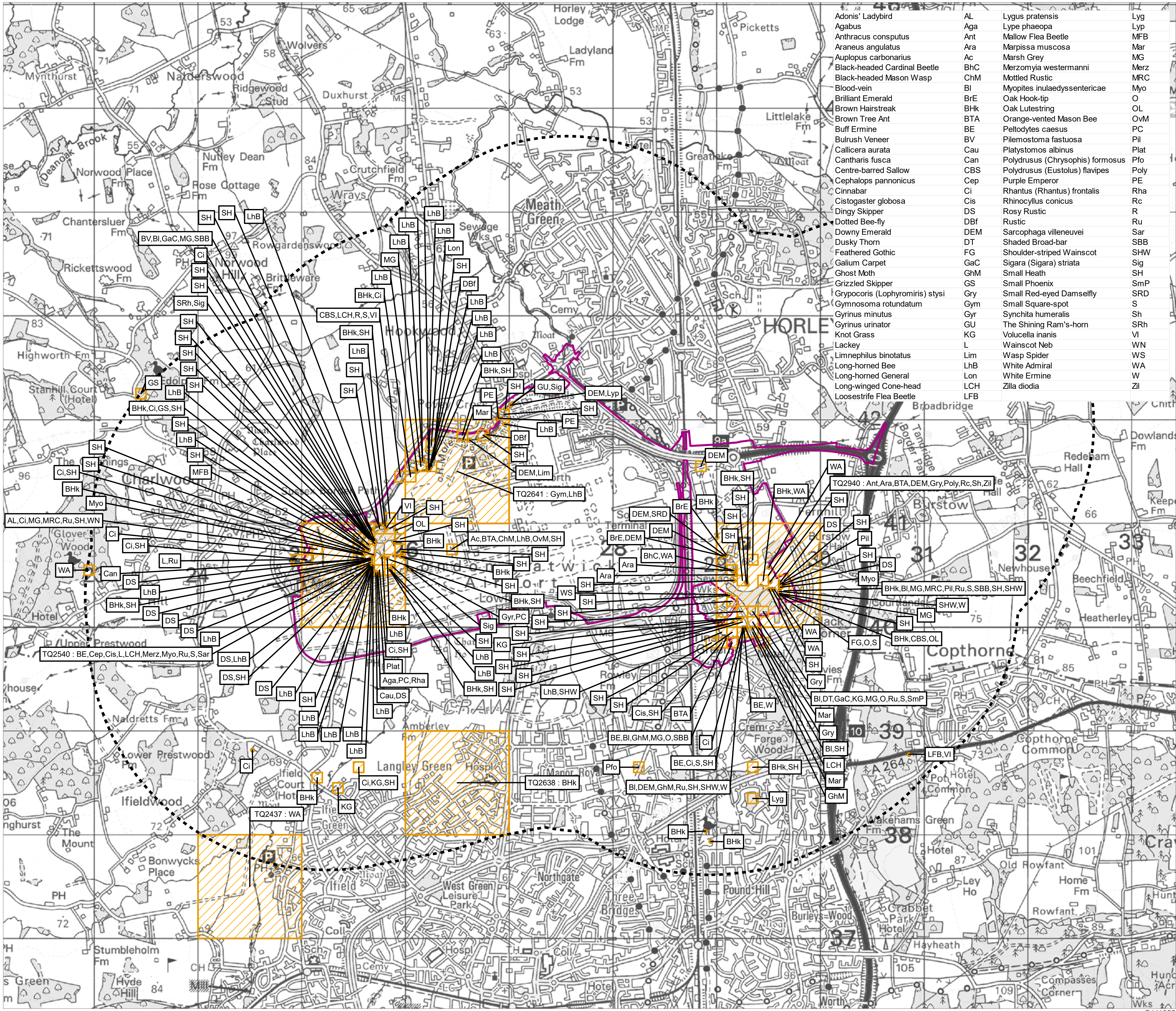

Adonis' Ladybird	AL	Lygus pratensis	Lyg
Agabus	Aga	Lype phaeopa	Lyp
Anthracus consputus	Ant	Mallow Flea Beetle	MFB
Araneus angulatus	Ara	Marpissa muscosa	Mar
Auplopus carbonarius	Ac	Marsh Grey	MG
Black-headed Cardinal Beetle	BhC	Merzomyia westermanni	Merz
Black-headed Mason Wasp	ChM	Mottled Rustic	MRC
Blood-vein	Bl	Myopites inulaedyssentericae	Myo
Brilliant Emerald	BrE	Oak Hook-tip	O
Brown Hairstreak	BHk	Oak Lutestring	OL
Brown Tree Ant	BTA	Orange-vented Mason Bee	OvM
Buff Ermine	BE	Peltodytes caesus	PC
Bulrush Veneer	BV	Pilemostoma fastuosa	Pil
Callicera aurata	Cau	Platystomos albinus	Plat
Cantharis fusca	Can	Polydrusus (Chrysophis) formosus	Pfo
Centre-barred Sallow	CBS	Polydrusus (Eustolus) flavipes	Poly
Cephalops pannonicus	Cep	Purple Emperor	PE
Cinnabar	Ci	Rhantus (Rhantus) frontalis	Rha
Cistogaster globosa	Cis	Rhinocyllus conicus	Rc
Dingy Skipper	DS	Rosy Rustic	R
Dotted Bee-fly	DBf	Rustic	Ru
Downy Emerald	DEM	Sarcophaga villeneuvei	Sar
Dusky Thorn	DT	Shaded Broad-bar	SBB
Feathered Gothic	FG	Shoulder-striped Wainscot	SHW
Galium Carpet	GaC	Sigara (Sigara) striata	Sig
Ghost Moth	GhM	Small Heath	SH
Grizzled Skipper	GS	Small Phoenix	SmP
Grypocoris (Lophyromiris) stysi	Gry	Small Red-eyed Damselfly	SRD
Gymnosoma rotundatum	Gym	Small Square-spot	S
Gyrinus minutus	Gyr	Synchita humeralis	Sh
Gyrinus urinator	GU	The Shining Ram's-horn	SRh
Knot Grass	KG	Volucella inanis	VI
Lackey	L	Wainscot Neb	WN
Limnephilus binotatus	Lim	Wasp Spider	WS
Long-horned Bee	LhB	White Admiral	WA
Long-horned General	Lon	White Ermine	W
Long-winged Cone-head	LCH	Zilla diodia	Zil
Loosestrife Flea Beetle	LFB		

YOUR LONDON AIRPORT
Gatwick

KEY

- Project Site Boundary (PEIR)
- 2km buffer from Project Site Boundary
- Invertebrate records <50m accuracy
- Invertebrate records >50m accuracy

Source:
Sussex Biodiversity Record Centre

DOCUMENT
Preliminary Environmental Information Report Appendix 9.6.1

DRAWING TITLE
Invertebrate Records

DATE
September 2021

ORIENTATION	DRAWING NO.	REVISION
N	FIGURE 3.3.6	For PEIR Issue
	DRAWN BY: CR/BG	PM / CHECKED BY: LM

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Alder Bracket	Ald
Bluebell	Bb
Blushing Wood Mushroom	BWM
Box	Box
Broad-leaved Spurge	BlS
Chives	Ch
Common Cudweed	CCud
Corn Mint	CMi
Cornflower	Crn
Creeping Willow	CW
Crimson Wax-Cap	Cri
Crosswort	C
Devil's-bit Scabious	Spra
Entoleuca mammata	Ent
False Chanterelle	Fal
Field Pepperwort	FPp
Ganoderma resinaceum	Gan
Green Hellebore	GHb
Hawkweed	Humb
Heath Speedwell	Voff
Heather	H
Ivy Broomrape	Ibr
Leafy Brain	LB
Lesser Spearwort	LS
Marsh Ragwort	MR
Meadow Saxifrage	MSx
Narrow-lipped Helleborine	NlH
Nectriopsis rubefaciens	Nec
Oak Toothcrust	OT
Pennyroyal	PR
Pipe Club	PC
Rooting Bolete	RB
Rusty Crust	RC
Sanicle	Seur
Spangle Waxcap	SpW
Splitgill	S
Stinking Hellebore	SHl
Welsh Poppy	WPop
White Dapperling	WD
White Knight	WK
Wild Strawberry	WS
Wood-sorrel	Oace
Yellow-glandular Hawkweed	YH

YOUR LONDON AIRPORT
Gatwick

KEY

Project Site Boundary (PEIR)

2km buffer from Project Site Boundary

5km buffer from Project Site Boundary

Plant and fungi records <50m accuracy

Plant and fungi records >50m accuracy

Source:
Sussex Biodiversity Record Centre

DOCUMENT
Preliminary Environmental Information Report Appendix 9.6.1

DRAWING TITLE
Plant and Fungi Records

DATE
September 2021

ORIENTATION
N

DRAWING NO.
FIGURE 3.3.7

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For PEIR Issue

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SCALE @ A3 1:50,000

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Preliminary Environmental Information Report
Appendix 9.6.2: Ecology Survey Report

September 2021

Table of Contents

1	Introduction	1
2	Methodology	1
3	Results	3
4	Evaluation	24
5	Conclusions	29
6	References	29

1 Introduction

1.1.1 The document forms Appendix 9.6.2 of the Preliminary Environmental Information Report (PEIR) prepared on behalf of Gatwick Airport Limited (GAL). The PEIR presents the preliminary findings of the Environmental Impact Assessment (EIA) process for the proposal to make best use of Gatwick Airport's existing runways (referred to within this report a 'the Project'). The Project proposes alterations to the existing northern runway which, together with the lifting of the current restrictions on its use, would enable dual runway operations. The Project includes the development of a range of infrastructure and facilities which, with the alterations to the northern runway, would enable the airport passenger and aircraft operations to increase. Further details regarding the components of the Project can be found in Chapter 5: Project Description.

1.1.2 This report provides details of ecological surveys undertaken on land within and around Gatwick Airport, Horley, West Sussex to inform the design of the Project, as detailed within Chapter 5: Project Description.

1.1.3 The areas surveyed included the Project site boundary and adjacent areas of potential ecological interest, where access allowed. Where an area is outwith the Project site boundary, this is signposted in the text and shown on the relevant figures.

1.1.4 The ecological surveys for protected or notable habitats or species included:

- Phase 1 habitat surveys;
- National Vegetation Classification (NVC) surveys;
- hedgerow survey;
- breeding bird surveys;
- wintering bird surveys;
- reptile surveys;
- great crested newt Triturus cristatus surveys;
- dormouse Muscardinus avellanarius surveys;
- otter Lutra lutra surveys;
- water vole Arvicola amphibious surveys;
- badger meles meles survey;
- bat roost assessment;
- bat emergence/re-entry surveys;
- bat activity transect surveys;
- bat crossing point surveys;
- bat static/automated surveys;
- terrestrial invertebrate survey;
- aquatic invertebrate survey; and
- fish survey.

1.1.5 Methodologies and results for the latter three are presented in Annexes 5 and 6 of this report.

1.1.6 Additional surveys have also been undertaken for bats, including thermal imaging of bat activity on the runway (to follow for ES), bat trapping and bat tracking (Appendix 9.6.3).

1.1.7 The methodologies and results of these surveys are described and presented within this report.

2 Methodology

2.1 Phase 1 Habitat Surveys

2.1.1 The methodology and habitat descriptions used have been based on the standard Joint Nature Conservation Committee (JNCC) Phase 1 Habitat Survey methodology 'Handbook for Phase 1 Habitat Survey' (JNCC, 2010).

2.1.2 The Phase 1 Habitat Survey was carried out on 18–22 March and 10 & 11 July 2019. The Phase 1 survey covered the area within the Project site boundary and adjacent habitats considered to be of potential ecological interest (Riverside Garden Park, for example).

2.1.3 Habitats identified during the survey were described using the categories set out in the Phase 1 handbook (JNCC, 2010).

2.2 NVC Surveys

2.2.1 A NVC survey was carried out following the methodology and guidelines detailed in the JNCC's NVC User's Handbook (Rodwell *et al*., 2006).

2.2.2 Fieldwork was carried out in April, July and August 2019 by Alex Powell Grad CIEEM (Chartered Institute of Ecology and Environmental Management), a qualified ecologist and botanist. The survey was undertaken during the optimal time for both grassland and woodland botanical surveys.

2.2.3 The survey methodology is detailed in full within Annex 1.

2.3 Hedgerow Surveys

2.3.1 A survey of all hedgerows within the Project site boundary was carried out in accordance with the methodology and guidelines set out in the Hedgerow Survey Handbook (Department for Environment, Food and Rural Affairs (Defra), 2007) to identify Important hedgerows, as defined in the Hedgerow Regulations 1997.

2.3.2 The assessment was carried out on the 5–8 August 2019 by Sam Barker and Alex Powell.

2.3.3 Any protected hedges identified were noted.

2.3.4 The survey methodology is detailed in full within Annex 1.

2.4 Breeding Bird Surveys

2.4.1 The breeding bird survey undertaken was based on a standard territory mapping methodology as outlined in Gilbert *et al*. (1998) and Bibby *et al*. (2000).

2.4.2 This method is based on the principle that the majority of species are territorial during the breeding season. This takes into account birds occupying discrete territories and displaying various behaviours (eg conspicuous song, visual display and periodic disputes with neighbouring individuals), allowing their location and abundance to be estimated.

2.4.3 Surveys for breeding birds were undertaken in spring/summer 2019 with a total of seven survey visits taking place.

2.4.4 The survey area, as shown in Figure 2.4.1, was walked at a slow pace in order to locate and identify all individual birds. Visits were undertaken early in the morning, finishing before midday.

2.4.5 The survey methodology is detailed in full within Annex 1.

2.5 Wintering Bird Surveys

2.5.1 The wintering bird surveys were based on a transect survey methodology as detailed in Bibby *et al*. (2000) and Gilbert *et al*. (1998).

2.5.2 The transect route was selected to include all field boundaries and visit all areas of the Project to within 200 metres, where possible. Visits were undertaken early in the morning.

2.5.3 All bird species were recorded and mapped across the whole Project site area, where accessible.

2.5.4 The survey methodology is detailed in full within Annex 1.

2.6 Reptile Surveys

2.6.1 The reptile survey followed the recommended methodology described in the Herpetofauna Worker's Manual (JNCC, 2003) and Froglife's Surveying for Reptiles (Froglife, 2016).

2.6.2 It was undertaken by experienced ecologists and was conducted within areas of the Project identified as containing the most favourable habitat for reptiles.

2.6.3 Reptiles are best surveyed from April following hibernation until June and then again in September and October.

2.6.4 The survey methodology is detailed in full within Annex 1.

2.7 Great Crested Newts Surveys

2.7.1 Each pond within the Project site boundary was assessed for its potential to support great crested newts, where accessible.

2.7.2 Surveys were undertaken following the advice given in Froglife's 'Great Crested Newt Conservation Handbook' (2001), English Nature's 'Great Crested Newt Mitigation Guidelines' (English Nature, 2001) and the 'Herpetofauna Workers Manual' (Gent and Gibson, 2003).

2.7.3 The survey methodology is detailed in full within Annex 1.

2.8 Dormouse Surveys

2.8.1 A dormouse nest tube survey was undertaken based on methodology and best practice guidelines set out in the dormouse conservation handbook, second edition (Bright, Morris and Mitchell-Jones, 2006).

2.8.2 Survey visits have been undertaken regularly in suitable weather conditions between May and October.

2.8.3 The survey methodology is detailed in full within Annex 1.

2.9 Aquatic Mammal Surveys

Otter Surveys

2.9.1 The otter survey was undertaken on the 13 and 14 May 2019 by suitably experienced ecologists. The survey was loosely based on the methodology described in the Design Manual for Roads and Bridges (DMRB), Volume 10 Section 4, Part 4 (Highways Agency *et al.*, 1999). Whilst it is acknowledged that the DMRB guidance has since been withdrawn and replaced by Volume 10, Section 4, Part 1 (LA 118) (Highways England *et al.*, 2019), no specific methodology in relation to otters has been revised. As such, the methodology contained within the former Volume 10, Section 4, Part 4 (Highways Agency *et al.*, 1999) remains relevant. The methodology was developed for linear schemes which are likely to affect otter habitats or populations but was adopted for this site.

2.9.2 The suitable areas along the River Mole and Gatwick Stream were walked and examined in detail for evidence of the presence of otters in the form of characteristic field signs.

2.9.3 The survey methodology is detailed in full within Annex 1.

Water Vole Surveys

2.9.4 The water vole surveys were carried out on the 13 and 14 May 2019 by suitably experienced ecologists.

2.9.5 The survey was carried out in accordance with guidelines of best practice set out in the water vole Conservation Handbook – Third Edition (Strachan *et al.*, 2011).

2.9.6 The suitable areas along the River Mole were walked and examined in detail for evidence of the presence of water vole in the form of characteristic field signs.

2.9.7 Wherever possible, the banks were inspected on both sides, from the water's edge to the top of the bank.

2.9.8 The survey methodology is detailed in full within Annex 1.

2.10 Badger Surveys

2.10.1 The site was systematically searched for evidence of badgers during walkover surveys. This involved looking for setts, latrines, hairs, footprints, runs, and any other signs of badger activity. Any evidence recorded was mapped.

2.10.2 Further details regarding badger survey methodology and results can be found in confidential Appendix 9.6.4.

2.11 Preliminary Bat Roost Assessment

Buildings

2.11.1 An assessment of the suitability of the buildings for bat roosting potential, within the landside and airside areas of the Project site boundary, was undertaken at the same time as the Phase 1 Habitat Survey.

2.11.2 The survey included a thorough, ground level inspection of the exterior of all accessible buildings and the features of the building listed below were noted:

- type;
- age;
- wall construction, in particular the type of material used;
- form of the roof, in particular the presence of gable ends, hipped roofs etc and the nature and condition of the roof; and
- the general condition of the building.

2.11.3 The methodology is detailed in full within Annex 1.

Trees

2.11.4 Details on the methodology for bat roost assessment of trees is to follow.

2.12 Bat Emergence/Re-entry Surveys

2.12.1 In order to comply with best practice guidelines (Collins, 2016) emergence surveys were carried out on any buildings considered to have bat roosting potential. Surveys were undertaken between May–October 2019. The aim of these surveys was to determine the use of the buildings (if any) by roosting bats, the species assemblage within the Project site boundary and the egress locations of any bats emerging from the buildings.

2.12.2 The methodology is detailed in full within Annex 1.

2.13 Bat Activity Transect Surveys

2.13.1 A total of five transect routes were devised to cover a broad range of the habitat types present on site but focusing on those likely to be of greatest value to bats, including woodland, woodland edges, river corridors and open grassland. Descriptions of each transect can be found in Annex 1.

2.13.2 Each transect was surveyed twice per month between April-October 2019.

2.13.3 The methodology is detailed in full within Annex 1.

2.13.4 In addition, further transects were completed in August to October 2020 within areas not surveyed in 2020. These surveys will be completed in 2021 and reported in the ES.

2.14 Bat Static/Automated Surveys

2.14.1 A total of 11 Elekon Batlogger A units were deployed across the Project site between April-October 2019 for a minimum of five nights. The units were positioned at various locations, in order to sample a broad range of the habitat types present on site but focusing on those likely to be of greatest value to bats.

2.14.2 The methodology is detailed in full within Annex 1.

2.15 Bat Crossing Point Surveys

2.15.1 Crossing Point surveys were undertaken at two locations, River Mole corridor and Riverside Park, in August 2020, September 2020, May 2021 and June 2021.

2.15.2 The full methodology is provided in Annex 1.

2.16 Invertebrate Scoping Survey

2.16.1 The invertebrate scoping survey was carried out by Marcel Ashby and Tristan Bantock, for Colin Plant Associates.

2.16.2 The survey assessed the potential for the Project site to support Species of Principal Importance in England, as defined within Section 41 of the Natural Environment and Rural Communities (NERC) Act 2006, although species included in other conservation categories were also considered. Additional aquatic invertebrate and terrestrial invertebrate surveys are proposed, and this report will be updated with the findings.

2.16.3 The survey report, including methodology in full, is supplied within Annex 4.

2.17 Terrestrial Invertebrate Surveys

2.17.1 Walk-over surveys for terrestrial invertebrates were completed by Ecus Ltd. on six occasions during 2020 – 27 May, 19 June, 22 June, 30 June, 10 September and 14 September 2020. These focused on areas along the River Mole and the Gatwick Stream. On each occasion, the areas were walked by an experienced entomologist who sampled along each transect using sweep netting, a beating tray and stout trowel.

2.17.2 The survey concentrated on the following major groups (orders): Coleoptera (beetles), Diptera (flies), Hemiptera (bugs, froghoppers, etc), Hymenoptera (bees, wasps and ants) and Lepidoptera (butterflies and moths). Some examples of other groups were noted if found.

2.17.3 Samples were collected for later laboratory identification.

2.17.4 The survey report, including methodology in full, is supplied within Annex 5.

2.18 Aquatic Macroinvertebrate Surveys

2.18.1 Following an initial scoping walk-over, 100 m sections of both the River Mole and Gatwick Stream were identified for detailed survey as representative of the site. Three survey visits were undertaken during 2020 by Ecus Ltd.; 4 June, 29 July and 29 September. Samples were collected at each of the sites using the Whalley Hawkes Paisley Trigg (WHPT) method comprising a standard three-minute kick sample using a long-handled pond net with 1 mm mesh size, which was supplemented by a one-minute hand search.

2.18.2 The survey report, including methodology in full, is supplied within Annex 6.

2.19 Fish Survey

2.19.1 Fish surveys were undertaken by Ecus Ltd. using the catch depletion method in order to assess species composition, age structure and to estimate population size. Surveys were undertaken by an accredited electric fishing team comprising three members of staff. Surveys and analysis conformed to the relevant guidance outlined in BS EN 14011:2003 Water Quality: Sampling of Fish with Electricity (British Standards Institute, 2003).

2.19.2 Surveys were undertaken in spring (04 June) and autumn (29 September) 2020 along the same 100 m stretches used for the aquatic invertebrate surveys.

2.19.3 The survey report, including methodology in full, is supplied within Annex 6.

3 Results

3.1 Phase 1 Habitat Surveys

3.1.1 The Gatwick airport site is located on the Sussex/Surrey border, west of the M23 and east of Charlwood. The majority of the site is a working airport comprising large areas of hardstanding associated with the runways and taxiways, buildings including terminals, hangars and other buildings associated with airport activities and well-maintained amenity grassland surrounding the runway, all of these areas were surrounded by security fencing.

3.1.2 Around the main airport the site comprised broadleaved and mixed woodland, neutral semi-improved, poor semi-improved, marshy and improved grassland, scattered and dense scrub, tall ruderal vegetation, running water, areas of standing water, dry ditches, species poor and species rich hedgerows, individual trees, dry ditches, fences, residential and commercial buildings and areas of hardstanding.

3.1.3 The site was divided into eight areas (A1-A8) that were loosely based on land use types and land ownership boundaries.

3.1.4 A description of the habitats identified, within each of the eight areas, during the survey is given below. The locations of each habitat within each survey area are shown on the Phase 1 habitat plan, Figures 3.1.1 and 3.1.2. The locations of ponds are shown on Figure 3.1.3.

3.1.5 A list of target notes is provided in Table 4 in Annex 2 and are referred to within the text. The locations of the target notes are shown of Figures 3.1.1 and 3.1.2.

A1 – Fields to the North and South of M23 for Construction Laydown Plus Link to J9

A1.2 Broadleaved Plantation Woodland

3.1.6 Along the embankments of Airport Way, highway associated planting of trees was present, from the B2036 in the east stretching to the railway boundary in the west. Trees in this area included semi-mature poplar *Populus sp.* around the northern edge of the roundabout, hawthorn *Crataegus monogyna*, pedunculate oak *Quercus robur,* ash *Fraxinus excelsior* and field maple *Acer campestre*.

3.1.7 Scattered through the trees, bramble *Rubus fruticosus* scrub was dense in patches.

3.1.8 In the far eastern end of the M23 spur, part of the junction had been planted with poplar and silver Birch *Betula pendula*, east of the scrub.

A2.1 Dense Scrub

3.1.9 Along the bottom of the southern M23 spur bank, dense bramble scrub over a wooden fence formed the boundary between highway land and the public footpath through the fields south of the road. Within the scrub there was occasional oak and ash saplings growing through the brambles.

3.1.10 Bramble scrub dominated the north western end of the spur road bank.

3.1.11 Directly south the scrub became less dense and the vegetation turned more ruderal with willowherb *Chamerion angustifolium*, taller swards of Yorkshire fog *Holcus lanatus*, thistle *Cirsium sp.* and broad-leaved dock *Rumex obtusifolius*.

A2.2 Scattered Scrub

3.1.12 Five areas of scattered scrub were present around the M23 and the spur road.

3.1.13 In the east, along the M23 scattered scrub was present in the piece of land between the motorway and the northbound slip road. Bramble scrub dominated here with occasional hawthorn and blackthorn *Prunus spinosa*.

3.1.14 On the western half of the junction where the spur meets the motorway, bramble and blackthorn scrub dominated with poor semi-improved grass in places.

3.1.15 In the south east of the M23 spur area, there was a small patch of bramble scrub (TN14) with yorkshire fog, perennial rye-grass *Lolium perenne*, cleavers *Galium aparine*, primrose *Primula vulgaris*, ivy *Hedera helix* and dock also present.

3.1.16 Along the field boundary next to the railway, north of the M23 spur, there was scattered scrub dominated by bramble, field rose and elder.

3.1.17 Along the northern boundary of Airport Way, bramble scrub was interspersed between young and semi-mature trees that was associated with highways planting.

A3.1 Scattered Broadleaved Trees

3.1.18 Within the roundabout that connects the M23 spur to Airport Way and north of the Long Stay South Car Park entrance, several Poplar trees had been planted as ornamental features.

3.1.19 Along the eastern edge of Car Park 'B' a planted treeline between the edge of the car park and the western edge of the public footpath within this area comprised ash, downy birch *Betula pubescens*, silver birch and immature sycamore *Acer pseudoplatanus*. Bramble and ivy were also present.

B2.2 Neutral Semi-improved Grassland

3.1.20 Directly south of the M23 spur road and east of the B2036, one field, with a public footpath going through, was dominated by cock's foot *Dactylus glomerata* and Yorkshire fog. However, there were also a number of herbaceous species throughout the grass including white clover *Trifolium repens*, Cut-leaved cranesbill *Geranium dissectum*, stitchwort *Stellaria sp.*, perennial rye-grass, shining cranesbill *Geranium lucidum*, vetch *Vicia sp.*, buttercup *Ranunculus sp.*, birds-foot trefoil *Lotus corniculatus*, cinquefoil *Potentilla reptans*, dock and pyramidal orchids *Anacamptis pyramidalis*. Bramble also ran through the grass.

B4 Improved Grassland

3.1.21 The improved grassland pasture fields north of the roundabout, east of the B2036 and the pasture fields south of the M23 spur were dominated by yorkshire fog and annual meadow-grass *Poa annua* grass with abundant dandelion *Taraxacum officinale* and occasional spear thistle *Cirsium vulgare*.

F1 Swamp

3.1.22 The area immediately surrounding Pond E11 was dominated by bulrushes creating a swamp habitat.

G1 Standing Water

3.1.23 An artificial attenuation pond (Pond E11) had been created at the eastern end of the spur road. The margins were dominated by bulrushes *Typha sp.* and reeds *Phragmites sp*.

J1.2 Amenity Grassland

3.1.24 Amenity grassland was present within some parts of the central reservation and associated with the roundabout linking the M23 spur and Airport Way.

J2.3.2 Species-poor Hedge with Trees

3.1.25 To the north of the M23 spur road, along the northern boundary of a public footpath, an old hedge with mature trees was present. The hedgerow was an oak and sycamore dominated treeline with a hawthorn hedge running underneath. Field rose *Rosa arvensis* was occasionally present.

3.1.26 A hedge with trees was present along the northern Project site boundary. This was located to the north of the roundabout linking the M23 spur to Airport Way and comprised oak, horse chestnut and copper beech.

J2.4 Fence

3.1.27 Around much of the area wooden fencing was present, mainly along the edge of public footpaths and road boundaries. Along the edge of the railway line and in staff Car Park B more secure metal fencing was used.

J2.6 Dry Ditch

3.1.28 At the time of survey seven field boundary ditches were dry. These ditches were mainly located in the land south of the M23 spur, three of these ran north to south within the improved grassland field. One dry ditch ran east to west along the south embankment of the spur road, one east to west under a treeline south of the neutral semi-improved grassland and one north to south along the east edge of the B2036 Balcombe Road.

3.1.29 One dry ditch was identified north of the spur road in a north to south direction along the western edge of the B2036 Balcombe Road.

3.1.30 No aquatic vegetation was present within the ditches. The two ditches along the B2036 had common nettle *Urtica dioica* and Hogweed *Heracleum sphondylium* growing out of them. The ditches under treelines were also choked with fallen leaf litter.

J4 Bare Ground

3.1.31 Part of the northern highway's embankment had been cleared at the eastern end of the M23 spur. The ground here had been cleared to form a site compound for the M23 Smart Motorway upgrade works.

J5 Other (Hardstanding)

3.1.32 The M23, Airport Way, B2036 and staff Car Park B were all tarmacked surfaces with heavy use.

3.1.33 The main London to Brighton trainline ran north to south between the northern pasture field and staff Car Park B.

A2 – Eastern Car Parking and Associated Surface Water Features

A1.1.1 Semi-natural Broadleaved Woodland

3.1.34 To the south of the Long Stay South Car Park, there was a large area of semi-natural broadleaved woodland that formed the northern portion of Horleyland Wood and Lower Pickett's Wood. These two areas have a similar range of species, with the canopy dominated by oak.

3.1.35 West of Pentagon Field was a large triangular area of woodland, within Long Stay South Car Park. This area of woodland was predominantly on a raised earth bank with ditches around the northern and southern bases. An access track heading east to west split the woodland from a line of trees further north. Blackthorn, yew *Taxus baccata* and bramble scrub covered the eastern and southern banks.

3.1.36 Heading from this woodland south along the western edge of Pentagon Field, the woodland continued until it joined with Lower Pickett's Wood.

A1.1.2 Plantation Broadleaved Woodland

3.1.37 Along the boundaries of the M23 spur strips, woodland had been planted on the bank of the carriageway. These areas spanned from the London to Brighton railway in the west to the B2036 in the East.

3.1.38 Forming the southern boundary and a sizable portion of the western boundary of Pentagon Field, oak and hazel *Corylus avellana* had been planted in rows. The western boundary planting being of older age than the southern boundary plantation.

3.1.39 Throughout Long Stay South car parks, woodland had been planted around remnants of old field boundaries with mature trees incorporated amongst the newer planting.

A3.1 Scattered Broadleaved Trees

3.1.40 Towards the eastern side of Pentagon Field, two isolated, mature oak trees were present.

3.1.41 Semi-mature and mature trees were planted around the roads, car parks and within the roundabout linking Long Stay South Car Park to the M23 Spur road. Trees were planted in small groups over non-native shrubs and amenity grassland.

3.1.42 Further young and mature trees were present throughout the Parking area east of the railway. Some of the tree lines were associated with old field boundaries with mature oak and beech. Some of the younger treelines were present over ornamental shrubs and amenity grassland.

B6 Poor Semi-improved Grassland

3.1.43 To the east of Long Stay South Car Park and west of the B2036, Pentagon Field was a large, open grazed field. The majority of the field was dominated cock's foot and perennial rye-grass. Areas around the eastern boundary and in places through the field were wetter and had rushes *Juncus sp.* and sedges *Carex sp.* colonising.

G1 Standing Water

3.1.44 Wet ditches surrounded the western, northern and eastern boundaries of Pentagon Field. These ditches were on the road and footpath side of the field boundary fences.

3.1.45 Pond G was located within the eastern car parking zone. Ditches that held water were also present around the majority of the car parks.

3.1.46 The majority of the water bodies were associated with flood management and were man made.

3.1.47 The northern most of these water bodies was a man-made holding lake with a barrier across it. The banks were vegetated with willow *Salix sp.,* bulrush and common reed.

3.1.48 A description of the waterbodies can be found in Annex 1.

J1.2 Amenity Grassland

3.1.49 A large area of well kept, regularly mown grassland was identified within the roundabout. This connected the M23 spur to Airport Way.

3.1.50 Areas of shorter managed grass was a regular occurrence within the northern section of ring road south and a further area of grassland in the west of the site, between the railway and Pond F, was also identified as having regular management regime.

3.1.51 Pennyroyal *Mentha pulegium* was found growing within this area of grassland (TN1). Information on this species protected status can be found in Annex 1.

J1.4 Introduced Shrub

3.1.52 Within the parking areas and along some of ring road south, non-native shrubs and hedgerows had been planted in borders. All the shrubs were relatively low in height and well maintained. Due to the non-native planting species within these areas were not recorded.

J2.4 Fence

3.1.53 Around Long Stay South Car Park large metal security fences lined the boundary of GAL owned land and other land ownership boundaries, including highway land and the railway.

J2.8 Earth Banks

3.1.54 The majority of the woodland sections were on raised earth banks. The banks were approximately 1.5 metres high and ranged in width and length.

3.1.55 A larger earth bank (TN2) was identified within a section of woodland, in the east of Long Stay South Car Park. The bank here was approximately 3 metres high and 25 metres x 55 metres.

J3.6 Buildings

3.1.56 A range of building types were identified throughout the wider eastern carparking area. These buildings were associated with commercial practices, hotels, airport car parking and private office blocks. The majority of these were large multi-storey buildings.

J5 Other (Hardstanding)

3.1.57 The majority of the car parks were large open tarmacked areas with walkways and raised planting. The southern and western most car parks had steel multi-storey parking within the associated parking area perimeters.

3.1.58 A raised walkway ran along the western edge of Horleyland Wood connecting the wood to the car parks further north.

A3 – Land East of the Railway Line

A1.1.1 Semi-natural Broadleaved Woodland

3.1.59 Within the biodiversity area there were two distinct areas of semi-natural broadleaved woodland, which included areas of ancient and semi-natural woodland. These two areas are referred to as Horleyland Wood (TN3) and Upper Pickett's Wood (TN4).

3.1.60 Both Horleyland Wood and Upper Pickett's Wood were predominantly oak dominated with beech *Fagus sylvatica*, birch and ash *Fraxinous excelsior* also throughout. The understorey differs between the woodland however with Horleyland Wood have an understorey dominated with bracken *Pteridium aquilinium*. Upper Pickett's Wood had a more diverse woodland understory with species such as wood vens *Geum urbanum*, enchanters nightshade *Circea lutiana* and ground ivy *Glechomoa hederacea* among others.

3.1.61 Located to the south of Upper Pickett's two Notable species; solomon's seal *Polygonatum odoratum* and narrow-lipped helleborine *Epipactis leptochila* was present (TN5), both of which were found within 20 metres of one another and are designated as Nationally Scarce. Bluebell *Hyacynthoides non-scripta* (a Schedule 8 species) were also found throughout the woodland.

3.1.62 South of the biodiversity car park an area of woodland surrounded a field on the western, eastern and southern boundaries. This area was dominated by oak and ash with occasional hawthorn, blackthorn, elder, beech and hazel present.

3.1.63 Little ground flora was present in this area of woodland, but occasional fern species were scattered through the understorey.

A1.1.2 Broadleaved Woodland Plantation

3.1.64 Multiple small areas of plantation woodland were recorded.

3.1.65 The area to the east of Gatwick Stream consisted of willow and alder *Alnus glutinosa* (TN6a).

3.1.66 The area to the south of the Crawley Sewage Treatment works consisted of coppiced hazel (TN6b).

3.1.67 The area located between these two areas consisted of beech (TN6c).

A2.1 Dense Scrub

3.1.68 Areas of scrub dominated by young stands of willow and alder with bramble, were situated throughout the attenuation fields. These stands had been planted between the retained earth banks and were fenced off by a wooden fence.

A3.1 Scattered Broadleaved Trees

3.1.69 Mature oak trees were scattered throughout the attenuation fields and sat upon earth mounds. There exact locations are shown on the phase one habitat plan.

B2.2 Neutral Semi-improved Grassland

3.1.70 The grassland to the south of the biodiversity area and around the perimeter of the attenuation fields were neutral semi improved grassland.

3.1.71 The grassland around the edge of the attenuation fields is herb rich and appears to originate from a seed mix. Here, wild carrot *Daucus carota*, black knapweed *Centurea nigra*, oxeye daisy *Leucanthamum vulgaris* and yellow rattle *Rhianthus minor* are the dominant herbs throughout with timothy grass *Phleum pratense* and false oat-grass *Arrhenatherum elatior* as the dominant grass species. Crested dogs-tail *Cynosurus cristatus* and sweet vernal-grass *Anthoxanthum odouratum* were also frequent throughout.

3.1.72 The northern most fields contained large patches of ruderal species with spear thistle and dock species being the dominant herbaceous species, false oat-grass was the dominant grass species in this area of the fields.

3.1.73 The field to the south of the car park differed in species composition with common bent *Agrostic cappilaris* being the dominant species with grass Vetchling *Lathyrus nissola* and birds-foot trefoil *Lotus corniculatus* the most dominant herbaceous species.

B5 Marsh/Marshy Grassland

3.1.74 The attenuation fields south of Crawley Sewage Treatment Works had a different species composition to that of the raised banks that ran around the perimeter of the area.

3.1.75 Species within the attenuation area was dominated by both hard rush *Juncus inflexus* and soft rush *Juncus effuses* with floating sweet-grass *Glyceria fluitans* and common water-plantain *Alisma plantago-aquatica* frequent within the wetter areas.

3.1.76 The drier areas within the attenuation fields had a varying species composition with graminoid species such as sweet vernal-grass, timothy grass, red fescue *Festuca rubra* and crested dog's-tail abundant throughout.

3.1.77 Forb species such as knapweed, meadow buttercup *Ranunculus acris* and cuckoo flower *Cardamine pratensis* were also frequent throughout the attenuation fields.

3.1.78 Throughout Upper Pickett's Wood were open areas of wet grassland. Young oak was scattered throughout with bramble growing around the edges of the openings. Both soft and hard rush were frequent throughout the grassland with species such as glaucous sedge *Carex flacca*, hairy sedge *Carex hirta*, marsh thistle *Cirsium palustre* and meadowsweet *Filipendula ulmaria* all indicative of marshy habitats. Other species found here were cock's-foot, red fescue and common knapweed among others.

C3.1 Tall Ruderal

3.1.79 Multiple stands of ruderal species were identified across the fields in the biodiversity area.

3.1.80 A long stretch of tall ruderal vegetation ran along the eastern boundary of the rail line. The species here were predominantly a mix of spear thistle and broad-leaf dock.

3.1.81 Within the areas of semi-improved grassland south of the sewage works were multiple areas of ruderal dominant vegetation. These habitats were all similar in species composition with spear thistle, creeping thistle, ragwort *Senecio vulgaris*, burdock *Arctium minor* and various dock species present in varying levels of dominance.

G1 Standing Water

3.1.82 Multiple ponds are present throughout the biodiversity area.

3.1.83 Pond 8N8 was located north of the Old Lagoon and south of New Lagoon. See Annex 2 for the pond reference and description.

3.1.84 The Old Lagoon was located within the biodiversity woodland and formed part of the sewage works. See Annex 2 for the pond reference and description.

3.1.85 Ponds AA20 and AA21 were located within the area of mixed woodland to the south of Upper Pickett's Wood. See Annex 2 for the pond reference and description.

3.1.86 Pond 1WH and NU1 were located to the south of the biodiversity area in a small patch of woodland located along the road to the Crawley Sewage Treatment Works. See Annex 2 for the pond reference and description.

3.1.87 Pond 30P was located within woodland south of Upper Pickett's Wood. See Annex 2 for the pond reference and description.

3.1.88 The locations of the ponds are shown on Figure 3.1.3.

G2 Running Water

3.1.89 The Gatwick Stream ran between the attenuation fields and the neutral grassland to the east. The stream was around 5 meters across and was fast flowing. The banks were steep and covered in vegetation. Himalayan balsam *Impatiens glandulifera,* a Schedule 9 species, was found growing along the banks of the stream.

J1.2 Amenity Grassland

3.1.90 The grassland around the sewage works lagoon was heavily managed and cut short. The species here were predominantly grasses with species like perennial rye-grass being dominant.

J2.4 Fence

3.1.91 The raised banks throughout the attenuation field had a wooden fence around the outside.

3.1.92 The areas of scrub in the attenuation fields had a wooden fence around the outside.

3.1.93 A wooded fence ran along the northern edge of the marshy grassland within the attenuation fields east of the rail line.

3.1.94 A metal security fence ran both sides of the Gatwick Stream between the Crawley Sewage Treatment Works and the attenuation fields east of the railway line. Security fencing also surrounded the Crawley Sewage Treatment Works and around the Old Lagoon and New Lagoon.

J2.8 Earth Banks

3.1.95 Throughout the attenuation fields were retained earth banks. Atop each bank stood a mature oak. The ground flora here differed to that of the surrounding habitat as woodland species such as dog's mercury *Murcuralis perenis* and bracken were present. Other species included fox glove *Digitalis purpurea*, bramble and false oat-grass.

3.1.96 Numerous linear earth banks were also situated throughout the fields to the south of the Crawley Sewage Treatment Works.

J4 Bare Ground

3.1.97 An area of bare ground was identified in the biodiversity area. This was used as a car park by the biodiversity team.

3.1.98 A bare ground path also ran through Upper Picketts Wood, to the east of the Old Lagoon and continued through the woodland.

J5 Other (Hardstanding)

3.1.99 The access road to the Crawley Sewage Treatment works split the biodiversity area into two. The road was tarmacked with treelines down both sides.

A4 – Airside

A1.1.1 Semi-natural Broadleaved Woodland

3.1.100 Crawter's Wood (TN13) was located along the southern boundary of the airside land parcel. The woodland had a high diversity of broadleaved species, the most dominant being sycamore, field maple, birch and ash among others. The ground flora was relatively species poor with a dense mat of ivy covering the ground.

A1.3.2 Mixed Plantation Woodland

3.1.101 To the north of the airside land parcel runs a raised earth bank. This has a ground cover of amenity grassland with mixed planted woodland growing along the bank. The tree species consist of mainly beech and oak with conifers growing throughout.

A2.1 Dense Continuous Scrub

3.1.102 An area of dense scrub was located around Pond FFJ, this was dominated by bramble and young shrubs such as hawthorn and willow.

A2.2 Scattered Scrub

3.1.103 The raised earth bank to the far east of the runway was covered in scattered scrub. Species such as young willow, gorse *Ulex europea*, and oak were scattered throughout with bramble and ruderal species such as sow-thistle *Sonchus sp.* and broad-leaved dock *Rumex obtusifolius* also present.

B6 Poor Semi-improved Grassland

3.1.104 An area of poor semi-improved grassland ran between Crawter's Wood and the amenity grassland associated with the airfield. This section of grassland was much longer with a greater species diversity than that of the amenity grassland areas.

3.1.105 The species here consisted of yorkshire fog, false oat-grass, common bent, cock's foot with flowering species such as white clover, red clover *Trifolium pratense*, thistle, knapweed, hogweed and bird's-foot trefoil.

G1 Standing Water

3.1.106 Pond FFJ was located to the north of the runway near the fire training area. It was surrounded by dense bramble scrub and marginal vegetation such as pond sedge *Carex riparia* and bulrush.

G2 Running Water

3.1.107 Crawter's Brook, a 3 metre wide stream, ran along the southern boundary of the main runway. The banks were regularly cleared of vegetation and the brook dredged. Some marginal vegetation was present in places with himalayan balsam and rushes growing along the bank.

J1.2 Amenity Grassland

3.1.108 The grassland surveyed around the runways was identified as being amenity grassland due to the high levels of management that it undergoes. The grassland was regularly mown to around 10-14 cm with selective herbicide applied.

3.1.109 The grassland was made up of yorkshire fog, false oat-grass, common bent with flowing species such as clover, thistle, hogweed and bird's-foot trefoil.

3.1.110 To the north of airside was a raised bank of well managed amenity grassland with planted trees.

J2.4 Fence

3.1.111 Around the airfield and building associated with the airfield, metal security gates topped with razor wire occurred.

J2.7 Earth Bank

3.1.112 Multiple earth banks were identified in the north west corner of the airfield.

3.1.113 The largest of the banks was dominated by scrub with gorse, bramble, hogweed and young oak as the dominant species.

3.1.114 Multiple smaller banks were also noted, these however were not scrubby in habit with the vegetation being consistent with the amenity grassland.

J3.6 Buildings

3.1.115 A large number of buildings were identified across the airside parcel, one of which was identified as having bat roost potential. All other building descriptions have been left out of the report.

3.1.116 Building D9H was a small single storey brick building with a flat roof that overhangs. A small open window was located on one of the walls.

J5 Other (Hardstanding)

3.1.117 All the runways, taxiways and roads airside were tarmacked and in good condition.

A5 – Non-Airside South and Land East of the Aviation Museum

A1.1.1 Semi-natural Broadleaved Woodland

3.1.118 The strip of woodland that ran between Gatwick Aviation Museum Field and the River Mole was dominated by oak, birch and sycamore with hawthorn and blackthorn understorey. The ground flora was sparse with ivy and bramble being common throughout.

3.1.119 The woodland to the west of the Fire Training Ground was observed to be young woodland with the dominant species being a mixture of birch and sycamore. The understorey was dominated by dense patches of bramble. There was lots of deadwood present throughout the woodland.

3.1.120 Crawter's Wood ran along the southern edge of the site. The species composition here was consistent with that of the woodland along the western side of the River Mole, with a mix of sycamore and oak among others.

A3.1 Scattered Broadleaved Trees

3.1.121 Along the northern perimeter of Car Park X, young willow and alder trees lined a wet ditch.

3.1.122 Lining the emergency access to Car Park X a mature treeline was present either side of the access track. The line was dominated by ash and oak.

3.1.123 Individual oak trees were scattered throughout Car Park X.

3.1.124 Within the land north of the Fire Training Ground there were a number of scattered mature oak trees along an old field boundary, north of the marshy grassland area.

A2.1 Dense/Continuous Scrub

3.1.125 A patch of dense scrub was located around Pond 29A, north east of the Fire Training Ground and west of the River Mole. These areas had long grasses mainly false oat-grass and cock's foot with bramble and young hawthorn growing throughout.

A2.1 Scattered Scrub

3.1.126 There were multiple areas of scrub throughout the land east of the Aviation Museum all predominately dominated by bramble. The areas of scrub were situated along the margins of woodland and are shown on the Phase 1 Habitat plan (Figures 3.1.1 and 3.1.2a – 3.1.2l).

B6 Poor Semi-improved Grassland

3.1.127 The fenced off area to the west and north east of the Fire Training Ground Was a mix of habitat types, a large section of this was semi-improved grassland. The dominant species here were creeping thistle *Circium arvense* and false-oat grass. Hard rush were also frequent throughout the wetter areas.

B4 Improved Grassland

3.1.128 The fields across the land east of the Aviation Museum were consistent with that of improved grassland. The species composition consisted of mainly Yorkshire fog and perennial rye-grass with forbs such as daisy *Bellis perennis* frequent throughout.

B5 Marshy Grassland

3.1.129 An area of marshy grassland was found within the south of the land east of the Aviation Museum. This was seasonally wet with wet depressions throughout. The dominant species was false oat-grass with stands of rushes around the wetter areas. Ruderal species such as common nettle and thistle were also frequent throughout the grassland.

C3.1 Tall Ruderal

3.1.130 A large patch of tall ruderal vegetation dominated by spear thistle and broad-leaved dock was found within the fenced off section west of the Fire Training Ground.

G1 Standing Water

3.1.131 Pond 29A was located between the Gatwick Aviation Museum Field and the River Mole. The pond was man made with steep sides; minimal vegetation was growing within the pond with only a small amount of soft rush.

3.1.132 Pond AVF was located to the south of the Aviation Museum Field. Marginal vegetation surrounded the pond, the dominant species was bulrush.

3.1.133 A wet drainage ditch runs though the secure area to the west of the Fire Training Ground. The species here are typical of wet ground with soft rush and bulrush present.

3.1.134 Pond MHA was located in the south west of Car Park X. The pond was seasonal and held water during wetter times of the year. Woodland and scrub surrounded the pond.

J1.2 Amenity Grassland

3.1.135 Patches of heavily managed short amenity grassland was identified along the southern boundary as grass verges along roads and around car parks. The species were consistent throughout with perennial rye-grass, cock's foot, buttercup, dandelion and dock throughout.

J2.1.1 Native Species-rich Hedge

3.1.136 One hedgerow within the land east of the Gatwick Aviation Museum Field was found to be species rich, it was located along the western boundary of the Project site. This contained hawthorn, blackthorn, dog rose *Rosa canina*, ash, dogwood *Cornus sanguinius* and oak. A hedgerow assessment was carried out and it was found not to be an important hedgerow.

J2.3.2 Species-poor Hedge with Trees

3.1.137 Within the land east of the Gatwick Aviation Museum Field, the majority of hedgerows were found to be species poor. They were predominantly made up of a mix of hawthorn and blackthorn. These hedgerows had mature oak and ash trees scattered throughout the hedgerow, some starting to take over and forming taller hedgerows. Especially along Man's Brook and the hedgerows running south from here.

J2.4 Fence

3.1.138 Poorly kept wooden fences bordered the fields within land east of the Gatwick Aviation Museum Field. Hedges and trees had encroached and caused the fences to be in a state of disrepair.

3.1.139 Around the southern edge of Crawter's Wood, metal security fencing was present.

J5 Other (Hardstanding)

3.1.140 Large areas of hardstanding were recorded throughout car parks and roads across the site.

A6 – The North West Zone, containing the River Mole Corridor and Brockley Wood Biodiversity Area

A1.1.1 Semi-natural Broadleaved Woodland

3.1.141 Brockley wood (TN7), located along the River Mole corridor, between Gatwick airside and the River Mole. The woodland was dominated with oak with birch also being present. The understorey was a mix of species typical of woodland habitats such as ivy, ground ivy and wood avens.

3.1.142 Along the northern bank of the Mole corridor runs a long continuous stretch of semi-natural broadleaved woodland. The species composition changes in dominance throughout with the more dominant species being sycamore, oak, ash, birch, willow. The understorey species consist mainly of hawthorn, dog rose, honeysuckle *Lonicera periclymenum* and bramble. The ground flora varies throughout the woodland with some areas of bare ground. The dominant species throughout the woodland were mainly ground ivy, ivy, common nettle, lords and ladies *Arum maculatum* and wood avens among others.

3.1.143 The woodland along the south of the River Mole was very similar in species composition to that of the woodland to the north. The main difference was the south bank was much more steeply sloping and the addition of black poplar *Populus nigra*.

A1.1.2 Broadleaved Plantation Woodland

3.1.144 The southern embankment of the River Mole flood plain was planted with native broadleaved tree species, after the River Mole realignment to its current course. The planting extends from Brockley Wood in the south to London Road in the north.

3.1.145 The trees have grown and filled in the space creating a dense woodland dominated by oak, silver birch, willow, poplar, hawthorn and blackthorn.

3.1.146 The understorey within this woodland comprised wild garlic *Allium ursinum*, hogweed, broad-leaved dock, bramble, lesser celandine *Ficaria verna*, daffodil *Narcissus sp.*, cuckoo flower, perennial rye-grass, compact rush *Juncus conglomeratus*, blackthorn, willow, small-leaved nettle *Urtica urens,* bulrush, creeping cinquefoil *Potentilla reptans*, dove's-foot crane's-bill *Geranium mole*, cherry laurel *Prunus laurocerasus*, common vetch and *Carex sp.*

A2.1 Dense Continuous Scrub

3.1.147 An area of dense scrub was situated adjacent to Brockley Wood (TN8). The area contained stands of bramble with hawthorn present throughout. Areas of raised banks and ditches ran through this area with rushes growing in the wetter parts. False oat-grass was common throughout as well as thistle.

3.1.148 Areas of dense scrub were present in the field to the north of Longbridge Roundabout, comprising blackthorn, hawthorn and bramble, with occasional elder.

A2.2 Scattered Scrub

3.1.149 Scattered scrub was growing on the banks of a large earth bank, south of Brockley Wood. The species consisted of mainly bramble with young saplings such as willow, oak and hawthorn. false oat-grass, wild carrot and common knapweed were also frequent in the less scrubby areas.

3.1.150 Within the marshy area of Pond C24, scattered willow and alder scrub was growing.

3.1.151 Patchy areas of scattered bramble scrub were present along the eastern bank of the field to the north of Longbridge Roundabout.

A3.1 Scattered Broadleaved Trees

3.1.152 Scattered mature trees were present along the southern, eastern and northern boundaries of the field to the north of Longbridge Roundabout, with species comprising oak, ash, field maple and elder.

A3.3 Mixed Scattered Trees

3.1.153 Within Longbridge Roundabout a mix of semi-mature broadleaved and coniferous trees had been planted. Tree species included oak, silver birch and leylandii.

3.1.154 Around the north west corner of the roundabout, south east of Holiday Inn, coniferous trees lined the eastern side of the amenity grassland, west of the pavement. A single example of a leylandii, a sycamore and a cherry were within the line of conifers.

B2.2 Semi-improved Neutral Grassland

3.1.155 The semi-improved grassland along the mole runs along the south bank. The lower lying areas of grassland contained a higher number of water tolerant species associated with regular flooding.

3.1.156 The grassland had a diverse mix of species, the dominant grass species was tufted hair-grass *Deschampsia cespitosa* which dominated large swards. In areas where this was less dominant, other grasses such as false oat-grass, timothy grass and meadow foxtail *Alopecurus pratensis* were frequent. In these areas the most common forb species were wild carrot, ox-eye daisy, greater bird's-foot trefoil *Lotus pedunculatus* and red bartsia *Odontites vernus*.

3.1.157 Lesser quaking grass *Briza minor* and ragged robin *Lychnis flos-cuculi* were both found within this area. They are both designated as Nationally Scarce and Near Threatened respectively (TN9).

B5 Marshy Grassland

3.1.158 There were multiple areas of marshy grassland present towards the south of the River Mole.

3.1.159 A large area of marshy grassland was located to the south of Brockley Wood (TN10a) (Figure 3.1.2j). The grassland here was seasonably wet and was relatively species poor, dominated with hard rush.

3.1.160 A smaller section of marshy grassland (TN10b) (Figure 3.1.2j) was located to south east of Brockley Wood. The species composition here differed from with the dominant species being common reed. Purple loose-strife *Lythrum salicaria* and thistle are also present throughout.

3.1.161 The southern margins of the River Mole were relatively diverse (TN10c) (Figure 3.1.2j). This area contained a range of species including purple loose-strife, common reed, marsh woundwort *Staccys palustris* and hard rush. Himalayan balsam a Schedule 9 species was also abundant in this area of the River Mole.

3.1.162 There was a small area of marshy grassland situated around Pond C24. The species here were dominated by common reed, bulrush was also present growing in the pond.

B6 Poor Semi-improved Grassland

3.1.163 A small section of poor semi-improved grassland was located around Pond M. The grass here was less diverse than the grassland along the River Mole and appears to be managed more heavily.

3.1.164 Longbridge Roundabout comprised managed grassland and mature trees. Species comprised cock's-foot, ribwort plantain *Plantago lanceolata*, common speedwell *Veronica persica,* dandelion and dock.

3.1.165 To the north of Longbridge Roundabout, a semi-improved field was present. The field was divided into two separate areas; the western half was managed as a paddock for horses, dominated by annual meadow-grass, with occasional dandelion, yorkshire fog, bristly ox-tongue *Helminthotheca echioides*, field speedwell and red clover.

C3.1 Tall Ruderal

3.1.166 The eastern half of the paddock was less frequently managed and comprised a greater variety of ruderal and scrub species such as spear thistle, creeping thistle, oxeye daisy, broadleaved dock, ragwort, buttercup, ribwort plantain, shepherds purse *Capsella bursa-pastoris*, red dead nettle, hogweed, common nettle and cleavers. A large stand of himalayan balsam was present on the southern boundary of the field and adjacent to the River Mole, along the eastern boundary.

F2.2.1 Marginal Vegetation

3.1.167 Marginal vegetation ran along the edge of the River Mole. This was dominated with common reed and bulrush. Himalayan balsam and hemlock water-dropwort *Oenathe crocata* were also occasional along the Mole.

G1 Standing Water

3.1.168 Multiple ponds were present along the River Mole Corridor. See Annex 2 for the pond reference and description. The locations of the ponds are shown on Figure 3.1.3.

3.1.169 Pond A was situated south of Brockley Wood and east of the Fire Training Ground. Pond A was used as an attenuation pond to hold run-off from the airfield.

3.1.170 Pond M was located along the southern boundary of the River Mole. It was situated to the west of the north stay car park and used as a water reservoir.

3.1.171 Pond C24 was located along the northern edge of the River Mole. It was situated within semi-improved grassland.

3.1.172 Pond D was situated along the northern boundary of the River Mole near the Travelodge hotel. Both ponds were used as reservoirs.

3.1.173 Pond AAA4 was located along the northern edge of the River Mole. It was situated within the northern area of semi-natural broadleaved woodland.

G2 Running Water

3.1.174 The River Mole was fast flowing and up to 3 metres wide. It flowed north to south and, within the Mole corridor, had shallow banks with floodplains and marshy grassland areas to the east and woodland with public footpaths to the west.

J1.2 Amenity Grassland

3.1.175 Amenity grassland was identified in multiple areas, it was mainly situated around the reservoirs along the southern side of the River Mole. The grass in these areas was much more heavily managed.

J2.4 Fence

3.1.176 Around the southern edge of Brockley Wood, deer fencing had been erected.

3.1.177 Along the top of the southern section of the River Mole floodplain a wooden fence was present.

J2.8 Earth Bank

3.1.178 South of Brockley Wood and east of the River Mole a large 8 metre tall earth bank was located (TN11). The bank was steep sided with scattered scrub growing over semi-improved grassland.

3.1.179 An earth track led to the top of the bank, which was flat with pooling water in places.

J4 Bare Ground

3.1.180 Areas of bare ground were identified as earth tracks running along the southern section of the River Mole.

J5 Other (Hardstanding)

3.1.181 Areas of hardstanding are located along the River Mole. This included the Long Stay North car parking, parking off Charlwood Road, Perimeter Road North and the bridge spanning the River Mole.

A7 – Non-airside North

A1.1.1 Semi-natural Broadleaved Woodland

3.1.182 Dog Kennel Wood (TN12) was a small area of woodland in the north east of the non-airside north section. Canopy species within this area of woodland was dominated by oak, gorse chestnut *Aesculus Hippocastanum* and sweet chestnut *Castanea sativa.* downy birch, goat willow *Salix caprea*, cherry *Prunus sp.*, ash and yew were also occasionally present within the canopy. The understorey comprised bramble, holly *Ilex aquifolium*, elder, rose, gorse and hazel with nettle, bluebell, dogs mercury, violet *Viola sp.*, daffodil and arum comprised the ground flora.

A2.2 Scattered Scrub

3.1.183 Within the man-made ditches around the western most Long Stay North Car Parks scattered willow and silver birch shrubs dominated the banks. Willow herb was occasionally present.

3.1.184 Along the western most ditch a patch of bramble was identified.

A2.3 Dense Scrub

3.1.185 Bramble had choked the southern ditches between the hedgerows and treelines.

3.1.186 In the south east corner of Long Stay North, a triangle shaped area of dense bramble, elder and hawthorn scrub had grown up around a couple of lines of trees.

A3.1 Scattered Broadleaved Trees

3.1.187 Within the north of Long Stay North, there were three lines of mature trees including oak, lime and horse chestnut.

3.1.188 The southern most of these mature lines formed more of a shorter rectangle area and included beech and ash.

3.1.189 Along the northern side of the southern ditches, within Long Stay North, trees had been planted in rows. Most of the trees were ornamental or non-native and young to semi-mature in age.

3.1.190 Along the western edge of Long Stay North, six mature oak lined the fence.

B6 Poor Semi-improved Grassland

3.1.191 The grassland around the bottom of the Pond M and west of the security fence contained areas of taller less managed grassland with false oat-grass, cock's foot and perennial rye-grass with occasional occurrences of birds-foot trefoil, ragwort, annual meadow-grass and dock.

3.1.192 The banks of the ditches in the west of Long Stay North were managed grassland with occasional bramble growing through.

F2.1 Marginal Vegetation

3.1.193 Within the bottom of Dog Kennel Pond a variety of marginal species dominated the lower banks and pond bed including willow, willowherb, pendulous sedge, water mint, field horsetail, bulrush, teasel, gypsywort *Lycopus europaeus*, soft rush, purple loosetrife *Lythrum salicaria* false fox-sedge *Carex otrubae,* redshank *Persicaria maculosa*, round-fruited rush *Juncus compressus,* common reed, marsh horsetail *Equisetum palustre,* common spike-rush *Eleocharis palustris* and wood club-rush *Scirpus sylvaticus*

G1 Standing Water

3.1.194 Pond M was present north east of Brockley Wood in the west of the non-airside north area. The banks of the pond were well kept grassland.

3.1.195 Dog Kennel Pond was a small manmade attenuation pond with steep banks showing high levels of maintenance. A diverse mix of aquatic and marginal vegetation was found within the pond.

3.1.196 Within the western most Long Stay North Car Park there was a man-made ditch. The ditch was present in the northern third of this area of car park and along the western and southern edge of the car park. The banks were 1 metre high made from crushed stone and tarmac. Less than 25 cm deep water was present, Bulrush dominated the wetter areas.

J1.2 Amenity Grassland

3.1.197 Around the banks of Dog Kennel Pond in the west of the non-airside area was well managed grassland with dominating species of cock's foot, perennial rye-grass, annual meadow-grass, birds-foot trefoil, cut-leaved cranesbill and occasional bristly ox-tongue.

J1.4 Introduced Shrub (Ornamental Planting)

3.1.198 Areas of non-native ornamental planting had been planted within the Long Stay North Car Park.

J2.1.2 Species-poor Hedgerow

3.1.199 Along the southern boundary and some of the ditches native, blackthorn, silver birch, hazel and willow, hedgerows had been left to go patchy.

J2.3.6 Dry Ditch

3.1.200 Dry ditches were present throughout Long Stay North Car Park, these ditches were associated with flood alleviation and were predominantly in the west and south of the Car Park.

3.1.201 All had similar characteristics of being one to 2 metres deep with scattered scrub around the outside. Some had hedgerows and treelines along them as well.

J3.6 Buildings

3.1.202 A range of building types were identified around the northern area of the terminal.

3.1.203 All buildings were associated with airport activity such as offices, terminals and industrial sections of the airport. One building associated with the Police dog kennels was also identified.

J5 Other (Hardstanding)

3.1.204 The north east of the non-airside north area of Gatwick was the Long Stay North car parks and walkways.

3.1.205 A number of roads and access roads were located to the north of the airfield perimeter security fencing that linked Brockley wood in the east to the Airport Way/London Road slipway roundabout in the west. Several service roads and hardstanding linked to the industries around this area were also identified.

3.1.206 South of the new Boeing hangar, a material store for Tarmac was located.

A8 – Riverside Garden Park

3.1.207 Note that the majority of Riverside Garden Park is not included in the Project site boundary but was surveyed during an early phase of the Project. As such, details are provided below for context.

A1.1.1 Semi-natural Broadleaved Woodland

3.1.208 Riverside Garden Park are dominated by semi-natural broadleaved woodland (see Figure 3.1.2I). The woodland was dominated by oak and sycamore with ash, hazel, goat willow, cherry and alder also occurring. Turkish oak *Quercus cerris* was recorded around the lake and along the river in towards the southern edge of the park.

3.1.209 The understorey was dominated by fallen leaves and bramble. Other herb species occurred less frequently including lesser celandine *Ficaria verna*, herb robert *Geranium robertianum*, common nettle, dandelion, yorkshire fog, ivy, cleavers, holly, wild garlic *Allium ursinum*, geranium, lords and ladies, harts tongue *Asplenium scolopendrium*, pendulous sedge *Carex pendula*, lady fern *Dryopteris Felix-femina* and buddleja.

A1.1.2 Broadleaved Plantation Woodland

3.1.210 Where the highway embankment rose to approximately 4 metres high at the southern end of Riverside Garden Park, a mixture of young and semi-mature oak, sycamore, elder, blackthorn, hazel and field maple had been planted. Dog rose was occasional.

A2.1 Dense/Continuous Scrub

3.1.211 Patches of dense and continuous scrub was identified within the Riverside Garden Park survey area. Along the edge of the eastern London Road to Airport Way slip road banking, the most western 300 metres of the bank was continuous bramble and gorse scrub with elder and hawthorn occurring frequently. Ribwort plantain and young hazel were also recorded.

3.1.212 At the north western end of Riverside Garden Park, in the areas where tree cover was limited areas of bramble had colonised. The most prevalent area of scrub was a large section of the western bank of the Gatwick Stream that had become dominated by bramble and hawthorn. Himalayan balsam was also scattered through the scrub along the bank of the Gatwick Stream.

3.1.213 Bramble scrub formed a transitional habitat from woodland to grassland around the margins of some of the open glades, the largest of these areas was around the top of the northern most glade.

3.1.214 A break in the tree cover had allowed brambles to take over and become dense within an old entrance to Riverside Garden Park from London Road.

3.1.215 An area of overgrown bramble and rose dominated part of the southern glade within Riverside Garden Park (TN15) (see Figure 3.1.2I).

3.1.216 Two further areas of dense scrub were identified within an old poorly kept paddock, east of the Gatwick Stream and south of the Riverside Road residential parking area. One area was located along the north eastern boundary of the paddock the other area of scrub was along the top of the eastern bank of the Gatwick Stream.

B6 Poor Semi-improved Grassland

3.1.217 There were several large open areas within the woodland that were managed and mown regularly, these areas were dominated by perennial rye-grass and annual meadow-grass. Other occasional grass species in these areas included rough meadow-grass *Poa trivialis* and sweet vernal-grass. Localised patches of cock's foot, wall barley *Hordium murialis* and meadow foxtail was also present.

3.1.218 Herb species also occurred at varied distributions including white clover, creeping buttercup, creeping thistle, greater plantain, curled dock, spear thistle, dandelion, musk mallow *Malva moschanta*, cow parsley, agrimony *Agrimonia eupatoria*, cut-leaved cranesbill, white dead nettle *Lamium album*, common sorrel *Rumex acetosa*, square-stalked st. john's wort *Hypericum tetrapterum*, Early forget-me-not *Myostis ramossima* and birds-foot refoil.

3.1.219 A track footpath passed through the north of the site, from the car park towards London Road, it acted as a ride as it passed through the woodland and generally had similar characteristics to the open grassland areas with a similar species composition. Some additional localised species were observed here including hedge woundwort *Staccys sylvatica,* dog rose, ribwort plantain, common Selfheal *Prunella vulgaris*, meadowsweet, wood avens and common knapweed.

3.1.220 Several footpaths that had been worn down to areas of bare ground though areas of open grass.

C3.1 Tall Ruderal

3.1.221 Common nettle, cleavers, curled dock, hogweed and willowherb were present in an area along the western bank of the Gatwick Stream in the north of the site. This area was between the northern most glade and areas of continuous scrub further north towards the confluence of the River Mole and Gatwick Stream.

3.1.222 Ruderal vegetation was present on the earth banks surrounding the carpark these were localised to the north west corner and south west corner of the bank, species in these areas included common nettle, dock, hogweed, bindweed, white dead-nettle, white clover, dandelion and buttercup. Burdock was localised to the north west corner of the bank only.

3.1.223 Within the horse paddock east of Riverside Garden Park an area of dock and common nettle ruderal was present along the eastern boundary of the paddock.

G1 Standing Water

3.1.224 A large fishing lake with several wooded islands was located in the centre of the park, the banks of the river were shallow and bare, with occasional aquatic vegetation close to the margins.

G2 Running Water

3.1.225 The Gatwick Stream ran the length of the eastern side of the park. The stream was 3-5 metres wide and steep banked along the majority of its length. The stream was then culverted to the south of the park as it went under the trainline, terminals and airport car parks.

3.1.226 The Gatwick Stream formed a distributary of the River Mole that in the northern most part of the Riverside Garden Park splits from the Mole as the River Mole continues west towards the runways and down the Mole corridor.

3.1.227 Aquatic vegetation associated with the Gatwick Stream included yellow-flag Iris *Iris psudoacorus,* lesser water-parsnip *Berula erecta* and himalayan balsam.

J2.8 Earth Banks

3.1.228 Around the car park earth banks were present on all sides and either side of the car park entrance after the bridge. The banks were dominated by grasses and ruderal vegetation.

J2.3.1 Native Species-rich Hedge with Trees

3.1.229 Along the eastern side of the London Road footpath a planted native hedge dominated hazel, field maple and hawthorn occurred. The planted hedgerow continued from the southern end of the park to approximately halfway along the park boundary. elder and ash was also occasional.

3.1.230 Towards the northern end of the hedgerow mature silver birch were spaced at regular intervals within the hedge.

3.1.231 The hedge was underlined by a mixture of hazel woven and wooden fencing.

J5 Other (Hardstanding)

3.1.232 A tarmac footpath/cycle way around the north-eastern side of Riverside Garden Park. This joined the underpass towards the short stay south carparks and bus station. The cycle way was lined by street lamps at approximately 50-100 metres apart.

3.1.233 West of the park London Road was aligned north to south with an associated footpath on the eastern carriageway. At the southern end of the park, where the slip road rose on an artificial bank, the tarmacked footpath continues south going through an underpass towards Gatwick train station.

J4 Bare Ground

3.1.234 Riverside Garden Park car park was a small rectangular car park, the ground of this was compacted earth and rubble with earth banks surrounding it. A worn-down footpath had been created in the western earth bank.

3.2 NVC Surveys

Site Description

3.2.1 The northern most stretch of the grassy habitat along the southern bank of the River Mole, as shown in the Phase 1 plan (Figures 3.1.1 and 3.1.2a – 3.1.2l), was identified as having a botanically interesting mix of grassland habitats and so a NVC survey was carried out.

3.2.2 The site consisted of multiple grassland habitats depending on the environmental conditions of the soils. In wetter areas such as along the edge of the River Mole and the more low-lying areas large continuous stands of marginal vegetation were dominant. In drier areas the species compositions changed with much more diverse grassland being present. At the upper most reaches the grassland gave way to scrub and woodland.

NVC Categories

S4 – *Phragmites australis* Swamp and Reed-beds

3.2.3 The marginal vegetation along the banks of the River Mole was consistent with the NVC category S4 *Phragmites australis* swamp and reed-beds. S4 is described as having an overwhelming dominance of *P. australis*. This was characteristic of the vegetation along the banks of the River Mole, as *P. australis* was the dominant species and in most cases the only species present.

3.2.4 S4 is described as being a species poor habitat with large continuous stands of *P.australis*, often clonal. *Typha latifolia* was also present in small stand along the River Mole. This was consistent with the S4 NVC community.

3.2.5 S4 shows a strong affinity with that of the habitat on site, as there were large stands of *P.australis* present.

MG9b - *Holcus lanatus – Deschampsia cespitosa* grassland. *Arrhenatherum elatior* Sub-community.

3.2.6 Multiple stands of MG9b *Deschampsia cespitosa* grassland. *Arrhenatherum elatior* sub-community were identified along the Mole corridor. These stands were found to be present on the dryer raised areas of ground.

3.2.7 MG9b is characteristic of permanently moist and periodically inundated soils in British lowlands. It is commonly found on sloping ground in pastures and meadows along water bodies. This matched the habitat surveyed along the stretch of the Mole corridor.

3.2.8 MG9b is described as being dominated by tussocky grasses such as *D. cespitosa*, *H. lanatus, Dactylis glomerata* and *A. elatius.* In shorter areas of vegetation, the species composition varies with *Alopecurus pratensis* and *Agrostis stolonifera* being present. Many forb species were also present such as *Centurea nigra, Ranunculus acris, Lathyrus pratensis* and *Plantago lanceolate*.

3.2.9 The species described were all found on site showing the grassland on site had a good affinity with MG9b.

3.2.10 The species composition within the quadrats observed are detailed within Annex 2.

M27c - *Filipendula ulmaria - Angelica sylvestris* mire. *Juncus effusus – Holcus lanatus* Sub-community.

3.2.11 A small patch of M27c - *Filipendula ulmaria - Angelica sylvestris* mire. *Juncus effusus – Holcus lanatus* sub-community was identified on site. This area was located in a low-lying area that appeared to be a drainage ditch. This NVC community was very localised to the wet ditch so was therefore a result of its construction.

3.2.12 M27c is described as having *F. ulmaria* as a dominant to abundant species. This was not the case with the habitat recorded on site as although it was present (outside of the quadrats) it was not the dominant species. Other species described in M27c were, however, present and matched that described in 'British Plant Communities Vol. 2'. *Juncus effusus, Holcus lanatus, Mentha aquatica* and *Oenanthe crocata* were all present in the stand.

3.2.13 M27c is described as occurring in moist, rich soils protected from grazing, being found across lowland Britain. It is typical of slow-moving streams, dykes and roadside ditches. This fitted the habitat on site as it was found along a low-lying wet ditch.

3.2.14 Although the dominant species does not match the description of M27c, the habitat description, and a large proportion of the less dominant species have a good match. M27c therefore shows an affinity with the habitat on site.

3.2.15 The species composition within the quadrats observed are detailed within Annex 2.

***Calamagrostis epigejos* Society**

3.2.16 Across much of the surveyed area of the Mole corridor were continuous stands of *C. epigejos*. These stands were very species poor and in most cases were pure stands of this one species. When calculating these stands of vegetation using Modular Analysis of Vegetation Information System (MAVIS) no clear NVC community was agreed, and those that were suggested all had low co-efficiency values with the communities not matching that of the habitat on site.

3.2.17 The dominant species *C. epegejos* only appears within the floristic tables for S24, a community of tall herb and fen vegetation. This Category is a better fit than that of the three suggested and better described the habitat found on site. However, the species composition varies significantly with S24 described as species rich.

3.2.18 British Plant Communities Vol. 4 (Rodwell, 1995) describes many areas of swamp and tell herb fen as difficult to classify due to the species poor nature of these habitats. It suggests in cases where they do not fit any particular NVC category instead the area should be grouped and labelled as a society of the dominant species. This approach has been used for these areas of vegetation and the habitat has been labelled *Calamagrostis epigejos* societies.

3.2.19 The species composition within the quadrats observed are detailed within Annex 2. The classification areas are shown on Figure 3.2.1.

3.3 Hedgerow Surveys

3.3.1 None of the hedgerows surveyed comprised important hedgerows.

3.4 Breeding Bird Surveys

3.4.1 A total of 72 species were recorded during the survey of breeding birds in 2019. Of these species, 48 were confirmed to be breeding and three possibly breeding (peregrine, little ringed plover and firecrest).

3.4.2 Table 16 of Annex 2 provides a summary of the breeding and conservation status of the 72 species recorded during the course of the survey, with the numbers of territories identified (or estimated in the case of probable and possible records).

3.4.3 The locations of territories of NERC Act Species of Principal Importance and Birds of Conservation Concern (BoCC) Red or Amber listed species recorded breeding within the survey area are shown in Figures 3.4.1a and 3.4.1b. The location of Annex 1 and/or Schedule 1 species recorded as possibly breeding within the survey area are shown in Figure 3.4.1c.

3.4.4 Further results are detailed within Annex 3.

3.5 Wintering Bird Surveys

3.5.1 A total of 61 species were recorded during the wintering bird surveys undertaken between October 2018 and March 2019. A summary of the species recorded, together with the peak and mean counts of species is provided in Table 18, Annex 2.

3.5.2 Twenty-four species recorded during the surveys meet at least one of a range of criteria relating to conservation importance. These species, and the relevant list of conservation importance, are shown below in Table 19, Annex 2 and their distribution is shown on Figure 3.5.1.

3.5.3 One species (red kite), afforded special statutory protection under Annex 1 of the EU Birds Directive (Directive 2009/147/EC), was recorded flying over the Project area during the winter bird surveys.

3.5.4 Nine species of principal importance listed under Section 41 of the NERC Act (2006), and also listed as UK Biodiversity Action Plan (BAP) Priority Species, were recorded during wintering bird surveys comprising bullfinch, dunnock, herring gull, house sparrow, lapwing, marsh tit, skylark, song thrush and starling.

3.5.5 Eleven species recorded during the wintering bird surveys are included on the BoCC Red List and 12 species are included on the BoCC Amber List.

3.5.6 Further discussion of the species of conservation concern identified within the Project site boundary is provided below.

Species Accounts

3.5.7 Bullfinch is a common resident breeding and wintering bird in the UK with an estimated population of 220,000 birds (Musgrove *et al.*, 2013). As such the numbers recorded during the winter bird surveys are considered unremarkable and broadly representative of the species in the wider landscape.

3.5.8 Black-headed gull is a frequent breeding bird in the UK with an estimated breeding population of 140,000 birds (Musgrove *et al.*, 2013). Over winter, the UK population of black-headed gulls significantly increases up to an estimated 2.3 million birds. As such the numbers recorded during the winter bird surveys are considered unremarkable and broadly representative of the species in the wider landscape.

3.5.9 Common Gull is a relatively frequent resident breeding bird in the UK, with an estimated population of 49,000 birds (Musgrove *et al.*, 2013). Common gull is however a common winter visitor with an estimated winter population size of 710,000 birds (Musgrove *et al.*, 2013). Only one observation of common gull was recorded during the surveys and therefore considered unremarkable and broadly representative of the species in the wider landscape.

3.5.10 Dunnock are common resident breeding and wintering bird in the UK with an estimated population size of 2,500,000 birds (Musgrove *et al.*, 2013). As such the numbers recorded during the winter bird surveys are considered unremarkable and broadly representative of the species in the wider landscape.

3.5.11 Fieldfare are a rare breeding bird in the UK but a common winter visitor with an estimated winter population size of 720,000 birds (Musgrove *et al*., 2013). As such the numbers recorded during the winter bird surveys are considered unremarkable and broadly representative of the species in the wider landscape.

3.5.12 Green sandpiper is a rare breeding bird in the UK with only the occasional pair recorded breeding each year. Population estimates of wintering green sandpiper suggest that fewer than 1,000 birds spend the winter in the UK, although rather more are seen on passage (Musgrove *et al*., 2013). Only one observation of green sandpiper was recorded during the surveys and, therefore, considered unremarkable and broadly representative of the species in the wider landscape.

3.5.13 Greylag goose is a relatively frequent breeding bird in the UK, with an estimated breeding population of 46,000 birds. Greylag goose is however a common winter visitor with an estimated winter population size of 230,000 birds (Musgrove *et al*., 2013). As such the numbers recorded during the winter bird surveys are considered unremarkable and broadly representative of the species in the wider landscape.

3.5.14 Grey wagtail is a common resident bird in the UK with an estimated population of 38,000 birds (Musgrove *et al*., 2013). As such the numbers recorded during the winter bird surveys are considered unremarkable and broadly representative of the species in the wider landscape.

3.5.15 Herring gull are a widespread breeding bird in the UK and a common winter visitor with an estimated winter population size of 740,000 birds (Musgrove *et al*., 2013). As such the numbers recorded during the winter bird surveys are considered unremarkable and broadly representative of the species in the wider landscape.

3.5.16 House sparrow is a widespread but declining resident bird in the UK with an estimated population of around 5.3 million birds. As such the numbers recorded during the winter bird surveys are considered unremarkable and broadly representative of the species in the wider landscape.

3.5.17 Kestrel are a widespread resident breeding and wintering bird in the UK with an estimated population size of 46,000 birds (Musgrove *et al*., 2013). As such the numbers recorded during the winter bird surveys are considered unremarkable and broadly representative of the species in the wider landscape.

3.5.18 Lapwing is one of the most widespread non-breeding wintering waders with an estimated over wintering population of around 650,000 birds. In general, lapwings tend to be concentrated in central and southern Britain during the winter (Lack, 1986). A high proportion of the birds that winter in Britain are of Scandinavian, Danish, Dutch and North German origin (Imboden, 1974). Lapwings respond rapidly to cold weather, and the numbers and distribution of non-breeding birds are strongly influenced by weather patterns in the UK as well as in continental Europe (Kirby and Lack, 1993). As such the numbers recorded during the winter bird surveys are considered unremarkable and broadly representative of the species in pastoral farmland in the South East of the UK. However, the site was considered likely to have some minor importance for wintering lapwing due to the likely suitable foraging habitat it supports.

3.5.19 Lesser black-backed gull is a widespread resident breeding and wintering bird in the UK with an estimated population size of between 110,000 and 130,000 birds. As such the numbers recorded during the winter bird surveys are considered unremarkable and broadly representative of the species in the wider landscape.

3.5.20 Mallard is a common and widespread resident breeding bird in the UK, with an estimated population of between 61,000 and 146,000 birds (Musgrove *et al*., 2013). Mallards are also a common winter visitor with an estimated winter population size of 710,000 birds (Musgrove *et al*., 2013). As such the numbers recorded during the winter bird surveys are considered unremarkable and broadly representative of the species in the wider landscape.

3.5.21 Marsh tit is a common resident breeding and wintering bird in the UK with an estimated population of 41,000 birds (Musgrove *et al*., 2013). As such the numbers recorded during the winter bird surveys are considered unremarkable and broadly representative of the species in the wider landscape.

3.5.22 Mistle thrush are a widespread resident breeding and wintering bird in the UK with an estimated population size of 170,000 birds (Musgrove *et al*., 2013). As such the numbers recorded during the winter bird surveys are considered unremarkable and broadly representative of the species in the wider landscape.

3.5.23 Meadow pipit are common resident breeding and wintering bird in the UK with an estimated population size of 2,000,000 birds (Musgrove *et al*., 2013). As such the numbers recorded during the winter bird surveys are considered unremarkable and broadly representative of the species in the wider landscape.

3.5.24 Red kite are a restricted resident breeding and wintering bird in the UK with an estimated population size of 1,600 birds (Musgrove *et al*., 2013). As such the numbers recorded during the winter bird surveys are considered unremarkable and broadly representative of the species in the wider landscape.

3.5.25 Redwing are a rare breeding bird in the UK but a common winter visitor with an estimated winter population size of 690,000 birds (Musgrove *et al*., 2013). As such the numbers recorded during the winter bird surveys are considered unremarkable and broadly representative of the species in the wider landscape.

3.5.26 Skylark are a common resident breeding and wintering bird in the UK with an estimated population size of 1,500,000 birds (Musgrove *et al*., 2013). As such the numbers recorded during the winter bird surveys are considered unremarkable and broadly representative of the species in the wider landscape.

3.5.27 Snipe is a relatively frequent resident breeding bird in the UK, with an estimated population of 80,000 birds (Musgrove *et al*., 2013). Snipe is however a common winter visitor with an estimated winter population size of 1.1 million birds (Musgrove *et al*., 2013). As such the numbers recorded during the winter bird surveys are considered unremarkable and broadly representative of the species in the wider landscape.

3.5.28 Song Thrush are a common resident breeding and wintering bird in the UK with an estimated population size of 1,200,000 birds (Musgrove *et al*., 2013). As such the numbers recorded during the winter bird surveys are considered unremarkable and broadly representative of the species in the wider landscape.

3.5.29 Starling are a common resident breeding bird in the UK with an estimated population size of 1,800,000 birds (Musgrove *et al*., 2013) this population swells in the winter with an additional influx of continental birds although no official estimate of the wintering population is available. As such the numbers recorded during the winter bird surveys are considered unremarkable and broadly representative of the species in the wider landscape.

3.5.30 Woodcock are a restricted resident breeding bird and widespread wintering bird in the UK with an estimated wintering population size of 1,400,000 birds (Musgrove *et al*., 2013). As such the numbers recorded during the winter bird surveys are considered unremarkable and broadly representative of the species in the wider landscape.

3.6 Reptile Surveys

Habitat Assessment

3.6.1 The Phase 1 Habitat Survey identified a range of habitats within the Project site boundary that provided good hibernating, basking, and foraging habitat for reptiles.

3.6.2 The areas that were deemed to have the best reptile habitat were the River Mole corridor and adjoining habitats, land south of the M23 spur road, the area of habitat west of the Fire Training Ground and the open areas around the Land East of the Railway Line woodland and biodiversity wetland, the east of the site.

3.6.3 These were the areas that were chosen to be surveyed and where reptile refugia were placed. The locations of the reptile refugia are provided on Figures 3.6.1a – 3.6.1e.

Survey Results

3.6.4 The results of the survey are detailed in the Annex 2 and shown on Figures 3.6.1a – 3.6.1e.

3.6.5 A peak count of ten grass snake *Natrix natrix* were identified during a single site visit. Following the population class size assessment, there was considered to be a 'Good' sized population.

3.6.6 The majority of the reptiles were recorded along the River Mole corridor with a few grass snake being recorded in the fields south east of the Land east of the Railway Line woodland.

3.6.7 No other reptile species were recorded.

3.7 Great Crested Newt Surveys

Water Body Assessment

3.7.1 A total of 36 ponds were identified either within the Project site boundary or with connectivity to it during the Phase 1 Habitat Survey, a desk-based study of ordnance survey maps and aerial photography and through identification during other protected species surveys. These are described in Table 21 of Annex 2.

3.7.2 A further 46 waterbodies were identified within the project site boundary, these included widespread networks of ditches through the car parks and airfield, roadside ditches and rivers. These waterbodies were not assessed for great crested newts in 2019.

3.7.3 Of the 36 ponds, 29 ponds were identified as requiring assessment for their potential to support great crested newt.

3.7.4 An additional nine ponds were identified within 250 metres of land identified for development and 22 ponds 500 metres from land identified for development, which were outside of the original Project site boundary which have not been assessed. Many of these are separated from development areas within the Project site boundary by busy A roads and rivers which are considered a barrier to GCN dispersal.

3.7.5 The locations of the ponds and waterbodies, the reference code used to identify them and the results of the survey are shown on Figures 3.7.1a - 3.7.1j.

Habitat Suitability Index Results

3.7.6 Great Crested Newt Habitat Suitability Index (HSI) surveys were undertaken on 26 water bodies. The scores are shown in Annex 2.

3.7.7 Nine ponds surveyed had a 'poor' HSI score, three had a 'below average' score, seven had an 'average' score, five ponds had a 'good' score and two had an 'excellent' habitat suitability score.

3.7.8 Three ponds; Old Lagoon, New Lagoon and Pond M did not have HSI conducted on them and no further great crested newt surveys either. These were all ruled out during the field visit due to them being concrete lined, large man-made ponds that had no aquatic vegetation and heavily managed surrounding terrestrial habitat. Levels of water in these ponds varied significantly and being linked to the Crawley sewage treatment works New Lagoon and Old Lagoon, the quality of water was considered poor.

3.7.9 Six further ponds were not surveyed for HSI as there were access restrictions to the land that they were within.

3.7.10 One pond, AAA4, was a newly created wildlife pond and so had not developed to be able to give an accurate HSI on.

Presence/Absence Results

3.7.11 From the HSI scores eleven ponds were chosen to be surveyed further because they had a score of 'average' or better. Pond AAA4 was included within the presence/absence surveys as it was created as a wildlife pond and was in close proximity to other ponds with 'excellent' HSI scores.

eDNA Results

3.7.12 eDNA surveys were conducted on Ponds 30Z, 8N8, A, AA21, FFJ and AVF. Only Pond 8N8 provided a positive result.

3.7.13 Due to the negative eDNA results, surveys on these ponds were not continued.

3.7.14 Four ponds were found to either contain the eDNA of great crested newts were found during survey visits; Ponds 8N8, W46, K5F and TTD. Population size class surveys were undertaken on these ponds to determine the size of the great crested newts populations present. A summary of the results are provided in Table 3.7.1 below and the full results for all the ponds are provided in Annex 2.

Table 3.7.1: Great Crested Newt Population Size Class

Pond No.	Max Great Crested Newt Count	Great Crested Newt Population Size Class
8N8	0 (but positive eDNA)	Small
W46	13	Medium
K5F	8	Small
TTD	10	Small

3.7.15 Using the Great Crested Newt Population Size Class assessment (Froglife, 2001) the maximum great crested newt count on one night using one survey method for each pond was zero for Pond 8N8, 13 for Pond W46, eight for Pond K5F and ten for Pond TTD.

3.7.16 This equates to a medium great crested newt population size for Pond W46 and small great crested newt population sizes for Ponds 8N8, K5F and TTD.

3.7.17 Two common toads were recorded on 3rd June 2019 within pond W46. One common toad was also recorded on 2nd October 2019 during a reptile survey, under an artificial refugia within the field, east of the River Mole and south of Brockley Wood.

3.8 Dormouse Surveys

3.8.1 No evidence of dormouse was found within any of the surveyed area. Survey areas are shown on Figure 3.8.1.

3.9 Aquatic Mammal Surveys

Otter Surveys

3.9.1 No evidence of otter was found along the River Mole, within the surveyed area, as shown on Figure 3.9.1.

Water Vole Surveys

3.9.2 No evidence of water vole was found along the River Mole, within the surveyed area, as shown on Figure 3.9.1.

3.10 Preliminary Bat Roost Assessment

Buildings

3.10.1 Two buildings within the Project site boundary were identified as having suitable features present to support roosting bats: one, a disused Control Tower (Building JW9) located in the north west of the Project site (landside), adjacent to Control Tower Road and east of the River Mole; and the second, a disused ancillary building (Building D9H) located along the southern boundary of the airside perimeter fencing, adjacent to Crawter's Brook and Staff Car Park Z.

Trees

3.10.2 A description of the bat roost assessment for trees is to follow.

3.11 Bat Emergence/Re-entry Surveys

3.11.1 As recommended by the BCT guidance, three dusk emergence surveys were undertaken on each of the two buildings identified within the Project site boundary as having bat roosting potential.

3.11.2 The surveys were undertaken to determine whether a bat roost was present and to determine the species and number of bats using it.

3.11.3 A summary of the survey dates, weather conditions and sunset times is provided in Table 3.11.1 below.

Table 3.11.1: Bat Emergence Survey Dates, Weather Conditions and Survey Times

Building ref.	Date	Weather	Sunset time	Survey start	Survey end
D9H	15/07/19	22°C, light cloud, no rain	21:15	21:00	22:45
D9H	20/08/19	16°C, light winds, dry, fair	20:20	20:05	21:50
D9H	26/09/19	17°C, windy, clear skies	18:55	18:40	20:25
JW9	15/07/19	22°C, light cloud, no rain	21:15	21:00	22:45
JW9	07/08/19	18°C, cloudy, dry	20:41	20:26	22:11
JW9	02/10/19	13°C, dry, clear, light winds	18:37	18:22	20:07

Building JW9 (Landside)

3.11.4 No bats were seen emerging from the building but were detected foraging nearby.

3.11.5 Bat activity was recorded at low levels during the emergence surveys on 15 July and 20 of August 2019.

3.11.6 On the emergence survey of 26 September 2019, bat activity was recorded at moderate levels during the survey; although no bats were seen, it was presumed that bats were foraging near to the grassland area to the west of the feature. Common pipistrelle, soprano pipistrelle, noctule, Leisler's bat and *Mytois* species were recorded.

3.11.7 Further details regarding the results of these surveys can be found in Annex 2.

Building D9H (Airside)

Bat Emergence Survey 15 July 2019

3.11.8 The bat emergence survey on the 15 July commenced at 21:00, 15 minutes before sunset and finished at 22:45.

3.11.9 No bats were seen emerging from the building during any of the surveys, however bats were detected at low levels, forging and commuting nearby. Common pipistrelle and noctule were recorded.

3.11.10 Further details regarding the results of these surveys can be found in Annex 2.

3.12 Bat Activity Transect Surveys

3.12.1 A summary of the survey dates, weather conditions and sunset times is provided in Table 3.9.1 within Annex 2.

3.12.2 In order to gain a comparison of species assemblage and utilisation across different habitats over the entire season, the results for each transect route have been grouped into pre-maternity (April and May), maternity (June and July) and post-maternity (August-October) seasons.

3.12.3 The utilisation of different areas along the transect routes are shown on Figures 3.13.1a – 3.13.1f for the pre-maternity season, Figures 3.13.2a – 3.13.2f for the maternity season, and Figures 3.13.3a – 3.13.3f for the post-maternity season.

3.12.4 The locations of the transects are shown on the above mentioned figures and are briefly described below:

- Transect 1: Horleyland Wood, Upper Pickets Wood and Lower Pickets Wood;
- Transect 2: Gatwick BAP Area, Land East of the Railway Line (LERL);
- Transect 3: Riverside Garden Park and Perimeter Road East;
- Transect 4: Perimeter Road South;
- Transect 5: Museum Field and other land west of the River Mole.

3.12.5 Overall, moderate levels of bat activity were recorded across all five transects during the pre-maternity, maternity and post-maternity seasons, except for Transect 4 which consistently recorded very low levels of activity.

3.12.6 The highest number of bat passes recorded in the pre-maternity season was along Transect 3, with 286 passes. In the maternity and post-maternity seasons, the highest number of passes was recorded along Transect 1, with 400 and 508 passes respectively. The fewest number of passes across all seasons was recorded along Transect 4 (24, 23 and 52 passes respectively).

3.12.7 Across transects 1 and 5, the overall levels of bat activity were considerably higher in the maternity season, compared to the pre-maternity season, whereas activity levels across Transect 3 were considerably lower. The activity levels along transect 2 and 4 remained constant across both seasons.

3.12.8 In the maternity season, significantly higher levels of bat activity were recorded along Transect 5, adjacent to the River Mole corridor and woodland strip, which are well connected with Brockley Wood.

3.12.9 Generally, high levels of bat activity were recorded within the woodland areas associated with transects 1, 2 and 3, including Horleyland Wood and Upper Pickett's Wood, adjacent to and north of the sewage treatment works and woodland associated with Riverside Garden Park, in the north east of the Project site boundary.

3.12.10 Higher levels of commuting activity were also recorded along linear features, notably the railway line adjacent to Transect 2, mature hedgerow and tree lines, and the river corridors, including the River Mole, Man's Brook, Crawter's Brook and Gatwick Stream.

3.12.11 Foraging activity was generally concentrated along mature hedgerows, through open canopy areas within woodland, woodland edges and adjacent/close to waterbodies, including the lake within Riverside Garden Park and the Crawley Sewage Treatment Works.

3.12.12 Lower levels of bat activity were observed in areas of open pasture, such as those associated with Transect 5 and habitat that comprised large, exposed areas of hardstanding with little canopy cover, such as those found along Transect 4.

3.12.13 Common pipistrelle *Pipistrellus pipistrellus* was the most frequently recorded species across all transect routes, with peak counts of 777, 1,005 and 1,232 passes recorded during the pre-maternity, maternity and post-maternity seasons respectively. Noctule *Nyctalus noctula* were also recorded in moderate numbers, with a peak count of 19 bats recorded along Transect 2 in the pre-maternity season. Lower numbers of soprano pipistrelle *Pipistrellus pygmaeus*, *Myotis sp.* and other big bat species (including serotine *Eptesicus serotinus* and Leisler's *Nyctalus leisleri* bats) were detected throughout the transect surveys. A single Nathusius' pipistrelle pass was recorded along Transect 2 in the maternity season and along Transect 3 in the post-maternity season.

3.12.14 Pipistrelle bats and *Myotis sp.* were generally associated with woodland areas and woodland edges, whereas bat passes from noctule, serotine and Leisler's bats were more frequently recorded in open areas of grassland and pasture.

3.13 Bat Static/Automated Surveys

3.13.1 Within the project site boundary, 11 static bat detectors were set out in April. The locations of these detectors are shown on Figure 3.14.1.

Location 1 – Land West of the Fire Training Ground

3.13.2 A summary of the survey dates, number of nights deployed, and bat passes for Location 1 is provided in Table 3.13.1 below. A summary of the number and species of bats recorded at Location 1 is provided in

3.13.3 Table 3.13.2. Full details of passes per night are provided in Annex 2.

Table 3.13.1: Bat Static/Automated Survey Summary for Location 1

Survey dates	Number of nights detector deployed	Total number of bat passes	Average bat passes / night
24 April 2019 – 30 April 2019	7	59	8
10 May 2019 - 15 May 2019	6	566	94
11 June 2019 – 15 June 2019	5	189	38
12 July 2019 – 16 July 2019	5	745	149
13 Aug 2019 – 18 Aug 2019	6	282	47
25 Sept 2019 – 29 Sept 2019	5	357	71
14 Oct 2019 – 18 Oct 2019	5	138	28

Table 3.13.2: Species Summary for Location 1

Survey Month	Bb	Pp	Ppy	Pn	Psp	Msp	Pl	Nn	Nl	Es	Total
April	0	51	0	1	0	3	1	3	0	0	**59**
May	0	532	19	4	2	0	2	7	0	0	**566**
June	0	177	4	0	0	0	0	8	0	0	**189**
July	0	555	8	1	6	14	3	151	5	2	**745**
August	0	222	3	3	0	17	3	31	0	3	**282**
Sept	1	34	0	0	3	7	0	312	0	0	**357**
Oct	1	103	3	0	8	7	0	16	0	0	**138**
Species total	**2**	**1,674**	**37**	**9**	**19**	**48**	**9**	**528**	**5**	**5**	**2,336**

Bb – barbastelle, Pp -common pipistrelle, Ppy - soprano pipistrelle, Pn - Nathusius' pipistrelle, Psp - pipistrelle bats, Msp - *Myotis* bats, Pl - long-eared bats, Nn - noctule, Nl - Leisler's bat, Es - serotine bat

3.13.4 A total of 2,336 bat passes were recorded at Location 1 between April and October 2019.

3.13.5 The highest number of passes for all species was recorded in July (745 passes) during the maternity season. The fewest number of passes was recorded in April (59 passes) during the pre-maternity season.

3.13.6 On average, higher numbers of bat passes were recorded during the maternity season (467 passes) than in the pre- and post-maternity seasons (313 and 259 passes respectively) at Location 1.

3.13.7 Common pipistrelle were the most frequently recorded species at this location across all seasons, with peak counts of 532 and 555 passes in May and July respectively. Although the overall number of passes at this location were comparatively fewer in April and June, common pipistrelle accounted for 72% of the overall species composition at this location. Fewer numbers of soprano pipistrelle were recorded at Location 1 and these accounted for between 1 and 3% of the species passes at this location.

3.13.8 Nathusius' pipistrelle *Pipistrellus nathusiusii* was recorded in very low numbers throughout the year, with a peak count of eight passes, recorded in October.

3.13.9 Noctule accounted for 11% of the species composition at Location 1; a peak count 312 noctule was recorded in September.

3.13.10 Moderate levels of *Myotis* sp. were recorded throughout the season, with the highest counts recorded in July (14 passes) and August (17 passes).

3.13.11 Lower level of activity for long-eared *Plecotus* sp., serotine and Leisler's bats were recorded at Location 1, with overall counts of nine, five and five passes respectively. Collectively, these species accounted for less than 1% of the overall species composition.

3.13.12 Barbastelle *Barbastella barbastellus* was recorded twice during the post-maternity season, with a single pass in September and October.

Location 2 – Land South West of the River Mole

3.13.13 A summary of the survey dates, number of nights deployed, and bat passes for Location 2 is provided in Table 3.13.3 below. A summary of the number and species of bats recorded at Location 2 is provided in Table 3.13.4. Full details of passes per night are provided in Annex 2.

Table 3.13.3: Bat Static/Automated Survey Summary for Location 2

Survey dates	Number of nights detector deployed	Total number of bat passes	Average bat passes / night
24 April 2019 – 30 April 2019	7	110	15
10 May 2019 - 15 May 2019	6	1,101	184
12 June 2019 – 16 June 2019	5	730	146
12 July 2019 – 16 July 2019	5	1,269	254
13 Aug 2019 – 18 Aug 2019	6	330	55
25 Sept 2019 – 27 Sept 2019	3	291	97
14 Oct 2019 – 18 Oct 2019	5	35	7

Table 3.13.4: Species Summary for Location 2

Survey Month	Pp	Ppy	Pn	Psp	Msp	Pl	Nn	Nl	Es	Total
April	96	5	0	0	8	0	1	0	0	**110**
May	948	48	0	0	7	1	97	0	0	**1,101**
June	66	5	0	3	13	1	642	0	0	**730**
July	1,183	20	0	1	18	2	41	0	4	**1,269**
August	149	15	0	39	53	16	69	13	12	**330**
Sept	42	1	0	1	7	2	238	0	0	**291**
October	24	5	0	0	5	0	0	1	0	**35**
Species total	**2,508**	**99**	**0**	**44**	**111**	**22**	**1,088**	**14**	**16**	**3,866**

Pp -common pipistrelle, Ppy - soprano pipistrelle, Pn - Nathusius' pipistrelle, Psp - pipistrelle bats, Msp - Myotis bats, Pl - long-eared bats, Nn - noctule, Nl - Leisler's bat, Es - serotine bat

3.13.14 A total of 3,866 bat passes were recorded at Location 2 between April and October 2019.

3.13.15 The highest number of passes for all species was recorded in July (1,269 passes) during the maternity season. The fewest number of passes was recorded in October (35 passes) during the post-maternity season.

3.13.16 On average, higher numbers of bat passes were recorded during the maternity season (1,000 passes) than in the pre- and post-maternity seasons (606 and 219 passes, respectively) at Location 2.

3.13.17 Overall, common pipistrelle were the most frequently recorded species at this location with a total of 2,508 passes and a peak count of 1,183 passes recorded in July. However, the total number of passes of common pipistrelle showed a marked difference between the pre-maternity/maternity and post-maternity seasons.

3.13.18 In April, May and July, common pipistrelles accounted for between 86% and 93% of the total species composition at Location 2. However, in June, only 9% (66 passes) were from common pipistrelles. In the post-maternity season, the number of common pipistrelle passes averaged only 33%.

3.13.19 Fewer numbers of soprano pipistrelle were recorded at this location which accounted for between 1% and 14% of the overall species composition at this location. A peak count of 48 passes was recorded in May.

3.13.20 Noctule accounted for 28% (1,088 passes) of the overall bat assemblage at Location 2 with peak counts of 642 and 238 passes in June and September, respectively.

3.13.21 Rarer species including serotine and Leisler's bats were also recorded at this location. The peak count for both species was in August with 12 and 13 passes, respectively.

3.13.22 Low numbers of long-eared bat species were recorded across all seasons, with a peak count of 16 passes recorded in August.

3.13.23 Nathusius' pipistrelle was not recorded at Location 2.

Location 3 – Brockley Wood

3.13.24 A summary of the survey dates, number of nights deployed, and bat passes for Location 3 is provided in Table 3.13.5 below. A summary of the number and species of bats recorded at Location 3 is provided in Table 3.13.6. Full details of passes per night are provided in Annex 2.

Table 3.13.5: Bat Static/Automated Survey Summary for Location 3

Survey dates	Number of nights detector deployed	Total number of bat passes	Average bat passes / night
25 April 2019 – 1 May 2019	7	2,410	344
10 May 2019 – 14 May 2019	5	19,553	3,911
12 June 2019 – 16 June 2019	5	2,358	472
12 July 2019 – 16 July 2019	5	9,914	1,983
13 Aug 2019 – 18 Aug 2019	6	4,330	722
25 Sept 2019 – 29 Sept 2019	5	1,393	279
14 Oct 2019 – 18 Oct 2019	5	1,787	357

Table 3.13.6: Species Summary for Location 3

Survey Month	Pp	Ppy	Pn	Psp	Msp	Pl	Nn	Nl	Es	Total
April	2061	228	0	1	117	0	3	0	0	**2410**
May	15612	529	0	3	3102	234	68	5	0	**19553**
June	1302	268	0	1	639	4	109	0	0	**2323**
July	7688	455	1	5	1728	3	34	0	0	**9914**
August	2339	904	0	535	541	3	6	0	2	**4330**
Sept	333	83	0	670	145	0	161	0	1	**1393**
October	455	268	0	53	1005	5	1	0	0	**1787**
Species total	**29790**	**2735**	**1**	**1268**	**7277**	**249**	**382**	**5**	**3**	**41710**

Pp -common pipistrelle, Ppy - soprano pipistrelle, Pn - Nathusius' pipistrelle, Psp - pipistrelle bats, Msp - Myotis bats, Pl - long-eared bats, Nn - noctule, Nl - Leisler's bat, Es - serotine bat

3.13.25 A total of 41,710 bat passes were recorded at Location 3 between April and October 2019, which is the highest number of passes recorded across all static detector locations.

3.13.26 The highest number of passes for all species was recorded in May during the pre-maternity season, with a total of 19,553 passes. The fewest number of passes was recorded in September during the post-maternity season, with 1,393 passes.

3.13.27 On average, higher numbers of bat passes were recorded during the pre-maternity season (10,982 passes) than in the maternity and post-maternity seasons (6,119 and 2,503 passes respectively) at Location 3.

3.13.28 Very high levels of common pipistrelle and high levels of soprano pipistrelle and *Myotis* sp. were recorded across all seasons, with the highest proportion of common pipistrelle passes recorded in May (80%), for soprano pipistrelles in August (21%) and for *Myotis* sp. in October (56%).

3.13.29 A single pass from Nathusius' pipistrelle was recorded in July.

3.13.30 Moderate levels of noctule activity were recorded at Location 3, with a peak count of 161 passes in September. Leisler's bat and serotine were recorded in fewer numbers with a total of five and three passes respectively. Collectively, these species accounted for less than 1% of the overall composition at Location 3.

3.13.31 Consistently low levels of *Plecotus* sp. passes were recorded across all months, with the exception of May, when a total of 234 passes were recorded.

Location 4 – North of the Long Stay North Car Park

3.13.32 A summary of the survey dates, number of nights deployed, and bat passes for Location 4 is provided in Table 3.13.7 below. A summary of the number and species of bats recorded at Location 4 is provided in

3.13.33 Table 3.13.8. Full details of passes per night are provided in Annex 2.

Table 3.13.7: Bat Static/Automated Survey Summary for Location 4

Survey dates	Number of nights detector deployed	Total number of bat passes	Average bat passes / night
25 April 2019 – 30 April 2019	6	3,093	516
10 May 2019 – 15 May 2019	6	3,781	630
12 June 2019 – 15 June 2019	4	141	35
12 July 2019 – 16 July 2019	5	470	94
13 Aug 2019 – 18 Aug 2019	6	520	87
25 Sept 2019 – 27 Sept 2019	3	123	41
14 Oct 2019 – 18 Oct 2019	5	53	11

Table 3.13.8: Species Summary for Location 4

Survey Month	Pp	Ppy	Pn	Psp	Msp	Pl	Nn	Nl	Es	Total
April	2795	147	5	1	96	39	6	1	3	**3093**
May	2405	1310	3	29	31	0	1	2	0	**3781**
June	99	2	1	0	9	4	26	0	0	**141**
July	299	23	2	5	78	18	36	0	9	**470**
August	385	13	0	6	67	3	32	10	4	**520**
Sept	38	4	0	0	12	6	63	0	0	**123**
October	16	2	0	0	15	0	20	0	0	**53**
Species total	**6037**	**1501**	**11**	**41**	**308**	**70**	**184**	**13**	**16**	**8181**

Pp -common pipistrelle, Ppy - soprano pipistrelle, Pn - Nathusius' pipistrelle, Psp - pipistrelle bats, Msp - Myotis bats, Pl - long-eared bats, Nn - noctule, Nl - Leisler's bat, Es - serotine bat

3.13.34 A total of 8,181 bat passes were recorded at Location 4 between April and October 2019.

3.13.35 The highest number of passes was recorded in May (3,871 passes) during the pre-maternity season. Only 141 passes were recorded in June and 53 passes were recorded in October.

3.13.36 On average, higher numbers of bat passes were recorded during the pre-maternity season (3,437 passes) than in the maternity and post-maternity seasons (306 and 232 passes respectively) at Location 4.

3.13.37 Common pipistrelle were the most frequently recorded species at this location with a total of 6,037 passes and a peak count of 2,795 passes recorded in May. Across all months, common pipistrelle accounted for between 63 and 90% of the total species composition at this location.

3.13.38 High numbers of both common and soprano pipistrelle were recorded in May with 2,405 and 1,310 passes respectively. Moderate numbers of *Myotis* and *Plecotus* sp. were recorded across all months, with peak counts of 96 and 39 passes recorded in April.

3.13.39 On average moderate numbers of noctule were recorded during the maternity and post-maternity seasons (31 and 38 passes, respectively) compared to the pre-maternity season (4 passes).

3.13.40 Low levels of activity were also recorded for Leisler's and serotine bats with a total of 13 and 16 passes, respectively.

3.13.41 Low levels of activity were also recorded for Nathusius' pipistrelle with a total count of 11 passes and a peak count of five passes in April.

Location 5 – Riverside Garden Park

3.13.42 Location 5 in Riverside Garden Park is outwith the Project site boundary. A summary of the survey dates, number of nights deployed, and bat passes for Location 5 is provided in Table 3.13.9 below. A summary of the number and species of bats recorded at Location 5 is provided in Table 3.13.10. Full details of passes per night are provided in Annex 2.

Table 3.13.9: Bat Static/Automated Survey Summary for Location 5

Survey dates	Number of nights detector deployed	Total number of bat passes	Average bat passes / night
10 May 2019 – 15 May 2019	6	3694	616
12 July 2019 – 16 July 2019	5	3321	664
13 Aug 2019 – 18 Aug 2019	6	564	94
25 Sept 2019 – 29 Sept 2019	5	305	61
14 Oct 2019 – 18 Oct 2019	5	68	14

Table 3.13.10: Species Summary for Location 5

Survey Month	Pp	Ppy	Pn	Psp	Msp	Pl	Nn	Nl	Es	Total
April	0	0	0	0	0	0	0	0	0	**0**
May	3461	35	0	0	6	7	1	0	0	**3694**
June	0	0	0	0	0	0	0	0	0	**0**
July	3060	144	0	2	8	0	16	0	91	**3321**
August	462	31	0	4	44	3	17	1	2	**564**
Sept	168	28	0	79	11	4	15	0	0	**305**
October	47	6	0	6	5	4	0	0	0	**68**
Species total	**7198**	**244**	**0**	**91**	**74**	**18**	**49**	**1**	**93**	**7952**

Pp -common pipistrelle, Ppy - soprano pipistrelle, Pn - Nathusius' pipistrelle, Psp - pipistrelle bats, Msp - Myotis bats, Pl - long-eared bats, Nn - noctule, Nl - Leisler's bat, Es - serotine bat

3.13.43 A total of 7,952 bat passes were recorded at Location 5 during May and between July and October 2019. No data was recorded during April or June due to equipment failure and malfunction.

3.13.44 The highest number of passes was recorded in May (3,694 passes) during the pre-maternity season. The lowest number of passes was recorded in October (68 passes), during the post-maternity season.

3.13.45 On average, higher numbers of bat passes were recorded during the pre-maternity season (3,694 passes) than in the maternity and post-maternity seasons (3,321 and 312 passes respectively) at Location 5.

3.13.46 Common pipistrelles accounted for the highest number of species passes at this location, with between 55% and 94% of the species composition across all seasons at Location 5.

3.13.47 Low numbers of soprano pipistrelles were recorded at Location 5, with a total of 244 passes (3% of total passes).

3.13.48 Moderate to low numbers of *Myotis* and *Plecotus* sp., serotine and noctule were also recorded at this location with a total of 91, 18, one and 93 passes respectively. A peak count of 91 serotine bat passes were recorded in July.

3.13.49 Nathusius' pipistrelle was not recorded at Location 5.

Location 6 – Land West of the Railway

3.13.50 A summary of the survey dates, number of nights deployed, and bat passes for Location 6 is provided in Table 3.13.11 below. A summary of the number and species of bats recorded at Location 6 is provided in Table 3.13.12. Full details of passes per night are provided in Annex 2.

Table 3.13.11: Bat Static/Automated Survey Summary for Location 6

Survey dates	Number of nights detector deployed	Total number of bat passes	Average bat passes / night
25 April 2019 – 27 April 2019	3	269	89
10 May 2019 – 12 May 2019	3	5,093	1,698
12 June 2019 – 16 June 2019	5	7,876	1,575
12 July 2019 – 16 July 2019	5	4,691	938
13 Aug 2019 – 18 Aug 2019	6	7,897	1,316
24 Sept 2019 – 28 Sept 2019	5	2,920	584
14 Oct 2019 – 19 Oct 2019	6	379	63

Table 3.13.12: Species Summary for Location 6

Survey Month	Pp	Ppy	Pn	Psp	Msp	Pl	Nn	Nl	Es	Total
April	266	2	1	0	0	0	0	0	0	**269**
May	4839	223	2	0	26	1	2	0	0	**5093**
June	7754	13	51	1	8	2	46	0	1	**7876**
July	4583	18	9	0	15	4	60	0	2	**4691**
August	7772	5	0	0	19	2	96	2	1	**7897**
Sept	2872	21	0	2	6	0	19	0	0	**2920**
October	346	29	0	0	2	0	2	0	0	**379**
Species total	**28432**	**31**	**63**	**3**	**76**	**9**	**225**	**2**	**4**	**28845**

Pp -common pipistrelle, Ppy - soprano pipistrelle, Pn - Nathusius' pipistrelle, Psp - pipistrelle bats, Msp - Myotis bats, Pl - long-eared bats, Nn - noctule, Nl - Leisler's bat, Es - serotine bat

3.13.51 A total of 28,845 bat passes were recorded at Location 6 between April and October 2019.

3.13.52 The highest number of passes was recorded in June (7,876 passes) during the maternity season. The lowest number of passes was recorded in April (269 passes), during the pre-maternity season.

3.13.53 On average, higher numbers of bat passes were recorded during the maternity season (6,284 passes) than in the pre-maternity and post-maternity seasons (2,681 and 3,732 passes, respectively) at Location 6.

3.13.54 Common pipistrelle were the most frequently recorded species at this location with a total of 28,432 passes across all months and a peak count of 7,772 passes recorded in August. Across all months, common pipistrelle accounted for between 95% and 99% of the total species composition at this location.

3.13.55 Generally low numbers of soprano pipistrelle were recorded across all months, except for May, where 223 passes were recorded. Noctule was also recorded in moderate numbers with peak counts of 60 and 96 passes in July and August, respectively.

3.13.56 Moderate numbers of Nathusius' pipistrelle and *Myotis* sp. were recorded at Location 6 with a total of 63 and 76 passes respectively. In June, a peak count of 51 Nathusius' pipistrelle passes was recorded.

3.13.57 Low activity levels were recorded for *Plecotus* sp., Leisler's and serotine bats with nine, two and four passes, respectively.

Location 7 – Horleyland Wood

3.13.58 A summary of the survey dates, number of nights deployed, and bat passes for Location 7 is provided in Table 3.13.13 below. A summary of the number and species of bats recorded at Location 7 is provided in Table 3.13.14. Full details of passes per night are provided in Annex 2.

Table 3.13.13: Bat Static/Automated Survey Summary for Location 7

Survey dates	Number of nights detector deployed	Total number of bat passes	Average bat passes / night
25 April 2019 – 30 April 2019	6	8,459	134
10 May 2019 – 13 May 2019	4	12,878	3,220
12 June 2019 – 16 June 2019	5	8,221	1,644
12 July 2019 – 15 July 2019	4	5,250	1,313
13 Aug 2019 – 18 Aug 2019	6	2,421	404
25 Sept 2019 – 27 Sept 2019	3	250	83
15 Oct 2019 – 20 Oct 2019	6	488	81

Table 3.13.14: Species Summary for Location 7

Survey Month	Pp	Ppy	Pn	Psp	Msp	Pl	Nn	Nl	Es	Total
April	8021	337	0	0	98	3	0	0	0	**8459**
May	12570	290	1	0	11	4	2	0	0	**12878**
June	7883	250	0	0	61	7	20	0	0	**8221**
July	5104	38	0	5	12	19	8	0	64	**5250**
August	2154	27	0	72	116	16	0	0	25	**2421**
Sept	148	2	0	84	1	5	10	0	0	**250**
October	436	42	0	2	7	0	1	0	0	**488**
Species total	**36316**	**986**	**1**	**163**	**306**	**54**	**41**	**0**	**89**	**37967**

Pp -common pipistrelle, Ppy - soprano pipistrelle, Pn - Nathusius' pipistrelle, Psp - pipistrelle bats, Msp - Myotis bats, Pl - long-eared bats, Nn - noctule, Nl - Leisler's bat, Es - serotine bat

3.13.59 A total of 37,967 bat passes were recorded at Location 7 between April and October 2019.

3.13.60 The highest number of passes was recorded in May (12,878 passes) during the pre-maternity season. The lowest number of passes was recorded in September (250 passes), during the post-maternity season.

3.13.61 On average, higher numbers of bat passes were recorded during the pre-maternity season (10,669 passes) than in the maternity and post-maternity seasons (6,736 and 1,053 passes respectively) at Location 7.

3.13.62 Common pipistrelle were the most frequently recorded species at this location with a total of 36,316 passes and a peak count of 12,570 passes recorded in May. Across all seasons, common pipistrelle accounted for between 59% and 98% of the species composition at this location.

3.13.63 High activity levels of soprano pipistrelle were recorded in the pre-maternity season, which average 314 passes compared to the maternity and post-maternity seasons, which averaged 144 and 24 passes respectively.

3.13.64 A single Nathusius' pipistrelle pass was recorded in May.

3.13.65 Activity levels of *Myotis* sp. remained relatively low throughout the season with a peak count of 116 passes in August and 98 passes in April. Only one *Myotis* sp. pass was recorded in September.

3.13.66 Moderate levels of activity were recorded for all other species at this location including for *Plecotus* sp. (54 passes), serotine (89 passes) and noctule (41 passes). Leisler's bat was not recorded during surveys at this location.

Location 8 – Land East of the Railway Line Wetland

3.13.67 A summary of the survey dates, number of nights deployed, and bat passes for Location 8 is provided in Table 3.13.15 below. A summary of the number and species of bats recorded at Location 8 is provided in

3.13.68 Table 3.13.16. Full details of passes per night are provided in Annex 2.

Table 3.13.15: Bat Static/Automated Survey Summary for Location 8

Survey dates	Number of nights detector deployed	Total number of bat passes	Average bat passes / night
24 April 2019 – 1 May 2019	8	1,758	219
12 May 2019 – 15 May 2019	4	2,121	530
11 July 2019 – 16 July 2019	6	203	34
14 Aug 2019 – 18 Aug 2019	5	14	3
25 Sept 2019 – 29 Sept 2019	5	1,775	355
14 Oct 2019 – 19 Oct 2019	6	889	148

Table 3.13.16: Species Summary for Location 8

Survey Month	Pp	Ppy	Pn	Psp	Msp	Pl	Nn	Nl	Es	Total
April	1,728	2	1	7	0	0	20	0	0	**1,758**
May	2,118	3	0	0	0	0	0	0	0	**2,121**
June	0	0	0	0	0	0	0	0	0	**0**
July	37	0	0	0	0	0	164	0	0	**203**
August	14	0	0	0	0	0	0	0	0	**14**
Sept	679	19	9	43	1	0	1,015	8	1	**1,775**
October	793	24	22	3	8	0	38	1	0	**889**
Species total	**5,369**	**48**	**32**	**53**	**9**	**0**	**1,237**	**9**	**1**	**6,760**

Pp -common pipistrelle, Ppy - soprano pipistrelle, Pn - Nathusius' pipistrelle, Psp - pipistrelle bats, Msp - Myotis bats, Pl - long-eared bats, Nn - noctule, Nl - Leisler's bat, Es - serotine bat

3.13.69 A total of 6,760 bat passes were recorded at Location 8 between April and May and between July and October 2019. No data was recorded during June due to equipment failure and malfunction.

3.13.70 The highest number of passes was recorded in May (2,121 passes) during the pre-maternity season. The lowest number of passes was recorded in August (14 passes), during the post-maternity season.

3.13.71 On average, higher numbers of bat passes were recorded during the pre-maternity season (1,940 passes) than in the maternity and post-maternity seasons (203 and 893 passes respectively), although in general, the number of bat passes at this location were comparatively lower than others.

3.13.72 Common pipistrelle were the most frequently recorded species at this location with a total of 5,369 passes and a peak count of 2,118 passes recorded in May.

3.13.73 Similar numbers of soprano pipistrelle and Nathusius' pipistrelle were recorded at Location 8, with similar numbers of bats recorded in September (19 and nine passes, respectively) and October (24 and 22 passes, respectively).

3.13.74 In July and September, noctule were more frequently recorded than any other species, accounting for 81% and 57% of the species composition at this location.

3.13.75 There were no recorded passes from *Plectous* sp. and very few passes from serotine and Leisler's bats (one and nine passes, respectively).

Location 9 – Perimeter Road South

3.13.76 A summary of the survey dates, number of nights deployed, and bat passes for Location 9 is provided in Table 3.13.17 below. A summary of the number and species of bats recorded at Location 9 is provided in Table 3.13.18. Full details of passes per night are provided in Annex 2.

Table 3.13.17: Bat Static/Automated Survey Summary for Location 9

Survey dates	Number of nights detector deployed	Total number of bat passes	Average bat passes / night
25 April 2019 – 1 May 2019	7	22	3
10 May 2019 – 15 May 2019	6	2,089	348
11 June 2019 – 16 June 2019	6	2,828	471
12 July 2019 – 16 July 2019	5	259	52
13th Aug 2019 – 18th Aug 2019	6	108	18

Survey dates	Number of nights detector deployed	Total number of bat passes	Average bat passes / night
25th Sept 2019 – 29th Sept 2019	5	132	26
15th Oct 2019 – 16th Oct 2019	2	3	2

Table 3.13.18: Species Summary for Location 9

Survey Month	Bb	Pp	Ppy	Pn	Psp	Msp	Pl	Nn	Nl	Es	Total
April	0	22	0	0	0	0	0	0	0	0	**22**
May	0	2,086	1	0	0	2	0	0	0	0	**2,089**
June	1	2,794	19	9	0	2	0	3	0	0	**2,828**
July	0	238	2	0	0	0	0	19	0	0	**259**
August	0	104	1	0	0	3	0	0	0	0	**108**
Sept	0	126	0	0	6	0	0	0	0	0	**132**
October	0	2	0	0	0	1	0	0	0	0	**3**
Species total	**1**	**5,372**	**23**	**9**	**6**	**8**	**0**	**22**	**0**	**0**	**5,441**

Pp -common pipistrelle, Ppy - soprano pipistrelle, Pn - Nathusius' pipistrelle, Psp - pipistrelle bats, Msp - Myotis bats, Pl - long-eared bats, Nn - noctule, Nl - Leisler's bat, Es - serotine bat

3.13.77 A total of 5,441 bat passes were recorded at Location 9 between April and October 2019.

3.13.78 The highest number of passes was recorded in June (2,828 passes) during the maternity season. The lowest number of passes was recorded in October (three passes), during the post-maternity season.

3.13.79 On average, higher numbers of bat passes were recorded during the maternity season (1,544 passes) than in the pre-maternity and post-maternity seasons (1056 and 81 passes respectively).

3.13.80 Common pipistrelle were the most frequently recorded species at this location with a total of 5,372 passes across all months and a peak count of 2,794 passes recorded in June.

3.13.81 The species diversity across all other months was generally quite low with low numbers of soprano pipistrelle (23 passes), Nathusius' pipistrelle (nine passes), *Myotis* sp. (eight passes) and noctule (22 passes) recorded.

3.13.82 A single barbastelle pass was recorded at this location in June.

3.13.83 Neither Leisler's bat nor serotine were recorded at Location 9.

Location 10 – Land West of Car Park X

3.13.84 A summary of the survey dates, number of nights deployed, and bat passes for Location 10 is provided in Table 3.13.19 below. A summary of the number and species of bats recorded at Location 10 is provided in Table 3.13.20. Full details of passes per night are provided in Annex 2.

Table 3.13.19: Bat Static/Automated survey summary for Location 10

Survey dates	Number of nights detector deployed	Total number of bat passes	Average bat passes / night
10 May 2019 – 15 May 2019	6	2,646	441
12 July 2019 – 16 July 2019	5	2,823	564
13 Aug 2019 – 15 Aug 2019	3	1,407	469
25 Sept 2019 – 29 Sept 2019	5	698	140
14 Oct 2019 – 18 Oct 2019	5	99	20

Table 3.13.20: Species Summary for Location 10

Survey Month	Pp	Ppy	Pn	Psp	Msp	Pl	Nn	Nl	Es	Total
April	0	0	0	0	0	0	0	0	0	**0**
May	2,293	345	0	4	3	0	1	0	0	**2,646**
June	0	0	0	0	0	0	0	0	0	**0**
July	2,656	136	0	1	6	1	23	0	0	**2,823**
August	1,227	125	0	12	19	7	12	2	3	**1,407**
Sept	491	74	1	2	9	2	117	2	0	**698**
October	78	4	0	0	5	0	11	1	0	**99**
Species total	**6,745**	**684**	**1**	**19**	**42**	**10**	**164**	**5**	**3**	**7,673**

Pp -common pipistrelle, Ppy - soprano pipistrelle, Pn - Nathusius' pipistrelle, Psp - pipistrelle bats, Msp - Myotis bats, Pl - long-eared bats, Nn - noctule, Nl - Leisler's bat, Es - serotine bat

3.13.85 A total of 7,673 bat passes were recorded at Location 10 during May and between July and October 2019. No data was recorded during April or June due to equipment failure and malfunction

3.13.86 The highest number of passes was recorded in July (2,823 passes) during the maternity season. The lowest number of passes was recorded in October (99 passes), during the post-maternity season.

3.13.87 Common pipistrelle were the most frequently recorded species at this location with 6,745 passes in total and accounting for between 70% and 94% of the species composition across each month. Low to moderate numbers of soprano pipistrelle were recorded throughout the survey season with a peak count of 345 passes recorded in May.

3.13.88 A single Nathusius' pipistrelle pass was recorded in September.

3.13.89 Low numbers of *Myotis* sp. and noctule were recorded at Location 10, with peak counts of 19 *Myotis* sp. passes in August and 117 noctule passes in September.

Location 11 – Crawter's Wood

3.13.90 A summary of the survey dates, number of nights deployed, and bat passes for Location 11 is provided in Table 3.13.21 below. A summary of the number and species of bats recorded at Location 11 is provided in Table 3.13.22. Full details of passes per night are provided in Annex 2.

Table 3.13.21: Bat Static/Automated Survey Summary for Location 11

Survey dates	Number of nights detector deployed	Total number of bat passes	Average bat passes / night
24 April 2019 – 1 May 2019	8	2,037	255
11 May 2019 – 15 May 2019	5	60	12
13 June 2019 – 16 June 2019	4	945	236
12 July 2019 – 16 July 2019	5	4,538	908
13 Aug 2019 – 17 Aug 2019	5	1,290	258
25 Sept 2019 – 27 Sept 2019	3	3,745	1,248
14 Oct 2019 – 19 Oct 2019	6	1546	258

Table 3.13.22: Species Summary for Location 11

Survey Month	Pp	Ppy	Pn	Psp	Msp	Pl	Nn	Nl	Es	Total
April	2,011	7	2	5	4	2	6	0	0	**2,037**
May	60	0	0	0	0	0	0	0	0	**60**
June	928	0	0	0	0	0	17	0	0	**945**
July	4,361	3	7	11	121	2	33	0	0	**4,538**
August	1,210	1	0	37	13	1	27	0	1	**1,290**

Survey Month	Pp	Ppy	Pn	Psp	Msp	Pl	Nn	Nl	Es	Total
Sept	2,895	4	0	246	58	3	539	0	0	**3,745**
October	1,456	9	0	2	59	0	20	0	0	**1,546**
Species total	**12,921**	**24**	**9**	**301**	**255**	**8**	**642**	**0**	**1**	**14,161**
Pp -common pipistrelle, Ppy - soprano pipistrelle, Pn - Nathusius' pipistrelle, Psp - pipistrelle bats, Msp - Myotis bats, Pl - long-eared bats, Nn - noctule, Nl - Leisler's bat, Es - serotine bat										

3.13.91 A total of 14,161 bat passes were recorded at Location 11 during between April and October 2019.

3.13.92 The highest number of passes was recorded in July (4,538 passes) during the maternity season. The lowest number of passes was recorded in May (60 passes), during the pre-maternity season, all of which were from common pipistrelle.

3.13.93 Overall, common pipistrelle were the most frequently recorded species at this location and accounted for 91% of the species assemblage at this location (12,921 passes).

3.13.94 Moderate to high levels of activity from *Myotis* sp. and noctule were recorded across all months, with a peak count of 121 *Myotis* sp. passes in July and 539 noctule passes in September. Low numbers of all other bat species were recorded including soprano pipistrelle (24 passes), Nathusius' pipistrelle (nine passes), *Plecotus* sp. (eight passes) and serotine (one pass).

Bat Crossing Point Survey

3.13.95 A total of 2459 bat passes were recorded across both locations, 2437 of which were observed using the target features (ie passing within 5m distance of the feature). A breakdown of the total number of passes observed at each crossing point is provided in Table 3.13.23 below.

Table 3.13.23: Total Bat Passes

Crossing point	Number of survey visits	Number of passes observed	Number of passes observed using the feature
River Mole	3	1298	1278
Riverside Garden Park	3	1161	1159

River Mole Crossing Point

3.13.96 A total of 1278 bat passes were observed using the feature, of which 220 (17.21%) were considered to be flying within the river corridor, 659 (51.57%) were considered to be flying directly above the river corridor and 399 (31.22%) were flying at a height above 5m from ground level. These data are presented per species / species group In Table 3.13.24 below.

Table 3.13.24 Breakdown of bat passes from River Mole

Species	Number of passes	Number of passes using the feature	Number of passes within river corridor	Number of passes directly above river corridor	Number of passes at a height higher than 5m from ground level
Myotis species	26	26	1	23	2
Noctule	53	53	0	7	40
Brown long-eared bat	3	3	0	3	0
Common pipistrelle	1017	1003	213	573	217
Soprano pipistrelle	24	24	5	19	0
Pipistrelle species	5	0	0	0	0
Unknown	170	170	1	34	135

3.13.97 Bats of at least five species were observed using the feature including Myotis species, noctule, brown long-eared bat, common pipistrelle and soprano pipistrelle. No additional species were confirmed as present by sound analysis.

Riverside Garden Park Crossing Point

3.13.98 A total of 1159 bat passes were observed using the feature, of which 216 (18.64%) were observed passing at an "unsafe height" and 943 (81.36%) were observed passing at a safe height. These data are presented per species / species group In Table 3.13.25 below.

Table 3.13.25: Breakdown of bat passes from Riverside Garden Park

Species	Number of passes	Number of passes using the feature	Number of passes at height below or equal to 5m height	%of passes at height below or equal to 5m height	Number of passes at height above 5m	% of passes at height above 5m
Myotis species	18	18	5	27.78	13	72.22
Brown long-eared bat	3	3	1	33.33	2	66.67
Common pipistrelle	655	653	142	21.75	511	78.25
Soprano pipistrelle	431	430	51	11.86	379	88.14
Pipistrelle species	10	10	7	70	3	30
Unknown	45	45	10	22.22	35	77.78

3.13.99 Bats of at least four species / species groups were observed using the feature including Myotis species, brown long-eared bat, common pipistrelle and soprano pipistrelle. An additional species, noctule, was confirmed by sound analysis as present, although not observed.

Invertebrate Scoping Survey

3.13.100 The results of the invertebrate scoping survey are detailed within Annex 4.

Terrestrial Invertebrate Survey

3.13.101 The results of the terrestrial invertebrate survey are detailed within Annex 5.

Aquatic Invertebrate Survey

3.13.102 The results of the aquatic invertebrate survey are detailed within Annex 6.

Fish Survey

3.13.103 The results of the fish survey are detailed within Annex 6.

4 Evaluation

4.1 Breeding Bird Surveys

4.1.1 Seventeen of the 51 species recorded during the survey qualify as being of ‘conservation interest’ by meeting one, or more, of the criteria listed in Annex 2. The following accounts relate to those species confirmed as breeding, or considered to be possibly breeding, within the survey area in 2019 that are included on one, or more, of the lists of species either afforded special statutory protection or denoting a species is of high conservation importance.

Specially Protected Species

4.1.2 Although no Annex 1 or Schedule 1 species were confirmed to be breeding within the survey area, three species (little ringed plover, peregrine and firecrest) were recorded within the Project site boundary and could possibly have bred.

4.1.3 Little ringed plover - one adult was recorded on visit five flying over the main lagoon east of Crawley Sewage Treatment Works in an area not accessible during the survey, so birds may have been present on previous surveys and not detected.

4.1.4 Peregrine - one male was recorded on visit three on top of Pier 3, just north of the South Terminal building. As there was only one observation recorded, and due to restrictions of access around airport buildings and high noise levels restricting possibilities of detecting adults, it was not possible to confirm signs of breeding during the surveys but was suspected from discussions with GAL staff.

4.1.5 Firecrest - single singing males were recorded at the eastern fringe of Horleyland Wood on visit two and in Upper Pickett’s Wood on visit three. These observations could relate to territorial males that failed to find a mate or passage migrants as there were no further records beyond late April.

Species of Principal Importance

4.1.6 Nine species, confirmed as breeding within the survey area (skylark, dunnock, song thrush, marsh tit, starling, house sparrow, linnet, bullfinch and reed bunting) are listed in Section 41 of the NERC Act 2006 as being of principal importance for the conservation of biodiversity in England.

Species of Conservation Concern

4.1.7 Eight species confirmed breeding within the survey area are included on the BoCC Red list. The species and reasons for Red list status are given below.

- Marsh tit – moderate breeding population decline over 25 years (-43%) and severe breeding population decline over the longer term (-72%).
- Skylark – moderate breeding population decline over 25 years (-32%) and severe breeding population decline over the longer term (-62%).
- Starling – severe breeding population decline over 25 years (-70%) and the longer term (-83%).
- Song thrush – severe breeding population decline over the longer term (-59%).
- Mistle thrush – moderate breeding population decline over 25 years (-45%) and severe breeding population decline over the longer term (-62%).
- House sparrow – moderate breeding population decline over 25 years (-32%) and severe breeding population decline over the longer term (-66%).
- Grey wagtail – moderate breeding population decline over 25 years (-33%) and severe breeding population decline over the longer term (-57%).
- Linnet – severe breeding population decline over the longer term (-60%).
- Six species recorded during the survey are included on the BoCC Amber List. The species and reasons for Amber list status are given below:
- Mallard – moderate non-breeding population decline over 25 years (-38%).
- Stock dove – UK breeding population is of international importance.
- Kestrel – moderate breeding population decline over 25 years (-33%) and the longer term (-46%).
- Dunnock – moderate breeding population decline over the longer term (-31%).
- Bullfinch – moderate breeding population decline over the longer term (-39%).
- Reed bunting – moderate breeding population decline over the longer term (-38%).

Geographic Importance

4.1.8 The following geographical frames of reference and selection criteria (based on the Guidelines for Ecological Impact Assessment in the United Kingdom (CIEEM, 2016)) are used to ascribe nature conservation value or potential value to the bird populations within the survey area.

- International importance - a species which is cited as part of the designated interest of a SPA and occurs in internationally or nationally important numbers.
- National importance - a species which is cited as part of the designated interest of a SSSI and occurs in nationally important numbers.
- Regional importance – NERC Species of Principal Importance, BoCC Red List species or UK BAP Priority species that regularly occur in regionally important numbers.
- County importance - NERC Species of Principal Importance, BoCC Red List species, UK or Hampshire BAP Priority Species that regularly occur in numbers that are important on a county basis.
- Local importance - NERC Species of Principal Importance, BoCC Red or Amber List species, UK or Hampshire BAP Priority Species which occur regularly in locally sustainable populations.
- Site - all common and widespread species.

4.1.9 For the purposes of this evaluation the number of breeding territories recorded during the survey is compared to the species’ national, regional (South East England) and county (Surrey and Sussex) population estimates (where available).

4.1.10 National breeding population estimates are based on Holling *et al*. (2018), Musgrove *et al*. (2013) and Wilson *et al*. (2018). For those species where data are available, regional breeding population estimates are based on Conway *et al*. (2008), Holling *et al*. (2018) and Wilson *et al*. (2018). For those species where data are available, county breeding population estimates are based on Holling *et al*. (2018), in addition, a descriptive county status has been derived from the Surrey and Sussex bird lists (Surrey Bird Club, 2019; Sussex Ornithological Society, 2016).

4.1.11 Where no regional or county population estimates are available, professional judgment and comparisons with population estimates at higher geographical levels have been used to inform this assessment.

4.1.12 Table 1 of Annex 4 summarises the abundance of species of conservation interest recorded during the survey, the national and/or regional population estimate and county status for these species and the geographical importance of the populations within the survey area as derived from the criteria outlined above.

4.1.13 The level of geographical importance of the breeding populations of species of conservation interest is local for all species except little ringed plover, peregrine, marsh tit and firecrest. peregrine was possibly present in numbers of regional importance; little ringed plover was possibly present in numbers of county importance; firecrest was possibly present in numbers of county importance and marsh tit was confirmed as present in numbers of county importance.

4.1.14 A single adult little ringed plover was recorded on visit five near Crawley sewage treatment works (in an area of restricted access). The breeding population of little ringed plover is stable in the UK although, in recent decades, the species has expanded its range further into Wales, northern England and south and east Scotland.

4.1.15 A single observation of peregrine falcon was recorded just north of the South Terminal building during visit three. The UK population of peregrine has increased in recent years, particularly lowland populations as found in Surrey and Sussex. Reasons for increases in populations of peregrines in the lowlands include increasing use of human structures as breeding sites (eg pylons), abundant availability of prey and a lack of conflict with humans.

4.1.16 The confirmed marsh tit territory was recorded within Upper Pickett's Wood on the eastern side of the Project area. Marsh tit populations in the UK (including Surrey and Sussex) have undergone severe declines. Contributory factors in these declines include habitat loss, increased woodland isolation, loss of woodland understorey and reductions in dead wood availability (Vanhinsbergh *et al*., 2001).

4.1.17 Two observations of singing firecrests were recorded during the survey; one on the eastern side of Horleyland Wood on visit two and the other in Upper Pickett's Wood on visit three. Firecrest populations in the UK (including Surrey and Sussex) have increased rapidly in recent years.

4.1.18 With the exception of the four species discussed above, the bird community recorded during the survey was considered typical for the habitats present within survey area. Whilst the majority of species recorded are common and widespread in Surrey and Sussex, the habitats within the survey area do provide breeding habitat for an assemblage of species of conservation importance.

Diversity of the Breeding Bird Assemblage

4.1.19 The number of species recorded in an area is a simple measure of diversity that can indicate the site's importance. Table 4.1.1 shows the criteria outlined in Fuller (1980) for breeding bird assemblages to indicate the importance of sites at various geographic levels.

Table 4.1.1: Breeding Bird Assemblage Diversity Criteria

	National Importance	Regional importance	County importance	Local importance
Number of species	85+	70-84	50-69	25-49

4.1.20 Based on Fuller's criteria, the breeding bird assemblage of 48-51 species recorded within the survey area in 2019 was at the lower limit of county importance and upper limit of local importance. However, it should be noted that Fuller's analysis was developed in the 1970's since when species diversity has declined significantly. As a result, Fuller's thresholds are considered too high for today's breeding bird populations. Taking this into consideration, the diversity of the breeding assemblage should be considered as of county importance.

4.1.21 Overall, the breeding bird assemblage within the Project site boundary was considered to be of county importance due to the diversity of species present and the presence of three species breeding, or possibly breeding, in numbers of county importance and one species possibly breeding in numbers of regional importance.

Potential Impacts on the Breeding Bird Assemblage

4.1.22 If no mitigation measures were put in place, potential impacts of the Project on the bird populations identified during the survey include:

- direct loss of habitat during the construction phase;
- indirect loss (through disturbance) of both on-site and adjacent habitat during the construction phase(s);
- disturbance of breeding birds and their dependent young (both on-site and within adjacent breeding habitat) during the construction phase;
- indirect loss (through disturbance) of both on-site and adjacent habitat during the post-construction phase, eg due to additional activity within, or close to, retained habitats; and
- fragmentation of natural/semi-natural habitats.

Conclusion

4.1.23 The survey of breeding birds recorded a breeding assemblage of 51 species in 2019. The survey undertaken from March-July 2019 was undertaken during the peak breeding period.

4.1.24 Of the 51 species recorded as breeding or possibly breeding within the survey area, 17 species meet at least one of a range of criteria relating to special statutory protection or conservation importance.

4.1.25 No breeding population of any species within the survey area approaches the 1% level of the national population. Therefore, no species considered to be breeding or possibly breeding are present in nationally important numbers.

4.1.26 One species (peregrine), possibly breeding within the survey area meets the 1% level of the regional population and was considered to be possibly breeding in regionally important numbers.

4.1.27 Two species (little ringed plover and firecrest), possibly breeding within the survey area meet the 1% level of the county (Surrey and/or Sussex) population and are considered to be possibly breeding in numbers of county importance.

4.1.28 One species (marsh tit) was confirmed breeding within the survey area and met the 1% level of the county (Surrey and/or Sussex) population and was considered to be breeding in numbers of county importance.

4.1.29 Records of black redstart were provided in the desk study data from 2013, with the last breeding records from 2012. Black redstart species were previously recorded around the Old Control Tower (landside). The habitat around this area was found to continue to provide some suitable breeding and foraging opportunities for black redstart; however, none were recorded during surveys undertaken between winter and spring 2019.

4.1.30 The diversity of species present within the survey area was at a level indicative of county importance for breeding birds.

4.1.31 If no mitigation or compensation measures were put in place the Project would cause direct and indirect loss of suitable breeding and foraging habitat.

4.2 Wintering Bird Surveys

4.2.1 A total of 61 species were recorded within the survey area during the wintering bird surveys undertaken between October 2018 and March 2019.

4.2.2 There were no wintering species recorded in any numbers which were considered to be of national or international significance (ie >1% of the wintering population) and in all cases, the numbers of birds recorded were considerably below this threshold.

4.2.3 The area within the Project site boundary was considered to be of site-level importance for wintering lapwing based on the peak counts for these species and their current conservation status; lapwing were predominantly recorded around the Crawley Sewage Treatment Works in the east of the Project site. However, the overall wintering bird population within the site was considered as being of no more than local importance.

4.3 Reptile Surveys

4.3.1 A good size population of grass snake was identified in grassland habitats along the River Mole in the west of the Project site.

4.3.2 Individual grass snakes were also identified around wetland habitats in the east of the site suggesting a separate low sized population.

4.3.3 The two areas where grass snake were recorded were disconnected from each other. The habitats between them were associated with the airport and comprised low value habitats for grass snake. Therefore, the survey results indicate two separate populations are present.

4.4 Great Crested Newt Surveys

4.4.1 Thirty-six ponds were identified within the Project site boundary.

4.4.2 Four ponds were identified as having great crested newts present. Ponds W46 was identified as having a medium sized great crested newt population, Ponds K5F and TTD were identified as having small populations of great crested newt.

4.4.3 Although no great crested newt adults were identified within Pond 8N8, great crested newt eggs were identified within the marginal vegetation and an eDNA survey produced a positive result for great crested newt.

4.4.4 Both ponds K5F and TTD had great crested newt eggs recorded within their marginal vegetation meaning that these along with Pond 8N8 are viable populations.

4.4.5 The distribution of the ponds indicates two great crested newt metapopulations are present.

4.4.6 Common toad was also recorded in habitat within the survey area. The toads were located in Pond W46 and within the field south of Brockley Wood.

4.5 Bat Surveys

Bat Assemblage

4.5.1 From field surveys undertaken between April and October 2019, at least 12 species of bat have been confirmed within the Project site boundary and surrounding area. These include:

- one very rare species – barbastelle;
- three rare species – Nathusius' pipistrelle, Brandt's bat and whiskered bat;
- one scarce species – Leisler's bat;
- two uncommon species – noctule and serotine; and
- five common species – common pipistrelle, soprano pipistrelle, Daubenton's bat, Natterer's bat and *Plecotus* sp.

4.5.2 Although *Myotis* species are notoriously difficult to distinguish from sound analysis alone, a number of calls were characteristic to those of Brandt's/whiskered bat, Daubenton's bat and natterer's bat. Therefore, these species have been included in the account below as they are likely to be present but from bat sound analysis alone their presence cannot be confirmed.

4.5.3 Desk study records confirmed the presence of two additional species within the search area, Bechstein's *Myotis bechsteinii* and Alcathoe *Myotis alcathoe*, which are considered very rare and rare species.

4.5.4 Species classified as very rare, rare, scarce and uncommon are as such because of restricted distribution and/or low to moderate populations.

4.5.5 Bats unidentified to species level comprised pipistrelle bats and *Myotis* species.

4.5.6 The highest levels of activity were recorded at Location 3 (Brockley Wood) (41,710 passes), Location 7 (Horleyland Wood) (37,967 passes), Location 6 (Perimeter Road East) (28,845 passes) and Location 11 (Crawter's Wood) (14,161 passes), indicating the importance of these woodland habitats to the bat assemblage within the Project site boundary and wider area.

4.5.7 A total of three barbastelle passes were recorded during the static surveys, comprising two passes at Location 1 (Land west of the Fire Training Ground) in September and one pass at Location 9 (Perimeter Road South) in July. This indicates that barbastelle use the woodland and woodland edge immediately to the south and west of the airport. Barbastelle's use a range of habitats and forage over a wide area.

4.5.8 Nathusius' pipistrelle were recorded during both transect and static surveys. During static surveys peak counts of 63 and 32 passes were recorded at Location 6 (Perimeter Road East) and Location 8 (Land East of the Railway Line Wetland) respectively. The majority of passes (83) were recorded in June, July and August. This coincides with likely higher levels of activity associated with the maternity season. In general, higher numbers of Nathusius' pipistrelle were recorded to the north and east of the Project site boundary, suggesting that they use the woodland associated with the Crawley Sewage Treatment Works, Riverside Garden Park and railway corridors for foraging and commuting.

4.5.9 Common and widespread species such as common pipistrelle and soprano pipistrelle were abundant throughout the survey area with moderate to high levels of activity recorded during both transect and static surveys. Common pipistrelle were the most frequently recorded species during static surveys, accounting for over 65% of the species composition across all locations. At Locations 6 and 9, common pipistrelle accounted for over 98% of all bat passes recorded between April-October.

4.5.10 Pipistrelle bats are generally flexible in their habitat requirements for foraging and commuting and are able to utilise a range of habitats in both urban and rural landscapes.

4.5.11 *Plecotus* species are generally a woodland species, although can be found utilising other habitats such as parkland. Peak counts of *Plecotus* species were recorded at Location 3 (Brockley Wood) (249 passes), Location 4 (North of the Long Stay North car park) adjacent to the River Mole corridor (70 passes) and Location 7 (54 passes). *Plecotus* species were recorded in generally low numbers throughout the Project site and were not recorded at either Location 8 or Location 9 during static surveys.

4.5.12 Higher numbers of *Myotis* species passes were generally associated with the woodland areas, such as Brockley Wood, Horleyland Wood, Upper Pickett's Wood and Riverside Garden Park. A total of 7,277 *Myotis* passes were recorded at Location 3

(Brockley Wood) with peak counts of 3,102 passes and 1,728 passes recorded in May and July respectively. These periods coincide with likely higher levels of activity associated with the pre-maternity and maternity seasons. A large number of *Myotis* bat passes were also recorded along the woodland edges associated with the River Mole Corridor in the west of the survey area. Although not confirmed through sound analysis, a proportion of these calls (particularly within the woodland) are likely to be from Bechstein's, which are known to be present in the area and typically roost and forage within deciduous woodland.

4.5.13 Daubenton's bats, which are commonly associated with habitats found within the area, including broadleaved woodland and standing water were detected during transect surveys, notably along Transect 2 and Transect 5.

4.5.14 Some of the Myotis sp. calls were characteristic of Whiskered and/or Brandt's bats, which were recorded along Transects 1 and 5. Both species are characteristic of woodland habitat, although to a lesser extent for Whiskered bats. Brandt's bats tend to forage at low and medium heights in the woodland canopy and are more likely to forage over open water, whereas Whiskered bats favour more woodland edges, close to vegetation, hedgerows and open habitats, including flowing water.

4.5.15 Several calls of *Myotis sp.* bats were characteristic of natterer's bat and recorded along Transects 1, 3 and 5. As much of the species prey is taken from foliage and normally fly at low altitudes (less than 5 metres), the woodland around Transects 1 and 3 and the woodland edge along the eastern and south western boundary of Transect 5 provide suitable foraging habitats for natterer's.

4.5.16 Moderate to high levels of bat activity of scarce and uncommon species, Leisler's, noctule and serotine, were recorded predominantly in areas of open riparian habitat, in comparison to those recorded along linear features (such as the river and railway corridors). These species often fly over open habitat, making them easier to detect.

4.5.17 Peak counts of noctules were recorded at Location 2 (Land south west of the River Mole) with 1,088 passes and Location 8 with 1,237 passes; the detectors in these locations were situated in more open areas of habitat. Noctules are a fast, high-flying species when foraging and commuting. They are typically associated with broadleaved woodland and open pasture and it was unlikely that the fragmentation of habitats would impact upon this species.

Foraging Habitat

4.5.18 Areas of significant bat foraging activity were recorded within the woodland areas across the survey area and water bodies (Old Lagoon and New Lagoon) associated with Crawley Sewage Treatment Works in the east of the Project site. The patchy wooded landscape and associated riparian habitats are likely to provide optimum foraging habitat for a variety of species including *Myotis* bats, pipistrelles and long-eared bats.

4.5.19 High levels of foraging activity were recorded along Transect 5, adjacent to the Aviation Museum; the boundary habitats here comprised of mature trees and hedgerows, woodland edge and the River Mole along the eastern boundary of the transect route.

4.5.20 The landscape in the area generally comprised large areas of woodland and interconnecting hedgerows and other linear features which provide links to high value habitat across the wider area.

4.5.21 The presence of less common and rare species suggests that the overall quality of the habitats present are able to support populations of large numbers of bats and a high diversity of species, which contributes to the importance of foraging habitat in this area.

Commuting Habitat

4.5.22 The woodland compartments connected by watercourses, mature hedgerows and tree lines provided suitable habitat to support the bat assemblage in this area.

4.5.23 Significantly lower levels of commuting activity were recorded along Transect 4, with only a handful of common pipistrelle passes recorded. This was likely to be due to the lack of suitable habitat and the presence of strong artificial light and noise emanating from the airport and surrounding ancillary buildings.

4.5.24 Overall, the continuity of connective habitat was likely to provide an extensive network of habitat features suitable for a wide range of commuting bats, providing links to the wider landscape in this area.

Crossing Point Surveys

River Mole

4.5.25 A total of 1278 bat passes from at least five species were observed using the feature over three survey visits, with the highest total number of passes from common pipistrelle (1017) and the lowest total number from brown long-eared bat (3). This indicates that bats recorded foraging and commuting could be impacted by river diversion works and increased use of aircraft.

4.5.26 Nineteen roosting locations for Bechstein's bats were identified in 2020 and 2021 using advanced bat survey techniques within Brockley Wood, which is located 30m to the north of River Mole.

4.5.27 The River Mole was identified as a core foraging area for this species from radiotracking surveys undertaken in 2019, 2020 and 2021. It was identified as a core foraging area in 2019 for a male and a peripheral foraging area for two males, out of the seven Bechstein's bats which were radio-tracked in 2019. It was identified as a core foraging area for three out of the fourteen Bechstein's bats which were radio-tracked in 2020 and 2021. These included a lactating female, a post-lactating female and an adult male.

4.5.28 Flightlines along the River Mole were identified for three males and one of the non-breeding females in 2019, out of the seven bats which were radio-tracked. No flightlines were recorded from bat roosts to foraging areas in 2020 and 2021 as the majority of bats were recorded close to their roosting locations

4.5.29 Twenty-four passes of Myotis species bats were recorded flying within the river corridor or directly above it. This, in conjunction with results of advanced bat survey techniques, indicates that Myotis bats species, likely including Bechstein's bats, are using the River Mole corridor to move across the landscape and for foraging.

Riverside

4.5.30 A total of 1159 passes from at least five species were observed using the feature over three survey visits, with the highest total number form common pipistrelle (654) and the lowest from brown long-eared bat (2).

4.5.31 Of the passes observed using the feature, 18.64% were observed passing at an "unsafe height" and 81.36% were observed passing at a safe height. The definition of safe and unsafe height is based on the assumption that the proposed road improvements will be at the current height of the ground.

4.5.32 The Riverside Park was identified as a core foraging area for Bechstein's bats using advanced bat survey techniques in 2019. This area was identified for one of the seven Bechstein's bats, an adult male radio-tracked in 2019. None of the fourteen Bechstein's bats radio-tracked in 2020 and 2021 was recorded foraging within Riverside Park.

4.5.33 A total of 18 passes of Myotis species were recorded within Riverside Park. This, in conjunction with the results of advanced bat survey techniques, indicates that Myotis bats species, likely including Bechstein's bats, are using Riverside Park for foraging and commuting.

Assessment of importance

River Mole

4.5.34 This location is confirmed as an important commuting route and foraging area for bats. River Mole is considered to be an important commuting route at regional level common pipistrelle, at county level for noctule and soprano pipistrelle, and at local level for brown long-eared bat. The River Mole is considered to be an important foraging area at county level for noctule and common pipistrelle, and at local level for brown long-eared bat and soprano pipistrelle.

4.5.35 Although it was not possible to distinguish between Myotis species om the basis of call parameters, twenty-four passes of Myotis species bats were recorded and the radio-tracking surveys confirmed that three Bechstein's bats out of a sample size of seven bats used the Rive Mole corridor as a core or peripheral foraging area in 2019, and that three Bechstein's bats out of a sample size of fourteen bats used the Rive Mole corridor as a core foraging area in 2020 and 2021. This indicates that the River Mole is likely to be an important foraging area for Bechstein's at regional level.

4.5.36 The radio-tracking surveys confirmed the River Mole to be used as a flightline by three Bechstein's bats out of a sample of seven bats. This indicates that the River Mole is likely to be an important commuting route for Bechstein's at regional level.

4.5.37 The calculations used for the assessment of importance are presented by species in tables 5.3.1 and 5.3.2.

Riverside Park

4.5.38 This location is confirmed as an important commuting route and foraging area for bats. Riverside is considered to be an important commuting route at regional level for common pipistrelle and soprano pipistrelle and at local level for brown long-eared bat. This feature is considered to be an important foraging area at county level for common pipistrelle and soprano pipistrelle, and at local level for brown long-eared bat.

4.6 Invertebrate Scoping Survey

4.6.1 Several of the sites under discussion present features of potential value to invertebrates which were considered to have a moderate invertebrate interest that would likely be raised above the expected regional background level.

4.7 Terrestrial Invertebrate Survey

4.7.1 Surveys of the NWZ and LERL identified a diverse assemblage of terrestrial invertebrates in these areas, including a range of scarce and unusual species.

4.8 Aquatic Invertebrate Survey

4.8.1 Several species designated under Section 41 of the NERC Act (2006) were identified by the desk study.

4.8.2 In 2019, the invertebrate habitat appraisal identified that Pond M and the ditches adjacent to Pentagon Field had features of moderate invertebrate interest above the expected regional background level.

4.8.3 Further detailed assessment of the River Mole and Gatwick Stream found both watercourses supported macroinvertebrate communities indicative of moderately polluted conditions, exacerbated by relatively low flow conditions and high levels of sedimentation. Dense macrophyte growth on the River Mole is contributing to acute reductions in dissolved oxygen which are impacting on the macroinvertebrate assemblage.

4.8.4 The presence of one record from 2013 of shining ram's-horn snail, an IUCN Red List species and UK species of principal importance under the 2006 NERC Act. Although not recorded during the survey, there remains a possibility that the species may occur at the site of the 2013 record at the downstream end of the desk study area.

4.8.5 The Gatwick Stream appears to be impacted by both organic pollution and silt deposition, possibly from a storm water discharge outlet from a nearby industrial area.

4.8.6 The invasive New Zealand mud snail was identified at the River Mole and Gatwick Stream sites, and signal crayfish were observed at both the Gatwick Stream sites during each visit

4.9 Fish Survey

4.9.1 The desk study identified that brown trout had previously been recorded within the Project site boundary, although it was not recorded in surveys in 2020. Brown trout is listed under Section 41 of the NERC Act (2006).

4.9.2 Both the River Mole and Gatwick Stream had consistently high fish populations. This is likely to be a consequence of stable temperature and DO conditions caused by shading and potentially high abundances of pollution tolerant macroinvertebrates such as Oligochaete worms as a food source.

4.10 Limitations

4.10.1 A number of survey limitations occurred during the 2019 survey periods. The most frequently occurring limitations across a range of surveys included:

- a lack of access to certain areas required to complete surveys;
- unsuitable weather conditions; and
- high levels of noise and lighting.

4.10.2 Further details are given below of specific limitations effecting each survey.

Breeding Birds

4.10.3 There were some limitations to the 2019 Gatwick reeding bird survey, these included:

- restrictions on land access from landowners and restricted areas airside. This included no access south of the runway during survey visit two, due to visibility restrictions in place at the time;
- excessive noise levels from aircraft and associated activities, particularly during airside surveys, which may have reduced / impeded distance to which vocalisations were detected; and
- moderate to poor weather conditions during the first day of both survey visits two and four.

4.10.4 In light of the above limitations to the survey methodology, consideration has been made during the analysis of survey data and in the writing of this report with regard to:

- the possibility of species presence not being detected during the survey; and
- the likelihood of a reduced number of territories being detected.

4.10.5 The majority of ecological data remain valid for only short periods due to the inherently transient nature of the subject. The survey results contained in this report are considered accurate for one year.

Wintering Birds

4.10.6 During the sixth and seventh survey visits within part of area A3 Land East of the Railway Line, a group of travellers had gotten into the fields south of Upper Picketts Wood and left a lot of rubbish piled up and destroyed some of the refugia, so these areas were not surveyed in the last two surveys,

Great Crested Newt Surveys

4.10.7 Six ponds were not able to be accessed due to restriction on the surrounding land, therefore we cannot rule, without further surveys on these, that they are not suitable to support great crested newt.

4.10.8 Ponds C24 and 29A were not included within the original surveys. However, HSI conducted outside of optimal survey season (September 2019) identified that Pond C24 had a 'good' habitat score and Pond 29A had an 'average' habitat score for great crested newt.

4.10.9 The other waterbodies, which were mainly drainage and runoff ditches, were not surveyed but could be used by great crested newt and be impacted on by the Project.

Bat Transects

4.10.10 The routes for Transects 1, 3 and 5 were modified between April and May, and 3 and 5 were changed again from June onwards.

4.10.11 Along Transect 3, a minor deviation was made to the route through the Riverside Garden Park to include a broader range of habitats along the northern and southern boundaries of the park; for Transect 5, the route deviated to incorporate an area of land to the north of the original transect route, which included a large area of pasture land and wooded hedgerows adjacent to Man's Brook. Transect 1 was changed due to the original transect being too complex to reliably duplicate over subsequent transects. The deviations from the original route are not thought to be a limitation to the results, as the new routes incorporate a larger and more diverse area, which could potentially be utilised by a greater variety of species.

4.10.12 The first post-maternity survey along Transect 2 was cancelled due to access constraints. Although the survey was not rescheduled, this is not considered to be a limitation of the results.

4.10.13 A number of static detectors failed to record data for a minimum of five nights due to equipment failure and malfunction. Where this occurred, the species assessment is conservative to account for gaps in the information.

4.10.14 A proportion of species are likely to be underrepresented in the analysis, such as long-eared bats. This is likely due to their call characteristics, which are comparatively quiet compared to that of other species. In order for the detectors to record long-eared bat calls, bats must fly within 3 metres of the microphone.

4.10.15 In addition, the calls of *Myotis* and long-eared bat species are notoriously difficult to distinguish and therefore calls were only analysed down to species level where they were characteristic of that species and present within suitable habitat. Although Bechstein's were not confirmed through sound analysis of activity data, it is likely that a proportion of unidentified *Myotis* bat calls are from Bechstein's bat, which are known to be present within the woodlands surveyed.

4.10.16 Additional survey techniques, including bat trapping and radio-tracking surveys ensured that the presence of this species was accounted for and included within the assessment of the overall bat assemblage at Gatwick.

4.10.17 Sound analysis was not possible for a small number of transect surveys during the pre-maternity and maternity seasons due to equipment failure and malfunction, therefore some species' accounts and interpretation are based on field observations only. This was not thought to be a limitation to the results and the species assessment was conservative to account for these gaps in information.

5 Conclusions

5.1.1 The ecology surveys undertaken on the Project site boundary found that the majority of the centre of the site, associated with the airport and infrastructure, comprised buildings, areas of hardstanding, amenity grassland and introduced shrubs and trees. They provided some areas of suitable habitat for breeding birds but were otherwise of overall low ecological value.

5.1.2 The habitats within the Project site boundary that surrounded the airport supported a number of higher value habitats, including semi-natural broadleaved woodland, scrub and trees, semi-improved neutral grassland, marshy grassland, ponds, rivers and hedgerows.

5.1.3 These areas were considered higher value habitats which supported a more diverse flora and fauna, especially within the associated Land East of the Railway Line wetland and woodland in the south east of the Project site boundary and the areas around the River Mole. They supported a variety of breeding birds, including species of conservation concern and were well used by foraging and commuting bats, including some rare bat species.

5.1.4 Populations of great crested newt and grass snake were found in these habitats within the Project site boundary.

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Annex 1

Survey Methodologies

A1.1 Survey Methodologies

National Vegetation Classification Surveys

A1.1.1 A National Vegetation Classification (NVC) survey was carried out following the methodology and guidelines detailed in the Joint Nature Conservation Committee's (JNCC) NVC User's Handbook (Rodwell *et al*., 2006).

A1.1.2 Fieldwork was carried out on the 8–12 April, 8–12 July and 6–8 August 2019 by Alex Powell Grad CIEEM (Chartered Institute of Ecology and Environmental Management), a qualified ecologist and botanist. The survey was undertaken during the optimal time for both grassland and woodland botanical surveys.

A1.1.3 A general walkover of the site was carried out to identify homogenous stands of vegetation within the survey boundary.

A1.1.4 Quadrat data was collected (1 metre x 1 metre quadrats) from within their represented stands of homogenous vegetation. Plant species within their quadrats were recorded following the nomenclature in Stace (2010). Percentage cover and DOMIN values were also recorded for each species. A breakdown of DOMIN values and their estimated percentage cover are outlined in Table 2.1.1.

A1.1.5 The habitat community was identified for each homogenous stand of vegetation using the computer programme TABLEFIT. The TABLEFIT programme computes 'Goodness of Fit' between quadrat data (from sampled vegetation) and the published NVC tables (which define the NVC communities and sub-communities). This gives an initial indication of which NVC types the data are most likely to have been drawn from – the highest coefficient does not necessarily indicate the correct NVC diagnosis.

A1.1.6 It was then necessary to identify the NVC type through careful consideration of the NVC descriptions in British Plant Communities (Rodwell, 1991, 1992, 1995, 2000; Rodwell *et al*., 2000). There is no guarantee that the highest coefficient corresponds to the 'correct' NVC diagnosis.

A1.1.7 DOMIN scale and percentage cover estimates:

Table A1.1.1: DOMIN Scale and Percentage Cover Estimates

Cover	DOMIN value
<4 % (few individuals)	1
<4 % (several individuals)	2
<4% (many individuals)	3
4 – 10 %	4
11 – 25 %	5
26 – 33 %	6
34 – 50 %	7
51 – 75 %	8
76 – 90 %	9
90 – 100 %	10

Hedgerow Surveys

A1.1.8 The hedgerow survey followed the methodology and guidance set out in the Hedgerow Survey Handbook: A standard procedure for local surveys in the UK (Department for Environmental, Food and Rural Affairs (Defra), 1997) and involved surveying 30 metre lengths of hedgerow.

A1.1.9 A hedgerow is defined as any boundary line of trees or shrubs over 20 metres long and less than 5 metres wide at the base, provided that at one time the trees or shrubs were more or less continuous. All hedgerows consisting of at least one woody UK native species are UK BAP priority habitats.

A1.1.10 Hedgerow surveys were undertaken on 5–8 August 2019 and all hedgerows were surveyed for whether they were protected or not. The method is based on definable lengths of hedgerow between two end points, that were identified as:

- any point of connection between two, or more, hedgerows or to other features eg fences, walls, ditches, roads;
- the point at which a hedgerow stops and there is a gap of more than 20 metres to the next hedgerow (eg where the hedgerow ends in the middle of a field); and
- the point at which the hedgerow links to a woodland or other semi-natural habitat such as a pond.

A1.1.11 Three additional end points were included in the assessment, where there was significant variation and the hedgerow needed refining, these were:

- the point at which the hedgerow changes character from one hedgerow type to another for 20 metres or more;
- where there is a distinct change in hedgerow height for lengths of 20 metres or more; and
- the ends of lengths (20 metres or more) of recent planting, coppicing or laying.

A1.1.12 Each section between two end points was considered a separate hedgerow and was surveyed as such. 30 metre lengths of each hedgerow were identified where, either the hedge was 30 metres or less in length then the whole hedge was surveyed or, if the hedge was between 30-100 metres then the central 30 metres of hedgerow was surveyed; or, if the hedge was between 100-200 metres long then the hedgerow was divided into two and the central 30 metres of the two sections was surveyed; or finally, if the hedge was over 200 metres it was divided into three sections and the central 30 metres of each of the thirds was surveyed.

A1.1.13 To be considered protected, the hedgerow had to exhibit one of the following:

- it had an average of seven or more woody species in the surveyed section(s);
- it had an average of six woody species in the surveyed section(s) and three or more features from:
  - a wall or bank along half or more of the length;
  - a ditch along half or more of the length;
  - an average of one standard tree or more per 50 metres of hedgerow;
  - gaps which do not add up to more than 10% of the hedge;
  - three woodland understorey species;
  - a parallel hedge within 15 metres; or
  - connections scoring four points. Connections to a hedge scores one point. Connections to a pond or wood score two points;
- it has six woody species and one of the following rare trees – black poplar, large leaved lime, small leaved lime, wild service tree;
- it has an average of five wood species on average in the surveyed section(s) and has four or more features listed above (bullet point two);
- it has four woody species on average in the surveyed section(s); is adjacent to a footpath, bridleway, byway open to all traffic (but not necessarily a normal adopted vehicular highway unless it also is one of these) and has two or more features listed above (bullet point two).

Breeding Bird Surveys

A1.1.14 The breeding bird survey undertaken was based on a standard territory mapping methodology as outlined in Gilbert *et al*. (1998) and Bibby *et al*. (2000).

A1.1.15 This method is based on the principle that the majority of species are territorial during the breeding season. This results in birds occupying discrete territories and displaying various behaviours (eg conspicuous song, visual display and periodic disputes with neighbouring individuals) allowing their location and abundance to be estimated.

A1.1.16 The survey area (Project site boundary), as shown in Figure 2.4.1, was walked at a slow pace in order to locate and identify all individual birds. Visits were undertaken early in the morning, finishing before midday. All of the site was covered where land access was granted or where it was safe to do so given constraints of operational airport. There was no access airside on visit one of survey so an extra visit to site to make up for this was carried out on the 27th of June. On the second visit, there was no access to the south-side of main runway due to a necessary enforcement of a visibility restriction preventing movement of security vehicles. No extra visits were conducted to cover this. Suitable optical equipment was used to observe bird behaviour and all accessible parts of the survey area were approached to within 50-100 metres. Survey routes were mapped and the direction walked alternated on each visit, to ensure that all areas were covered at various times of morning across the duration of the survey. All species encountered within the survey area were recorded and mapped.

A1.1.17 Surveys for breeding birds were undertaken in spring/summer 2019 with a total of seven survey visits taking place. The survey visits and ornithologist undertaking the survey were as follows:

- Visit 1: 27 and 28 March 2019 - Andrew Seth;
- Visit 2: 9 and 10 April 2019 - Andrew Seth;
- Visit 3: 23 and 24 April 2019 - Andrew Seth;
- Visit 4: 7 and 8 May 2019 - Andrew Seth;
- Visit 5: 21 and 22 May 2019 - Andrew Seth;
- Visit 6: 5 and 6 June 2019 - Andrew Seth; and
- Visit 7: 27 June 2019 ('airside' only) - Andrew Seth.

A1.1.18 On each visit, registrations were recorded directly into ESRI Arcpad GIS software loaded on handheld PDA devices, with a 1:10,000 scale Ordnance Survey base map of the Project area and adjacent land. A fresh map was used for each survey. Registrations of birds were recorded using standard British Trust for Ornithology (BTO) two letter species codes (BTO, 2009). Specific codes were also used to denote singing, calling, movement between areas, flight, carrying food, nest building, aggressive encounters and other behaviour.

A1.1.19 The expected outcome of a territory mapping survey is that mapped registrations fall into clusters approximately coinciding with territories. A cluster is generally a spatially distinct group of registrations that represent the activity of not more than one territorial male or pair. Ideally, clusters include registrations of territorial behaviour across all visits and are clearly demarcated from adjacent clusters by simultaneous recording of neighbouring birds. Where a species exhibits high territory density, the mapping of simultaneously singing birds becomes essential. Territory boundaries are assumed to be between such birds.

A1.1.20 Territory mapping methods produce analysis maps of non-overlapping ellipses encircling clusters of records thought to relate to separate territorial males or breeding pairs. These ellipses may not show the entire extent of a pairs' actual breeding territory, which may be significantly larger; however, they are likely to show those areas in which the pair is most active.

A1.1.21 On completion of the surveys, analysis maps were produced for each species, consisting of all registrations recorded during the survey. From these species maps, the number of territories was calculated by identifying the number of clusters present.

A1.1.22 Standard registration mapping techniques were also used to record non-breeding species.

A1.1.23 The following definitions have been used to identify the breeding status of the species recorded.

- Confirmed breeding: includes species for which territories were positively identified as a result of the number of registrations, the location of an active nest, and the presence of recently fledged young or downy young.
- Probable breeding: includes a pair observed in suitable nesting habitat in breeding season, or agitated behaviour / anxiety calls from adults suggesting probable presence of nest or young nearby. Behaviour was observed on insufficient occasions to confirm the presence of a territory.
- Possible breeding: includes species observed in breeding season in suitable nesting habitats or singing male present (or breeding calls heard) in breeding season in suitable breeding habitat.
- Non-breeding: fly-over species observed but suspected to be on migration, or species observed but suspected to be summering non-breeder.

Assessment Criteria

A1.1.24 The assessment of the breeding bird community within the Project site boundary includes a focus on species that are afforded special statutory protection or those included on one, or more, of the lists of species of conservation interest, these include:

- Species listed on Annex 1 of the EC Birds Directive (Directive 2009/147/EC).
- Species listed on Schedule 1 of the Wildlife and Countryside Act 1981 (as amended).
- Species included on the Section 41 list of Species of Principal Importance of the Natural Environment and Rural Communities (NERC) Act 2006.
- Species included in the Birds of Conservation Concern (BoCC) Red and Amber Lists (Eaton *et al*., 2015).
- Species occurring in nationally, regionally or locally important numbers.

A1.1.25 Annex 1 species are those for which the UK Government are required to take special measures, including the designation of Special Protection Areas (SPAs), to ensure the survival and reproduction of these species throughout their area of distribution.

A1.1.26 Schedule 1 species are those which, along with their nests, eggs and dependant young, are afforded additional protection during the breeding season.

A1.1.27 The NERC list of Species of Principal Importance is used to guide decision-makers such as public bodies, including local and regional authorities, in implementing their duty under section 40 of the NERC Act 2006; under Section 40 every public authority (eg a local authority or local planning authority) must, in exercising its functions, have regard, so far as is consistent with the proper exercise of those functions, to the purpose of conserving biodiversity. In addition, with regard to those species on the list of Species of Principal Importance prepared under Section 41, the Secretary of State must:

"(a) take such steps as appear to the Secretary of State to be reasonably practicable to further the conservation of the living

organisms and types of habitat included in any list published under this section", or

"(b) promote the taking by others of such steps."

A1.1.28 Species listed on the BoCC Red List are those that have declined in numbers by 50% over the last 25 years, those that have shown a historical population decline between years 1800 and 1995 and species that are of global conservation concern. The 67 species on the Red List are of the most urgent conservation concern.

A1.1.29 Species listed on the BoCC Amber List, of which there are currently 96, include those that have shown a moderate decline in numbers (25%-49%) over the last 25 years and those with total populations of less than 300 breeding pairs. Also included are those species which represent a significant proportion (greater than 20%) of the European breeding or wintering population, those for which at least 50% of the British population is limited to ten sites or less, and those of unfavourable conservation status in Europe.

A1.1.30 The remaining species are placed on the Green List, indicating that they are of low conservation priority. These species still receive full protection through the provisions of the Wildlife and Countryside Act 1981, as amended.

Wintering Bird Surveys

A1.1.31 The wintering bird surveys were based on a transect survey methodology as detailed in Bibby *et al*. (2000) and Gilbert *et al*. (1998).

A1.1.32 The survey area (Project site boundary) is shown on Figure 2.4.1.

A1.1.33 The transect route was selected to include all field boundaries and visit all areas of the Project site boundary to within 200 metres, where possible. Visits were undertaken early in the morning.

A1.1.34 On each visit the route was walked at a slow pace with start and finish times noted. All birds seen and heard were recorded directly onto an ArcGIS base map using ESRI software on hand-held PDA devices, with a 1:10,000 scale Ordnance Survey base map of the study area (and adjacent land). A fresh map was used for each survey. Registrations of birds were recorded using standard BTO two letter species codes.

A1.1.35 All bird species were recorded and mapped across the whole Project site, where accessible.

A1.1.36 Surveys for wintering birds were undertaken between October 2018 and March 2019. A total of five survey visits were undertaken, each over two consecutive days. The survey visits and ornithologist undertaking the survey were as follows:

- Visit 1: 30 and 31 October 2018 - Andrew Seth;
- Visit 2: 22 and 23 November 2018 - Andrew Seth;
- Visit 3: 19 and 20 December 2018 - Andrew Seth;
- Visit 4: 23 and 24 January 2019 - Andrew Seth; and
- Visit 5: 20 and 21 March 2019 - Andrew Seth.

A1.1.37 An assessment of the ornithological importance of the survey area during the winter period was made by evaluating the species recorded against the following criteria:

- Annex 1 of the EU Birds Directive;
- UK BAP priority bird species;
- NERC Species of Principal Importance; and
- BoCC Red and Amber Lists (Eaton *et al*., 2015).

A1.1.38 Reference is not made to species afforded special protection under Schedule 1 of the Wildlife and Countryside Act (1981) as the protection measures only apply to these species within the breeding season.

Reptile Surveys

A1.1.39 The reptile survey followed the recommended methodology described in the Herpetofauna Worker's Manual (Joint Nature Conservation Committee (JNCC), 2003) and Froglife's Surveying for Reptiles (Froglife, 2016). It was undertaken by experienced ecologists and was conducted in areas of the site identified as containing the most favourable habitat for reptiles.

A1.1.40 Reptiles are best surveyed from April following hibernation until June and then again in September. At this time of year, the sun is often shining but air temperatures are low, so reptiles spend a long time basking and are therefore more easily observed.

A1.1.41 The reptile survey was conducted using artificial refugia made from corrugated tin and roofing felt measuring 50 cm x 50 cm and 50 cm x 100 cm. These provide shelter and basking opportunities for reptiles, which can be recorded on or under the refugia in suitable weather conditions.

A1.1.42 On the 26-28 March, 29 May and 7 August reptile refugia was placed in areas identified as providing the greatest suitability for reptiles and which had optimal basking opportunities. The locations of the refugia are shown on Figures 3.6.1a – 3.6.1e.

A1.1.43 The refugia were left undisturbed for ten days prior to the first survey being undertaken in order to allow them to bed down and to give them time for reptiles to find them. In order to conform to best practice guidelines, the refugia was inspected on seven separate survey visits and a visual search was undertaken when the refugia were being laid.

A1.1.44 On each of the visits every refugia was inspected for reptiles basking on top and was then lifted to identify any reptiles beneath. The number, species, age class and where possible, sex of each reptile observed was recorded.

A1.1.45 Visit times were selected to coincide with suitable weather conditions and times of day when refugia would be acting as heat traps which would attract reptiles to use them whilst basking. Periods of strong wind or heavy rain were avoided, and surveys were typically undertaken during periods of sunshine and when air temperatures were between 10°C and 18°C.

A1.1.46 Froglife (1999) provides a basic index of relative abundance of reptiles based on peak survey counts (Table 1 of the guidance). The figures in the table refer to the maximum number of adults seen by direct observation and/or on or under refuges by one person in one day.

Great Crested Newt Surveys

Habitat Suitability Index (HSI)

A1.1.47 HSI assessments of all ponds within 250 metres of the Project scoping boundary were undertaken, where access was allowed. All ponds were reassessed to consider any changes since the original assessment, such as desiccation rate.

A1.1.48 An HSI is a numerical index, between 0 and 1 where 0 indicates unsuitable habitat and 1 represents optimal habitat.

- <0.5: poor;
- 0.5 – 0.59: below average;
- 0.6 – 0.69: average;
- 0.7 – 0.79: good; and
- >0.8: excellent.

A1.1.49 The HSI methodology for great crested newts has been developed to assess the suitability of ponds for use as breeding sites. The assessments were made in accordance with the methodology set out in Advice Note 5 published by the Amphibian and Reptile Group UK (ARGUK) (ARGUK, 2010).

A1.1.50 The HSI incorporates ten suitability indices, all of which are factors thought to affect the likelihood of great crested newt presence. The ten indices are location, pond area, pond drying, water quality, shade, waterfowl, fish, other ponds within 1 km, terrestrial habitat and macrophytes.

eDNA

A1.1.51 The surveys were conducted by great crested newt license holders. The surveys followed the eDNA surveying and laboratory analysis techniques as described by Biggs *et al*. (2014).

A1.1.52 Water samples were collected using sampling kits supplied by NatureMetrics Ltd.

A1.1.53 Surveyors collected 30ml water samples from Ponds 30Z, 8N8, A, AA21, FFJ and AVF along the margins of the waterbody using a sterile ladle. Surveyors collected the sample from the bank edge and did not enter the water.

A1.1.54 Where access allowed, the samples were collected from points evenly spaced along the waterbody. Samples were spread out as much as possible to ensure a representative sample was collected and to ensure the effectiveness of the survey was not compromised.

A1.1.55 The surveyors used the ladle to gently agitate the water to mix the water column, whilst taking care not to disturb and collect any sediment. The samples collected were emptied into a sterile plastic bag and homogenised by gently shaking the bag to ensure eDNA was evenly mixed through the sample.

A1.1.56 A pipette was used to collect 15 ml subsamples of the pond water from the bag into sterile tubes already containing 35 ml of ethanol to preserve the eDNA sample.

A1.1.57 The samples were then removed from site and sent off to NatureMetrics Ltd for analysis. The water samples were analysed using the quantitative Polymerase Chain Reaction (qPCR) eDNA test.

A1.1.58 Biggs *et al.* (2014) has demonstrated the effectiveness of eDNA in the detection of great crested newt. In detailed field studies eDNA detected great crested newt 99.3% of the time in ponds where they were known to occur.

Bottle Trapping

A1.1.59 Bottle traps constructed from 2 L plastic drinks bottles supported on bamboo canes were located at approximately 2 metre intervals around the edge of each pond. On each survey visit traps were set out before dusk and were emptied and removed the next morning before 10 am. Traps were always placed ¾ submerged so that they contained at least ¼ air; they also had air holes in the exposed ends. The species, number and sex of newts captured in the traps were recorded and the newts were carefully released back into the pond from which they were caught.

Torch Survey

A1.1.60 The shoreline of each water body was scanned after dusk using a high powered torch of 1,000,000 candlepower. The perimeter and centre of the pond were slowly scanned with the torch and the number, and where possible sex, of any amphibians seen was recorded.

Egg Searching

A1.1.61 Egg searches are undertaken by searching for folded leaves on marginal and aquatic vegetation around the perimeter of a pond and carefully opening them up to reveal newt eggs.

A1.1.62 The eggs of great crested newts can be distinguished from those of other species by their size and colour.

Dormouse Surveys

A1.1.63 A dormouse nest tube survey was undertaken based on methodology and best practice guidelines set out in the dormouse conservation handbook, second edition (Bright, Morris and Mitchell-Jones, 2006).

A1.1.64 A total of 684 dormouse tubes were set out on site 1– 8 April 2019 and 22 May. They were tied to suitable vegetation around the site following standard survey guidelines (English Nature 2006), to provide nesting opportunities for any dormice present (Figure 3.8.1).

A1.1.65 Survey visits have been undertaken regularly in suitable weather conditions between May and June, with additional monthly visits until November 2019. Following the table of probability of finding dormice in the Dormouse Conservation Handbook (Table 5 – English Nature, 2006) and assuming the tubes are in situ until September, this gives a score in excess of 20 which is considered an acceptable level of survey.

Aquatic Mammal Surveys

Otter Survey

A1.1.66 The otter survey was undertaken with regard to the methodology described in the Design Manual for Roads and Bridges, Volume 10 Section 4, Part 4 (Highways Agency *et al*., 2001). The methodology was developed for linear schemes which are likely to affect otter habitats or populations but was adopted for this site.

A1.1.67 The suitable areas along the River Mole were walked and examined in detail for evidence of the presence of otter in the form of characteristic field signs.

A1.1.68 The following field signs were searched for:

- spraints;
- prints;
- holts and couches;
- slides and runs; and
- feeding remains.

Water Vole Surveys

A1.1.69 The water vole surveys were carried out on the 13 and 14 May 2019 by suitably experienced ecologists.

Describe Location of Survey/Surveys.

A1.1.70 Although they do not hibernate, water voles are not very active above ground during the winter, so surveys are best carried out between April and October when field signs are most abundant.

A1.1.71 The survey was carried out in accordance with guidelines of best practice set out in the water vole Conservation Handbook – Third Edition (Strachan *et al.*, 2011).

A1.1.72 The suitable areas along the River Mole were walked and examined in detail for evidence of the presence of water vole in the form of characteristic field signs.

A1.1.73 Wherever possible, the banks were inspected on both sides, from the water's edge to the top of the bank.

A1.1.74 American mink is a non-native, invasive species listed under Section 9 of the Wildlife and Countryside Act 1981 (as amended). They predate on water voles and are considered to be to one of the main reasons for the dramatic decline in the size of the water vole population in the UK. Therefore, incidental signs of this species observed during the survey were also noted.

A1.1.75 The following water vole field signs were sought during the survey work.

Field Signs

Latrines

A1.1.76 Droppings are the most distinctive field sign. These are about 8-12 mm long and 4-5 mm wide, cylindrical and symmetrical with blunt ends. Colouration varies from green, brown, black and even purple, depending on what food has been eaten and its water content. They have the texture of putty when fresh but when dry may show green concentric rings of fine plant material if broken open. Rat droppings are always larger than water vole droppings and have an unpleasant odour. Most droppings are deposited at discrete latrine sites near the nest, at range boundaries and where they enter and leave the water. Latrines are established and maintained from February to November. Scent from the lateral flank glands is deposited on the latrine when the vole drum marks with its hind feet, so that many latrines often show a flattened mass of old droppings, topped with fresh ones.

Feeding Stations

A1.1.77 Food items are often brought to favoured feeding stations along voles' pathways or at haul-out platforms along the water edge. These show feeding remains as a neat pile of chewed lengths of vegetation. The sections are typically up to 10 cm long showing the marks of the two large incisors and are quite good field signs of the presence of water vole. These chopped sections of vegetation are often taken into the burrow entrances by the voles and laid up as stores along the tunnels or in chambers.

Burrows

A1.1.78 Water vole burrow entrances are typically wider than high with a diameter of between 4-8 cm. At the water's edge the entrances may occasionally appear larger due to erosion, but the tunnel soon contracts down to the size of two fingers. Externally the burrow system appears as a series of holes along the water's edge, some at or just above the water level on steep banks, some opening below the water line and others occurring within the vegetation up to five metres from the water's edge (for access to food and for ventilation). At the water's edge spoil excavated from the burrows tends to be washed away while those burrows opening high on the bank are probably dug from underground as no spoil can normally be found around them.

Lawns

A1.1.79 Around land holes, grazed 'lawns' can be found. These frequently occur when the female is nursing young and time away from the nest is kept to a minimum. The female grazes the vegetation short to the ground within easy reach of the hole; often by not fully leaving the hole and being wary to dart back should danger threaten.

Nests

A1.1.80 Both males and females take bedding underground to line nest chambers in the burrow system. Nurseries consist of a large ball of finely shredded grasses or reed and the chamber entrance may be plugged by the female with loose soil or grass. Where vegetation cover is dense and the water table is high, nests roughly the same size and shape of a rugby ball can sometimes be found above ground, often woven into the bases of rushes, sedges or reed.

Footprints

A1.1.81 Although footprints may be readily found along the soft margin of a watercourse (of many species besides water voles) they are not the easiest field sign to use. Large adult water vole tracks will appear very similar to those of juvenile rats. As with all rodents, the imprints show four toes in a star arrangement from the forefoot and five toes of the hind foot with the outer ones splayed, but often the tracks of the hind feet partially overlap those of the fore. The hind foot typically measures between 26-34 mm and is noticeably smaller than that of the Common Rat at 40-45 mm (heel to claw measurements). The Brown Rat is also heavier and so leaves a deeper impression.

Runways in Vegetation

A1.1.82 These are most often found within 2 metres of the water's edge and take the form of low tunnels pushed through the vegetation. Pathway width may be 5-9 cm broad and often branch many times, leading to the water's edge, burrow entrances or favoured feeding areas. Rat runs on the other hand are usually very obvious as clear or bare pathways linking burrows and often running along the bank away from the water's edge.

Assessing Population Size

A1.1.83 Water voles live in colonies, but string themselves out along a watercourse through a series of contiguous territories. Breeding female water voles are territorial but may share territory with their female offspring. Males have home ranges which overlap with the territories of a number of females and other males. A female's territory length typically varies between 30 metres to 150 metres and a male's home range from 60 metres to 300 metres.

A1.1.84 The number of water vole latrines present gives an indication of the strength of the water vole colony. Approximately six latrines are maintained per breeding female. However, larger and more robust populations show a large number of closely packed latrines. Typically, fewer maintained latrines are present when water vole populations are small and fragmented.

Preliminary Bat Roost Assessment

Buildings

A1.1.85 An assessment of the suitability of the buildings for bat roosting potential, within the landside and airside areas of the Project site, was undertaken at the same time as the Phase 1 Habitat Survey.

A1.1.86 The survey included a thorough, ground level inspection of the exterior of all accessible buildings and the features of the building listed below were noted:

- type;
- age;
- wall construction, in particular the type of material used;
- form of the roof, in particular the presence of gable ends, hipped roofs etc and the nature and condition of the roof; and
- the general condition of the building.

A1.1.87 The above information would inform the potential for roost features to be present and identify potential bat access points and roost places and field signs of bats being present.

A1.1.88 When suitable features were identified, they were inspected for signs indicating use or possible use by bats including tiny scratches, staining and flies around the entry points, bat droppings and feeding remains in, around and below entrances, distinctive smell of bats and the smoothing of surfaces around cavities.

A1.1.89 Guidance from the Bat Conservation Trust (BCT) (2016) on the features of buildings which correlate with their use by bats was considered.

A1.1.90 Preliminary bat roost assessments of buildings can be carried out at any time of year; however, summer surveys are more likely to reveal signs of bat activity.

Trees

A1.1.91 Details on the methodology for bat roost assessment of trees is to follow.

Bat Emergence/Re-entry Surveys

A1.1.92 In order to comply with best practice guidelines (Collins, 2016) emergence surveys were carried out on any buildings considered to have bat roosting potential. Surveys were undertaken between May–October 2019. The aim of these surveys was to determine the use of the buildings (if any) by roosting bats, the species assemblage within the Project site and the egress locations of any bats emerging from the buildings.

A1.1.93 Observations were made outside the buildings from where it was considered bats might emerge. The dusk survey commenced 15 minutes before sunset, and lasted for approximately 90 minutes, to record any bats that may emerge from the buildings.

A1.1.94 During each survey visit, the building was continuously surveyed by up to three experienced ecologists and visual observations were made of the where bats emerged/re-entered and in what direction they were flying to or from. Behavioural observations were also recorded for any bats encountered on site or within the vicinity, including direction of flight and activity observed eg foraging or commuting.

A1.1.95 Elekon Batlogger and Anabat bat detectors were used to record bat echolocation calls of any emerging bats and identify species, where possible.

A1.1.96 Bat activity can be strongly dependent on weather conditions; therefore, the surveys were only carried out in favourable conditions when bat activity was deemed to be likely (sunset temperature 10ºC or above, no rain or strong wind).

Bat Activity Transect Surveys

A1.1.97 A total of five transect routes were devised to cover a broad range of the habitat types present on site but focusing on those likely to be of greatest value to bats, including woodland, woodland edges, river corridors and open grassland. A brief overview of each transect route is as follows.

Transect 1

A1.1.98 Transect 1 was devised to include potentially high value habitat in the south eastern part of the Project site (within the airport's biodiversity area), including the old and new lagoons associated with the Crawley Sewage Treatment Works (hereafter referred to as 'the sewage works') and immediately surrounding woodland areas, including Upper Pickett's Wood to the south east and Horleyland Wood to the north west.

A1.1.99 The lagoons and open water habitats were considered to provide good opportunities for a wide variety of bats to forage upon, so too the woodland. Additionally, the woodland habitat would provide foraging and roosting opportunities for a wide variety of species associated with this habitat type, including pipistrelle and *Myotis* species.

A1.1.100 The transect route also incorporated the corridors between woodland compartments, including those to the north of the Crawley Sewage Treatment Works and adjacent to the Long Stay South Car Park. These areas would likely be used for foraging and commuting bats.

Transect 2

A1.1.101 Transect 2 focussed on areas of potentially high value habitat, immediately to the south of Transect 1 and the Crawley Sewage Treatment Works.

A1.1.102 The transect route covered large areas of open grassland to the east of the railway corridor, the woodland edges and connecting habitat which linked woodland corridors and linear features, such as the Gatwick Stream and railway line, to the Crawley Sewage Treatment Works and Horleyland Wood.

A1.1.103 These linear features were considered to potentially provide good commuting corridors between woodland compartments, further linking to the wider area. The large areas of open grassland would likely provide foraging opportunities for larger species of bats, such as noctule, Leisler's and serotine bats which typically exploit these types of habitats.

Transect 3

A1.1.104 Transect 3 covered areas of potentially high value habitat in the north eastern part of the Project site.

A1.1.105 The transect included a narrow strip of woodland between the railway line and A23 London Road, heading north towards the main trunk road leading to the M23. From there, the transect covered Riverside Garden Park, which included areas of both dense and open canopy woodland, grassland and a large pond in the south of the park. Gatwick Stream ran adjacent to the transect route along the north eastern edge of the Project site boundary.

A1.1.106 The habitats present along the transect route were considered likely to provide a range of opportunities for both woodland and larger bat species to forage upon. The woodland edges, railway corridor and stream would likely provide linear features for bats to commute along to access areas of high value habitat to the north and south of the Project site boundary, including the woodland compartments adjacent to Crawley Sewage Treatment Works.

Transect 4

A1.1.107 Transect 4 covered an area in the southern part of the site, adjacent to buildings and car parks (X and Z) associated with the airport.

A1.1.108 The transect also included small strips of woodland located between the A23 London Road and Perimeter Road South, and between the staff car park and Charlwood Road. Part of the transect incorporated the length of Crawter's Brook which sits between Perimeter Road South and the southern boundary of the airport.

A1.1.109 The transect route aimed to incorporate habitat which could potentially be used as commuting corridors between different woodland compartments, linking to further suitable habitat within the wider landscape.

Transect 5

A1.1.110 Transect 5 covered a broadly open area of habitat, Land East of the Aviation Museum, in the north west of the Project site.

A1.1.111 The transect incorporated areas of potentially high value habitat such as mature hedgerows and tree lines, Man's Brook to the north of the Project site and the River Mole and woodland corridor along the east of the transect route. The River Mole and woodland corridor further linked to large areas of woodland to the north and south of the Project site, including Brockley Wood.

A1.1.112 The woodland corridor to the east of the transect route would likely provide strong commuting links, for all bat species, to areas of suitable foraging and roosting habitat within the wider are, particularly to the open and diverse mosaic of habitat to the north west of the airport. The large areas of open grassland within the Project site boundary would likely provide foraging opportunities for larger bat species, such as noctule, Leisler's and serotine bats which typically exploit these types of habitats.

Methods

A1.1.113 Each transect was surveyed twice per month between April-October 2019. Each visit commenced at least fifteen minutes before sunset and continued until at least two hours after sunset.

A1.1.114 On each visit, two ecologists walked along the transect at a steady speed starting at opposite points of the transect to ensure the full transect route was covered and to reduce bias associated with levels of bat activity at particular times of day/night. Several spot-sampling locations were included, distributed evenly along the transect route. The surveyors stopped at each of these points for between three and five minutes and recorded all bat activity seen and/or heard.

A1.1.115 Visual observations for bats were undertaken by scanning the skyline, and bat detectors were used to listen to and record echolocation calls. Elekon Batlogger and Anabat bat detectors were used, and recordings were made. For any bats encountered, notes were made on location, species or species group, behavioural observations (eg direction of flight, habitat) and activity heard (eg feeding buzzes or social calls).

A1.1.116 Bat activity can be strongly dependent on weather conditions; therefore, the surveys were only carried out in favourable conditions when bat activity was deemed to be likely (sunset temperature 10ºC or above, no rain or strong wind).

Bat Static/Automated Surveys

A1.1.117 A total of 11 Elekon Batlogger A units were deployed across the site between April-October 2019 for a minimum of five nights. The units were positioned at various locations, in order to sample a broad range of the habitat types present on site but focusing on those likely to be of greatest value to bats.

A1.1.118 The automated bat detectors were programmed to commence recording approximately 15 minutes before sunset and terminating 30 minutes after sunrise. This period covered the peak time bats would be commuting to and from their roosts.

Bat Data Analysis

A1.1.119 The bat passes were recorded, and all bats were identified to species level, where possible, on site. Echolocation calls were subsequently analysed using computer software (BatExplorer and Kaleidoscope) for confirmation of species. Where possible, additional notes on size, flight height, type of flight (such as commuting, foraging, fast or slow) and direction of flight were also recorded.

A1.1.120 All sound files were subject to manual analysis by an experienced bat ecologist. Where possible, identification was carried out to species level. Bats of the species group *Myotis* and long-eared bat species are notoriously difficult to distinguish and therefore calls were only analysed down to species level where they were characteristic of that species and present within suitable habitat.

A1.1.121 The number of bat passes recorded is not representative of the number of bats present within any given area, as a single bat may have made many passes. Therefore, descriptions of bat species assemblage represent the minimum number present rather than a definite list of all species present.

A1.1.122 Where several bat species were present within a call segment, then all the species were tagged in the results spreadsheet. For example, a common pipistrelle, soprano pipistrelle and *Myotis* bat all calling simultaneously would result in three individual bat registrations for calculating bat pass counts.

Bat Crossing Point Surveys

A1.1.123 The methods generally follow the standard best practice (Berthinussen and Altringham, 2015). Any specific deviations due to objectives of the surveys are detailed where necessary.

A1.1.124 Crossing Point surveys were undertaken at two locations, River Mole corridor and Riverside Park, in August 2020, September 2020, May 2021 and June 2021. Table A1.1.2 summarises survey dates, personnel and location (easting and northing) for both crossing point locations.

Table A1.1.2: Crossing Point Surveyors and Locations

Crossing Point location	Easting	Northing	Dates of surveys and personnel
River Mole A	525699	140500	18/08/2020 (Sophie Bracken), 01/09/2020 (Sophie Bracken), 05/05/2021 (not valid due to unsuitable weather, Rosanna Marston), 18/05/2021 (Rosanna Marston) and 01/06/2021 (Sophie Bracken)
River Mole B	526002	140589	18/08/2020 (Viola Zanetta), 01/09/2020 (Viola Zanetta), 05/05/2021 (not valid due to unsuitable weather, Viola Zanetta), 18/05/2021 Viola Zanetta), 01/06/2021 (Viola Zanetta)
Riverside Park A	527619	142393	19/08/2020 (Viola Zanetta), 22/09/2020 (Viola Zanetta), 06/05/2021 (Sophie Bracken), 02/06/2021 (Viola Zanetta)
Riverside Park B	527629	142392	19/08/2020 (Sophie Bracken), 22/09/2020 (Robin Searle), 06/05/2021 (Rosanna Marston), 02/06/2021 (Jennifer Crossman)

A1.1.125 The locations were selected using the results of trapping and radio-tracking surveys undertaken in 2019, which recorded Bechstein's bats flying along the River Mole and foraging within Riverside Park as well as due to potential impacts to the areas in relation to a new flood mitigation strategy and North Terminal Junction improvements.

A1.1.126 The River Mole runs along a bare ground vehicle track and presents steep vegetated embankment at this crossing point location. Wildlife netting was present on both embankments at both locations A and B. It had also been installed across the river corridor at location A.

A1.1.127 Riverside Park is an area of public open space comprising broadleaved woodland with grassland glades and paths. It is bounded by Gatwick Stream which runs south-east to north-west. The crossing point is located in the north-west of Riverside Park along a public footpath, with woodland to the north, east and south, and Gatwick Stream to the west with its vegetated steep embankments covered in tall ruderals.

A1.1.128 The Defra research report (Berthinussen and Altringham, 2015) recommends undertaking a preliminary dusk and dawn survey at each location to determine if a feature can be considered a flight path when certain conditions are met. These conditions include that when surveying the feature at dusk and dawn on the same night more than either 10 bats of common species or five bats of rarer species must be recorded using the habitat feature per survey to consider it to be a flight path. After the first dusk visit these conditions were met and therefore it was considered that the lack of data at dawn is not a constraint to the survey results.

A1.1.129 Visits to each crossing point comprised observing bats at dusk, with surveys commencing 15 minutes before sunset and continuing for 120 minutes after sunset as advised by the Defra research report (Berthinussen and Altringham, 2015) when woodland-adapted bat species are present within the area.

A1.1.130 Two surveyors monitored each crossing point, one at either side of the habitat feature used by commuting bats.

A1.1.131 Each surveyor was provided with a Elekon Batlogger M full spectrum detector and with a thermal camera (FLIR T1020).

A1.1.132 The ultrasonic bat detectors were set to automatically record ultrasound between 13 and 155 kHz and signals were digitised at a rate of 312 kHz with 16-bit sampling depth. This allowed for the recording of any bat passes [1]which were in close proximity of the surveyor.

A1.1.133 The thermal equipment was used with a combination of 45 degree lenses, thermal sensitivity <20mK at 30°C and an infrared resolution of 1024 x 768 pixels allowing for a maximum detection distance for a bat in flight to be of 104m (Fawcett-Williams, 2019).

A1.1.134 The data in radiometric format captured during the surveys was stored on an SD card inside the camera. Radiometric data allows analysis (Flir Tools) of thermal patterns in the images through thermal tuning and the use of different colour palettes. The object of interest can then be enhanced through thermal tuning with non-target objects falling outside the scale (Infrared Training Centre, 2017). The colour palettes allow different colours to be assigned to mark specific temperature levels. For this study, high contrast palettes were utilised to enhance small temperature differences and improve the detectability of small moving objects (bats) against a varied background.

A1.1.135 Each surveyor/analyst recorded direct observation of bats, their species (where this could be accurately determined) and their flight behaviour, ground-level distance from the feature and height above the ground when observed. The closest distance the bat came to the feature was recorded, and for flight height during crossing, the lowest height was recorded. Incidental records of bat activity near the surveyor locations were also collected. Each passing bat was recorded as a separate observation, regardless of whether the same bat has clearly passed the surveyor more than once.

A1.1.136 Each pass was assigned species either by the surveyor in the field, or by matching recordings of the passing bat wither on the proforma, or the time the bat was observed during analysis. Recordings were analysed post-survey to determine the bat species they represent using Elekon BatExplorer. The output from sound analysis was subsequently checked against the surveyor's identification, and changes made were necessary, favouring the identification made manually.

A1.1.137 For instances where recordings revealed more than one bat species present (eg a Myotis sp. and a Pipistrellus sp.) passes were included for each, but flight behaviour data was left as unknown for those which were not observed by surveyors/analysts.

A1.1.138 The output of sound and radiometric analysis was subject to a quality assurance process; a minimum of 10% of the sound files identified to each species / genus and a minimum of 30 minutes of radio-metric were verified by a principal grade analyst using BatExplorer of Flir Tools software.

A1.1.139 Data for each crossing point was categorised and presented the following information for each survey and location:

- Total number of passing bats observed;
- Total number of passing bats observed per species;
- Number of bats using (passing within 5m distance of the feature) and not using (passing further than 5m distance) the habitat feature;
- Number of bats flying at a 'safe' height at Riverside Park and therefore not at risk of collision, defined as passing at a height higher than 5m from the ground and based on the assumption that the proposed road improvements will be at the current height of the ground and any impacts from traffic would be within 5m height;
- Number of bats using the River Mole (passing within 5m distance of the feature) at a height below or equal to ground level (within the river corridor), at a height comprised between ground level and 5m (directly above the river corridor) and at a height above 5m[2]; and
- Species of bats heard but not seen.

A1.1.140 Safe and unsafe height are defined with reference to the maximum height for a heavy goods vehicle on UK roads which is 4.95m. It has been rounded to 5m for the purposes of analysis. Bats passing above this threshold were considered to not be at risk of collision.

Assessment of importance

A1.1.141 The value of the River Mole and Riverside Park as commuting routes and foraging areas for bat species have been calculated using Wray et al. (2010) where the rarity of the species involved, the approximate numbers of bats using them (based on crossing point survey data), the proximity of known roosts, and the nature and complexity of linear features in the landscape are all taken into account. The importance of the areas are assessed at a geographical level eg local, regional, national.

A1.1.142 It was not possible to carry out this assessment for species groups as rarity of single species within the groups varies greatly and sound analysis does not allow to separate species on the basis of call parameters. However, an assessment was made for Bechstein's bats using crossing point survey data for Myotis species in conjunction with radio-tracking survey data from 2019, 2020 and 2021.

Data validity and limitations

A1.1.143 It is important to note that even where data are held, a lack of records for a defined geographical area does not necessarily mean that there is a lack of ecological interest; the area may be

[1] A single bat pass is defined as one or more clearly recognisable echolocation calls from a single species, separated from the next one by a gap of at least a second (Berthinussen and Altringham, 2015).

[2] This analysis is related to the proposed diversion of the River Mole and increase use of aircraft which would have potential impacts on commuting and foraging bats.

simply under-recorded. Bats are highly mobile animals and can move roost sites both within and between years.

A1.1.144 Data from bat surveys should be considered to be valid for a period of 18 months, unless there are any meaningful changes to the buildings or other habitats within the site.

A1.1.145 Due to unseasonal low temperatures (below 7°C) and lack of bat activity the survey carried out at River Mole on 5th May 2021 is not considered valid. It was not possible to carry out a survey at River Mole on 17th May 2021 due to unsuitable weather conditions representative of rainfall being above the long-term averages for the month of May in the United Kingdom (Met Office, 2021). Both survey visits are scheduled to be repeated in July 2021. The report will need to be updated once these surveys are complete.

A1.1.146 The analysis of the data from surveys undertaken in early June in both locations has yet to be undertaken. The updated report will include the results from these surveys and will be presented in the ES.

Annex 2

Extended Results

A2.1 Extended Results

Phase 1 Habitat Surveys

Annex 2.1.1: Pond Descriptions

Gatwick Pond ID No.	Ecology ID number	Description
FCZ	P1	No access was granted to this pond.
9VG	P2	No access was granted to this pond.
Pond F	P3	A Large man-made attenuation pond, a barrier crosses the middle running north to south and marginal vegetation was present around all the sides.
SM7	P4	Small pond behind services with poor water quality and little aquatic vegetation.
981	P5	Large pond within a woodland. No aquatic vegetation and little woodland ground flora. Mature trees surround pond and a film of algae across pond.
Pond G	P6	Shallow pond with a silt bed that was mostly dry.
30Z	P7	Large pond within Horleyland Wood. Pond has shallow banks and marginal vegetation.
8N8	P8	woodland pond flooded over into surrounding woodland and cutting off footpath to rest of woodland
W46	P9	Small man-made wildlife pond, lots of aquatic vegetation along the southern bank. Banks relatively steep sided with a fallen tree across middle.
Old Lagoon	P10	Y shaped lagoon, man made, amenity grass banks and steep sided.
E11	P11	Long linear settlement pond, wider at eastern end, linked to the M23 spur road. Reeds and bulrush dominated.
Pond E	P12	No access granted to this pond
A0A	P13	Pond within Police training area, swamped with willow and surrounded by woodland.
MHA	P14	Circular pond in the middle of the southern staff car park. The pond was surrounded with vegetation.
JCT	P15	Outside Project boundary, no access granted.
Pond A	P16	A pond located to the north of the runway near the fire training area. It was surrounded by dense bramble scrub and marginal vegetation such as pond sedge and bulrush
New Lagoon	P17	A circular sewage pond known as 'New lagoon' was a man-made, steep sided amenity grassland settlement lagoon.
Pond M	P18	Settlement pond east of the biodiversity wall. A man made structure with steep concrete walls. Semi-improved grassland surrounded the pond. Only the eastern half of the pond held water.
WP9	P19	No access granted to this pond
AA20	P20	Awaiting further detail
AA21	P21	Awaiting further detail
K5F	P22	A long pond with 0.5m high banks around the northern side. The southern bank was covered with scrub and inaccessible. Around all sides there was a large amount of aquatic vegetation.
TTD	P23	A small circular man made pond surrounded by willow and pine trees. Aquatic vegetation was present around the eastern, northern and southern sides. A concrete outflow was identified in the south east corner of the pond.

Gatwick Pond ID No.	Ecology ID number	Description
C24	P24	Large pond around 30 metres x 20 metres Lots of marginal vegetation mainly bull rush completely dry willow and ash growing around edge
Pond D	P25	A rectangular attenuation pond. It was concrete sided with an outflow into the Mole corridor.
Pond D	P26	A triangular attenuation pond made from concrete and steep sided. The pond was surrounded by managed grassland.
293	P27	Large open fishing lake in middle of public park. Two islands within middle of the lake densely covered with trees.
FFJ	P28	A small attenuation pond for the runway. Marginal vegetation was present here with rushes being dominant.
29A	P29	A long thin man-made channel. 5m high sides with a fenceline around the top of it. Water was swamped by algae and had little aquatic vegetation, the banks were vegetated with tufted grass.
30P	P30	Murky shallow pond with clear animal tracks leading to it.
AVF	P31	A large pond within the Land East of the Aviation Museum covered with reeds and willowherb and algae topped. Nettle and willowherb ruderal surrounds the pond.
Dog Kennel Pond	P32	A small manmade attenuation pond with steep banks showing high levels of maintenance. A diverse mix of aquatic and marginal vegetation was found within the pond.
Dog Kennel Pond	P33	A small manmade attenuation pond with steep banks showing high levels of maintenance. A diverse mix of aquatic and marginal vegetation was found within the pond.
AAA4	P34	Newly created pond along mole corridor.
1WH	P35	Pond in centre of eastern part of woodland had a small amount of water in with a heavy covering of duckweed.
NU1	P36	Pond in centre of eastern part of woodland had a small amount of water in with a heavy covering of duckweed. Linked to Pond 1WH

Annex 2.1.2: List of Protected or Notable Species Identified During Botanical Survey

Species Name	Common Name	Protected or Notable Status	Location
Briza minor	Lesser quaking grass	Nationally scarce	River Mole
Epipactis lepochila	Narrow-lipped helleborine	Nationally scarce	LERL Biodiversity area (woodland)
Hyacinthoides non-scripta	Bluebell	Schedule 8	LERL Biodiversity area (woodland, attenuation field)
Lychnis flos-cuculi	Ragged robin	Near Threatened	River Mole
Mentha pulegium	Pennyroyal	UK BAP, Nationally Scarce, Endangered, Schedule 8, NERC S.41, Critically Endangered	Grassland along rail line
Polygonatum odouratum	Solomon’s seal	Nationally scarce	LERL Biodiversity area (Woodland)

Annex 2.1.3: Invasive Plant Species Identified Across the Gatwick Project Boundary

Species Name	Common Name	Protected or Notable Status	Location
Impatens glandifera	Himalayan balsam	Schedule 9	River Mole, Gatwick Stream, Airside Stream

Annex 2.1.4: Target Notes

Target Note Ref.	Description
TN1	Location of pennypoyal
TN2	Large vegetated earth bank within Eastern Carparking
TN3	Horleyland Wood
TN4	Upper Pickett's Wood
TN5	Solomons seal, narrow-lipped helleborine and bluebell locations
TN6a	Plantation woodland 1
TN6b	Plantation Woodland 2
TN6c	Plantation Woodland 3
TN7	Brockley Wood
TN8	Large Area of Scrub near Brockley Wood
TN9	Lesser quaking grass, and ragged robin location
TN10a	Western marshy grassland
TN10b	Eastern marshy grassland
TN10c	Marshy grassland along the River Mole
TN11	Large, 8 metres tall earth bank south west of Brockley Wood
TN12	Dog Kennel Wood
TN13	Crawter's Wood
TN14	Area of isolated dense scrub
TN15	Area of dense, overgrown bramble and rose encroaching onto open grassy glade.

NVC Surveys

Annex 2.1.5: Q1

Homogenous Stand 1		
Species Name	**Common Name**	**% Cover**
Lotus pedunculatus	Greater bird's foot trefoil	20
Juncus comglomeratus	Compact rush	20
Dactylis glomerata	Cock's foot	20
Holcus lanatus	Yorkshire fog	10
Centurea nigra	Common knapweed	10
Carex otrubae	False fox-sedge	10
Alopecurus pratensis	Meadow foxtail	10
Vicia cracca	Bird vetch	>1
Poa trivialis	Rough meadow-grass	>1
Lathryrus nissolia	Grass vetchling	>1
Arrhenatherum elatius	False oat-grass	>1
NVC Category: MG9b Holcus lanatus – Deschampsia cespitosa grassland. Arrhenatherum elatior sub-community.		

Annex 2.1.6: Q2

Homogenous Stand 1		
Species Name	**Common Name**	**% Cover**
Centurea nigra	Common knapweed	40
Lotus pedunculatus	Greater bird's-foot trefoil	15
Potentilla reptans	Creeping cinquefoil	15
Juncus conglomeratus	Compressed rush	10
Agrostis stolonifera	Creeping bent	10
Arrhenatherum elatius	False oat-grass	5
Holcus lanatus	Yorkshire fog	5
Phleum pratensis	Timmothy grass	5
Deschampsia cespitosa	Tufted Hair grass	5
Trifolium pratense	Red clover	>1
Oenanthe crocata	Hemlock water dropwort	>1
Ranunculus acris	Meadow buttercup	>1
NVC Category: MG9b Holcus lanatus – Deschampsia cespitosa grassland. Arrhenatherum elatior sub-community.		

Annex 2.1.7: Q3

Homogenous Stand 1		
Species Name	**Common Name**	**% Cover**
Centurea nigra	Common knapweed	30
Anthoxanthum odouratum	Sweet vernal grass	15
Plantago lanceolate	Ribwort plantain	15
Agrostice cappilaris	Common bent	10
Galium verum	Lady's bedstraw	10
Achillia milliofolium	Yarrow	10
Lotus pedunculatus	Greater bird's-foot trefoil	10
Holcus lanatus	Yorkshire fog	5
Briza minor	Lesser quaking grass	5
Deschampsia cespitosa	Tufted hair grass	5
NVC Category: MG9b Holcus lanatus – Deschampsia cespitosa grassland. Arrhenatherum elatior sub-community.		

Annex 2.1.8: Q4

Homogenous Stand 1		
Species Name	**Common Name**	**% Cover**
Plantago lanceolate	Ribwort plantain	20
Centurea nigra	Common knapweed	20
Stachys palustre	Marsh woundwort	20
Briza minor	Lesser quaking grass	20
Galium verum	Lady's bedstraw	10
Odontites vernus	Red barista	10
Festuca rubra	Red fescue	>1
Agrostice stolonifera	Creeping bent	>1
NVC Category: MG9b Holcus lanatus – Deschampsia cespitosa grassland. Arrhenatherum elatior sub-community.		

Annex 2.1.9: Q5

Homogenous Stand 1		
Species Name	**Common Name**	**% Cover**
Agrostice stolonifera	Creeping bent	20
Briza minor	Lesser quaking grass	20
Centurea nigra	Common knapweed	15
Arrhenatherum elatius	False oat-grass	15
Stachys palustris	Marsh woundwort	10
Galium verum	Lady's bedstraw	10
Anthoxanthum odouratum	Sweet vernal grass	10
Plantago lanceolate	Ribwort plantain	10
Hypericum perforatum	Perforate st john's-wort	5
Agrimonia eupatoria	Agrimony	5
Calamagrostice epigejos	Hair grass	5
Agrostice stolonifera	Creeping bent	20
NVC Category: MG9b Holcus lanatus – Deschampsia cespitosa grassland. Arrhenatherum elatior sub-community.		

*Other Species: *Primula sp.*, Primrose, *Cynosurus cristatus*, Crested Dog's Tail, *Sanguisorba officinalis*, Great Burnette.

Annex 2.1.10: Q6

Homogenous Stand 2		
Species Name	**Common Name**	**% Cover**
Calamagrostice epigejos	Wood small reed	80
Pleum pratense	Timothy grass	10
Juncus conglomerate	Compact rush	5
Lotus pedunculatus	Greater bird's-foot trefoil	5
Calamagrostis epigejos Society		

Annex 2.1.11: Q7

Homogenous Stand 2		
Species Name	**Common Name**	**% Cover**
Calamagrostice epigejos	Wood small reed	80
Deschampsia cespitosa	Tuffted hair grass	15
Alopecurus pratensis	Meadow foxtail	10
Calamagrostis epigejos **Society**		

Annex 2.1.12: Q8

Homogenous Stand 2		
Species Name	**Common Name**	**% Cover**
Lotus peduncludatus	Greater bird's-foot trefoil	40
Centurea nigra	Common knapweed	15
Briza minor	Lesser quaking grass	10
Calamagrostice epigejos	Wood small reed	10
Arrhenatherum elatior	False oat-grass	10
Holcus lanatus	Yorkshire fog	10
Anthoxanthum odouratum	Sweet vernal grass	5
Ranunculus acris	Meadow buttercup	5
Calamagrostis epigejos Society		

Annex 2.1.13: Q9

Homogenous Stand 3		
Species Name	**Common Name**	**% Cover**
Lotus pedunculatus	Greater bird's-foot trefoil	20
Briza minor	Lesser quaking grass	10

Homogenous Stand 3		
Leucanthamum vulgare	Oxeye daisy	10
Anthoxanthum odouratum	Sweet vernal grass	10
Agrostice stolonifera	Creeping bent	10
Centurea nigra	Common knapweed	10
Juncus effuses	Soft rush	10
Calamagrostice epigejos	Wood small reed	10
Daucus carota	Wild carrot	5
Ranunculus acris	Meadow buttercup	5
Holcus lanatus	Yorkshire fog	>1
NVC Category: M27c Filipendula ulmaria-Angelica sylvestris mire, Juncus effuses – Holcus lanatus sub-community.		

Annex 2.1.14: Q10

Homogenous Stand 3		
Species Name	**Common Name**	**% Cover**
Juncus effuses	Soft rush	40
Oenanthe Crocata	Hemlock water-dropwort	20
Calamagrostice epigejos	Wood small reed	20
Epilobium hirsuta	Grater willowherb	10
Potentilla argentium	Silverweed	10
Scrophularia auriculata	Water figwort	5
NVC Category: M27c Filipendula ulmaria-Angelica sylvestris mire. Juncus effuses – Holcus lanatus sub-community.		

Annex 2.1.15: Q11

Homogenous Stand 3		
Species Name	**Common Name**	**% Cover**
Juncus effuses	Soft rush	70
Mentha aquatica	Water mint	20
Oenanthe crocata	Hemlock water dropwort	10
Lythrum salicaria	Purple loosestrife	5
Lychnis flos-cuculi	Ragged robin	>1
NVC Category: M27c Filipendula ulmaria-Angelica sylvestris mire. Juncus effuses – Holcus lanatus sub-community.		

Breeding Bird Surveys

Annex 2.1.16: Breeding Statur, Abundance and Conservation Status of Birds Recorded within the Gatwick Airport Survey Area in 2019

Species	Breeding status	No. of territories	Annex 1 EU Birds Directive	Schedule 1 WCA	NERC Species of Principal Importance	BoCC 4 Red and Amber species
Great Crested Grebe	Non-breeding	-	-	-	-	-
Cormorant	Non-breeding	-	-	-	-	-
Grey Heron	Non-breeding	-	-	-	-	-
Greylag Goose	Confirmed	3	-	-	-	- 1
Canada Goose	Confirmed	3	-	-	-	-
Mallard	Confirmed	9	-	-	-	Amber
Red Kite	Non-breeding	-	■	■	-	-
Common Buzzard	Confirmed	2	-	-	-	-
Kestrel	Confirmed	4	-	-	-	Amber
Peregrine	Possible	1	■	■	-	-
Sparrowhawk	Non-breeding	-	-	-	-	-
Red-legged Partridge	Non-breeding	-	-	-	-	-
Pheasant	Confirmed	3	-	-	-	-
Moorhen	Confirmed	5	-	-	-	-
Coot	Confirmed	3	-	-	-	-
Little ringed plover	Possible	1	-	■	-	-
Snipe	Non-breeding	-	-	-	-	Amber
Black-headed gull	Non-breeding	-	-	-	-	Amber
Herring gull	Non-breeding	-	-	-	■	Amber
Lesser black-backed gull	Non-breeding	-	-	-	-	Amber
Feral rock dove	Confirmed	6	-	-	-	-
Stock dove	Confirmed	3	-	-	-	Amber
Woodpigeon	Confirmed	37	-	-	-	-
Collared dove	Confirmed	2	-	-	-	-
Swift	Non-breeding	-	-	-	-	Amber
Ring-necked parakeet	Non-breeding	-	-	-	-	-
Green woodpecker	Confirmed	3	-	-	-	-
Great spotted woodpecker	Confirmed	11	-	-	-	-
Skylark	Confirmed	12	-	-	■	Red
Swallow	Non-breeding	-	-	-	-	-
House martin	Non-breeding	-	-	-	-	Amber
Pied wagtail	Confirmed	5	-	-	-	-
Grey wagtail	Confirmed	1	-	-	-	Red
Wren	Confirmed	74	-	-	-	-
Dunnock	Confirmed	18	-	-	■	Amber

Species	Breeding status	No. of territories	Annex 1 EU Birds Directive	Schedule 1 WCA	NERC Species of Principal Importance	BoCC 4 Red and Amber species
Robin	Confirmed	100	-	-	-	-
Nightingale	Non-breeding	-	-	-	-	Red
Wheatear	Non-breeding	-	-	-	-	-
Song thrush	Confirmed	19	-	-	■	Red
Redwing	Non-breeding	-	-	■	-	Red
Mistle thrush	Confirmed	2	-	-	-	Red
Blackbird	Confirmed	58	-	-	-	-
Garden warbler	Confirmed	2	-	-	-	-
Blackcap	Confirmed	43	-	-	-	-
Lesser whitethroat	Confirmed	2	-	-	-	-
Whitethroat	Confirmed	9	-	-	-	-
Reed warbler	Confirmed	1	-	-	-	-
Willow warbler	Non-Breeding	-	-	-	-	Amber
Chiffchaff	Confirmed	12	-	-	-	-
Goldcrest	Confirmed	9	-	-	-	-
Firecrest	Possible	1	-	■		-
Great tit	Confirmed	72	-	-	-	-
Coal tit	Confirmed	8	-	-	-	-
Blue tit	Confirmed	89	-	-		-
Marsh tit	Confirmed	1	-	-	■	Red
Long-tailed tit	Confirmed	15	-	-	-	-
Nuthatch	Confirmed	7	-	-	-	-
Treecreeper	Confirmed	7	-	-	-	-
Magpie	Confirmed	23	-	-	-	-
Jay	Confirmed	4	-	-	-	-
Jackdaw	Confirmed	11	-	-	-	-
Rook	Non-breeding	-	-	-	-	-
Carrion crow	Confirmed	15	-	-	-	-
Starling	Confirmed	2	-	-	■	Red
House sparrow	Confirmed	4	-	-	■	Red
Chaffinch	Confirmed	8	-	-	-	-
Linnet	Confirmed	1	-	-	■	Red
Goldfinch	Confirmed	10	-	-	-	-
Greenfinch	Non-breeding	-	-	-	-	-
Siskin	Non-breeding	-	-	-	-	-
Bullfinch	Confirmed	1	-	-	■	Amber
Reed bunting	Confirmed	2	-	-	■	Amber

Note: 1. The native population of Greylag Goose in the UK is amber listed, however, the birds recorded during the survey are part of the introduced feral population and, as such, do not meet the criteria relating to species of conservation importance.

Annex 2.1.17: Alphabetical List of Bird Species Recorded During the Survey in 2019

English name	Scientific name
Blackbird	*Turdus merula*
Blackcap	*Sylvia atricapilla*
Black-headed gull	*Chroicocephalus ridibundus*
Blue Tit	*Cyanistes caeruleus*
Bullfinch	*Pyrrhula pyrrhula*
Buzzard	*Buteo buteo*
Canada goose	*Branta canadensis*
Carrion crow	*Corvus corone*
Chaffinch	*Fringilla coelebs*
Chiffchaff	*Phylloscopus collybita*
Coal tit	*Periparus ater*
Collared dove	*Streptopelia decaocto*
Coot	*Fulica atra*
Cormorant	*Phalacrocorax carbo*
Dunnock	*Prunella modularis*
Feral Dove	*Columba livia*
Firecrest	*Regulus ignicapilla*
Garden warbler	*Sylvia borin*
Goldcrest	*Regulus regulus*
Goldfinch	*Carduelis carduelis*
Great crested grebe	*Podiceps cristatus*
Great spotted woodpecker	*Dendrocopos major*
Great tit	*Parus major*
Green woodpecker	*Picus viridis*
Greenfinch	*Chloris chloris*
Grey heron	*Ardea cinerea*
Grey wagtail	*Motacilla cinerea*
Greylag goose	*Anser anser*
Herring gull	*Larus argentatus*
House martin	*Delichon urbicum*
House sparrow	*Passer domesticus*
Jackdaw	*Coloeus monedula*
Jay	*Garrulus glandarius*
Kestrel	*Falco tinnunculus*
Lesser black-backed gull	*Larus fuscus*
Lesser whitethroat	*Sylvia curruca*
Linnet	*Linaria cannabina*
Little ringed plover	*Charadrius dubius*
Long-tailed tit	*Aegithalos caudatus*

English name	Scientific name
Magpie	*Pica pica*
Mallard	*Anas platyrhynchos*
Marsh tit	*Poecile palustris*
Mistle thrush	*Turdus viscivorus*
Moorhen	*Gallinula chloropus*
Nightingale	*Luscinia megarhynchos*
Nuthatch	*Sitta europaea*
Peregrine	*Falco peregrinus*
Pheasant	*Phasianus colchicus*
Pied wagtail	*Motacilla alba*
Red kite	*Milvus milvus*
Red-legged partridge	*Alectoris rufa*
Redwing	*Turdus iliacus*
Reed bunting	*Emberiza schoeniclus*
Reed warbler	*Acrocephalus scirpaceus*
Ring-necked parakeet	*Psittacula krameri*
Robin	*Erithacus rubecula*
Rook	*Corvus frugilegus*
Siskin	*Spinus spinus*
Skylark	*Alauda arvensis*
Snipe	*Gallinago gallinago*
Song thrush	*Turdus philomelos*
Sparrowhawk	*Accipiter nisus*
Starling	*Sturnus vulgaris*
Stock dove	*Columba oenas*

Wintering Bird Surveys

Annex 2.1.18: Summary Count Data of Birds Recorded During Survey - October 2018 and March 2019

Species	Peak Count	Mean Count	Species	Peak Count	Mean Count
Blackbird	54	44.4	Kestrel	4	3
Bullfinch	7	2.8	Red kite	1	0.2
Black-headed gull	110	34.6	Lapwing	240	48
Blue tit	140	98.2	Lesser black-backed gull	2	0.4
Buzzard	3	2	Long-tailed tit	58	24.4
Carrion crow	42	31.4	Mistle thrush	3	1.2
Chiffchaff	15	3	Mallard	17	14.2
Collared dove	2	0.6	Magpie	36	22.6
Canada goose	28	7.2	Moorhen	8	3.6
Chaffinch	6	2.6	Mandarin duck	2	0.4

Species	Peak Count	Mean Count	Species	Peak Count	Mean Count
Common gull	1	0.2	Meadow pipit	31	7.8
Coal tit	10	5	Marsh tit	3	0.6
Dunnock	15	10.4	Nuthatch	11	6.4
Feral rock dove	9	2.2	Pheasant	3	0.8
Egyptian goose	2	0.4	Pied wagtail	10	5
Firecrest	1	0.2	Robin	81	57.8
Fieldfare	19	7.8	Reed bunting	1	0.2
Green woodpecker	3	1.8	Redwing	75	20.4
Goldcrest	33	16.4	Ring-necked parakeet	2	0.6
Green sandpiper	1	0.4	Rook	27	8
Greylag goose	5	1	Skylark	13	3.2
Grey wagtail	3	1.4	Starling	55	26.8
Goldfinch	12	7.4	Sparrowhawk	2	0.4
Greenfinch	2	0.4	Siskin	23	5.2
Great spotted woodpecker	11	7.6	Snipe	7	1.4
Great tit	83	64	Song thrush	17	14.2
Grey heron	3	1.4	Treecreeper	7	4.8
Herring gull	10	3	Woodcock	1	0.2
House sparrow	3	1.2	Woodpigeon	102	62.2
Jay	15	7.2	Wren	38	21.8
Jackdaw	175	75.6			

Annex 2.1.19: Conservation Status of Birds Recorded within the Project Area - October 2018 and March 2019

Species	Annex 1 EU Birds Directive	UK BAP Priority Species	NERC Species of Principal Importance	Birds of Conservation Concern
Bullfinch		•	•	Amber
Black-headed gull				Amber
Common gull				Amber
Dunnock		•	•	Amber
Fieldfare				Red
Green sandpiper				Amber
Greylag goose				Amber
Grey wagtail				Red
Herring gull		•	•	Amber
House sparrow		•	•	Red
Kestrel				Amber
Lapwing		•	•	Red

Species	Annex 1 EU Birds Directive	UK BAP Priority Species	NERC Species of Principal Importance	Birds of Conservation Concern
Lesser black-backed gull				Amber
Mallard				Amber
Marsh tit		•	•	Red
Mistle thrush				Red
Meadow pipit				Amber
Red kite	•			N/A
Redwing				Red
Skylark		•	•	Red
Snipe				Amber
Song thrush		•	•	Red
Starling		•	•	Red
Woodcock				Red

Reptile Surveys

Annex 2.1.20: Reptile Survey Results

Survey	Survey Area	Date	Weather	Species recorded
1	A3, A5	17/04/19	15C, Wind F2, Cloud 3/8	None
	A6 River Mole Corridor	18/04/19	14C, Wind F3, Cloud 2/8	None
	A1	12/06/19	14C, Wind F1, Cloud 7/8	None
	A6 Field south of Brockley Wood	03/09/19	19C, Wind F1, Cloud 7/8	None
2	A3	01/05/19	10-11C, Wind F1, Cloud 1/8-3/8	None
	A5			None
	A6 River Mole Corridor			3 female grass snake, 1 sub-adult male grass snake, 3 juvenile grass snake and 3 grass snake
	A1	18/06/19	16C, Wind F2, Cloud 2/8	None
	A6 Field south of Brockley Wood	05/09/19	15C, Wind F2, Cloud 3/8	None
3	A3	13/05/19	15C, Wind F1, Cloud 2/8	None
	A5			None
	A6 River Mole Corridor			4 grass snake, 1 juvenile grass snake, 3 adult grass snake and 2 sub-adult grass snake
	A1	26/06/19	18C, Wind F1, Cloud 7/8	1 grass snake, 1 juvenile grass snake
	A6 Field south of Brockley Wood	10/09/2019	16C, Wind F1, Cloud 3/8	None
4	A5	03/06/19	19C, Wind F3, Cloud 3/8	2 juvenile grass snake
	A3, A6 River Mole Corridor	13/06/19	13C, wind F3, Cloud 6/8	None
	A1	08/08/2019	18C, Wind F1, Cloud 1/8	None
	A6 Field south of Brockley Wood	16/09/2019	15C, Wind F1, Cloud 5/8	None
5	A3	26/06/19	18C, wind F1, Cloud 7/8	1 grass snake, 1 juvenile grass snake
	A5			None
	A6 River Mole Corridor			None

Survey	Survey Area	Date	Weather	Species recorded
	A1	16/09/2019	15C, Wind F1, Cloud 5/8	None
	A6 Field south of Brockley Wood	19/09/2019	15C, Wind F1, Cloud 1/8	None
6	A5	06/08/19	20C, wind F4, Cloud 4/8	None
	A3	08/08/19	18C, Wind F3, Cloud 6/8	None
	A6 River Mole Corridor			2 grass snake slough
	A6 Field south of Brockley Wood	19/09/2019	15C, Wind F1, Cloud 1/8	None
7	A1	26/09/2019	18C, Wind F3, Cloud 3/8	None
	A3, A5, A6 River Mole Corridor, A6 Field south of Brockley Wood	02/10/2019	14C, Wind F2, Cloud 1/8	None

Great Crested Newt Surveys

Annex 2.1.21: HSI Scores for All Ponds within Project Boundary

Pond No.	Description	HSI score
FCZ	No access was granted to this pond.	N/S
9VG	No access was granted to this pond.	N/S
Pond F	A Large man-made attenuation pond, a barrier crosses the middle running north to south and marginal vegetation was present around all the sides.	Poor
SM7	Small pond behind services with poor water quality and little aquatic vegetation.	Poor
981	Large pond within a woodland. No aquatic vegetation and little woodland ground flora. Mature trees surround pond and a film of algae across pond.	Below average
Pond G	Shallow pond with a silt bed that was mostly dry	Below average
30Z	Large pond within Horleyland Wood. Pond has shallow banks and marginal vegetation.	Average
8N8	Woodland pond flooded over into surrounding woodland and cutting off footpath to rest of woodland	Good
W46	Small man-made wildlife pond, lots of aquatic vegetation along the southern bank. Banks relatively steep sided with a fallen tree across middle.	Average
Old Lagoon	Y shaped lagoon, man made, amenity grass banks and steep sided.	N/S
E11	Long linear settlement pond, wider at eastern end, linked to the M23 spur road. Reeds and bulrush dominated.	Average
Pond E	No access granted to this pond,	N/S
A0A	Pond within Police training area, swamped with willow and surrounded by woodland.	Below average
MHA	Circular pond in the middle of the southern staff car park. The pond was surrounded with vegetation.	poor
JCT	Outside Project boundary, no access granted.	N/S
Pond A	A pond located to the north of the runway near the fire training area. It was surrounded by dense bramble scrub and marginal vegetation such as pond sedge and bulrush	Good
New Lagoon	A circular sewage pond known as 'New lagoon' was a man-made, steep sided amenity grassland settlement lagoon.	N/S
Pond M	Settlement pond east of the biodiversity wall. A man made structure with steep concrete walls. Semi-improved grassland surrounded the pond. Only the eastern half of the pond held water.	N/S
WP9	No access granted to this pond.	N/S
AA20	Awaiting details.	Poor

Pond No.	Description	HSI score
AA21	Awaiting details.	Poor
K5F	A long pond with 0.5m high banks around the northern side. The southern bank was covered with scrub and inaccessible. Around all sides there was a large amount of aquatic vegetation.	Excellent
TTD	A small circular man made pond surrounded by willow and pine trees. Aquatic vegetation was present around the eastern, northern and southern sides. A concrete outflow was identified in the south east corner of the pond.	Excellent
C24	Large pond around 30 x 20 m. Lots of marginal vegetation mainly bull rush completely dry willow and ash growing around edge.	Good*
Pond D	A rectangular attenuation pond. It was concrete sided with an outflow into the Mole corridor.	Poor
Pond D	A triangular attenuation pond made from concrete and steep sided. The pond was surrounded by managed grassland.	Poor
293	Large open fishing lake in middle of public park. Two islands within middle of the lake densely covered with trees.	Poor
FFJ	A small attenuation pond for the runway. Marginal vegetation was present here with rushes being dominant.	Good
29A	A long thin man-made channel. 5m high sides with a fence line around the top of it. Water was swamped by algae and had little aquatic vegetation, the banks were vegetated with tufted grass.	Average*
30P	Murky shallow pond, with clear animal tracks leading to it.	Poor
AVF	A large pond within the Land East of the Gatwick Aviation Museum Field covered with reeds and willowherb and algae topped. Nettle and willowherb ruderal surrounded the pond.	Good
Dog Kennel Pond	A small manmade attenuation pond with steep banks showing high levels of maintenance. A diverse mix of aquatic and marginal vegetation was found within the pond.	Average
AAA4	Newly created pond along mole corridor.	N/S
1WH	Pond in centre of eastern part of woodland had a small amount of water in with a heavy covering of duckweed.	Average
NU1	Pond in centre of eastern part of woodland had a small amount of water in with a heavy covering of duckweed. Linked to Pond 1WH	Average

Bat Emergence/Re-entry Surveys

Building JW9 (Landside)

Bat Emergence Survey 15 July 2019

A2.1.1 The bat emergence survey on 15 July commenced at 21:00 hours, 15 minutes before sunset and finished at 22:45 hours.

A2.1.2 No bats were seen emerging from the building but were detected foraging nearby. Bat activity was recorded at low levels during the survey.

A2.1.3 The following bat activity was recorded during the survey:

- 21:59 – noctule heard but not seen;
- 22:15 – noctule heard close by;
- 22:19 – noctule heard close by; and
- 22:22 – noctule heard close by.

Bat emergence survey 20 August 2019

A2.1.4 The bat emergence survey on the 20th August commenced at 20:00 hours, 15 minutes before sunset and finished at 21:45 hours.

A2.1.5 No bats were seen emerging from the building but were detected foraging and commuting nearby. Bat activity was recorded at low levels during the survey.

A2.1.6 The following bat activity was recorded during the survey:

- 20:56 – Leisler's bat pass and foraging soprano pipistrelle heard nearby;
- 20:58 – soprano pipistrelle heard foraging;
- 21:19 – soprano pipistrelle foraging; and
- 21:49 – brief Leisler's bat pass, not seen.

Bat Emergence Survey 26 September 2019

A2.1.7 The bat emergence survey on 26 September commenced at 18:55 hours, 15 minutes before sunset and finished at 20:30 hours.

A2.1.8 Not bats were seen emerging from the building but were detected foraging and commuting nearby. Bat activity was recorded at moderate levels during the survey; although no bats were seen, it was presumed that bats were foraging near to the grassland area to the west of the feature.

A2.1.9 The following bat activity was recorded during the survey.

- 19:18 – noctule heard but not seen.
- 19:28 – distant noctule call.
- 19:29 – brief *Myotis* call – not seen.
- 19:30 – noctule heard but not seen – made several passes until 19:39, possibly over the grassland areas adjacent to building. Mainly foraging and social calls.
- 19:32 – faint common pipistrelle call heard.
- 19:39 – distant common pipistrelle call.
- 19:45 – distant common pipistrelle call.
- 19:46 – *Myotis* bat heard.
- 19:48 – at least two noctule's foraging nearby.
- 20:03-20:14 – noctule, *Myotis* and pipistrelle heard foraging nearby; calls gradually getting quieter towards the end of the survey.

Building D9H (Airside)

Bat Emergence Survey 15 July 2019

A2.1.10 The bat emergence survey on the 15 July commenced at 21:00 hours, 15 minutes before sunset and finished at 22:45 hours.

A2.1.11 No bats were seen emerging from the building but were detected forging and commuting nearby.

A2.1.12 The following bat activity was recorded during the survey:

- 21:49 – faint common pipistrelle bat pass;
- 22:04 – distant pass from common pipistrelle;
- 22:11 – common pipistrelle commuting east along building;
- 22:12 – common pipistrelle heard but not seen, foraging nearby;
- 22:27 – noctule heard but not seen;
- 22:34 – brief noctule pass;
- 22:35 – brief noctule pass;
- 22:36 – brief noctule pass; and
- 22:39 – brief noctule pass.

Bat Emergence Survey 7 August 2019

A2.1.13 The bat emergence survey on 7 August commenced at 20:26 hours, 15 minutes before sunset and finished at 22:11 hours.

A2.1.14 No bats were seen emerging from the building and only a single Noctule was recorded briefly at 21:43 hours.

Bat Emergence Survey 2 October

A2.1.15 The bat emergence survey on 2 October commenced at 18:22 hours, 15 minutes before sunset, and finished at 20:07 hours.

A2.1.16 No bats were seen emerging from the building but were recorded foraging nearby. Bat activity was recorded at low levels during the survey; noctule were heard making regular, brief passes between 19:11 and 20:03 hours.

Bat Activity Transect Surveys

Annex 2.1.22: Bat Activity Transect Survey Dates, Weather Conditions and Sunset Times

Survey date	Sunset time	Survey start	Weather conditions
Transect 1			
09/04/19	19:46	19:31	8°C, cloudy, light breeze, no rain
24/04/19	20:10	19:57	10°C, heavy cloud cover, light wind
08/05/19	20:33	20:26	11°C, dry, light cloud, light breeze
21/05/19	20:52	20:37	17°C, no cloud, light breeze
12/06/19	21:16	21:09	13°, overcast, occasional light rain
25/06/19	21:20	21:05	22°C, humid, cloudy, light wind
09/07/19	21:15	21:00	20°C, dry, warm, overcast
23/07/19	21:01	20:46	26°C, clear, hot, humid
06/08/19	20:41	20:25	18°C, cloudy, calm
28/08/19	19:56	19:40	20°C, cloudy, light breeze, no rain
03/09/19	19:41	19:36	18°C, dry, cloudy, light wind
25/09/19	18:55	18:40	16°C, patchy cloud, dry, light wind
15/10/19	18:09	19:50	16°C, clear sky, dry, light wind
30/10/19	16:41	16:25	10°C, light wind, clear, dry
Transect 2			
09/04/19	19:46	19:31	8°C, cloudy, light breeze, no rain
24/04/19	20:10	19:58	10°C, heavy cloud cover, light wind
08/05/19	20:33	20:18	11°C, dry, light cloud, light breeze
21/05/19	20:52	20:37	17°C, no cloud, light breeze
12/06/19	21:16	21:09	13°, overcast, occasional light rain

Survey date	Sunset time	Survey start	Weather conditions
25/06/19	21:20	21:05	22°C, humid, cloudy, light wind
09/07/19	21:15	21:00	20°C, dry, warm, overcast
23/07/19	21:01	20:46	26°C, clear, hot, humid
06/08/19	20:41	20:25	18°C, cloudy, calm
28/08/19	19:56	19:40	20°C, cloudy, light breeze, no rain
25/09/19	18:55	18:40	16°C, patchy cloud, dry, light wind
16/10/19	18:09	19:50	16°C, clear sky, dry, light wind
30/10/19	16:41	16:25	10°C, light wind, clear, dry
Transect 3			
09/04/19	19:46	19:26	12°C, cloudy, no wind
24/04/19	20:10	20:00	Heavy cloud. damp
08/05/19	20:34	20:18	11°C, dry, light cloud, light breeze
21/05/19	20:52	20:43	17°C, no cloud, light breeze
18/06/19	21:19	21:00	16°C, dry, overcast, light wind
25/06/19	21:20	21:05	22°C, humid, cloudy, light wind
09/07/19	21:15	21:00	20°C, dry, warm, overcast
23/07/19	21:01	20:46	26°C, clear, hot, humid
06/08/19	20:41	20:25	18°C, cloudy, calm
29/08/19	19:54	19:46	19°C, light cloud, no rain
03/09/19	19:41	19:33	18°C, dry, cloudy, light wind
25/09/19	18:55	18:40	16°C, patchy cloud, dry, light wind
16/10/19	18:09	19:50	16°C, clear sky, dry, light wind
30/10/19	16:41	16:25	10°C, light wind, clear, dry
Transect 4			
10/04/19	19:48	19:32	10°C, clear skies, light breeze
25/04/19	20:12	19:57	11°C, high cloud, light wind
13/05/19	20:42	20:27	11°C, light winds, fair
22/05/19	20:54	20:39	19°C, clear, dry, no wind

Survey date	Sunset time	Survey start	Weather conditions
13/06/19	21:17	21:00	13°C, cloudy, occasional light rain
26/06/19	21:20	21:05	18°C, cloudy, windy
10/07/19	21:15	21:00	17°C, dry, light wind, patchy cloud
24/07/19	21:00	20:40	27°C, patchy cloud, no wind
05/08/19	20:41	20:20	20°C, light wind, no rain
29/08/19	19:54	19:46	19°C, light cloud, no rain
04/09/19	19:40	19:25	17°C, clear, breezy
24/09/19	18:55	18:40	18°C, light wind and light cloud
15/10/19	18:09	19:50	16°C, clear sky, dry, light wind
29/10/19	16:40	16:25	13°C, cloudy, light wind
Transect 5			
10/04/19	19:48	19:32	10°, clear skies, light breeze
25/04/19	20:12	19:57	11°C, high cloud, light wind
14/05/19	20:43	20:28	12°C, moderate breeze, fair
22/05/19	20:54	20:39	19°C, clear, dry, no wind
13/06/19	21:17	21:02	13°C, cloudy, occasional light rain
26/06/19	21:20	21:05	18°C, cloudy, windy
10/07/19	21:15	21:00	17°C, dry, light wind, patchy cloud
24/07/19	21:00	20:40	27°C, patchy cloud, no wind
05/08/19	20:41	20:20	20°C, light wind, no rain
29/08/19	19:54	19:46	19°C, light cloud, no rain
04/09/19	19:40	19:25	17°C, clear, breezy
24/09/19	18:55	18:40	18°C, light wind and light cloud
15/10/19	18:09	19:50	18°C, clear sky, dry, light wind
29/10/19	16:40	16:25	13°C, cloudy, light wind

Pre-maternity

Transect 1

A2.1.17 A total of four visits were undertaken for Transect 1 during the pre-maternity season in 2019: 9 April, 24 April, 8 May and 21 May.

A2.1.18 A total of 240 bat passes were recorded during the surveys. These comprised passes from:

- 217 common pipistrelles;
- 19 soprano pipistrelles;
- Three *Myotis* sp. (including two characteristic of whiskered/Brandt's *Myotis mystacinus/brandtii* bat); and
- One noctule.

A2.1.19 Figure 3.13.1a shows the transect route and the number and location of species recorded during the surveys.

Transect 2

A2.1.20 A total of four visits were undertaken for Transect 2 during the pre-maternity season in 2019: 9 April, 24 April, 8 May and 21 May.

A2.1.21 A total of 217 bat passes were recorded during the surveys. These comprised passes from:

- 192 common pipistrelles;
- Two soprano pipistrelles;
- Three *Myotis* sp. (including two characteristic of Daubenton's bat *Myotis daubentonii*);
- One long-eared *Plecotus sp.* bat; and
- 19 noctule.

A2.1.22 Figure 3.13.1b shows the transect route and the number and location of species recorded during the surveys

Transect 3

A2.1.23 A total of four visits were undertaken for Transect 3 during the pre-maternity season in 2019: 9 April, 24 April, 8 May and 21 May.

A2.1.24 A total of 286 bat passes were recorded during the surveys. These comprised passes from:

- 242 common pipistrelles;
- 30 soprano pipistrelles; and
- 14 *Myotis* sp. (including three characteristic of Natterer's bat *Myotis nattereri* and one of Daubenton's bat).

A2.1.25 Figure 3.13.1c and 3.13.3d shows the transect route and the number and location of species recorded during the surveys.

Transect 4

A2.1.26 A total of four visits were undertaken for Transect 4 during the pre-maternity season in 2019: 10 April, 25 April, 13 May and 22nd May.

A2.1.27 A total of 24 bat passes were recorded during the surveys. These comprised passes from:

- 21 common pipistrelles; and
- Three noctule.

A2.1.28 Figure 3.13.1e shows the transect route and the number and location of species recorded during the surveys.

Transect 5

A2.1.29 A total of four visits were undertaken for Transect 5 during the pre-maternity season in 2019: 10 April, 25 April, 14 May and 22 May.

A2.1.30 A total of 131 bat passes were recorded during the surveys. These comprised passes from:

- 77 common pipistrelles;
- 12 soprano pipistrelles;
- One pipistrelle species;
- 25 *Myotis* sp. (including three characteristic of whiskered/Brandt's bats, two of Daubenton's bats and four of Natterer's bats); and
- 16 noctule.

A2.1.31 Figure 3.13.1f shows the transect route and the number and location of species recorded during the surveys.

Maternity

Transect 1

A2.1.32 A total of four visits were undertaken for Transect 1 during the maternity season in 2019: 12 June, 25 June, 9 July and 23 July.

A2.1.33 A total of 400 bat passes were recorded during the surveys. These comprised passes from:

- 301 common pipistrelles;
- 56 soprano pipistrelles;
- 16 *Myotis* sp. (including one characteristic of whiskered/Brandt's bat and one of Natterer's bat);
- 15 noctule;
- Six Leisler's bats;
- Ten *Nyctalus* sp.; and
- Six serotine bats.

A2.1.34 Figure 3.13.2a shows the transect route and the number and location of species recorded during the surveys.

Transect 2

A2.1.35 A total of four visits were undertaken for Transect 2 during the maternity season in 2019: 12 June, 25 June, 9 July and 23 July.

A2.1.36 A total of 218 bat passes were recorded during the surveys. These comprised passes from:

- 197 common pipistrelles;
- Two soprano pipistrelles;
- One Nathusius' pipistrelle;
- 14 noctule; and
- Four serotine bats.

A2.1.37 Figure 3.13.2b shows the transect route and the number and location of species recorded during the surveys

Transect 3

A2.1.38 A total of four visits were undertaken for Transect 3 during the maternity season in 2019: 18 June, 2 June, 9 July and 23 July.

A2.1.39 A total of 252 bat passes were recorded during the surveys. These comprised passes from:

- 211 common pipistrelles;
- 31 soprano pipistrelles;
- Two *Myotis* sp. (including one characteristic of Natterer's bat);
- One noctule;
- One *Nyctalus* sp.; and
- Six serotine bats.

A2.1.40 Figure 3.13.2c and 3.13.2d shows the transect route and the number and location of species recorded during the surveys.

Transect 4

A2.1.41 A total of four visits were undertaken for Transect 4 during the maternity season in 2019: 13 June, 26 June, 10 July and 24 July.

A2.1.42 A total of 23 bat passes from common pipistrelles were recorded during the surveys.

A2.1.43 Figure 3.13.2e shows the transect route and the number and location of species recorded during the surveys.

Transect 5

A2.1.44 A total of four visits were undertaken for Transect 5 during the maternity season in 2019: 13 June, 26 June, 10 July and 24 July.

A2.1.45 A total of 333 bat passes were recorded during the surveys. These comprised passes from:

- 260 common pipistrelles;
- 32 soprano pipistrelles;
- 23 *Myotis* sp. (including three characteristic of whiskered/Brandt's bats and one of Daubenton's bat);
- 15 noctule;
- Two Leisler's bats; and
- One *Nyctalus* sp.

A2.1.46 Figure 3.13.2f shows the transect route and the number and location of species recorded during the surveys.

Post-maternity

Transect 1

A2.1.47 A total of six visits were undertaken for Transect 1 during the post-maternity season in 2019: 6 August, 28 August, 3 September, 25 September, 15 October and 30 October.

A2.1.48 A total of 508 bat passes were recorded during the surveys. These comprised passes from:

- 433 common pipistrelles;
- 46 soprano pipistrelles;
- Nine *Myotis* sp.;
- One Plecotus sp.
- 16 noctule;
- One serotine bat; and
- Two *Nyctalus* sp.

A2.1.49 Figure 3.13.3a shows the transect route and the number and location of species recorded during the surveys.

Transect 2

A2.1.50 A total of five visits were undertaken for Transect 2 during the post-maternity season in 2019: 6 August, 28 August, 25 September, 16 October and 30 October. One survey was cancelled in early September due to access constraints.

A2.1.51 A total of 243 bat passes were recorded during the surveys. These comprised passes from:

- 227 common pipistrelles;
- Four soprano pipistrelles;
- Five *Myotis* sp. (including one characteristic of Daubenton's bat);
- One Plecotus sp.;
- Four noctule; and
- Two Nyctalus sp.

A2.1.52 Figure 3.13.3b shows the transect route and the number and location of species recorded during the surveys.

Transect 3

A2.1.53 A total of six visits were undertaken for Transect 3 during the post-maternity season in 2019: 6 August, 29 August, 3 September, 25 September, 16 October and 30 October.

A2.1.54 A total of 378 bat passes were recorded during the surveys. These comprised passes from:

- 328 common pipistrelles;
- 37 soprano pipistrelles;
- One Nathusius' pipistrelle;
- Five *Myotis* sp.;
- Three Leisler's bats; and
- Four noctule.

A2.1.55 Figure 3.13.3c and 3.13.3d shows the transect route and the number and location of species recorded during the surveys.

Transect 4

A2.1.56 A total of six visits were undertaken for Transect 4 during the post-maternity season in 2019: 5 August, 29 August, 4 September, 24 September, 15 October and 29 October.

A2.1.57 A total of 52 passes were recorded during the surveys. These comprised passes from:

- 32 common pipistrelles;
- Four soprano pipistrelles;
- One Nathusius' pipistrelle;
- 12 noctule;
- One Leisler's bat; and
- Two *Nyctalus* sp.

A2.1.58 Figure 3.13.3e shows the transect route and the number and location of species recorded during the surveys.

Transect 5

A2.1.59 A total of six visits were undertaken for Transect 5 during the post-maternity season in 2019: 5th August, 29th August, 4th September, 24th September, 15th October and 29th October.

A2.1.60 A total of 297 bat passes were recorded during the surveys. These comprised passes from:

- 212 common pipistrelles;
- 16 soprano pipistrelles;
- 47 *Myotis* sp. (including 12 characteristic of whiskered/Brandt's bat, six Daubenton's bats and six Natterer's bats);
- One serotine bat;
- Five *Plecotus* sp.;
- 14 noctule; and
- Two *Nyctalus* sp.

A2.1.61 Figure 3.13.3f shows the transect route and the number and location of species recorded during the surveys.

Bat Static/Automated Surveys

Annex 2.1.23: Bat Records at Location1

Survey Date	Pp	Ppy	Pn	Psp	Msp	Plsp	Nn	Nl	Es	Total
24/04/19	0	0	0	0	0	0	0	0	0	**0**
25/04/19	2	0	0	0	1	0	0	0	0	**3**
26/04/19	1	0	0	0	0	0	1	0	0	**2**
27/04/19	0	0	0	0	0	0	0	0	0	**0**
28/04/19	16	0	1	0	1	1	2	0	0	**21**
29/04/19	10	0	0	0	1	0	0	0	0	**11**
30/04/19	22	0	0	0	0	0	0	0	0	**22**
Species total	**51**	**0**	**1**	**0**	**3**	**1**	**3**	**0**	**0**	**59**

Survey Date	Pp	Ppy	Pn	Psp	Msp	Plsp	Nn	Nl	Es	Total
10/05/19	14	1	0	0	0	0	0	0	0	**15**
11/05/19	159	4	3	2	0	0	4	0	0	**172**
12/05/19	114	8	0	0	0	0	3	0	0	**125**
13/05/19	116	0	0	0	0	0	0	0	0	**116**
14/05/19	64	1	1	0	0	0	0	0	0	**66**
15/05/19	65	5	0	0	0	2	0	0	0	**72**
Species total	**532**	**19**	**4**	**2**	**0**	**2**	**7**	**0**	**0**	**566**

Survey Date	Pp	Ppy	Pn	Psp	Msp	Plsp	Nn	Nl	Es	Total
11/06/19	0	0	0	0	0	0	0	0	0	**0**
12/06/19	0	0	0	0	0	0	0	0	0	**0**
13/06/19	9	0	0	0	0	0	3	0	0	**12**
14/06/19	69	0	0	0	0	0	1	0	0	**70**
15/06/19	99	4	0	0	0	0	4	0	0	**107**
Species total	**177**	**4**	**0**	**0**	**0**	**0**	**8**	**0**	**0**	**189**

Survey Date	Pp	Ppy	Pn	Psp	Msp	Plsp	Nn	Nl	Es	Total
12/07/19	81	1	0	1	4	1	9	3	1	**101**
13/07/19	171	3	1	1	3	1	36	2	1	**219**
14/07/19	119	0	0	2	1	0	54	0	0	**176**
15/07/19	80	0	0	2	2	0	4	0	0	**88**
16/07/19	104	4	0	0	4	1	48	0	0	**161**
Species total	**555**	**8**	**1**	**6**	**14**	**3**	**151**	**5**	**2**	**745**

Survey Date	Pp	Ppy	Pn	Psp	Msp	Plsp	Nn	Nl	Es	Total
13/08/19	43	1	0	0	4	0	6	0	1	**55**
14/08/19	34	0	0	0	1	1	5	0	1	**42**
15/08/19	106	2	0	0	6	0	4	0	0	**118**
16/08/19	2	0	0	0	1	0	2	0	0	**5**
17/08/19	16	0	0	0	2	0	14	0	1	**33**
18/08/19	21	0	3	0	3	2	0	0	0	29
Species total	**222**	**3**	**3**	**0**	**17**	**3**	**31**	**0**	**3**	**282**

Survey Date	Bb	Pp	Ppy	Pn	Psp	Msp	Plsp	Nn	Nl	Es	Total
25/09/19	0	15	0	0	3	1	0	0	0	0	**19**
26/09/19	0	5	0	0	0	2	0	53	0	0	**60**
27/09/19	0	1	0	0	0	2	0	158	0	0	**161**
28/09/19	0	2	0	0	0	1	0	31	0	0	**34**
29/09/19	1	11	0	0	0	1	0	70	0	0	**83**
Species total	**1**	**34**	**0**	**0**	**3**	**7**	**0**	**312**	**0**	**0**	**357**

Survey Date	Bb	Pp	Ppy	Pn	Psp	Msp	Plsp	Nn	Nl	Es	Total
14/10/19	0	8	0	0	0	0	0	2	0	0	**10**
15/10/19	0	91	1	0	8	3	0	14	0	0	**117**
16/10/19	1	4	2	0	0	3	0	0	0	0	**10**
17/10/19	0	0	0	0	0	0	0	0	0	0	**0**
18/10/19	0	0	0	0	0	1	0	0	0	0	**1**
Species total	**1**	**103**	**3**	**0**	**8**	**7**	**0**	**16**	**0**	**0**	**138**

Annex 2.1.24: Bat Records at Location 2

Survey Date	Pp	Ppy	Pn	Psp	Msp	Plsp	Nn	Nl	Es	Total
24/04/19	0	0	0	0	0	0	0	0	0	**0**
25/04/19	4	2	0	0	1	0	0	0	0	**7**
26/04/19	2	0	0	0	0	0	1	0	0	**3**
27/04/19	13	0	0	0	1	0	0	0	0	**14**
28/04/19	35	2	0	0	5	0	0	0	0	**42**
29/04/19	28	1	0	0	1	0	0	0	0	**30**
30/04/19	14	0	0	0	0	0	0	0	0	**14**
Species total	**96**	**5**	**0**	**0**	**8**	**0**	**1**	**0**	**0**	**110**

Survey Date	Pp	Ppy	Pn	Psp	Msp	Plsp	Nn	Nl	Es	Total
10/05/19	58	2	0	0	0	0	4	0	0	**64**
11/05/19	173	6	0	0	3	0	7	0	0	**189**
12/05/19	135	10	0	0	1	1	16	0	0	**163**
13/05/19	241	22	0	0	1	0	4	0	0	**268**
14/05/19	217	8	0	0	0	0	20	0	0	**245**
15/05/19	124	0	0	0	2	0	46	0	0	**172**
Species total	**948**	**48**	**0**	**0**	**7**	**1**	**97**	**0**	**0**	**1,101**

Survey Date	Pp	Ppy	Pn	Psp	Msp	Plsp	Nn	Nl	Es	Total
12/06/19	7	0	0	0	0	0	25	0	0	**32**
13/06/19	15	3	0	0	6	0	131	0	0	**155**
14/06/19	16	2	0	3	3	1	224	0	0	**249**
15/06/19	11	0	0	0	1	0	90	0	0	**102**
16/06/19	17	0	0	0	3	0	172	0	0	**193**
Species total	**66**	**5**	**0**	**3**	**13**	**1**	**642**	**0**	**0**	**730**

Survey Date	Pp	Ppy	Pn	Psp	Msp	Plsp	Nn	Nl	Es	Total
12/07/19	390	6	0	0	5	2	12	0	1	**416**
13/07/19	348	5	0	0	6	0	8	0	0	**367**
14/07/19	245	1	0	0	2	0	7	0	0	**255**
15/07/19	99	3	0	1	4	0	5	0	2	**114**
16/07/19	101	5	0	0	1	0	9	0	1	**117**
Species total	**1,183**	**20**	**0**	**1**	**18**	**2**	**41**	**0**	**4**	**1,269**

Survey Date	Pp	Ppy	Pn	Psp	Msp	Plsp	Nn	Nl	Es	Total
13/08/19	28	7	0	1	10	9	29	5	1	**90**
14/08/19	0	0	0	0	0	0	0	0	0	**0**
15/08/19	80	4	0	1	22	1	2	8	2	**120**
16/08/19	2	0	0	0	1	0	2	0	0	**5**
17/08/19	38	3	0	0	17	6	33	0	8	**105**
18/08/19	1	1	0	1	3	0	3	0	1	**10**
Species total	**149**	**15**	**0**	**39**	**53**	**16**	**69**	**13**	**12**	**330**

Survey Date	Pp	Ppy	Pn	Psp	Msp	Plsp	Nn	Nl	Es	Total
25/09/19	18	0	0	0	2	0	53	0	0	**73**
26/09/19	21	1	0	0	5	2	96	0	0	**125**

Survey Date	Pp	Ppy	Pn	Psp	Msp	Plsp	Nn	Nl	Es	Total
27/09/19	3	0	0	1	0	0	89	0	0	**93**
Species total	**42**	**1**	**0**	**1**	**7**	**2**	**238**	**0**	**0**	**291**

Survey Date	Pp	Ppy	Pn	Psp	Msp	Plsp	Nn	Nl	Es	Total
14/10/19	8	3	0	0	3	0	0	0	0	**14**
15/10/19	5	2	0	0	2	0	0	1	0	**10**
16/10/19	1	0	0	0	0	0	0	0	0	**1**
17/10/19	0	0	0	0	0	0	0	0	0	**0**
18/10/19	10	0	0	0	0	0	0	0	0	**10**
Species total	**24**	**5**	**0**	**0**	**5**	**0**	**0**	**1**	**0**	**35**

Annex 2.1.25: Bat Records at Location 3

Survey Date	Pp	Ppy	Pn	Psp	Msp	Plsp	Nn	Nl	Es	Total
25/04/19	61	28	0	0	2	0	0	0	0	**91**
26/04/19	1	1	0	0	3	0	0	0	0	**5**
27/04/19	0	5	0	0	0	0	0	0	0	**5**
28/04/19	404	37	0	0	39	0	0	0	0	**480**
29/04/19	585	64	0	0	48	0	3	0	0	**700**
30/04/19	485	53	0	0	6	0	0	0	0	**544**
01/05/19	525	40	0	1	19	0	0	0	0	**585**
Species total	**2,061**	**228**	**0**	**1**	**117**	**0**	**3**	**0**	**0**	**2,410**

Survey Date	Pp	Ppy	Pn	Psp	Msp	Plsp	Nn	Nl	Es	Total
10/05/19	3,200	63	0	1	382	65	1	0	0	**3,712**
11/05/19	3,381	76	0	1	599	48	16	1	0	**4,135**
12/05/19	3,838	148	0	0	931	38	31	3	0	**4,989**
13/05/19	3,545	103	0	1	780	53	12	0	0	**4,494**
14/05/19	1,648	139	0	0	410	30	8	1	0	**2,236**
Species total	**15,612**	**529**	**0**	**3**	**3,102**	**234**	**68**	**5**	**0**	**19,553**

Survey Date	Pp	Ppy	Pn	Psp	Msp	Plsp	Nn	Nl	Es	Total
12/06/19	0	2	0	0	0	0	2	0	0	**4**
13/06/19	248	58	0	0	74	1	24	0	0	**406**
14/06/19	604	82	0	0	159	3	24	0	0	**895**
15/06/19	276	84	0	0	563	0	31	0	0	**662**

Survey Date	Pp	Ppy	Pn	Psp	Msp	Plsp	Nn	Nl	Es	Total
16/06/19	174	42	0	1	143	0	28	0	0	**391**
Species total	**1,302**	**268**	**0**	**1**	**639**	**4**	**109**	**0**	**0**	**2,358**

Survey Date	Pp	Ppy	Pn	Psp	Msp	Plsp	Nn	Nl	Es	Total
12/07/19	1,432	86	0	2	306	0	6	0	0	**1,832**
13/07/19	1,440	83	1	2	251	0	12	0	0	**1,789**
14/07/19	1,880	99	0	0	414	0	11	0	0	**2,404**
15/07/19	1,269	81	0	0	347	0	1	0	0	**1,698**
16/07/19	1,667	106	0	1	410	3	4	0	0	**2,191**
Species total	**7,688**	**455**	**1**	**5**	**1,728**	**3**	**34**	**0**	**0**	**9,914**

Survey Date	Pp	Ppy	Pn	Psp	Msp	Plsp	Nn	Nl	Es	Total
13/08/19	630	186	0	109	137	3	2	0	0	**1,067**
14/08/19	487	95	0	99	107	0	0	0	0	**788**
15/08/19	257	166	0	92	54	0	3	0	1	**573**
16/08/19	14	23	0	0	5	0	0	0	0	**42**
17/08/19	543	250	0	154	92	0	1	0	0	**1,040**
18/08/19	408	186	0	81	146	0	0	0	1	**820**
Species total	**2,339**	**904**	**0**	**535**	**541**	**3**	**6**	**0**	**2**	**4,330**

Survey Date	Pp	Ppy	Pn	Psp	Msp	Plsp	Nn	Nl	Es	Total
25/09/19	40	41	0	127	17	0	56	0	1	**282**
26/09/19	101	19	0	131	48	0	40	0	0	**339**
27/09/19	34	3	0	203	22	0	26	0	0	**288**
28/09/19	52	10	0	33	9	0	20	0	0	**124**
29/09/19	106	10	0	176	49	0	19	0	0	**360**
Species total	**333**	**83**	**0**	**670**	**145**	**0**	**161**	**0**	**1**	**1,393**

Survey Date	Pp	Ppy	Pn	Psp	Msp	Plsp	Nn	Nl	Es	Total
14/10/19	66	11	0	0	126	0	0	0	0	**203**
15/10/19	330	124	0	39	679	1	1	0	0	**1,174**
16/10/19	19	53	0	12	182	4	0	0	0	**270**
17/10/19	34	0	0	0	0	0	0	0	0	**34**
18/10/19	6	80	0	2	18	0	0	0	0	**106**
Species total	**455**	**268**	**0**	**53**	**1,005**	**5**	**1**	**0**	**0**	**1,787**

Annex 21.26: Bat Records at Location 4

Survey Date	Pp	Ppy	Pn	Psp	Msp	Plsp	Nn	Nl	Es	Total
25/04/19	662	27	1	1	42	18	0	0	0	**751**
26/04/19	354	25	0	0	7	0	0	0	1	**387**
27/04/19	14	8	0	0	3	0	0	0	1	**25**
28/04/19	272	10	1	0	13	3	3	1	0	**303**
29/04/19	400	31	0	0	18	8	0	0	1	**458**
30/04/19	1,093	46	3	0	14	10	3	0	0	**1,169**
Species total	**2,795**	**147**	**5**	**1**	**96**	**39**	**6**	**1**	**3**	**3,093**

Survey Date	Pp	Ppy	Pn	Psp	Msp	Plsp	Nn	Nl	Es	Total
10/05/19	31	4	1	0	6	0	0	1	0	**43**
11/05/19	52	15	1	0	7	0	1	0	0	**76**
12/05/19	142	18	0	4	2	0	0	1	0	**167**
13/05/19	138	512	0	6	1	0	0	0	0	**657**
14/05/19	1,214	375	0	7	10	0	0	0	0	**1,606**
15/05/19	828	386	1	12	5	0	0	0	0	**1,232**
Species total	**2,405**	**1,310**	**3**	**29**	**31**	**0**	**1**	**2**	**0**	**3,781**

Survey Date	Pp	Ppy	Pn	Psp	Msp	Plsp	Nn	Nl	Es	Total
12/06/19	4	0	0	0	3	0	0	0	0	**7**
13/06/19	30	0	0	0	4	0	1	0	0	**35**
14/06/19	37	2	0	0	2	4	23	0	0	**68**
15/06/19	28	0	1	0	0	0	2	0	0	**31**
Species total	**99**	**2**	**1**	**0**	**9**	**4**	**26**	**0**	**0**	**141**

Survey Date	Pp	Ppy	Pn	Psp	Msp	Plsp	Nn	Nl	Es	Total
12/07/19	59	9	0	1	15	2	4	0	6	**96**
13/07/19	56	3	0	1	25	8	5	0	1	**99**
14/07/19	54	0	0	1	11	4	4	0	2	**76**
15/07/19	62	4	1	0	8	0	5	0	0	**80**
16/07/19	68	7	1	2	19	4	18	0	0	**119**
Species total	**299**	**23**	**2**	**5**	**78**	**18**	**36**	**0**	**9**	**470**

Survey Date	Pp	Ppy	Pn	Psp	Msp	Plsp	Nn	Nl	Es	Total
13/08/19	85	2	0	3	23	0	15	9	2	**139**
14/08/19	53	2	0	3	7	0	2	0	0	**67**
15/08/19	102	0	0	0	28	3	10	1	2	**146**
16/08/19	32	0	0	0	4	0	0	0	0	**36**
17/08/19	56	3	0	0	1	0	5	0	0	**65**
18/08/19	57	6	0	0	4	0	0	0	0	**68**
Species total	**385**	**13**	**0**	**6**	**67**	**3**	**32**	**10**	**4**	**520**

Survey Date	Pp	Ppy	Pn	Psp	Msp	Plsp	Nn	Nl	Es	Total
25/09/19	19	1	0	0	4	0	21	0	0	**45**
26/09/19	10	3	0	0	5	4	21	0	0	**43**
27/09/19	9	0	0	0	3	2	21	0	0	**35**
Species total	**38**	**4**	**0**	**0**	**12**	**6**	**63**	**0**	**0**	**123**

Survey Date	Pp	Ppy	Pn	Psp	Msp	Plsp	Nn	Nl	Es	Total
14/10/19	0	0	0	0	0	0	0	0	0	**0**
15/10/19	11	0	0	0	2	0	8	0	0	**21**
16/10/19	3	1	0	0	3	0	12	0	0	**19**
17/10/19	0	0	0	0	0	0	0	0	0	**0**
18/10/19	2	1	0	0	10	0	0	0	0	**13**
Species total	**16**	**2**	**0**	**0**	**15**	**0**	**20**	**0**	**0**	**53**

Annex 2.127: Bat Records at Location 5

Survey Date	Pp	Ppy	Pn	Psp	Msp	Plsp	Nn	Nl	Es	Total
10/05/19	522	6	0	0	0	0	1	0	0	**529**
11/05/19	395	2	0	0	3	0	0	0	0	**400**
12/05/19	281	0	0	0	3	0	0	0	0	**284**
13/05/19	582	7	0	0	0	1	0	0	0	**590**
14/05/19	696	4	0	0	0	6	0	0	0	**706**
15/05/19	985	16	0	0	0	0	0	0	0	**1,001**
Species total	**3,461**	**35**	**0**	**0**	**6**	**7**	**1**	**0**	**0**	**3,694**

Survey Date	Pp	Ppy	Pn	Psp	Msp	Plsp	Nn	Nl	Es	Total
12/07/19	1,337	47	0	1	1	0	9	0	50	**14,45**
13/07/19	234	6	0	0	2	0	2	0	27	**271**
14/07/19	878	84	0	0	2	0	5	0	5	**974**
15/07/19	339	6	0	1	1	0	0	0	6	**353**
16/07/19	272	1	0	0	2	0	0	0	3	**278**
Species total	**3,060**	**144**	**0**	**2**	**8**	**0**	**16**	**0**	**91**	**3,321**

Survey Date	Pp	Ppy	Pn	Psp	Msp	Plsp	Nn	Nl	Es	Total
13/08/19	162	20	0	1	0	0	0	0	0	**183**
14/08/19	53	2	0	3	7	0	2	0	0	**67**
15/08/19	102	0	0	0	28	3	10	1	2	**146**
16/08/19	32	0	0	0	4	0	0	0	0	**36**
17/08/19	56	3	0	0	1	0	5	0	0	**65**
18/08/19	57	6	0	0	4	0	0	0	0	**67**
Species total	**462**	**31**	**0**	**4**	**44**	**3**	**17**	**1**	**2**	**564**

Survey Date	Pp	Ppy	Pn	Psp	Msp	Plsp	Nn	Nl	Es	Total
25/09/19	1	0	0	0	0	0	1	0	0	**2**
26/09/19	31	3	0	14	3	0	2	0	0	**53**
27/09/19	24	6	0	26	1	1	5	0	0.	**63**
28/09/19	20	2	0	3	0	0	1	0	0	**26**
29/09/19	92	17	0	36	7	3	6	0	0	**161**
Species total	**168**	**28**	**0**	**79**	**11**	**4**	**15**	**0**	**0**	**305**

Survey Date	Pp	Ppy	Pn	Psp	Msp	Plsp	Nn	Nl	Es	Total
14/10/19	0	0	0	0	0	0	0	0	0	**0**
15/10/19	25	3	0	2	3	1	0	0	0	**34**
16/10/19	14	2	0	4	2	2	0	0	0	**24**
17/10/19	0	0	0	0	0	0	0	0	0	**0**
18/10/19	8	1	0	0	0	1	0	0	0	**10**
Species total	**47**	**6**	**0**	**6**	**5**	**4**	**0**	**0**	**0**	**68**

Annex 2.128: Bat Records at Location 6

Survey Date	Pp	Ppy	Pn	Psp	Msp	Plsp	Nn	Nl	Es	Total
25/04/19	0	0	0	0	0	0	0	0	0	**0**
26/04/19	239	0	1	0	0	0	0	0	0	**240**
27/04/19	27	2	0	0	0	0	0	0	0	**29**
Species total	**266**	**2**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**269**

Survey Date	Pp	Ppy	Pn	Psp	Msp	Plsp	Nn	Nl	Es	Total
10/05/19	2,728	124	2	0	4	0	2	0	0	**2,860**
11/05/19	1,746	64	0	0	20	1	0	0	0	**1,831**
12/05/19	365	35	0	0	2	0	0	0	0	**402**
Species total	**4,839**	**223**	**2**	**0**	**26**	**1**	**2**	**0**	**0**	**5,093**

Survey Date	Pp	Ppy	Pn	Psp	Msp	Plsp	Nn	Nl	Es	Total
12/06/19	10	0	0	0	2	0	0	0	0	**10**
13/06/19	2,588	1	9	0	4	0	7	0	0	**2,607**
14/06/19	1,791	2	4	1	0	2	22	0	0	**1,826**
15/06/19	1,752	1	30	0	2	0	3	0	1	**1,787**
16/06/19	1,613	9	8	0	0	0	14	0	0	**1,646**
Species total	**7,754**	**13**	**51**	**1**	**8**	**2**	**46**	**0**	**1**	**7,876**

Survey Date	Pp	Ppy	Pn	Psp	Msp	Plsp	Nn	Nl	Es	Total
12/07/19	2,074	12	8	0	1	3	25	0	1	**2,124**
13/07/19	581	1	0	0	2	0	7	0	1	**592**
14/07/19	1061	4	0	0	7	1	10	0	0	**1,083**
15/07/19	866	1	1	0	5	0	18	0	0	**891**
16/07/19	1	0	0	0	0	0	0	0	0	**1**
Species total	**4,583**	**18**	**9**	**0**	**15**	**4**	**60**	**0**	**2**	**4691**

Survey Date	Pp	Ppy	Pn	Psp	Msp	Plsp	Nn	Nl	Es	Total
13/08/19	0	0	0	0	0	0	0	0	0	**0**
14/08/19	1,839	1	0	0	3	0	11	1	0	**1,855**
15/08/19	1,560	0	0	0	10	2	69	1	1	**1,643**
16/08/19	51	0	0	0	0	0	0	0	0	**51**
17/08/19	2,173	1	0	0	1	0	12	0	0	**2,187**
18/08/19	2,149	3	0	0	5	0	4	0	0	**2,161**
Species total	**7,772**	**5**	**0**	**0**	**19**	**2**	**96**	**2**	**1**	**7,897**

Survey Date	Pp	Ppy	Pn	Psp	Msp	Plsp	Nn	Nl	Es	Total
24/09/19	0	0	0	0	0	0	0	0	0	**0**
25/09/19	1,429	15	0	2	1	0	7	0	0	**1,454**
26/09/19	1,411	3	0	0	3	0	2	0	0	**1,419**
27/09/19	11	3	0	0	0	0	4	0	0	**18**
28/09/19	21	0	0	0	2	0	6	0	0	**29**
Species total	**2,872**	**21**	**0**	**2**	**6**	**0**	**19**	**0**	**0**	**2,920**

Survey Date	Pp	Ppy	Pn	Psp	Msp	Plsp	Nn	Nl	Es	Total
14/10/19	54	7	0	0	0	0	0	0	0	**61**
15/10/19	85	3	0	0	0	0	1	0	0	**89**
16/10/19	26	0	0	0	1	0	1	0	0	**28**
17/10/19	0	0	0	0	0	0	0	0	0	**0**
18/10/19	126	19	0	0	1	0	0	0	0	**146**
19/10/19	55	0	0	0	0	0	0	0	0	**55**
Species total	**346**	**29**	**0**	**0**	**2**	**0**	**2**	**0**	**0**	**379**

Annex 2.1.29: Bat Records at Location 7

Survey Date	Pp	Ppy	Pn	Psp	Msp	Plsp	Nn	Nl	Es	Total
25/04/19	1,966	38	0	0	38	1	0	0	0	**2,043**
26/04/19	559	18	0	0	4	0	0	0	0	**581**
27/04/19	201	98	0	0	1	0	0	0	0	**300**
28/04/19	1,815	81	0	0	34	2	0	0	0	**1,932**
29/04/19	1,577	72	0	0	14	0	0	0	0	**1,663**
30/04/19	1,903	30	0	0	7	0	0	0	0	**1,940**
Species total	**8,021**	**337**	**0**	**0**	**98**	**3**	**0**	**0**	**0**	**8,459**

Survey Date	Pp	Ppy	Pn	Psp	Msp	Plsp	Nn	Nl	Es	Total
10/05/19	3,674	79	0	0	7	2	0	0	0	**3,762**
11/05/19	3,897	75	1	0	1	0	2	0	0	**3,976**
12/05/19	3,596	80	0	0	2	2	0	0	0	**3,680**
13/05/19	1,403	56	0	0	1	0	0	0	0	**1,460**
Species total	**12,570**	**290**	**1**	**0**	**11**	**4**	**2**	**0**	**0**	**12,878**

Survey Date	Pp	Ppy	Pn	Psp	Msp	Plsp	Nn	Nl	Es	Total
12/06/19	615	11	0	0	0	0	8	0	0	**634**
13/06/19	2,037	58	0	0	10	0	0	0	0	**2,105**
14/06/19	2,883	118	0	0	10	1	3	0	0	**3,015**
15/06/19	1,952	61	0	0	40	5	0	0	0	**2,058**
16/06/19	396	2	0	0	1	1	9	0	0	**409**
Species total	**7,883**	**250**	**0**	**0**	**61**	**7**	**20**	**0**	**0**	**8,221**

Survey Date	Pp	Ppy	Pn	Psp	Msp	Plsp	Nn	Nl	Es	Total
12/07/19	855	3	0	1	1	3	0	0	15	**878**
13/07/19	1,075	7	0	2	5	6	4	0	34	**1,133**
14/07/19	1,900	12	0	0	2	6	0	0	11	**1,931**
15/07/19	1,274	16	0	2	4	4	4	0	4	**1,308**
Species total	**5,104**	**38**	**0**	**5**	**12**	**19**	**8**	**0**	**64**	**5,250**

Survey Date	Pp	Ppy	Pn	Psp	Msp	Plsp	Nn	Nl	Es	Total
13/08/19	645	10	0	9	9	1	0	0	0	**674**
14/08/19	28	0	0	1	0	0	0	0	0	**29**
15/08/19	443	9	0	5	12	4	0	0	0	**479**
16/08/19	35	1	0	0	0	0	0	0	0	**36**
17/08/19	559	2	0	33	95	9	0	0	0	**702**
18/08/19	444	5	0	24	0	2	0	0	25	**501**
Species total	**2,154**	**27**	**0**	**72**	**116**	**16**	**0**	**0**	**25**	**2,421**

Survey Date	Pp	Ppy	Pn	Psp	Msp	Plsp	Nn	Nl	Es	Total
25/09/19	48	0	0	47	0	0	5	0	0	**100**
26/09/19	98	2	0	28	1	5	2	0	0	**136**
27/09/19	2	0	0	9	0	0	3	0	0	**14**
Species total	**148**	**2**	**0**	**84**	**1**	**5**	**10**	**0**	**0**	**250**

Survey Date	Pp	Ppy	Pn	Psp	Msp	Plsp	Nn	Nl	Es	Total
15/10/19	21	2	0	0	0	0	0	0	0	**23**
16/10/19	23	1	0	0	1	0	0	0	0	**25**
17/10/19	0	0	0	0	0	0	0	0	0	**0**
18/10/19	152	4	0	2	2	0	0	0	0	**160**
19/10/19	29	19	0	0	0	0	1	0	0	**49**
20/10/19	211	16	0	0	4	0	0	0	0	**231**
Species total	**436**	**42**	**0**	**2**	**7**	**0**	**1**	**0**	**0**	**488**

Annex 2.1.30: Bat Records at Location 8

Survey Date	Pp	Ppy	Pn	Psp	Msp	Plsp	Nn	Nl	Es	Total
24/04/19	0	0	0	0	0	0	0	0	0	**0**
25/04/19	173	0	0	0	0	0	0	0	0	**173**
26/04/19	23	0	0	0	0	0	0	0	0	**25**
27/04/19	13	0	0	0	0	0	0	0	0	**13**
28/04/19	280	0	1	0	0	0	3	0	0	**284**
29/04/19	367	0	0	4	0	0	0	0	0	**371**
30/04/19	267	0	0	0	0	0	10	0	0	**277**
01/05/19	603	2	0	3	0	0	7	0	0	**615**
Species total	**1,728**	**2**	**1**	**7**	**0**	**0**	**20**	**0**	**0**	**1,758**

Survey Date	Pp	Ppy	Pn	Psp	Msp	Plsp	Nn	Nl	Es	Total
12/05/19	71	0	0	0	0	0	0	0	0	**71**
13/05/19	1,118	1	0	0	0	0	0	0	0	**1,119**
14/05/19	787	2	0	0	0	0	0	0	0	**789**
15/05/19	142	0	0	0	0	0	0	0	0	**142**
Species total	**2,118**	**3**	0	0	0	0	0	0	0	**2,121**

Survey Date	Pp	Ppy	Pn	Psp	Msp	Plsp	Nn	Nl	Es	Total
11/07/19	0	0	0	0	0	0	0	0	0	**0**
12/07/19	5	0	0	0	0	0	7	0	0	**12**
13/07/19	7	0	0	0	0	0	39	0	0	**46**
14/07/19	14	0	0	0	0	0	101	0	0	**114**
15/07/19	8	0	0	0	0	0	0	0	0	**8**
16/07/19	3	0	0	0	0	0	20	0	0	**23**
Species total	**37**	**0**	**0**	**0**	**0**	**0**	**164**	**0**	**0**	**203**

Survey Date	Pp	Ppy	Pn	Psp	Msp	Plsp	Nn	Nl	Es	Total
14/08/19	1	0	0	0	0	0	0	0	0	**1**
15/08/19	2	0	0	0	0	0	0	0	0	**2**
16/08/19	0	0	0	0	0	0	0	0	0	**0**
17/08/19	7	0	0	0	0	0	0	0	0	**7**
18/08/19	4	0	0	0	0	0	0	0	0	**4**
Species total	**14**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**14**

Survey Date	Pp	Ppy	Pn	Psp	Msp	Plsp	Nn	Nl	Es	Total
25/09/19	227	4	0	31	0	0	113	0	0	**375**
26/09/19	138	6	0	4	0	0	175	2	0	**325**
27/09/19	9	0	0	0	0	0	39	0	0	**48**
28/09/19	125	1	9	6	0	0	46	0	0	**187**
29/09/19	180	8	0	2	0	0	642	6	1	**840**
Species total	**679**	**19**	**9**	**43**	**1**	**0**	**1,015**	**8**	**1**	**1,775**

Survey Date	Pp	Ppy	Pn	Psp	Msp	Plsp	Nn	Nl	Es	Total
14/10/19	21	3	0	0	0	0	11	0	0	**35**
15/10/19	332	16	22	2	1	0	14	1	0	**388**
16/10/19	38	0	0	0	0	0	2	0	0	**40**
17/10/19	1	0	0	0	0	0	0	0	0	**1**
18/10/19	217	3	0	0	7	0	5	0	0	**232**
19/10/19	184	2	0	1	0	0	6	0	0	**193**
Species total	**793**	**24**	**22**	**3**	**8**	**0**	**38**	**1**	**0**	**889**

Annex 2.1.31: Bat Records at Location 9

Survey Date	Bb	Pp	Ppy	Pn	Psp	Msp	Plsp	Nn	Nl	Es	Total
24/04/19	0	0	0	0	0	0	0	0	0	0	**0**
25/04/19	0	4	0	0	0	0	0	0	0	0	**4**
26/04/19	0	0	0	0	0	0	0	0	0	0	**0**
27/04/19	0	0	0	0	0	0	0	0	0	0	**0**
28/04/19	0	1	0	0	0	0	0	0	0	0	**1**
29/04/19	0	4	0	0	0	0	0	0	0	0	**4**
30/04/19	0	12	0	0	0	0	0	0	0	0	**12**
01/05/19	0	1	0	0	0	0	0	0	0	0	**1**
Species total	0	**22**	0	0	0	0	0	0	0	0	**22**

Survey Date	Bb	Pp	Ppy	Pn	Psp	Msp	Plsp	Nn	Nl	Es	Total
10/05/19	0	197	0	0	0	0	0	0	0	0	**197**
11/05/19	0	214	0	0	0	0	0	0	0	0	**214**
12/05/19	0	305	1	0	0	0	0	0	0	0	**306**
13/05/19	0	352	0	0	0	0	0	0	0	0	**352**
14/05/19	0	453	0	0	0	1	0	0	0	0	**454**
15/05/19	0	565	0	0	0	1	0	0	0	0	**566**
Species total	0	**2,086**	**1**	0	0	**2**	0	0	0	0	**2,089**

Survey Date	Bb	Pp	Ppy	Pn	Psp	Msp	Plsp	Nn	Nl	Es	Total
13/06/19	1	428	7	8	0	2	0	0	0	0	**446**
14/06/19	0	950	6	1	0	0	0	3	0	0	**960**
15/06/19	0	653	6	0	0	0	0	0	0	0	**659**
16/06/19	0	763	0	0	0	0	0	0	0	0	**763**
Species total	**1**	**2,794**	**19**	**9**	**0**	**2**	**0**	**3**	**0**	**0**	**2,828**

Survey Date	Bb	Pp	Ppy	Pn	Psp	Msp	Plsp	Nn	Nl	Es	Total
12/07/19	0	91	2	0	0	0	0	16	0	0	**109**
13/07/19	0	31	0	0	0	0	0	2	0	0	**33**
14/07/19	0	46	0	0	0	0	0	0	0	0	**46**
15/07/19	0	60	0	0	0	0	0	0	0	0	**60**
16/07/19	0	10	0	0	0	0	0	1	0	0	**11**
Species total	**0**	**238**	**2**	**0**	**0**	**0**	**0**	**19**	**0**	**0**	**259**

Survey Date	Pp	Ppy	Pn	Psp	Msp	Plsp	Nn	Nl	Es	Total
13/08/19	18	1	0	0	0	0	0	0	0	**19**
14/08/19	3	0	0	0	0	0	0	0	0	**3**
15/08/19	10	0	0	0	2	0	0	0	0	**12**
16/08/19	7	0	0	0	0	0	0	0	0	**7**
17/08/19	26	0	0	0	1	0	0	0	0	**27**
18/08/19	40	0	0	0	0	0	0	0	0	**40**
Species total	**104**	**1**	**0**	**0**	**3**	**0**	**0**	**0**	**0**	**108**

Survey Date	Pp	Ppy	Pn	Psp	Msp	Plsp	Nn	Nl	Es	Total
25/09/19	52	0	0	1	0	0	0	0	0	**53**
26/09/19	45	0	0	5	0	0	0	0	0	**50**
27/09/19	19	0	0	0	0	0	0	0	0	**19**
28/09/19	6	0	0	0	0	0	0	0	0	**6**
29/09/19	4	0	0	0	0	0	0	0	0	**4**
Species total	**126**	**0**	**0**	**6**	**0**	**0**	**0**	**0**	**0**	**132**

Survey Date	Pp	Ppy	Pn	Psp	Msp	Plsp	Nn	Nl	Es	Total
15/10/19	2	0	0	0	0	0	0	0	0	**2**
16/10/19	0	0	0	0	1	0	0	0	0	**1**
Species total	**2**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**3**

Annex 2.1.32: Bat Records at Location 10

Survey Date	Pp	Ppy	Pn	Psp	Msp	Plsp	Nn	Nl	Es	Total
10/05/19	33	0	0	1	0	0	0	0	0	**34**
11/05/19	118	2	0	2	1	0	1	0	0	**124**
12/05/19	133	23	0	0	0	0	0	0	0	**156**
13/05/19	670	1	0	0	2	0	0	0	0	**673**
14/05/19	736	112	0	1	0	0	0	0	0	**849**
15/05/19	603	207	0	0	0	0	0	0	0	**810**
Species total	**2,293**	**345**	**0**	**4**	**3**	**0**	**1**	**0**	**0**	**2,646**

Survey Date	Pp	Ppy	Pn	Psp	Msp	Plsp	Nn	Nl	Es	Total
12/07/19	289	20	0	0	0	0	6	0	0	**315**
13/07/19	324	9	0	1	2	0	5	0	0	**341**
14/07/19	1,243	68	0	0	3	1	3	0	0	**1,318**
15/07/19	369	39	0	0	1	0	9	0	0	**418**
16/07/19	431	0	0	0	0	0	0	0	0	**431**
Species total	**2,656**	**136**	**0**	**1**	**6**	**1**	**23**	**0**	**0**	**2,823**

Survey Date	Pp	Ppy	Pn	Psp	Msp	Plsp	Nn	Nl	Es	Total
13/08/19	459	93	0	1	6	2	4	2	2	**569**
14/08/19	305	1	0	0	1	0	2	0	0	**309**
15/08/19	463	31	0	11	12	5	6	0	1	**529**
Species total	**1,227**	**125**	**0**	**12**	**19**	**7**	**12**	**2**	**3**	**1,407**

Survey Date	Pp	Ppy	Pn	Psp	Msp	Plsp	Nn	Nl	Es	Total
25/09/19	248	17	0	2	2	0	57	2	0	**328**
26/09/19	109	13	1	0	2	1	12	0	0	**138**
27/09/19	1	0	0	0	0	0	2	0	0	**3**
28/09/19	25	8	0	0	2	0	37	0	0	**72**
29/09/19	108	36	0	0	3	1	9	0	0	**157**
Species total	**491**	**74**	**1**	**2**	**9**	**2**	**117**	**2**	**0**	**698**

Survey Date	Pp	Ppy	Pn	Psp	Msp	Plsp	Nn	Nl	Es	Total
14/10/19	30	1	0	0	1	0	4	1	0	**37**
15/10/19	6	0	0	0	2	0	3	0	0	**11**
16/10/19	6	1	0	0	1	0	4	0	0	**12**
17/10/19	10	0	0	0	0	0	0	0	0	**10**
18/10/19	26	2	0	0	1	0	0	0	0	**29**
Species total	**78**	**4**	**0**	**0**	**5**	**0**	**11**	**1**	**0**	**99**

Annex 2.1.33: Bat Records at Location 11

Survey Date	Pp	Ppy	Pn	Psp	Msp	Plsp	Nn	Nl	Es	Total
24/04/19	0	0	0	0	0	0	0	0	0	0
25/04/19	585	3	2	1	1	0	0	0	0	**592**
26/04/19	94	0	0	0	0	0	0	0	0	**94**
27/04/19	1	0	0	0	0	0	0	0	0	**1**
28/04/19	357	2	0	1	0	1	1	0	0	**362**
29/04/19	166	1	0	3	0	0	0	0	0	**170**
30/04/19	626	1	0	0	3	1	1	0	0	**632**
01/05/19	182	0	0	0	0	0	4	0	0	**186**
Species total	**2,011**	**7**	**2**	**5**	**4**	**2**	**6**	**0**	**0**	**2,037**

Survey Date	Pp	Ppy	Pn	Psp	Msp	Plsp	Nn	Nl	Es	Total
11/05/19	5	0	0	0	0	0	0	0	0	5
12/05/19	9	0	0	0	0	0	0	0	0	9
13/05/19	21	0	0	0	0	0	0	0	0	21
14/05/19	2	0	0	0	0	0	0	0	0	2
15/05/19	23	0	0	0	0	0	0	0	0	23
Species total	**60**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**60**

Survey Date	Pp	Ppy	Pn	Psp	Msp	Plsp	Nn	Nl	Es	Total
13/06/19	196	0	0	0	0	0	6	0	0	**202**
14/06/19	97	0	0	0	0	0	5	0	0	**102**
15/06/19	155	0	0	0	0	0	3	0	0	**158**
16/06/19	480	0	0	0	0	0	3	0	0	**483**
Species total	**928**	**0**	**0**	**0**	**0**	**0**	**17**	**0**	**0**	**945**

Survey Date	Pp	Ppy	Pn	Psp	Msp	Plsp	Nn	Nl	Es	Total
12/07/19	865	0	1	3	26	1	6	0	0	**902**
13/07/19	1,376	0	1	2	19	0	3	0	0	**1,401**
14/07/19	1,207	1	2	3	46	0	5	0	0	**1,264**
15/07/19	482	1	1	0	23	1	9	0	0	**517**
16/07/19	431	1	2	3	7	0	10	0	0	**454**
Species total	**4,361**	**3**	**7**	**11**	**121**	**2**	**33**	**0**	**0**	**4,538**

Survey Date	Pp	Ppy	Pn	Psp	Msp	Plsp	Nn	Nl	Es	Total
13/08/19	57	0	0	0	1	0	5	0	0	**63**
14/08/19	663	0	0	25	1	0	5	0	1	**695**
15/08/19	57	1	0	0	6	1	6	0	0	**71**
16/08/19	210	0	0	1	5	0	7	0	0	**223**
17/08/19	223	0	0	11	0	0	4	0	0	**238**
Species total	**1,210**	**1**	**0**	**37**	**13**	**1**	**27**	**0**	**1**	**1,290**

Survey Date	Pp	Ppy	Pn	Psp	Msp	Plsp	Nn	Nl	Es	Total
25/09/19	2,003	2	0	165	35	1	322	0	0	**2,528**
26/09/19	875	1	0	80	22	1	212	0	0	**1,191**
27/09/19	17	1	0	1	1	1	5	0	0	**26**
Species total	**2,895**	**4**	**0**	**246**	**58**	**3**	**539**	**0**	**0**	**3,745**

Survey Date	Pp	Ppy	Pn	Psp	Msp	Plsp	Nn	Nl	Es	Total
14/10/19	252	5	0	0	17	0	0	0	0	**274**
15/10/19	183	0	0	0	19	0	16	0	0	**218**
16/10/19	26	1	0	0	5	0	4	0	0	**36**
17/10/19	0	0	0	0	0	0	0	0	0	**0**
18/10/19	986	3	0	2	18	0	0	0	0	**1,009**
19/10/19	9	0	0	0	0	0	0	0	0	**9**
Species total	**1,456**	**9**	**0**	**2**	**59**	**0**	**20**	**0**	**0**	**1,546**

Annex 3

Evaluation

A3.1 Evaluation

Breeding Bird Surveys

Annex 3.1.1: Species of Conservation Interest, Number of Territories, National, Regional and County Status and Geographical Importance of Survey Area Population

Species	No. of pairs	UK Breeding Population	Regional Breeding Population	County Status	Geographical Importance
Mallard	9	61,000-146,000	-	Surrey: common breeding resident. Sussex: common resident and winter visitor.	Local
Little ringed plover[1]	1	1,115	123	Surrey: summer visitor breeding annually in small numbers and passage migrant (estimated at 10 pairs in 2016). Sussex: scarce breeding summer visitor and passage migrant (14 pairs in 2016).	County
Stock dove	3	260,000	-	Surrey: common breeding resident and passage migrant. Sussex: common resident and possible winter visitor.	Local
Kestrel	4	46,000	-	Surrey: moderately common breeding resident. Sussex: Fairly common resident and passage migrant.	Local
Peregrine[1]	1	1,731	93	Surrey: increasing breeding resident, passage migrant and winter visitor (14 pairs in 2016). Sussex: scarce breeding resident (33 pairs in 2016).	Regional
Marsh tit	1	41,000	-	Surrey: uncommon and declining breeding resident. Sussex: scarce resident.	County
Skylark	12	1,500,000	-	Surrey: common but declining breeding resident, passage migrant and winter visitor. Sussex: very common but declining resident; and probably common passage migrant and winter visitor.	Local
Starling	2	1,900,000	-	Surrey: common breeding resident. Sussex: common but declining resident; and very common to abundant winter visitor.	Local
Song thrush	19	1,200,000	-	Surrey: common breeding resident. Sussex: very common but decreasing resident and partial migrant; common passage migrant and winter visitor.	Local
Mistle thrush	2	170,000	-	Surrey: common breeding resident. Sussex: common resident and partial migrant.	Local
Firecrest[1]	1	4,000+	c.250	Surrey: moderately common breeding resident, passage migrant and winter visitor (estimated at 150 singing males in 2016). Sussex: scarce or possibly fairly common breeding resident; passage migrant; and winter visitor (estimated at 100 singing males in 2015).	County
House sparrow	4	5,300,000	-	Surrey: common breeding resident. Sussex: very common but possibly declining resident.	Local
Dunnock	18	2,500,000	-	Surrey: common breeding resident. Sussex: very common resident.	Local
Grey wagtail	1	38,000	-	Surrey: moderately common breeding resident and passage migrant. Sussex: scarce resident and fairly common passage migrant and winter visitor.	Local
Bullfinch	1	220,000	-	Surrey: moderately common breeding resident. Sussex: fairly common or common resident.	Local
Linnet	1	430,000	-	Surrey: moderately common resident, passage migrant and winter visitor. Sussex: common but decreasing resident and partial migrant.	Local
Reed bunting	2	250,000	-	Surrey: moderately common breeding resident. Sussex: fairly common resident; passage migrant and winter visitor.	Local

Note 1: Species considered to be possibly breeding

Annex 4

Invertebrate Scoping Survey

COLIN PLANT ASSOCIATES (UK)
CONSULTANT ENTOMOLOGISTS

[redacted]

[redacted]

25th June 2019

Our Reference: CPA - 19110

Land bordering Gatwick Airport: Appraisal of invertebrate habitats outside the Biodiversity Areas

Dear [redacted]

Further to your instruction of 24th May 2019, we have now visited the above site; the surveyors on this occasion were Marcel Ashby and Tristan Bantock. This letter is our formal report of that visit.

Statement of impartiality

Please note that this report presents our surveyors' impartial and unbiased opinion on the existing invertebrate ecology of the site at the date of examination. Unless otherwise stated, our findings and any conclusions drawn or recommendations made are independent of the detail of any proposed development to the site and are wholly independent of any third party opinions where these may exist.

If this report contains suggestions or recommendations relating to mitigating losses, these have been made without specific consideration of the details of the proposed development works and are offered on the assumption that the entire area inside the red line would be lost.

Introduction and scope of visit

The purpose of the visit was to appraise the invertebrate habitats present on site and to advise whether or not it is likely that a proposed development would have an impact on invertebrate ecology. Of particular concern was the potential for the site to support Species of Principal Importance in England, as defined within Section 41 of the *Natural Environment and Rural Communities (NERC) Act* 2006, although species included in other conservation categories were also considered.

It was previously agreed that the scope of the appraisal should focus solely on land outside the two existing Biodiversity Areas. These two areas comprise (1) the River Mole corridor and Brockley Wood, located close to the north west perimeter and (2) land east of the railway line, including the Gatwick Stream, Horleyland Wood, Lower Picketts Wood, Upper Picketts Wood, Goat Meadow, Rolls Field and Ashleys Field. Both

Biodiversity Areas are managed for nature conservation and are known to support important invertebrate assemblages on the basis of recent records gathered by Gatwick Airport Biodiversity Consultant Rachel Bicker. These include various species of conservation significance such as Dingy Skipper *Erynnis tages*, Grizzled Skipper *Pyrgus malvae*, Brown Hairstreak *Thecla betulae*, Long-horned Bee *Eucera longicornis* and Black-headed Mason Wasp *Odynerus melanocephalus*, all of which are Section 41 species (Bicker, 2018).

In the light of the above, eight areas were selected which were considered to be of potential importance for invertebrates. The locations of these are shown in Figures 1 and 2. The site visit was undertaken on 17th June in sunny and warm conditions.

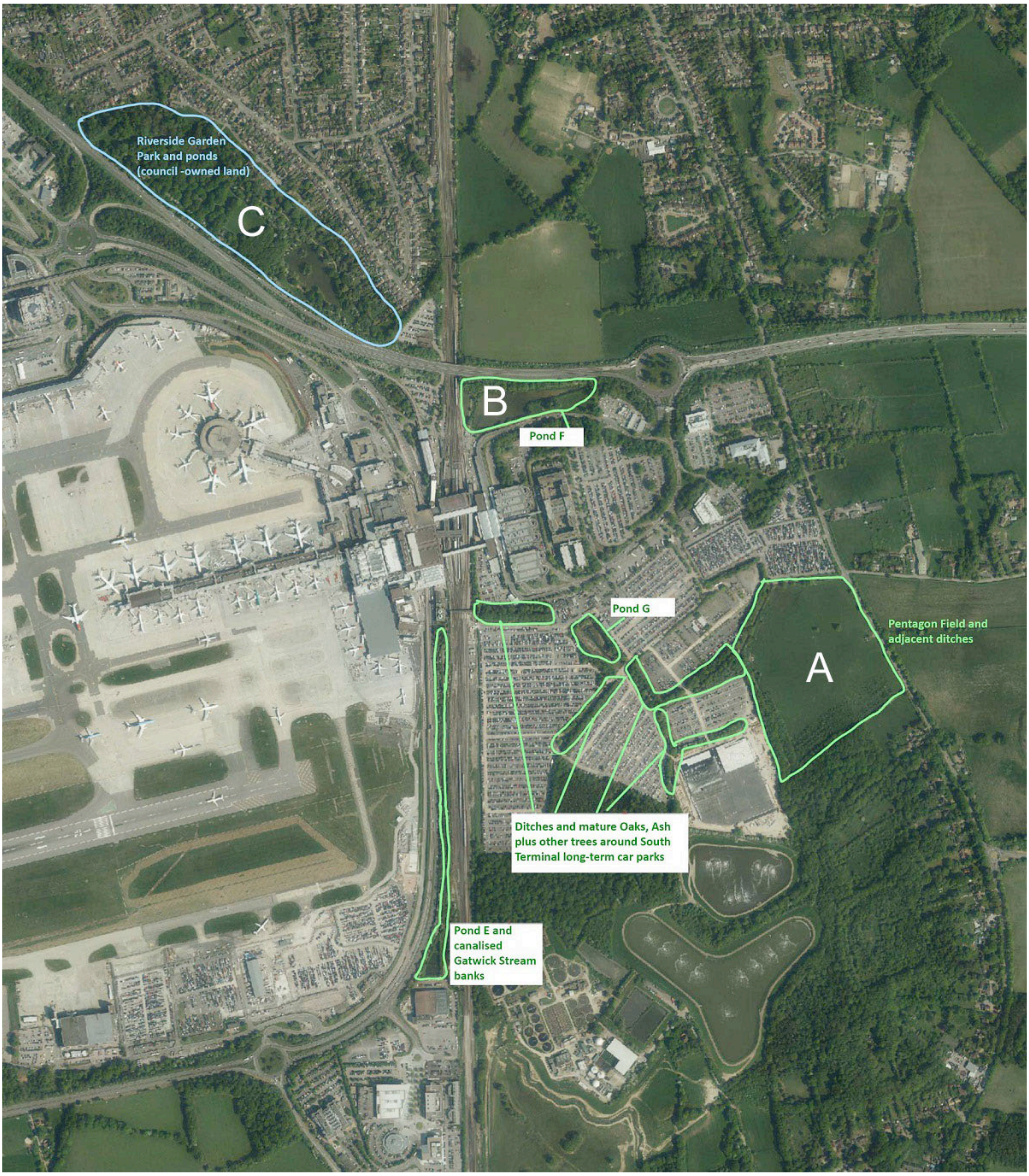

Fig. 1 Areas examined in the eastern sector (Sites A - C).

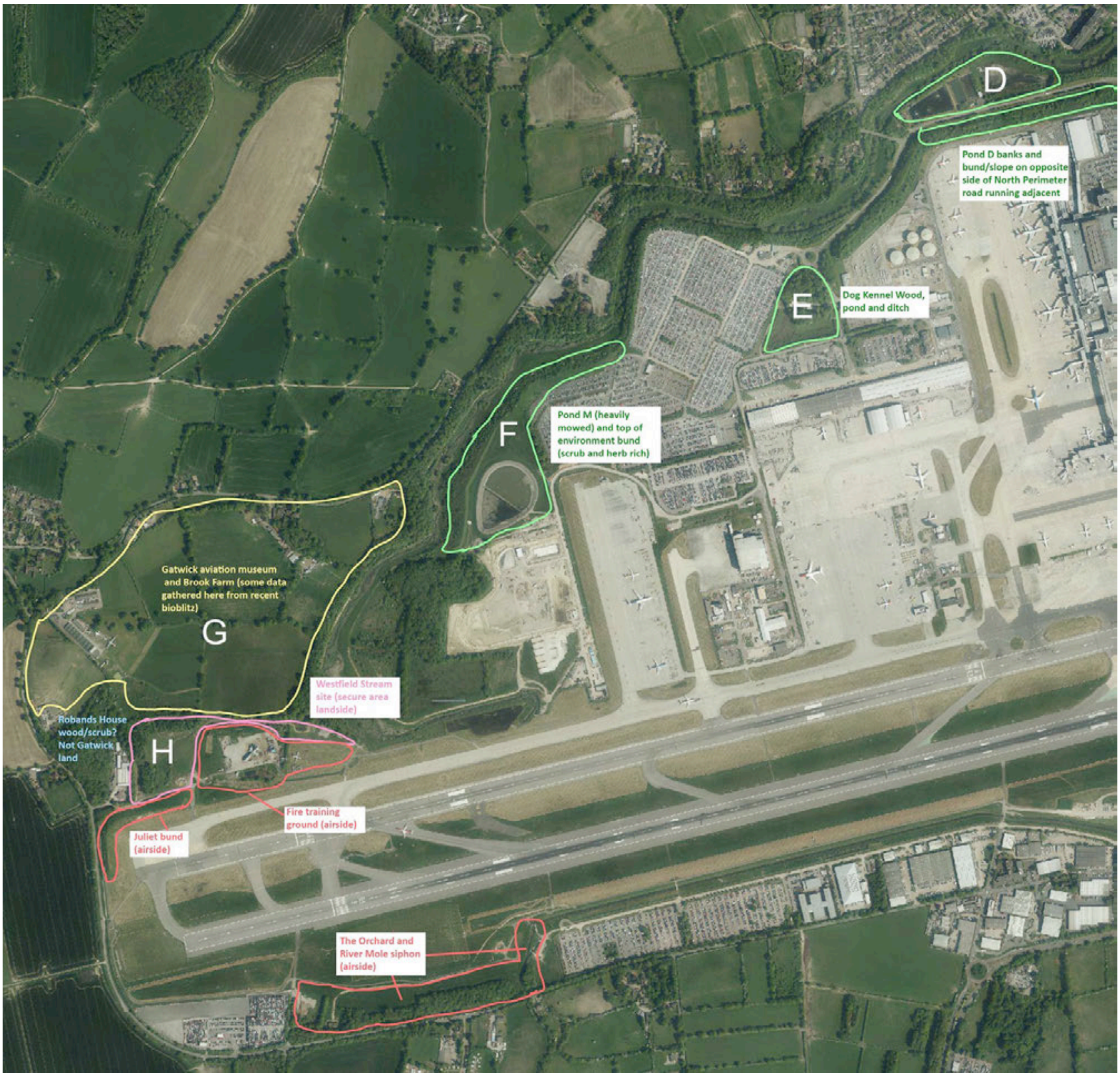

Fig. 2 Areas examined in the western sector (Sites D - H).

INVERTEBRATE HABITATS PRESENT IN JUNE 2019

Site A: Pentagon Field and adjacent ditches

This area lies directly north of Lower Picketts Wood and covers approximately 10 ha. The habitats present comprise an expanse of dry semi-improved neutral grassland bounded by a wooded hedgerow and a ditch on the western margin. A strip of immature plantation woodland is present along the southern boundary.

The grassland is rather uniform in nature and very few herbaceous species are represented in the sward. This lack of structural variation combined with its low floristic diversity predicts a species-poor invertebrate assemblage dominated by those with more generalist ecological requirements, which are usually of lower conservation value.

The hedgerow includes numerous overmature oaks, some of which contain obvious amounts of standing dead wood and aerial wood decay features, including a large red rotten cavity at the base of one tree. These trees offer a range of potential niches for invertebrates which are both phytophagous and saproxylic.

In Britain alone, there are at least 700 native species of beetle (Coleoptera) and over 700 species of two-winged fly (Diptera) which appear to be dependent on decaying wood at some stage in their life cycles. Many of these are of high conservation value and are listed as Section 41 species.

The ditch on the western margin is open and unshaded along much of its length and held a high water level on the day of examination. The ditch profile is gently shelving which has allowed a diverse riparian and emergent flora to develop, including Hemlock Water-dropwort and Meadowsweet, as well as sedges and stands of bulrush. These are positive features that suggest its potential importance for invertebrates is likely to be raised.

Overall we consider that Site A has a **moderate** intrinsic invertebrate interest.

Site B: Pond F

This area covers approximately 1.7 ha and lies between the A23 to the north, railway lines to the west and airport car parks to the south.

It comprises a single waterbody which is rather deep and steep sided and was probably originally constructed as a balancing pond. The pond is surrounded by a narrow zone of alder and willow scrub, but there is only minimal emergent vegetation at the margins and the bankside vegetation is largely dominated by dense bramble scrub. Several mats of White Water-lily are present. The water is subject to nutrient enrichment by wildfowl and presumably there is also some runoff from surrounding roads.

Overall we consider that Site B has a **low** intrinsic invertebrate interest.

Site C: Riverside Garden Park and ponds

This area covers approximately 11 ha and lies between the A23 to the south and the urban edge of Horley to the north.

The site presents as a mosaic of dense mature woodland interspersed with open areas of grassland. A range of tree species are represented including oak, hawthorn and elder which offer numerous niches for phytophagous invertebrates, but only a minimal standing or fallen dead wood resource is apparent with the exception of a single dead barkless oak. The grassland is highly improved in nature and a minimal herbaceous flora is present in the open areas. In places the woodland understorey is dominated by dense stands of stinging nettles, indicating high soil fertility.

A stocked fishing lake is present close to the southern boundary. The water column appeared turbid and is presumably subject to extensive nutrient enrichment from the large numbers of feral Greylag Geese present. Areas of marginal vegetation are minimal and emergent macrophytes are represented only by small stands of Yellow Flag and some cover by White Water-lily.

The Gatwick Stream runs through the Riverside Garden Park but the channel is very eroded and steep-sided, supporting minimal riparian vegetation and dominated by dense bramble cover.

Overall we consider that Site C has a **low** intrinsic invertebrate interest.

Site D: Pond D

This area covers approx. 2 ha and is located between the northern airport perimeter and the River Mole.

The eastern half of the site comprises a pond adjacent to a water management facility which makes up the western section. The pond margins were bare and muddy indicating recent fluctuation and the surrounding banks dominated by an improved grass sward which had recently been mown. It was not possible to physically access the pond edges but the marginal flora appeared to be impoverished and represented solely by small stands of rushes and sedges.

Overall we consider that Site D has a **low** intrinsic invertebrate interest.

Site E: Dog Kennel Wood, pond and ditch

This area covers approximately 2.7 ha and is located very close to the northern airport perimeter and largely surrounded by the built environment of the airport on all sides.

Despite this it contains a range of habitats, comprising a water body and a small copse of mature woodland which encloses the dog kennels. The pond is set in a deep and roughly triangular depression and is almost entirely vegetated, with only minimal standing water apparent on the day of examination. The western half is dominated by Common Reed and the remainder by bulrush, Hemlock Water-dropwort, Meadowsweet, rushes and sedges, with a number of small willows also present.

The bankside flora comprises dry semi-improved neutral grassland with a range of herbaceous species including Creeping Cinquefoil, Common Bird's-foot Trefoil, Self-heal and tall ruderal species such as ragworts, docks, teasel and Perforate St John's Wort. The sloping nature of the bank presents a warm south-facing aspect across the northern section, a positive feature for invertebrates requiring a warm microclimate at the ground surface.

The relatively diverse flora which includes a range of host plants in combination with the transition from wet to dry soils provides a large range of potential niches for invertebrates. The presence of a range of mature trees in the adjoining woodland contributes to the overall interest.

Overall we consider that Site E has a **moderate** intrinsic invertebrate interest.

Site F: Pond M and top of environment bund

This area covers approximately 6 ha and is located between the northern airport perimeter and the River Mole.

Various habitats are present around a concrete-sided water body which is split into two halves. This pond is presumably used in silt extraction as the western half was almost entirely dry on the day of examination and the bed entirely covered by silt deposits. This area has some potential for invertebrates which require very fine-grained sediments, although is unlikely to support a rich fauna.

The surrounding area comprises dry semi-improved neutral grassland with a range of herbaceous species including Creeping Cinquefoil, Common Bird's-foot Trefoil, Meadow Vetchling, Grass Vetchling and Tufted Vetch, as well as tall ruderal flora in the form of docks and thistles. The structural variation within the grassland, combined with its floristic diversity, predicts that various plant-feeding groups of invertebrates such as phytophagous beetles and true bugs may have rich faunas. During the visit a single Section 41 species were noted, the Small Heath *Coenonympha pamphilus*. This area possibly lies within the foraging range of the Long-horned Bee *Eucera longicornis* which is known to nest along the adjacent River Mole corridor and use legumes such as vetchlings and trefoils as its principal forage plants.

Overall we consider that Site F has a **moderate** intrinsic invertebrate interest.

Site G: Gatwick Aviation Museum and Brook Farm

This large area covers approximately 35 ha and presents as a network of hedgerows dominated by mature oaks surrounded by dry grassland.

The grassland is rather improved in nature around the Aviation Museum and has been recently mown to produce amenity areas. Further east the sward is more diverse and presents as dry semi-improved neutral grassland with a range of herbaceous species including Common Bird's-foot Trefoil, Meadow Vetchling, Grass Vetchling and Foxglove, offering a range of niches for phytophagous invertebrates. During the visit a single Section 41 species were noted, the Small Heath *Coenonympha pamphilus*. The eastern boundary of the site possibly lies within the foraging range of the Long-horned Bee *Eucera longicornis* which is known to nest along the adjacent River Mole corridor and use legumes such as vetchlings and trefoils as its principal forage plants.

Several ponds are present along the southern margin although the water column is entirely covered by duckweed. Stands of bulrush and Hemlock Water-dropwort are also apparent.

Numerous open grown overmature oaks are present in the hedgerows which contain a significant standing dead wood resource and may support a range of saproxylic invertebrates of conservation significance.

Overall we consider that Site G has a **moderate** intrinsic invertebrate interest.

Site H: Westfield Stream site

This area covers approximately 3 ha and is located between the southern boundary of Site G and the airport perimeter.

The site presents as a mosaic of wet and dry habitats with elements of wet woodland grading through to dry, sparsely-vegetated areas. The transitional nature of the habitats present on this site ensure that numerous potential niches for invertebrates are represented.

The Westfield stream runs along the western margin and was almost dry on the day of examination. The channel contains stands of bulrush and Hemlock Water-dropwort, while the tops and sides of the bank support a community of ephemeral short perennial vegetation, including Creeping Cinquefoil, Common Bird's-foot Trefoil, Common Mallow and Meadow Vetchling, as well as numerous alder saplings which are presumably rather heat-stressed. An area of damp woodland containing alder, willow and White Poplar is present in the southwest sector of the site, while the areas of woodland along the northern edge are drier and contain more oak. In freely draining parts of the site extensive stands of gorse are apparent, an important plant for invertebrates, while the areas that retain a wetter influence throughout the year support numerous *Juncus* tussocks.

Overall we consider that Site H has a **moderate** intrinsic invertebrate interest

Conclusions and recommendations

Several of the sites under discussion presents features of potential value to invertebrates and in our opinion, have a moderate invertebrate interest that is likely to be raised above the expected regional background level.

References

Bicker, R. (2018) Gatwick Biodiversity Action Plan: Five Year Review 2012-2017.

* * *end of formal report* * * *

I hope that you will find this report adequate for your client's current needs.

With all best wishes,

[redacted]

Annex 5

Terrestrial Invertebrate Survey

Gatwick Airport Northern Runway Project –

Assessment of Terrestrial Invertebrate Interest

RPS Group Plc

Report prepared by:
Ecus Ltd.
[redacted]

[redacted]

June 2021

Ecus Ltd

Report to: [redacted]

Report Title: **Gatwick Airport Northern Runway Project - Assessment of Invertebrate Interest**

Version: **V1.0**
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Originated By: [redacted]

Date: March 2021

Reviewed By: [redacted]

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Version	Author	Description	Date
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]

Contents

SUMMARY .... **IV**

1. INTRODUCTION **1**

1.1 BACKGROUND 1

2. CONSERVATION STATUS AND LEGAL PROTECTION **2**

2.1 CONSERVATION STATUS 2
2.2 LEGISLATION 3

3. METHODOLOGY **4**

3.1 SURVEY VISITS 4
3.2 SITE COMPARTMENTS 4
3.3 LOCATION AND COLLECTION OF SPECIMENS 4
3.4 TAXONOMIC COVERAGE 4
3.5 LIMITATIONS 4

4. RESULTS **5**

4.1 GENERAL 5
4.2 NOTEWORTHY SPECIES 5

5. SITE ASSESSMENT **13**

5.1 DISCUSSION 13

6. CONCLUSION **14**

7. REFERENCES **15**

FIGURE 1. SITE LOCATIONS (THREE SEPARATE PARCELS - GATWICK AIRPORT) **17**

APPENDIX 1. FULL SPECIES LIST **18**

Summary

Ecus Ltd was commissioned by RPS Group Plc in May 2020 to undertake terrestrial invertebrate surveys of three separate land parcels/compartments adjoining Gatwick Airport as part of the surface water management and flood alleviation for the Northern Runway Project development. The three survey areas comprised Compartment P: Riverside Park (National Grid Reference (NGR): TQ 28055 42020, Compartment M: River Mole Corridor NGR: TQ 25772 40623 and Compartment G: Gatwick Brook Grasslands NGR: TQ 29000 39799, hereafter referred to as 'the Site'. The three land parcel locations are shown on **Figure 1.**

Although Gatwick Airport is now nominally in the County of West Sussex, for the purposes of biological recording it is in Vice-County 17, Surrey.

Six site field visits were made during 2020: 27th May, 19th June, 22nd June, 30th June, 10th September and 14th September. Six visits were made to cover all sites in total, however all three parcels were not covered on all six visits, but more on a rotation basis to cover each one at appropriate points across the 2020 season.

A list of 303 terrestrial invertebrate species was recorded in total (see **Appendix 1**). This total was considered a relatively diverse list for such a site.

Numerous unusual and scarce insects were found, including:

- *Acinia corniculata*, a nationally rare fly that breeds in the seed-heads of knapweed.
- *Catoplatus fabricii*, a nationally scarce lacebug that breeds on oxeye daisy.
- *Dioxyna bidentis*, a nationally scarce fly that breeds on trifid bur-marigold.
- *Dorycera graminum*, a nationally rare fly of damp meadows and floodplains.
- *Ectobius lapponicus*, the dusky cockroach, a species of rough heathy grasslands.
- *Hylaeus cornutus*, a nationally scarce yellow-faced bee.
- *Merzomyia westermanii*, a nationally scarce picture-winged fly that breeds on ragwort.
- *Paraclusia tigrina*, a nationally rare fly of old broad-leaved woodlands.
- *Podagrica fuscicornis*, a nationally scarce leaf beetle that feeds on mallows.
- *Reptalus quinquicostatus*, a nationally scarce frog-hopper of dry grasslands.
- *Rhinocyllus conicus*, a nationally scarce weevil that feeds on thistles.
- *Squamapion vicinum*, a nationally scarce weevil that feeds on water mint.
- *Tachys bistriatus*, a nationally scarce ground beetle of damp muddy pond edges.
- *Uleiota planata*, a nationally scarce beetle that breeds under fungoid tree bark.
- *Variimorda villosa*, a nationally scarce flower beetle associated with ancient woods.

The diverse species list and numerous scarce and unusual insects recorded, reflect a diversity of habitat types present at the Site: river edge, flowery grassland, hedgerows, disturbed ground, woodland and scrub.

The individual parcels are suggested as having the following invertebrate interest:

- Riverside Park — low.
- River Mole Corridor — medium/high.
- Gatwick Brook Grasslands — low/medium.

1. Introduction

1.1 Background

1.1.1 Ecus Ltd was commissioned by RPS Group Plc in April 2020 to undertake terrestrial invertebrate surveys of three land parcels adjoining Gatwick Airport as part of the surface water management and flood alleviation for the Northern Runway Project development. The three land parcels (compartments), hereafter referred to as 'the Site', are described below and the location is shown **in Figure 1**.

1.1.2 Compartment P: Riverside Park. This is a public open space, mainly wooded, although likely more open in the past. It is heavily managed with plentiful short amenity grassland. Of little interest in terms of entomology, apart from a narrow corridor alongside the A23 which was the focus for survey here. This area is centred on National grid reference TQ 28055 42020.

1.1.3 Compartment M: River Mole Corridor. This is an irregular plot to the west of the airport, comprising brownfield zones, rough grassy areas, the River Mole and riverbanks, hedgerows and woodland edges. This area is centred on National grid reference TQ 25772 40623.

1.1.4 Compartment G: Gatwick Brook Grasslands. This is an irregular plot to the east of the airport, comprising rough grassy areas, a few mature trees, scrub, Gatwick Brook, hedgerows and woodland edges. This area is centred on National grid reference TQ 29000 39799.

1.1.5 This survey is part of a wider ecological assessment of the site to be undertaken by RPS Group Plc.

2. Conservation Status and Legal Protection

2.1 Conservation Status

2.1.1 The national significance of species recorded in this survey is assessed here with regard to the Red Data Book Species. IUCN guidelines are used to give rare insects a status. It is, however, dependent on the degree of threats that they face (originally published in Shirt, 1987; Hyman & Parsons, 1992 and recently updated in a series of ongoing reviews).

2.1.2 Statuses continue to be assessed and reassessed over time. **Table 1** details the statuses that can be applied at this current time.

Table 1: Categories and criteria used to assess invertebrate statuses

Status	Description
Endangered (RDB-1)	The rarest taxa. Taxa in danger of extinction in Great Britain; species with very few recorded localities or living in especially vulnerable habitats.
Vulnerable (RDB-2)	Very rare species. Taxa likely to move into the RDB1 category; species declining in their range.
Rare (RDB-3)	Rare species. Taxa with small populations and which are at risk; species estimated to occur in 15 or fewer of the 10-km squares in the national Ordnance Survey grid since 1970, or nominated later date if applicable.
Insufficiently known (RDB-K)	Species thought to be very rare in Britain, recorded from less than 15 of the 10-km squares of the national Ordnance Survey grid since 1970 or later date, and which warrant RDB classification of some sort, but for which there is a recognized lack of accurate information.
Nationally scarce (notable A)	Very local species, thought to occur in 16 to 30 of the 10-km squares of the national Ordnance Survey grid since 1970, or later date.
Nationally scarce (notable B)	Very local species, thought to occur in 31 to 100 of the 10-km squares of the national Ordnance Survey grid since 1970 or later date.
Nationally scarce	Status is sometimes not subdivided into categories A and B, (notable, occurring in 16 to 100 10-km squares).
Very local	Status is a much more subjective, but nevertheless useful, measure of scarcity and is based on personal experience, published and unpublished records. It is applied to species that are very limited in distribution or confined to very limited specialist habitats. This group includes species previously considered nationally rare or scarce, but which have had statuses reviewed following more recent study.

2.2 Legislation

2.2.1 Three invertebrate species occurring in the UK are European protected species (EPS), so are therefore protected under European law. These species are Fisher's Estuarine Moth (*Gortyna borelii lunata*), Large Blue Butterfly (*Phengaris arion*) and Lesser Whirlpool Ramshorn Snail (*Anisus vorticulus*).

2.2.2 It is an offence to capture, kill, disturb or injure these species. As well as to damage or destroy their breeding or resting places or to obstruct access to any such place (either deliberately or accidentally).

2.2.3 Forty invertebrate species occurring in the UK are included on Schedule 5 Section 9.1 of the Wildlife & Countryside Act 1981 (as amended). This it makes it an offence to kill, injure or take any of the species.

2.2.4 Four species are listed under Schedule 5 Section 9.4 of the Wildlife & Countryside Act 1981 (as amended). This makes it illegal to damage or destroy their breeding or resting places or to obstruct access to any such place.

2.2.5 Twenty seven species are listed under Schedule 5 Section 9.5 of the Wildlife & Countryside Act 1981 (as amended), which prevents them from being sold or transported.

3. Methodology

3.1 Survey Visits

3.1.1 The surveys were undertaken by an experienced entomologist to the Site six times during 2020: 27th May, 19th June, 22nd June, 30th June, 10h September and 14th September. Six visits were made to cover all sites in total, however all three sites were not covered on all six visits, but more on a rotation basis to cover each one at appropriate points across the 2020 season. A walk-over assessment of the Site, taking note of habitats and features in relation to invertebrates was complemented by the collection of specimens for either Site or subsequent laboratory analysis.

3.2 Site Compartments

3.2.1 Three broad compartments/parcels were identified which equated to three separate sites. These sites are described in Section 1.1 and illustrated in Figure 1. Each of these compartments was visited on at least three occasions during 2020. In the following species descriptions, reference is made of these compartments and 10-figure National grid references are also provided where appropriate.

3.3 Location and Collection of Specimens

3.3.1 A walk-over type survey was carried out. Invertebrates were located and collected by general methods using sweep net, beating tray and a stout trowel. Flowers, leaf surfaces, rocks, bare ground, logs and tree trunks were examined by visual searching. Others were found by finger-tip grubbing in loose soil, rubble, and plant roots, logs, stumps and animal dung. Squares of roofing felt left out for reptile monitoring were also examined. Voucher specimens of all but the most common and characteristic species were collected for examination later under the microscope.

3.4 Taxonomic Coverage

3.4.1 The survey concentrated on the following major groups (orders): Coleoptera (beetles), Diptera (flies), Hemiptera (bugs, froghoppers, etc), Hymenoptera (bees, wasps and ants) and Lepidoptera (butterflies and moths). Some examples of other groups were noted if found.

3.4.2 These are hugely numerous and diverse orders of insects, and identification to species is not always possible, especially in many of the microscopically small specimens. Consequently on any given site, there is much subjective selection of which families or genera are worth taking as sample specimens, for later study. This is often influenced by a knowledge of the groups for which useable identification keys are available, and for which the individual entomologist has particular experience. Nevertheless, a wide coverage of insect orders allows some assessment of just how important any given site may be for its invertebrate biodiversity.

3.5 Limitations

3.5.1 The surveys were undertaken during the optimal season for terrestrial invertebrates (April – September inclusive) and all areas of the land parcels could be accessed safely. It is therefore considered that the findings of the survey provide an accurate representation of the insect assemblages present.

4. Results

4.1 General

4.1.1 A list of 303 terrestrial invertebrate species was recorded across the 2020 season. They represent a range of different groups of insects as set out in **Table 2** below.

Table 2: Orders of invertebrates recorded

Order & Group Common Name	Total of Species
Coleoptera (beetles)	119
Dermaptera (earwigs)	1
Diptera (flies)	65
Hempitera (bugs)	48
Hymenoptera (bees, wasps, etc)	24
Lepidoptera (butterflies & moths)	23
Dictyoptera (cockroaches)	1
Odonata (dragonflies)	7
Orthoptera (grasshoppers)	6
Aranaea (spiders)	3
Opiliones (harvestmen)	1
Isopoda (woodlice & hoglice)	3
Mollusca (slugs & snails)	2
TOTAL	**303**

4.1.2 303 species is a relatively high number and reflects a diversity produced by several different habitat types spread over three separate sites. Several interesting and unusual species are included in this list as discussed below.

4.1.3 The full list of species recorded is provided in **Appendix 1**.

4.2 Noteworthy Species

4.2.1 Most of the insects recorded were common examples, which might be expected to occur in any open area in southern England. However, a number are uncommon or otherwise unusual and merit highlighting.

4.2.2 Common or garden species occur commonly in gardens, or indeed almost anywhere; they are often mobile, adaptable, fast-reproducing with quick generation times, feeding on common and widespread plants or occurring in a wide variety of diverse habitat types. They tell us very little about a site since they often occur in almost every bit of open space available.

4.2.3 Scarce species, however, are scarce because they have very particular habitat requirements — they feed on scarce plants which only occur in limited habitat pockets, they have very narrow toleration of climate, including daily or yearly temperature or rainfall minima or maxima, or they only occur in niches where they can avoid serious competition, predation or parasitism from abundant and widespread species. The occurrence of these scarcer species gives a much clearer picture of the environmental health or conservation biodiversity status of a particular site.

4.2.4 The following species are highlighted as being especially noteworthy. Most are uncommon nationally. Criteria for allocation of accepted 'nationally rare' (previously red data book) and 'nationally scarce' (previously notable) statuses are varied and complex (originally published in Shirt, 1987; Hyman & Parsons, 1992 and recently updated in a series of ongoing reviews). Statuses continue to be assessed, reassessed and altered over time and a JNCC database is available giving an up to date summary overview. Every time a rare insect is found there are more records added to the scoring system (based on grid squares in which an insect is found) and it becomes less rare. These statuses are useful to gauge relative rarity, but despite the apparent objectivity of counting numerical records, there is still a subjective element of exactly how rare an organism may be. Those that are relevant to this Site are listed in brief here:

- **Endangered (RDB-1).** The rarest taxa. Taxa in danger of extinction in Great Britain; species with very few recorded localities or living in especially vulnerable habitats.
- **Vulnerable (RDB-2).** Very rare species. Taxa likely to move into the RDB1 category; species declining in their range.
- **Rare (RDB-3).** Rare species. Taxa with small populations and which are at risk; species estimated to occur in 15 or fewer of the 10-km squares in the national Ordnance Survey grid since 1970, or nominated later date if applicable.
- **Insufficiently known (RDB-K).** Species thought to be very rare in Britain, recorded from less than 15 of the 10-km squares of the national Ordnance Survey grid since 1970 or later date, and which warrant RDB classification of some sort, but for which there is a recognized lack of accurate information.
- **Nationally scarce (notable A).** Very local species, thought to occur in 16 to 30 of the 10-km squares of the national Ordnance Survey grid since 1970, or later date.
- **Nationally scarce (notable B).** Very local species, thought to occur in 31 to 100 of the 10-km squares of the national Ordnance Survey grid since 1970 or later date.
- **Nationally scarce** status is sometimes not subdivided into categories A and B, (notable, occurring in 16 to 100 10-km squares).
- **Very local** status is a much more subjective, but nevertheless useful, measure of scarcity and is based on personal experience, published and unpublished records. It is applied to species that are very limited in distribution or confined to very limited specialist habitats. This group includes species previously considered nationally rare or scarce, but which have had statuses reviewed following more recent study.

4.2.5 The following is a description of the more interesting and noteworthy species taken at the Site. Where possible a nominal 10-figure National grid reference is given to indicate the exact location(s) where they were found.

***Acinia corniculata* (Zetterstedt)**

4.2.6 A small pink picture-winged fly, family Tephritidae. Status: endangered (red data book category 1, Shirt, 1987; Falk, 1991b). At the time of the national review this very rare fly was known only from a handful of localities in southern England, all National Nature Reserves. It breeds in the seed heads of common knapweed, but despite the abundance of its host plant, it remains very elusive. Until the late 1990s, it seemed to be primarily associated with a few East Anglian fens, but has recently been recorded from several localities in Sussex, London, Surrey, Hampshire, Dorset and

Gloucestershire (Clemons, 1997, 2004, 2015). It may be increasing its range after a series of warm summers and mild winters. It remains, nevertheless, very elusive, but its status may need revision. Several specimens were found by sweeping knapweed, Gatwick Brook Grassland, dated 22.6.2020, at TQ 28941 40057.

***Athous campyloides* (Newman)**

4.2.7 A medium-sized brown click beetle, family Elateridae. Status: nationally scarce (notable B, Hyman & Parsons, 1992). This very local species is associated with rough grassy places in south-east England (Mendel & Clarke, 1996). The larvae are thought to feed at the roots of grass and herbs. It was once regarded as an extremely rare species, but appears to have colonized Britain in the early 19th century, and is still spreading (Jones, 2001). Several specimens were found by sweeping, River Mole Corridor and Gatwick Brook Grassland, dated 27.5.2020 and 19.6.2020.

***Bruchidius imbricornis* (Panzer)**

4.2.8 A tiny mottled bean weevil, family Chrysomelidae. Status: very local. A recent colonist to Britain, this small but distinctive beetle was first found, in Essex, in 2012. Its food plant is nominally goat's rue, *Galega officinalis*, a widespread alien vetch that has become widely established in brownfield sites in England. Several specimens were found by sweeping, River Mole Corridor, dated 19.6.2020 and 10.9.2020.

***Camarota curvipennis* (Latreille)**

4.2.9 A minute black 'frit' fly, family Chloropidae. Status: very local. Once much more widespread, breeding the heads of wheat, rye and barley, this species has declined dramatically in the last 50 years following 'advances' in agriculture. Although not accorded notable status in the national review by Falk (1991b), the decline of this fly has alerted dipterists to suggest that this species be monitored for possible future nationally scarce notification. Two specimens were found by sweeping, Gatwick Brook Grassland, dated 14.9.2020, at TQ 28976 39926.

***Campiglossa malaris* (Seguy)**

4.2.10 A minute pink and grey picture-winged fly, family Tephritidae. Status: very local. Originally suggested to be nationally rare, but insufficiently known (red data book category K, Clemons, 1997), this status has not been official agreed by JNCC. This scarce fly is thought to feed on ragworts, but whether it forms stem or leaf galls, or breeds in the seed heads is not known. In the 1970s and 80s it was known from only two UK sites, both on the Kent coast, and was accorded endangered status (red data book category 1) by Shirt (1987) and Falk (1991b), but this was later revised to RDB-K by Clemons (1997, 2004) when further Kent localities were discovered. Since then further reports appear to document a spread into England and there are now numerous records from inland Kent, East Sussex and other Home Counties and outliers beyond into central England. This species often occurs in rough grassy places and disturbed ground where the food-plants grow. The fly remains very rare, but its status may need another revision. It is currently not accorded any conservation status by JNCC. Several specimens were found by sweeping, River Mole Corridor, dated 19.6.2020, at TQ 26064 40625.

***Catoplatus fabricii* (Stal)**

4.2.11 A minute pale lacebug, family Tingidae. Status: nationally scarce (notable B, Kirby, 1992). This scarce lacebug feeds on ox-eye daisy, *Leucanthemum vulgare* and although the food-plant grows commonly and widely on disturbed ground, chalk downland, verges, railway cuttings and rough meadows, the bug is extremely local. It occurs in widely scattered localities in central and southern England, but its precise ecological requirements are unclear. A single specimen was swept from the roadside verge of Riverside Park, dated 27.5.2020, at TQ 28105 41966.

***Coccidula scutellata* (Herbst)**

4.2.12 A small red and black ladybird, family Coccinellidae. Status: very local. Although widespread across much of England and parts of Wales, the localities for this beetle are widely scattered. It is confined to freshwater sites, stream banks, pond-sides, and marshes (Roy *et al*, 2011). Several specimens were swept from waterside vegetation, River Mole Corridor, dated 27.5.2020, at TQ 25573 40591.

***Dioxyna bidentis* (Ronbinaeu-Desvoidy)**

4.2.13 A small grey picture-winged fly, family Tephritidae. Status: nationally scarce (Notable, Falk, 1991b). This very scarce fly occurs in a few widely scattered localities in England and South Wales, with an old record from Scotland (Clemons, 1997, 2004, 2015). It breeds in the flower heads of various composites (Asteraceae), particularly *Bidens tripartita*, the trifid bur-marigold. Several specimens were swept from vegetation bordering the stream, River Mole Corridor, dated 10.9.2020, at TQ 25565 40797.

***Dorycera graminum* (Fabricius)**

4.2.14 A small mottled fly, family Ulidiidae. Status: nationally rare (red data book category 3, Shirt, 1987; Falk, 1991b). *Dorycera* is usually associated with herb-rich unimproved meadows, often in association with umbellifers and broad-leaved trees. The life history is unknown, but the larvae probably develop in decaying vegetable matter, possibly in the dead or dying roots of hogweed, *Heracleum sphondylium* or a near relative. It was once regarded as a fairly frequent insect, but appears to have declined dramatically in recent years. Threats are thought to come from loss of unimproved flowery meadows through drainage or lack of grazing leading to scrub invasion. Although there are old records from Hampshire and Worcestershire, most of the recent records are from the Thames Estuary where it regularly occurs on brownfield sites (Ismay, 2000; Jones, 2003, 2007). On a personal note, however, I have recorded this fly in many widely spread localities in the Home Counties in the last 5 years, indicating that it may be increasing and spreading in some areas at least. Two specimens were found sweeping, River Mole Corridor, dated 27.5.2020, at TQ 25825 40566.

***Ectobius lapponicus* (Linnaeus)**

4.2.15 The 'dusky cockroach', family Blatellidae. Status: nationally scarce (notable B, Haes & Harding, 1997). This is one of Britain's native cockroach species, not to be confused with the many domestic pest species that have been introduced into buildings. It is very uncommon, and in Britain it is confined to southern England and most colonies are either in the Sussex Weald or the New Forest (Marshall & Haes, 1988) or west Surrey (Baldock, 1999). It is an omnivorous scavenger, living in grass litter. Several specimens were found by sweeping, River Mole Corridor, dated 27.5.2020, at TQ 25570 40654.

***Hippodamia (*formerly *Adonia) variegata* (Goeze)**

4.2.16 The Adonis ladybird, family Coccinellidae. Status: nationally scarce (notable B, Hyman & Parsons, 1992), but status may need revision. Until about 30 years ago, this species was always regarded as having a coastal distribution, occurring in warm sheltered locations such as chalk downs, dunes, undercliffs and other disturbed areas (Majerus *et al*., 1997). However, it is now known to be fairly widespread in England, especially in the London area and Thames Estuary, where it is associated with sparsely vegetated post-industrial brownfield sites, and it has also spread across central England (Roy *et al*., 2011). Several specimens were found by general sweeping of sparse herbage, River Mole Corridor, dated 10.9.2020, at TQ 25872 40560.

***Hylaeus cornutus* (Curtis)**

4.2.17 A small black white-faced bee, family Colletidae. Status: nationally scarce (notable A, Falk, 1991a). This uncommon bee occurs in a variety of habitats, including woodland and fenland, but is mainly found in dry chalky areas, particularly in the Thames Estuary and Thames Valley (Edwards & Telfer, 2001) and Surrey (Baldock, 2008). It visits a variety of flowers after nectar and pollen and nests in the tough hollow stems of various dead plants such as dock and bramble. Several specimens were found visiting flowers, River Mole Corridor and Gatwick Brook Grassland, dated 27.5.2020 and 22.6.2020.

Lasius brunneus **(Latreille)**

4.2.18 A small brown ant, family Formicidae. Status: nationally scarce (notable A, Falk, 1991a). This is a very local species restricted mainly to central and southern England from Essex to Shropshire. It seems to be centred on the Thames and Severn Valleys (Edwards, 1998), but appears to be spreading. It nests exclusively in dead wood (logs and standing timber) where it excavates its galleries, and it is particularly associated with ancient woodlands. Several were found crawling up tree trunks or under bark of dead trunks, Gatwick Brook Grassland, dated 22.6.2020, at TQ 28976 39926 and TQ 28874 39869.

Magdalis armigera **(Geoffroy)**

4.2.19 A small black weevil, family Curculionidae. Status: very local. This widespread, but scarce species breeds in the twigs and branches of elm trees. It is currently increasing again, after becoming extremely scarce following the disappearance of elm trees from the landscape after the ravages of Dutch elm disease in the 1970s. One was beaten from small elm trees, Riverside Park, dated 27.5.2020, at TQ 27924 42151.

Malthodes pumillus **(Brebisson)**

4.2.20 A minute soldier beetle, family Cantharidae. Status: very local. This beetle is usually found on herbage in old woodlands, and although recorded from numerous localities across much of the British Isles, it is very local and seldom seen. A single specimen was found by sweeping, Gatwick Brook Grassland, dated 22.6.2020, at TQ 29195 40057.

Merzomyia (**formerly** ***Icterica) westermanni*** **(Meigen)**

4.2.21 A medium-sized brown and orange picture-winged fly, family Tephritidae. Status: nationally scarce (notable, Falk, 1991b). This very local fly is known from an area south-east of a line from The Wash, to Gloucester to Weymouth. It breeds in the heads of ragwort, *Senecio* species, but despite the widespread abundance of its foodplant, it remains a scarce fly (Clemons, 1997, 2004, 2015). Several specimens were found by sweeping, River Mole Corridor, dated 10.9.2020, at TQ 26064 40625.

Metopoplax ditomoides **(Costa)**

4.2.22 A small black and white ground bug, family Lygaeidae. Status: very local, but spreading. A single specimen of this bug was first found in Britain on a rubbish tip in Hounslow in 1953, after its spread had been monitored across Europe. Regarded as a vagrant or adventitious species, it was not included in the review of British Hemiptera (Kirby, 1992), but was rediscovered in Britain, in Oxfordshire, shortly after publication. It feeds on various species of mayweed, *Matricaria*. It has since been found on a number of occasions on brownfield sites in south-east England and appears to be spreading (Jones, 2008). Several specimens found by sweeping, River Mole Corridor, dated 17.5.2020 and 19.6.2020.

Microlestes minutulus **(Goeze)**

4.2.23 A small black ground beetle, family Carabidae. Status: very local. This recent discovery in Britain was first found on the Suffolk coast in 1976, but was not recognized until 1995. It was later found in a few scattered coastal sites in Suffolk, Essex and Kent, usually in coastal litter (Luff, 1998). Since then it has continued to spread inland and is now known from numerous localities in southern and Eastern England. It seems to be associated with warm, well-drained soils with sparse vegetation. One specimen was found under rubble and broken bricks, Gatwick Brook Grassland, dated 14.9.2020, at TQ 29114 40000.

Neottiglossa pusilla **(Gmelin)**

4.2.24 A tiny brown shieldbug, family Pentatomidae. Status: very local. This is a scarce species of rough grassy places in central and south-eastern England (Bantock, 2018). It is a secretive, ground-dwelling species, and easily overlooked. A single specimen was found by sweeping, Gatwick Brook

Grasslands, dated 22.6.2020, at TQ 29104 40030.

***Ophonus ardosiacus* (Luts)**

4.2.25 A medium-sized blue-black ground beetle, family Carabidae. Status: very local. Although given nationally scarce (notable B) status by Hyman & Parsons (1992), this was not confirmed by Telfer (2016) after recent records show it to be more widespread, even increasing in numbers and geographic range. This is still an uncommon species of southern England, south of the Severn/Wash line, and most localities are coastal or estuarine, with a large series of localities on the north Kent and South Essex coast of the Thames Estuary and London area (Luff, 1998). Several specimens were found under rubble and by finger-tip grubbing, Gatwick Brook Grassland, dated 27.5.2020, at TQ 29114 40000.

***Orchesia undulata* (Kraatz)**

4.2.26 A small mottled fungus beetle, family Melandryidae. Status: very local. A widespread, but rather local species found under the rotten bark of fungoid logs and trees. Originally listed as nationally scarce (notable B) by Hyman (1985), this was not confirmed by Hyman & Parsons (1992) or Alexander *et al*. (2014). A single specimen was found under the fungoid bark of a fallen/ cut tree trunk, Riverside Park, dated 14.9.2020, at TQ 28001 42089.

***Paraclusia tigrina* (Fallen)**

4.2.27 A small pink fly, family Clusiidae. Status: vulnerable (red data book category 2, Shirt, 1987, Falk, 1991b). This small fly is thought to breed in dead and decaying timber and is associated with woodlands and parklands. Since the review of Diptera was published (Falk, 1991b), there have been many more records of this species, suggesting that it is either increasing in abundance and range, or was previously overlooked. Its status probably needs to be reviewed. One specimen was seen running on a dead tree trunk, Riverside Park, dated 14.9.2020, at TQ 27716 42294.

***Podagrica fuscicornis* (Linnaeus)**

4.2.28 A small pink and blue leaf beetle, family Chrysomelidae. Status: nationally scarce (notable B, Hyman & Parsons, 1992; Hubble, 2014). A very local species, mainly of east and south-eastern England where it feeds on mallows, *Malva* species (Cox, 2007). Several specimens were swept from the foodplant, River Mole Corridor, dated 19.6.2020, at TQ 25987 40641.

***Polydrusus formosus* (Mayer)**

4.2.29 A small metallic green weevil, family Curculionidae. Status: nationally scarce (notable A, Hyman & Parsons, 1992). This very local weevil occurs on various broad-leaved trees, including hazel, oak, beech, apple and sallow in southern England. Until recently (about 2000) it was only recorded from Sussex, Hampshire and Kent, but has apparently started to spread and is now widely recorded in southern England, London and Thames Gateway area, with a scatter of records throughout much of England and Wales and outliers in Scotland. Its status may need revision. One was beaten from bushes, River Mole Corridor, dated 27.5.2020, at TQ 25678 40692.

***Reptalus quinquicostatus* formerly *Oliarus panzeri* (Low)**

4.2.30 A small brown plant hopper, family Cixiidae. Status: nationally scarce (notable, Kirby, 1992). This scarce bug has a very restricted south-eastern distribution and is thought to have declined dramatically in the last 50 years (Kirby, 1992). It has recently only been found in the extreme south-east, London, Thames Estuary, Sussex and Kent (Jones & Hodge, 1999). It seems to be associated with areas of rough ground, particularly where there are areas of bare soil, or where there is regular cracking in the ground during periods of drought. It may be a root-feeder during its nymph stage. A single specimen was found by sweeping, River Mole Corridor, dated 19.6.2020, at TQ 25650 40606.

***Rhinocyllus conicus* (Frohlich)**

4.2.31 A small mottled brown weevil, family Curculionidae. Status: nationally scarce (notable A, Hyman &

Parsons, 1992). Historically, this very scarce beetle was only known from a few scattered localities in south and south-west England, usually on disturbed ground. It was usually regarded as a coastal species, but appears to have been spreading in recent years, occurring at many inland sites right across central England. Its status may need revision. Several specimens were swept from thistles, River Mole Corridor, dated 27.5.2020 and 19.6.2020, at TQ 26064 40625.

***Sermylassa halensis* (Linnaeus)**

4.2.32 A small pink and green leaf beetle, family: Chrysomelidae. Status: very local. This beetle feeds on bedstraws, in rough grassy places such as verges, heathland, downs and chalk pits, usually in warm dry places (Cox, 2007). Two specimens were found by sweeping, River Mole Corridor, dated 10.9.2020, at TQ 25936 40624.

***Squamapion vicinum* (Kirby)**

4.2.33 A minute grey weevil, family Apionidae. Status: nationally scarce (notable B, Hyman & Parsons, 1992). This very local weevil breeds in the stems of water mint, *Mentha aquatica*, and although the food-plant is very common and widespread, the beetle seems very restricted. It is recorded widely, but sporadically, across England and Wales. Several specimens were found by sweeping water mint, River Mole Corridor, dated 27.5.2020, at TQ 25549 40781.

***Stictopleurus abutilon* (Rossi)**

4.2.34 A medium-sized brown leaf bug (family Rhopalidae). Status: extinct (Kirby, 1992), but now recolonized (Bantock, 2016). At the time of the national review of the British Hemiptera in 1992, this bug had only been found in the UK on a handful of occasions, the last being in 1948 and it was regarded as being extinct. During 1996 it was found in several localities in southern England and appeared to have successfully recolonized Britain. Since then it has been recorded on many occasions. Like the following species it has become a species typical of dry, well-drained and sparsely vegetated rough grassy places and brownfield sites in southern England, but remains relatively scarce and localized (Bantock, 2018). Several specimens were found by sweeping, River Mole Corridor, dated 30.6.2020.

***Stictopleurus punctatonervosus* (Goeze)**

4.2.35 A medium-sized brown leaf bug, family Rhopalidae. Status: extinct (Shirt, 1987, Kirby, 1992), but now recolonized and spreading across Britain (Bantock, 2016). At the time of the national review of British Hemiptera, this species was regarded as being extinct. It had been recorded from only two localities in Britain, the last in 1870. It appears to have successfully recolonized Britain since it was recorded in Essex in 1997. It has now become a species typical of the dry, well-drained and sparsely vegetated brownfield sites in and around urban London and the Thames Estuary (Jones, 2008) and is spreading widely across England (Bantock, 2018). Several specimens were found by sweeping, River Mole Corridor and Gatwick Brook Grasslands, dated 27.5.2020, 19.6.2020, 22.6.2020 and 10.9.2020.

***Tachys bistriatus* (Duftschmid)**

4.2.36 A minute brown ground beetle, family Carabidae. Status: nationally scarce (notable B, Hyman & Parsons, 1992; Telfer, 2016). This scarce beetle occurs on damp clay or sand by freshwater pools and ditches; it is more or less confined to southern England, and most records are from near the coast (Luff, 1998). Several specimens were found running about on the muddy edges of the river, River Mole Corridor, dated 19.6.2020, at TQ 25528 40714.

***Temnocerus (Rhynchites) nanus* (Paykull)**

4.2.37 A very small blue-black weevil, family Attelabidae. Status: very local. This scarce beetle breeds in the leaf buds of birch trees. Although recorded widely in England and Wales, records are scattered. One specimen was beaten from trees, Gatwick Brook Grassland, dated 27.5.2020, at TQ 29133 39913.

Uleiota planata **(Linnaeus)**

4.2.38 A small flat bark beetle, family Cucujidae. Status: nationally scarce (notable A, Hyman & Parsons, 1992). This rare beetle occurs under the fungoid bark of broad-leaved trees, usually beech, elm, oak or birch, in ancient woodlands. It is listed in ancient woodland saproxylic fauna group 1 by Harding & Rose, 1986. Although recorded from Wales and Lancashire, most records are from central southern England: Hampshire, Surrey, Sussex and Berkshire. Several specimens were found under the bark of a large fallen/felled tree, Riverside Park, dated 14.6.2020, at TQ 28001 42089.

Variimorda villosa **(Schrank)**

4.2.39 A small grey and black flower beetle, family Mordellidae. Status: nationally scarce (notable B, Hyman & Parsons, 1992; Alexander *et al*., 2014). This scarce southern beetle is mostly found in Hampshire, Sussex and Kent. It is usually associated with old broadleaved woodland where it is thought to breed in dead fungoid wood, or wood mould, though it is most often found visiting flowers. Two specimens were found resting on hogweed flower heads, River Mole Corridor, dated 19.6.2020, at TQ 25937 40597.

5. Site Assessment

5.1 Discussion

5.1.1 The terrestrial invertebrate value of the three Gatwick sites, as discussed below, is mixed. Each has its own contribution to local biodiversity for the different habitat types they represent.

Compartment P: Riverside Park

5.1.2 Much of this linear habitat is heavily shaded, secondary woodland, although several scarce species were recorded associated with living trees, fallen logs and rotten tree stumps: *Magdalis armigera, Orchesia undulata, Uleiota planata* and *Paraclusia tigrina*. The most unusual insect recorded was the scarce lace-bug, *Catoplatus fabricii*, swept from the narrow overgrown verge of the busy A23 on the south western perimeter.

Compartment M: River Mole Corridor

5.1.3 This large river corridor area contained a variety of habitat types: brownfield/disturbed ground, river edge, rough grassland, woodland edge and scrub. Many of the scarce and unusual insects were recorded in this area, highlighting its diversity and ecological value. The most interesting species were: *Campiglossa malaris, Coccidula scutellata, Dioxyna bidentis, Dorycera graminum, Ectobius lapponicus, Hylaeus cornutus, Merzomyia westermanni, Reptalus quinquicostatus, Rhinocyllus conicus, Squamapion vicinum, Tachys bistriatus* and *Variimorda villosa*. Several of these (Coccidula, Dioxyna, Squamapion, Tachys) are closely associated with the riverside habitat. Apart from the old woodland *Variimorda*, all the others are species of rough flowery, grassy places or disturbed ground.

Compartment G: Gatwick Brook Grasslands

5.1.4 This large rough grassland area belies the fact that it was recently re-profiled for surface water management and flood alleviation with ground levels significantly lowered, leaving the large mature trees (mostly oak) standing on tumulus-like hummocks. The unusual species found here — *Acinia corniculata, Camarota curvipennis, Hylaeus cornutus, Microlestes minutulus, Neottiglossa pusilla, Ophonus ardosiacus* — are mainly species of disturbed flowery and grassy land. However, *Lasius brunneus* is solely an old woodland species and must still occur on the mature trees in relic colonies, even though the land between the undisturbed tree mounds has been completely altered in approximately the last decade. *Temnocerus nanus* and *Malthodes pumillus* are mature hedgerow species.

5.1.5 The 303 species recorded across the combined Gatwick survey area is a relatively diverse overall assemblage. Considering the unusual and scarce species found, the biodiversity values of each of the three compartments is recommended as follows:

- Compartment P: Riverside Park - Low. It should be noted that the survey effort here focussed on the narrow densely flowering zone alongside the A23 and its environs and not the heavily shaded amenity park.
- Compartment M: River Mole Corridor - Medium/High.
- Compartment G: Gatwick Brook Grasslands - Low/Medium.

6. Conclusion

6.1.1 In total the three survey parcels associated with Gatwick Airport as part of this study, have provided a diverse and high value species list for the biodiversity of the area. All three parcels have varying diverse habitat types which provide for differing species and species groups. Numerous scarce, unusual and higher value species were recorded and should be taken into account during any development proposals.

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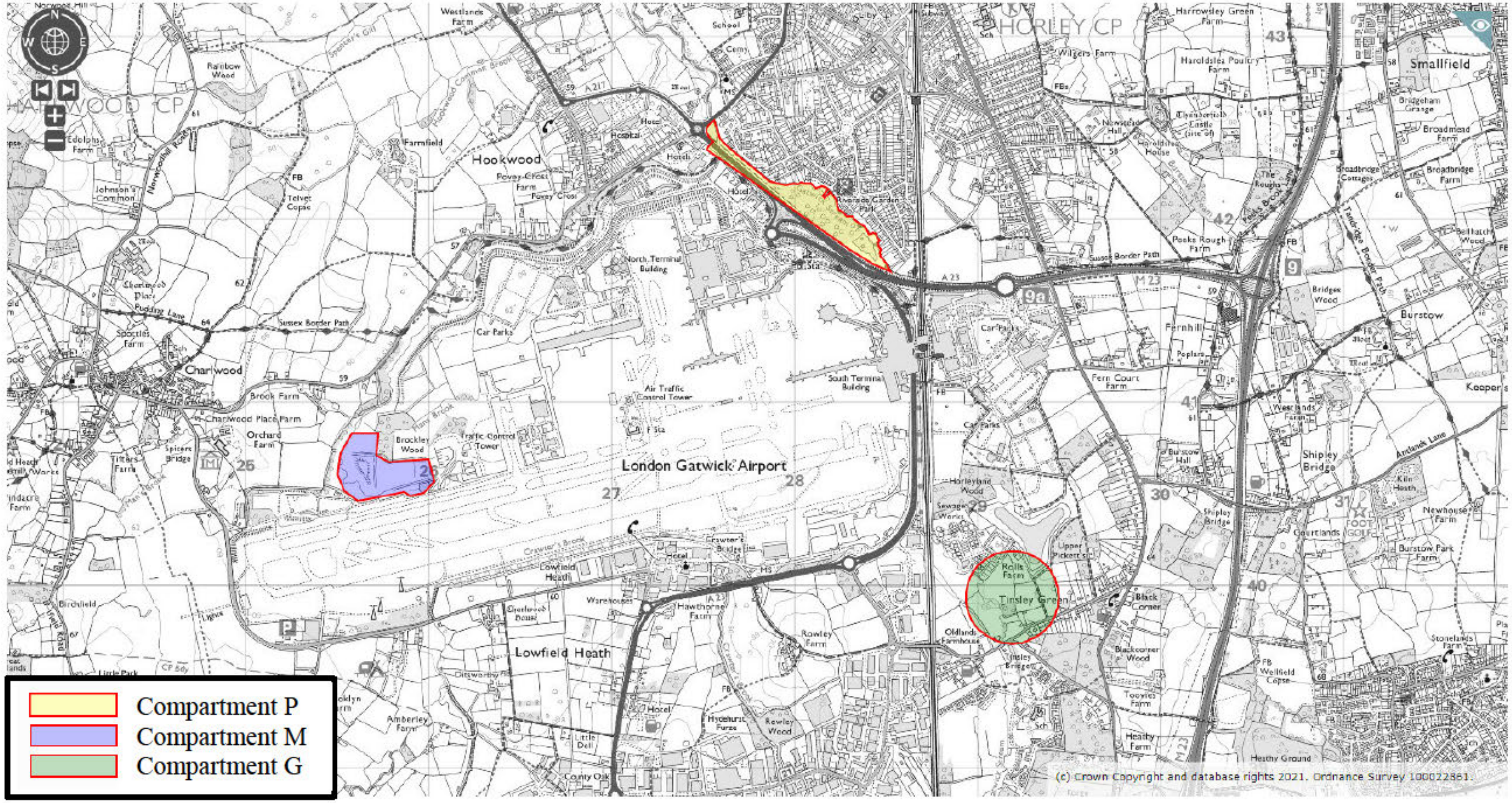
Figure 1. Site Locations (Three separate parcels - Gatwick Airport)

Image taken from MAGIC (https://magic.defra.gov.uk/home.htm)



Appendix 1. Full Species List

Locality name:		**Gatwick Airport (3 separate sites)**	
Nominal National grid reference:		**TQ 256406**	
Vice-County		**17, Surrey**	
Order & Species	**Status**	**Site Notes**	**Survey Date* & Land Parcel (G = Gatwick Brook; P = Riverside Park; M = River Mole)**
			* month as Roman numeral
COLEOPTERA, Beetles			
Ptinidae (formerly Anobiidae) woodworm beetles			
Anobium (Hemicoelus) fulvicorne (Sturm)	common	Various dead timber	22.vi.2020 (G)
Ptilinus pectinicornis (Lin.)	local	On various dead timbers	27.v.2020 (P)
Stegobium paniceum (Lin.)	local	Indoors, in stored food products	
Anthicidae, 'ant' beetles			
Anthicus antherinus L.	local	Compost heaps, grass cuttings	14.ix.2020 (G)
Apionidae, Minute weevils			
Apion frumentarium (Lin.) (formerly A. miniatum)	local	On docks, Rumex species	27.v, 19.vi, 14.ix.2020 (G, M)

Aspidapion radiolus (Mars.)	common	On mallows, Malva species.	22.vi.2020 (P)
Ceratapion gibbirostre (Gyll.)	local	On thistles, Cirsium and Carduus	22.vi.2020 (G)
Eutrichapion ervi Kirby	common	On vetches, Viccia, grassy places	19.vi.2020 (M)
Exapion ulicis (For.)	common	On gorse, Ulex europeus, etc.	10.ix.2020 (M)
Nanophyes marmoratus (Goeze)	local	On Lythrum salicaria	30.vi, 10.ix.2020 (M)
Perapion curtirostre Germ.	common	On docks, Rumes species	27.v.2020 (M, P)
Squamapion vicinum (Kirby)	Nb	On water mint	27.v.2020 (M)
Trichapion simile (Kirby)	common	On birch	10.ix.2020 (M)
Attelabidae, weevils			
Temnocerus (Rhynchites) nanus (Payk.)	v. local	On birch, sallow and alder.	27.v.2020 (G)
Biphylidae, fungus beetles			
Biphyllus lunatus (Fab.)	local	In Daldinia fungus on ash, ancient woodland indicator	30.vi.2020 (M)
Cantharidae, Soldier beetles			
Cantharis lateralis (Lin.)	local	Woods, larvae predatory in rotten wood	27.v, 19.vi, 22.vi.2020 (M, G)
Cantharis flavilabris (formerly nigra (Deg.))	local	Larvae predatory in rotten wood, soil, etc	27.v, 19.vi.2020 (G, M)
Cantharis nigricans Mull.	common	Larvae predatory in rotten wood, soil, etc	22.vi.2020 (G)
Cantharis pallida Goez	common	Larvae predatory in rotten wood, soil, etc	22.vi.2020 (G)

Cantharis rustica Fallen	common	Larvae predatory in rotten wood, soil, etc	19.vi.2020 (M)
Malthodes marginatus Latr.	local	Woods and meadows	22.vi.2020 (G)
Malthodes minimus (Lin.)	common	Woods, larvae predatory in rotten wood	22.vi.2020 (G)
Malthodes pumilus (Breb.)	v. local	Woods and grassland	22.vi.2020 (G)
Rhagonycha fulva (Scop.)	common	Adults on flowers, larvae predators in soil layer	27.v, 22.vi.2020 (M, G)
Rhagonycha nigriventris (formerly limbata)	local	Adults on flowers, larvae predators in soil layer	27.v.2020 (M)
Carabidae, Ground beetles			
Abax parallelepipedus (P. & M.)	common	Under logs, stones, etc, in woods	22.vi.2020 (G)
Acupalpus dubius	local	Damp grassy places	27.v.2020 (M, G)
Amara plebeja Gyll.	common	Various habitats	27.v.2020 (M)
Bembidion articulatum Panz.	local	River and stream banks	19.vi.2020 (M)
Bembidion biguttatum (Fab.)	local	Damp places, stream and pond sides	30.vi.2020 (M)
Bembidion mannerheimi Sahl.	local	Damp grasslands	27.v.2020 (M)
Demetrias atricapillus (Lin.)	common	Long grass	27.v.2020 (G)
Paradromius linearis Ol.	common	Dry grassy areas	27.v, 19.vi, 10.ix.2020 (M)
Harpalus ardosiacus Luts.	v. local	Chalk or limestone, usually coastal	27.v.2020 (G)
Microlestes minutulus	v. local	Dry sandy places, mostly East Anglia and London	14.ix.2020 (G)

Poecilus (Pterostichus) cupreus (Lin.)	common	Open fields, bare ground	27.v.2020 (M)
Poecilus (Pterostichus) versicolor Sturm	local	Open ground, bare soil.	27.v, 14.ix.2020 (G)
Tachys bistriatus (Dufts.)	Nb	On damp clay soils.	19.vi.2020 (M)
Cerambycidae, Longhorn beetles			
Pseudovadonia (Leptura) livida Fab.	local	Larvae in fungal hyphae in soil	19.vi.2020 (M)
Stenurella (Leptura) melanura (Lin.)	local	Larvae in dead timber or roots	19.vi, 22.vi.2020 (M, G)
Rutpela (Strangalia) maculata (Poda)	common	Larvae in dead wood of various trees	27.v.2020 (G)
Chrysomelidae, Leaf and flea beetles			
Bruchidius varius (Ol.)	local	On red clover, recent colonist	27.v.2020 (M)
Bruchidius imbricornis Panz.	v. local	New colonist in Britain	19.vi, 10.ix.2020 (M)
Bruchidius villosus (Fab.)	local	Rough grassy places	27.v.2020 (P)
Bruchus atomarius (Lin.)	local	Various habitats	27.v, 10.ix.2020 (M)
Bruchus loti Payk.	common	On Lotus corniculata	19.vi.2020 (M)
Cassida flaveola Thunb.	local	Dry grassy places	27.v.2020 (M)
Cassida rubiginosa Mull.	common	On thistles, Cirsium species.	22.vi.2020 (G)
Cassida vibex Fab.	local	On Centaurea species	27.v, 22.vi.2020 (G)
Cassida viridis (Lin.)	common	On water mint etc, Mentha species	19.vi.2020 (M)

Crepidodera (Chalcoides) aurea (Fourc.)	common	On willows, sallows, poplars etc	22.vi.2020 (P)
Crepidopdera (Chalcoides) fulvicornis (Fab.)	common	On willows, sallows, poplars etc	27.v.2020 (G)
Chalcoides plutus (Latr.)	local	On willows, sallows, poplars etc	19.vi, 10.ix.2020 (M)
Neocrepidodera transversa (Marsh.)	common	On thistles	22.vi.2020 (G)
Cryptocephalus fulvus Goeze	local	Dry grassy areas.	19.vi.2020 (M)
Cryptocephalus pusillus Fab.	local	On birch, sandy and chalky areas	14.ix, 19.vi.2020 (M, P)
Galerucella lineola Fab.	common	On alders, willows etc	19.vi.2020 (M)
Gastrophysa viridula Deg.	local	Wet meadows, marshes	19.vi, 22.vi.2020 (M, G)
Lilioceris lilii (Scop.)	local	On cultivated lilies, gardens and parks	14.ix.2020 (P)
Oulema obscura Steph.	common	Meadows and fields	22.vi.2020 (G)
Podagrica fuscicornis (Lin.)	Nb	Grassland, rough ground, on mallows.	19.vi.2020 (M)
Psylliodes chrysocephala (Lin.)	common	On crucifers	27.v.2020 (P)
Sermylassa halensis (Lin.)	v. local	On bedstraws	10.ix.2020 (M)
Sphaeroderma rubidum (Gra.)	common	On thistles, Cirsium species	19.vi, 22.vi.2020 (M, G)
Sphaeroderma testaceum Fab.	common	On thistles, Cirsium species	19.vi, 14.ix.2020 (M, G)
Coccinellidae, Ladybirds			
Anisosticta 19-punctata (Lin.)	local	Water ladybird, near ponds	19.vi.2020 (M)

Coccidula rufa (Herbst)	local	Marshy places, reed and sedge beds	19.vi.2020 (M)
Coccidula scutellata (herbst)	v. local	Marshes, reed beds, stream sides	27.v.2020 (M)
Coccinella 7-punctata Lin.	common	7-spot. Wide variety of habitats.	27.v, 19.vi, 22.vi, 10.ix, 14.ix.2020 (G, M, P)
Harmonia axyridis Pallas	common	Recent arrival in Britain	27.v, 19.vi, 22.vi, 30.vi.2020 (M, G, P)
Hippodamia variegata	Nb	Adonis ladybird. Mainly coastal and London basin	10.ix.2020 (M)
Micraspis 16-punctata (Lin.)	common	16-spot, mildew feeder, grassy places	27.v, 19.vi, 22.vi, 10.ix, 14.ix.2020 (G, M)
Propylea 14-punctata (Lin.)	common	14-spot. Wide variety of habitats	19.vi, 22.vi, 10.ix, 14.ix.2020 (M, G, P)
Psyllobora 22-punctata (Lin.)	common	22-spot. Wide variety of habitats, mildew-feeder.	10.ix, 14.ix.2020 (M, P, G)
Rhyzobius litura (Fab.)	common	Rough grassy places	27.v, 14.ix.2020 (G, P)
Subcoccinella 24-punctata (Lin.)	common	24-spot. On false-oat grass	27.v, 19.vi, 10.ix, 14.ix.2020 (M, G)
Colydiidae, fungus beetles			
Bitoma crenata	local	Under fungoid bark of broadleaved trees	14.ix.2020 (P)
Cryptophagidae, Fungus beetles, etc			
Micrambe ulicis Steph.	local	General grassy places	27.v.2020 (G, P)
Cucujidae (fungus beetles)			
Uleiota planata (L.)	Na	Under fungoid bark	14.ix.2020 (P)
Curculionidae (weevils)			

Ceutorhynchus obstrictus Marsh. (assimilis)	common	On various crucifers	27.v.2020 (M)
Ceutorhynchus pallidactylus = quadridens (Pz.)	common	On aliaria and other crucifers, woods and hedges	27.v.2020 (M)
Nedyus (Cidnorhynchus) 4-maculatus (L.)	common	On stinging nettles	22.vi.2020 (G)
Cionus alauda (Herbst)	common	On water figwort, Scrophulria aquatica	19.vi.2020 (M)
Curculio glandium (L.)	common	On oaks	27.v, 22.vi.2020 (P, G)
Archarius (Curculio) pyrrhoceras Mars.	local	On oaks	27.v, 22.vi.2020(P, G)
Gymnetron pascuorum Gyll.	common	On plantains, Plantago species	27.v, 19.vi, 22.vi.2020 (G, M, P)
Hypera nigrirostris 9Fab.)	common	Grassy places, on clovers	19.vi.2020 (M)
Hypera rumicis (Lin.)	common	Rough grassy places, on docks, Rumex species	19.vi.2020 (M)
Magdalis armigera (Geoff.)	v. local	Breeds in the twigs and branches of elm trees	27.v.2020 (P)
Miccotrogus picirostris (Fab.)	common	On clovers, Trifolium species	22.vi.2020 (P)
Polydrusus formosus (splendidus) (Mayer)	Na	On hazel, oak and other trees, spreading	27.v.2020 (M)
Rhamphus pulicarius	local	On sallow, birch, poplars, boggy places	19.vi.2020 (M)
Rhinocyllus conicus Froh.	Na	On thistles, southern England	27.v, 19.vi.2020 (M)
R. pericarpius (Lin.)	common	On Rumex species	22.vi, 10.ix.2020 (G, M)
Sitona hispidulus (Fab.)	common	On clovers and other legumes	10.ix.2020 (M)
Sitona humeralis Steph.	common	Dry grassy areas, on clover etc.	10.ix.2020 (M)

Sitona lineatus (Lin.)	common	On clovers, and many other legumes	19.vi, 10.ix.2020 (M)
Trichosirocalus troglodytes (Fab.)	common	On ribwort plantain, Plantago lanceolata	27.v, 19.vi, 14.ix.2020 (G, M)
Dermestidae, Hide & larder beetles			
Anthrenus verbasci (Lin.)	common	Museum beetle. Indoors in kitchens, carpets, outdoors on flowers	22.vi.2020 (P)
Elateridae, Click beetles			
Agriotes acuminatus Steph.	common	Larvae in grass roots etc	22.vi.2020 (G)
Agriotes obscurus (Lin.)	common	Larvae in grass roots etc	19.vi.2020 (M)
Athous campyloides Newm.	Nb	Larvae in grass roots, rotten wood etc	27.v, 19.vi.2020 (G, M)
Hydrophilidae, Water beetles			
Helophorus minutus F.	common	Wet areas, ponds, streams, marshes	22.vi.2020 (G, M)
Melandryidae, Fungus beetles			
Orchesia undulata Kr.	v. local	Under rotten wood, in fungus	14.ix.2020 (P)
Melyridae, False soldier beetles			
Axinotarsus marginalis (Lap.)	common	Various habitats, larvae probably in rotten wood or soil.	19.vi, 22.vi.2020 (M, G)
Malachius bipustulatus (Lin.)	common	Open grassy areas, on flowers, larvae predatory	27.v, 19.vi, 22.vi.2020 (P, M, G)
Malachius viridis Fab.	common	Open grassy areas, on flowers, larvae predatory	27.v, 19.vi.2020 (G, M)

Mordellidae, Flower beetles			
M. pumila (Gyll.)	common	Flowery places	27.v.2020 (G)
Variimorda villosa Schr.	Nb	Broad-leaved woodland, larvae in dead wood.	19.vi.2020 (M)
Nitidulidae, Pollen beetles			
Brachypterus glaber (Steph.)	common	On stinging nettles	27.v.2020 (P)
Oedemeridae, Flower beetles			
Oedemera lurida (Marsh.)	common	On flowers, leaves, etc.	27.v, 19.vi, 22.vi, 30.vi.2020 (G, P, M)
Oedemera nobilis (Scopoli)	local	On flowers	27.v, 19.vi, 22.vi.2020 (G, P, M)
Scarabaeidae, chafers and dung beetles			
Onthophagus coenobita Herbst	local	In mammalian dung	19.vi.2020 (M)
Scirtidae, marsh beetles			
Microcara testacea (L).	local	Marshy places	27.v.2020 (M)
Scraptiidae, Flower beetles			
Anaspis maculata Fourc.	common	Adults on flowers, larvae in rotten wood	27.v, 22.vi.2020 (M, P)
Silvanidae, fungus beetles			
Silvanus unidentatus (Ol.)	local	Under fungoid bark	14.ix.2020 (P)
Staphylinidae, Rove beetles			

Anotylus rugosus (Fab.	common	Damp grassy places	19.vi, 30.vi.2020 (M)
Platystethus cornutus/ degener	local	Muddy places, stream and pond banks	19.vi.2020 (M)
Stenus cicindeloides (Sch.)	local	Marshy places	19.vi.2020 (M)
Stenus juno Payk.	common	Rough grassy places	27.v.2020 (G)
DERMAPTERA, Earwigs			
Forficulidae, Earwigs			
Forficula auricularia L.	common	Variety of habitats, woods, gardens etc.	22.vi.2020 (G, P)
DIPTERA, True flies			
Asilidae, robberflies			
Dioctria atricapilla Meig.	local	Dry grasslands	27.v.2020 (M)
Dioctria baumhaueri Meigen	common	Grassy places, predatory	22.vi.2020 (G)
Leptogaster cylindrica (Deg.)	local	Grassy places in southern England	27.v, 19.vi, 22.vi, 30.vi.2020 (G, M)
Chloropidae, fruit flies			
Camarota curvipennis Lat.	v. local	Breeds in heads of wheat, rye, barley	14.ix.2020 (G)
Clusiidae, 'druid' flies			

Paraclusia tigrina Fallen	RDB2	Breeds in dead timber	14.ix.2020 (P)
Conopidae, Thick-headed flies			
Sicus ferrugineus (Lin.)	common	Parasitoid of various bumblebee species.	19.vi, 22.vi.2020 (M, G)
Dolichopodidae, long-footed flies			
Poecilobothrus nobilitatus Lin.	common	Associated with wet areas, mud, etc	19.vi.2020 (M)
Scellus notatus Fab.	local	Damp woods and meadows	27.v, 19.vi, 22.vi, 30.vi.2020 (M, G)
Lauxaniidae, acalyptrate flies			
Peplomyza litura (Meig.)	common	Hedgerows, woodland edges etc	22.vi.2020 (G)
Opomyzidae, minute flies			
Geomyza tripunctata (Fall.)	common	Grassy places	22.vi.2020 (G)
Opomyza germiniationis (Lin.)	common	Grassy places	22.vi, 10.ix, 14.ix.2020 (G)
Sciomyzidae, snail-killing flies			
Coremacera marginata (Fab.)	common	Biology unknown, probably snail parasitoid	27.v, 19.vi, 10.ix, 14.ix.2020 (M G)
Dichetophora obliterata (Fab.)	local	Biology unknown, probably snail parasitoid	10.ix.2020 (M)
Ilione albiseta (Scop.)	local	Attacks snails, moist places	19.vi, 30.vi.2020 (M)
Limnia unguicornis (Scop.)	local	Attacks snails, moist places	19.vi.2020 (M)
Pherbina coryleti (Scop.)	common	Attacks snails, moist places	10.vi, 10.ix.2020 (M)

Sepedon sphegea (Fab.)	local	Parasitoid of snails	19.vi.2020 (M)
Tetanocera elata (Fab.)	common	Probably predator/parasitoid of land snails	19.vi.2020 (M)
Stratiomyidae, Soldier flies			
Beris chalybata (Fors.)	common	Larvae in decaying organic matter	27.v.2020 (P)
Chloromyia formosa (Scop.)	common	Larvae in dung and compost.	27.v, 19.vi.2020 (G)
Chorisops tibialis Meigen	common	Woodland edges, breeds in wood mould etc	22.vi.2020 (G)
Pachygaster atra (Panz.)	local	Larvae in fungus, soil, rotten wood	19.vi.2020 (M)
Pachygaster leachii (Curtis)	common	Larvae in fungus, soil, rotten wood	19.vi, 22.vi.2020 (M, G)
Syrphidae, Hoverflies			
Baccha elongata (Fab.)	common	Woodland and hedgerows	19.vi, 14.ix.2020 (M)
Chrysotoxem bicinctum (Lin.)	local	Grassland, hedgerows, woodland edges.	30.vi.2020 (M)
Episyrphus balteatus (Lin.)	common	Wide variety of habitats, gardens etc.	19.vi, 22.vi.2020 (M, G)
Eristalinus sepulchralis (Lin)	local	Larvae in rot holes in trees, ditches, ponds	10.ix.2020 (M)
Eristalis arbustorum (Lin.)	common	Larvae in rot holes in trees, ditches, ponds	19.vi, 22.vi, 30.vi.2020 (M, G)
Eristalis nemorum (Lin.)	local	Larvae in rot holes, ditches, stagnant ponds	10.ix.2020 (M)
Eristalis pertinax (Scop.)	common	Larvae in rot holes, ditches, stagnant ponds	19.vi.2020 (M)
Eristalis tenax (Lin.)	common	Larvae in rot holes in trees, ditches, ponds	27.v, 19.vi, 22.vi.2020 (M, G)

Eupeodes luniger (Meig.)	common	Wide variety of habitats, gardens.	22.vi.2020 (G)
Helophilus pendulus (Lin.)	common	Breeds in ditches and stagnant ponds.	27.v, 19.vi, 22.vi, 10.ix, 14.ix.2020 (G, M)
Myathropa florea (Lin.)	common	Larvae in rot holes in trees	27.v, 19.vi.2020 (G)
Pipizella viduata (Lin.)	local	Dry grassland, chalk and coastal	19.vi.2020 (M)
Platycheirus albimanus Fab.	common	Woods and fields	22.vi.2020 (G)
Rhingia campestris (Meig.)	common	Woodlands, hedgerows, in cow and horse dung	10.ix.2020 (M)
Scaeva pyrastri (Lin.)	common	Wide variety of grassy habitats	22.vi.2020 (G)
Sphaerophoria scripta (Lin.)	common	Wide variety of grassy habitats	19.vi, 22.vi, 30.vi, 10.ix.2020 (M, G)
Syritta pipiens (Lin.)	common	Wide variety of habitats, gardens etc.	27.v, 19.vi, 22.vi.2020 (M, G)
Volucella pellucens (Lin.)	common	Variety of habitats, breeds in wasp nests	22.vi.2020 (P)
Xylota sylvarum (Lin.)	local	Woodlands	22.vi.2020 (G)
Tabanidae, horseflies			
Haematopota pluvialis (Lin.)	local	Adults suck blood, wet meadows	19.vi.2020 (M)
Tachinidae, parasitic flies			
Eriothrix rufomaculata (Deg.)	common	Hosts unknown, even though fairly common	22.vi.2020 (G)
Exorista species	—	Several species, impossible to separate females	19.vi.2020 (M)
Lydella grisescens R.-D.	common	Parasitoid of various moth caterpillars	10.ix.2020 (M)

Phasia obesa (Fab.)	local	Parasitoid of bugs	27.v, 22.vi, 10.ix.2020 (P, G, M)
Phasia pusilla Meig.	local	Parasitoid of shieldbugs	19.vi, 10.ix.2020 (M)
Siphona geniculata Degeer	common	Parasitoid of various insect larvae	19.vi, 22.vi.2020 (M, G)
Tachina fera (Lin.)	common	Parasitoid of various common moth caterpillars	10.ix.2020 (M)
Tephritidae, picture-winged flies			
Acinia corniculata (Zett.)	RDB1	Breed in heads of Centaura nigra	22.vi.2020 (G)
Campiglossa malaris Seguy	RDB1	Larvae in heads of ragworts, spreading	19.vi.2020 (M)
Chaetorellia jaceae (R.-D.)	local	In heads of Centaurea	27.v, 19.vi, 22.vi.2020 (M, G, P)
Chaetostomella cylindrica (R.-D.)	local	Breeds in heads of Centaurea etc	22.vi.2020 (G)
Dioxyna bidentis	N	Breeds in flower heads of Bidens tripartita	10.ix.2020 (M)
Merzomyia (Icterica) westermanni (Meig.)	N	In heads of ragwort	10.ix.2020 (M)
Tephritis formosa (Loew)	local	Larvae in the heads of Sonchus species	27.v.2020 (M)
Terellia colon (Meig.)	local	In heads of Centauria scabiosa	22.vi.2020 (G)
Terellia ruficauda (Fab.)	common	Larvae in heads of Cirsium arvense	19.vi, 22.vi, 30.vi.2020 (M, G)
Terellia serratulae (Lin.)	local	Breeds in heads of thistles	19.vi.2020 (M)
Urophora cardui (Lin.)	common	Larvae in galls in stems of Cirsium arvense	27.v.2020 (M)
Urophora jaceana (Her.)	common	Larvae in galls in knapweed heads	19.vi, 19.vi.2020 (M, P)

Urophora quadrifasciata (Meig.)	local	Larvae in galls in knapweed heads	27.v, 19.vi, 22.vi.2020 (M, G)
Urophora stylata (Fab.)	common	Larvae in heads of Cirsium arvense	19.vi, 22.vi.2020 (M, G)
Ulidiidae, picture-winged flies			
Dorycera graminum (Fab.)	RDB3	Rough meadows, southern England, Thames Estuary	27.v.2020 (M)
HEMIPTERA, True bugs			
Anthocoridae, flower bugs			
Orius niger (Woolf)	common	Predatory on small insects, on flowers and grass	14.ix.2020 (P)
Berytinidae, stilt bugs or thread bugs			
Cymus melanocephalus Fieb.	local	Marshy places	27.v, 10.ix.2020 (G, M)
Cercopidae, Frog hoppers			
Aphrophora alni (Fallen)	common	On willows, sallows, etc.	22.vi.2020 (G)
Philaenus spumarius (Lin.)	common	Nymphs on various herbs, variety of habitats	19.vi, 22.vi, 10.ix, 14.ix.2020 (M, G, P)
Cicadellidae, leafhoppers			
Aphrodes bicinctus (Schr.)	common	Various grassy habitats	22.vi.2020 (G)
Cicadella viridis (Lin.)	local	Damp grassy places	10.ix.2020 (M)
Eupterycyba jucunda (H.-S.)	Local	On alder	22.vi.2020 (G)

Eupteryx aurata L.	common	On stinging nettles	14.ix.2020 (P)
Iassus scutellaris (Fieb.)	local	On elms	14.ix.2020 (P)
Cixiidae, froghoppers			
Cixius cunicularius (L.)	Local	Rough grassy places	10.ix.2020 (M)
Reptalus quinquicostatus (formerly Oliarus) panzeri Low	N	Dry grassy places	19.vi.2020 (M)
Coreidae, Leaf bugs			
Coreus marginatus (Lin.)	common	Woods, meadows, gardens, on docks, Rumex species.	27.v, 19.vi, 22.vi, 10.ix, 14.ix.2020 (P, M, G)
Coriomeris denticulatus (Scop.)	local	On medicks, trefoils and melilots, dry areas.	27.v, 14.ix.2020 (G, M)
Delphacidae, Ground hoppers			
Allygus mixtus (Fab.)	common	Usually on trees	22.vi.2020 (G)
Ditropis pteridis (Spin.)	common	On bracken, Pteridium aquilinum	22.vi.2020 (G)
Stenocranus minutus (Fab.)	common	Grassy places	10.ix.2020 (M)
Lygaeidae, Ground bugs			
Heterogaster urticae (Fab.)	common	On stinging nettles	27.v, 19.vi, 22.vi, 14.ix.2020 (M, G, P)
Ischnodemus sabuleti (Fall.)	common	Grassy places, meadows and marshes	27.v, 19.vi, 10.ix.2020 (M)
Kleidocerys resedae (Panz.)	common	On wide variety of trees and shrubs	14.ix.2020 (P)

Metopoplax ditomoides (Costa)	v. local	On chamomile and scentless mayweed	27.v, 19.vi.2020 (M)
Nysius senecionis (Schill.)	local	On Guernsey fleabane and ragworts	10.ix.2020 (M)
Peritrechus geniculatus (Hahn)	common	In leaf litter and grass roots	27.v, 14.ix.2020 (G, M)
Scolopostethus thomsoni Reut.	common	Under stones, bare ground, sparse vegetation	19.vi.2020 (M)
Miridae, Leaf bugs			
Capsus ater (Lin.)	common	Various habitats on various plants	27.v, 19.vi, 22.vi.2020 (G, M)
Charagochilus gyllenhali (Fall.)	common	Dry places, on bedstraws	30.vi, 10.ix.2020 (M)
Deraeocoris flavilinea (Costa)	local	On maples and sycamores	19.vi, 22.vi.2020 (M, G, P)
Deraeocoris ruber (Lin.)	common	On stinging nettles and various other plants	22.vi.2020 (G)
Deraeocoris lutescens	common	On various low plants and trees	22.vi, 10.ix.2020 (G, P)
Dryophilocoris flavoquadrimaculatus	common	On oaks	27.v.2020 (G, P)
Heterotoma planicornis (Fab.)	common	On stinging nettles	19.vi, 22.vi.2020 (M, G)
Leptopterna dolobrata (Lin.)	common	Grassy places	19.vi, 22.vi.2020 (M, G, P)
Notostira elongata (Geoff.)	common	Grassy places	14.ix.2020 (G)
Orthops campestris (L.)	common	On umbellifers and other plants	30.vi.2020 (M)
Phytocoris varipes Boh.	common	Grassy places	10.ix.2020 (M)
Pithanus maerkeli (H.-S.)	common	Grassy places	19.vi.2020 (M)

Nabidae, Damsel bugs			
Nabis flavomarginatus Sch.	common	Rough grassland, damp areas	19.vi.2020 (M)
Nabis rugosus (Lin.)	common	Grassy areas, bare ground, predatory.	19.vi, 10.ix.2020 (M)
Pentatomidae, Shield bugs			
Aelia acuminata (Lin.)	local	Various grassy habitats	27.v, 19.vi, 22.vi, 10.ix, 14.ix.2020 (G, M)
Dolycoris baccarum (Lin.)	local	Woodland edges and hedges, on variety of plants	27.v, 19.vi, 22.vi, 30.vi, 10.ix, 14.ix.2020 (G, M)
Eurydema oleracaea (Lin.)	common	On wild and garden brassicas and other crucifers	19.vi, 30.vi.2020 (M)
Neottiglossa pusilla (Gmel.)	v.local	Grassy places	22.vi.2020 (G)
Palomena prasina (Lin.)	common	On a variety of plants	22.vi, 10.ix, 14.ix.2020 (G, P, M)
Pentatoma rufipes Lin.	common	On a variety of trees, mainly oak	27.v, 22.vi.2020 (P, G)
Rhopalidae, Leaf bugs			
Myrmus miriformis (Fall.)	local	Grassy places, chalk, sand and marshes	19.vi, 10.ix.2020 (M)
Stictopleurus abutilon (Rossi)	v. local	Open, sunny localities	30.vi.2020 (M)
Stictopleurus punctatonervosus	v. local	Open, sunny localities	27.v, 19.vi, 22.vi, 10.ix.2020 (M, G)
Scutelleridae, tortoise bugs			
Eurygaster testudinaria (Geoff.)	local	Grassy and marshy places	27.v, 19.vi.2020 (M)
Tingidae, Lace bugs			

Catoplatus fabricii	Nb	On ox-eye daisy	27.v.2020 (P)
HYMENOPTERA, Bees, wasps, etc			
Andrenidae, solitary bees			
Andrena bimaculata (Kirby)	Local	Various habitats	27.v.2020 (M)
Anthophoridae, solitary bees			
Nomada flavoguttata Kirby	common	Cleptoparasite of Andrena species	22.v.2020 (G)
Apidae, bees			
Bombus lapidarius (Lin.)	common	Wide variety of habitats	19.vi, 10.ix.2020 (M)
Bombus pascuorum (Scop.)	common	Wide variety of habitats	10.ix.2020 (M)
Bombus terrestris L.	common	Wide variety of habitats	19.vi.2020 (M)
Bethylidae, aculeate wasps			
Bethylus cephalotes (Forster)	local	Parasitoid of moth caterpillars	22.vi, 14.ix.2020 (G)
Bethylus fuscicornis (Jurine)	Local	Parasitoid of moth caterpillars	19.vi.2020 (M)
Chrysididae, rubytails			
Omalus auratus (Lin.)	common	Woods, gardens, parks, parasitoid of solitary wasps in dead stems	22.v.2020 (G)

Colletidae, solitary bees			
Hylaeus cornutus Curt.	Na	Woodland edges, chalky and sandy places	27.v, 22.vi.2020 (M, G)
Cynipidae, gall wasps			
Andricus kollari	common	Makes marble galls on oak twigs	10.ix.2020 (M)
Diplolepis rosae (L.)	common	Robin pin cushion or bedeguar galls on wild roses	19.vi, 10.ix.2020 (M)
Neuroterus numismalis (Geoff.)	common	silk button galls on oak leaves	14.ix.2020 (P)
Neuroterus quercusbaccarum (Sch.)	common	spangle galls on oak leaves	14.ix.2020 (P)
Eumenidae, Potter wasps			
Ancistrocerus parietum (Lin.)	common	Builds mud nest in cavities in walls, tree trunks, rocks etc	19.vi, 22.vi.2020 (M, G)
Formicidae, Ants			
Formica fusca Lin.	common	England and Wales, widespread	19.vi, 22.vi.2020 (M, G)
Lasius brunneus (Latr.)	Na	Central England, Severn Valley, local, spreading	22.vi.2020 (G)
Lasius niger Lin.	common	Ubiquitous	22.vi.2020 (P)
Myrmica rubra (Lin.)	common	Various habitats, nests under stones, logs, etc.	27.v.2020 (G, M)
Ichneumonidae, ichneumon wasp			
Amblyteles armatorius (Fab.)	common	Parasitoid of moth caterpillars	22.vi.2020 (G)
Melittidae, solitary bees			

Lasioglossum morio (F.)	common	Various localities, on flowers	19.vi.2020 (M)
Lasioglossum fum (Schenck)	local	sandy of dry soils, flowery places	19.vi.2020 (M)
Sphecidae, Solitary wasps			
Pemphredon inornata (Say)	common	Nests in hollow stems.	27.v.2020 (M)
Tenthredinidae, Sawflies			
Rhogogaster viridis (L.)	common	Larvae on alder	27.v.2020 (P)
Vespidae, social wasps			
Vespa crabro L.	local	Hornet. Woodlands and parks	10.ix.2020 (M)
LEPIDOPTERA, Butterflies & moths			
Erebidae, tiger moths, etc			
Tyria jacobaeae (Lin.)	common	Cinnabar moth, caterpillars on ragwort	27.v, 19.vi, 22.vi.2020 (G, M)
Hesperidae, skippers			
Ochlodes venata (L.)	common	Large skipper, grassy places	27.v, 19.vi, 22.vi.2020 (G, M)
Thymelictus lineola (Ochs.)	common	Essex skipper, grassy places, larvae on grasses	19.vi.2020 (M)
Thymelictus sylvestris (Poda)	common	Small skipper. Grassy places, larvae on various grasses	19.vi, 22.vi.2020 (M, G)
Lycaenidae, Blues			

Lycaena phlaeas (L.)	common	Small copper, larvae on trefoils and medics	14.ix.2020 (G)
Polyommatus icarus Rott.	common	Common blue. Grassy places, larvae of trefoils, clovers and medicks.	14.ix.2020 (G)
Lymantridae, tussock moths			
Orygia antiqua (Lin.)	common	Vapourer, larvae on wide variety of plants	27.v.2020 (M)
Noctuidae, moths			
Acronicta rumicis	common	Knotgrass moth, larvae on various food plants	22.vi.2020 (G)
Notodontidae, prominent moths			
Cerura vinula	common	Puss moth, on willows and poplars. Cocoon.	30.vi.2020 (M)
Nymphalidae, Brush-footed butterflies			
Aglais urticae (Lin.)	common	Small tortoiseshell. Larvae on stinging nettles.	22.vi.2020 (G)
Aphantopus hyperanthus (L.)	local	Ringlet, woods and woodland edges	30.vi.2020 (M)
Coenonympha pamphilus (L.)	local	Small heath, larvae on grasses	27.v, 19.vi, 22.vi, 10.ix, 14.ix.2020 (G, M)
Inachis io (Lin.)	common	Peacock, larvae on stinging nettles	27.v, 22.vi.2020 (M, G)
Maniola jurtina (Lin.)	common	Meadow brown. Grassy places, on various grasses.	19.vi, 22.vi, 30.vi, 10.ix.2020 (M, G)
Melanargia galathea (Lin.)	Local	Marbled white. Chalk and limestone downs	19.vi.2020 (M)
Pararge aegeria (Lin.)	common	Speckled wood. Woodland edges and rides, larvae on grasses	27.v, 22.vi, 14.ix.2020 (G, P)

Polygonia c-album (Lin.)	common	Comma, larvae on stinging nettles	27.v, 22.vi.2020 (M, G, P)
Pyronia tithonus (L.)	common	Gatekeeper, hedges and grassy places	22.vi.2020 (G)
Vanessa atalanta (Lin.)	common	Red admiral. Larvae on stinging nettles. Migrant.	19.vi.2020 (M)
Pieridae, cabbage whites			
Pieris brassicae (Lin.)	common	Large white, on brassicas, wild and garden species	22.vi, 14.ix.2020 (P)
Pieris napi (Lin.)	common	Green-veined white, on brassicas	10.ix.2020 (M)
Tortricidae, micromoths			
Tortrix viridana (L.)	common	Green tortrix, on oak, larvae can defoliate trees	27.v.2020 (P)
Zygaenidae, burnets			
Zygaena filipendulae (L.)	common	6-spot burnet, dry grassy places	22.vi.2020 (G)
DICTYOPTERA, Cockroaches			
Blattellidae, Cockroaches			
Ectobius lapponicus (L.)	Nb	Southern, heathland, sand or chalk soils	27.v.2020 (M)
ODONATA, Dragonflies			
Aeshnidae, hawkers			

Aeshna juncea (L.)	common	Ponds, streams, rivers, lakes	10.ix.2020 (M)
Anax imperator Leach	local	Ponds, lakes and canals	27.v, 19.vi.2020 (G, M)
Calopteryx splendens (Har.)	common	Slow-moving streams and ditches	27.v, 22.vi.2020 (M, G)
Cordulegastridae, hawkers			
Cordulegaster boltoni (Don.)	local	Heaths and moors, mostly western in UK	10.ix.2020 (M)
Coenagrionidae, Damselflies			
Enallagma cyanthigerum (Ch.)	common	Ponds, streams and lakes.	19.vi, 22.vi.2020 (M, G)
Libellulidae, darters			
Libellula depressea (Lin.)	common	Lakes and ponds	27.v.2020 (M)
Sympetrum striolatum (Charp.)	common	Ponds, lakes and streams	27.v, 10.ix.2020 (M)
ORTHOPTERA, Grasshoppers			
Acrididae, grasshoppers			
Chorthippus brunneus (Thunb.)	common	Wide variety of grassy habitats.	10.ix.2020 (M)
Chorthippus parallelus (Zett.)	common	Wide variety of grassy habitats.	19.vi, 22.vi, 30.vi, 10.ix.2020 (M, G)
Conocephalidae, coneheads			
Conocephalus fuscus (Fab.) = discolor (Thunb.)	Local	Grassy places, spreading recently	19.vi, 10.ix.2020 (M)

Tettigoniidae, bush crickets			
Leptophyes punctatissima (Bos.)	common	Various habitats, woodlands and gardens	19.vi, 22.vi.2020 (M, G)
Meconema thalassinum Deg.	common	On trees and shrubs	22.vi.2020 (G)
Metrioptera roeselii (Hag.)	local	Dry grassy places, Essex, Kent, London spreading west	27.v, 19.vi.2020 (M)
ARANAEA, Spiders			
Araneidae, orb-web spiders			
Agalenatea redii (Scop.)	local	Fields and meadows	10.ix.2020 (M)
Pisauridae, nursery web spiders			
Pisaura mirabilis (Clerck)	common	Wide variety of habitats	22.vi, 10.ix.2020 (G)
Thomiscidae, crab spiders			
Misumena vatia (Cl.)	local	Southern England, on flowers	19.vi.2020 (M)
OPILIONES, Harvestmen			
Leiobunidae, harvestmen			
Dicranopalpus ramosus (Sim.)	local	On trees	14.ix.2020 (G)

ISOPODA, Woodlice and hoglice			
Armadillidiidae, pill woodlice			
Armadillidium vulgare (Latr.)	common	Under logs and stones etc, mainly dry places	27.v, 19.vi, 30.vi.2020 (G, M)
Philosciidae, striped woodlice			
Philoscia muscorum (Scop.)	common	Under logs, stones, leaf litter etc	27.v, 22.vi, 30.vi.2020 (G, M)
Porcellionidae, Rough woodlice			
Porcellio scaber (Latr.)	vc	Under logs, stones, leaf litter etc	27.v, 22.vi.2020 (G)
MOLLUSCA, Slugs and snails			
Helicidae, snails			
Cornu aspersum (formerly Helix aspersa)	common	Gardens, parks, fields and woods	14.ix.2020 (G)
Monacha cantiana	common	Various roughly vegetated habitats	22.vi.2020 (G)

Annex 6

Aquatic Ecology Survey

Gatwick Airport Northern Runway Project –

Aquatic Ecology Surveys Report

RPS Group PLC

Report prepared by:
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Ecus Ltd

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Contents

SUMMARY AND KEY RECOMMENDATIONS 1

SUMMARY 1
CONCLUSIONS 2
KEY RECOMMENDATIONS 2

1. INTRODUCTION 4

1.1 DEVELOPMENT BACKGROUND 4
1.2 THE OBJECTIVES 4
1.3 BACKGROUND TO THE WATERCOURSES 4

2. METHODOLOGY 5

2.1 AQUATICS DESK STUDY 5
2.2 SURVEY: AQUATIC MACROINVERTEBRATES 5
2.3 AQUATIC MACROINVERTEBRATE DATA ANALYSIS 6
2.4 SURVEY: FISH 7
2.5 LIMITATIONS 8

3. RESULTS 9

3.1 AQUATICS DESK STUDY 9
3.2 FIELD DATA 12

4. DISCUSSION 18

4.1 RIVER MOLE 18
4.2 GATWICK STREAM 19

5. CONCLUSIONS AND RECOMMENDATIONS 21

5.1 CONCLUSIONS 21
5.2 RECOMMENDATIONS 21
5.3 FURTHER SURVEY 22

6. REFERENCES 23

APPENDIX 1: AQUATICS TEAM REPORT WITH FIGURES 24

Summary and Key Recommendations

Summary

ECUS Ltd was commissioned by RPS Group Plc in May 2020 to undertake fish and aquatic invertebrate surveys of two water courses adjoining Gatwick Airport as part of the surface water management and flood alleviation for the Northern Runway Project development. This will affect the two sites close to Gatwick Airport, one on the River Mole and the other on the Gatwick Stream (Gatwick Brook). The River Mole may be re-meandered and land close to the river may be re-profiled to increase flood storage. The Gatwick Stream has already had surrounding land re-profiled for flood storage in recent years, however this area may be expanded to encompass both sides of the river. The aquatics team at Thomson Environmental were commissioned to assist ECUS in undertaking aquatic macroinvertebrate and fish baseline surveys and a targeted aquatics desk study, to inform this report and the proposals.

The study area encompasses two watercourses; a 1.3km stretch of the River Mole immediately downstream of where it emerges from under the runway at Gatwick Airport and a 750m stretch of the Gatwick Stream (a tributary of the River Mole) upstream of the Crawley sewage works. A 100m survey section was identified on each watercourse from an initial walkover survey conducted in June 2020. Three survey visits during 2020 were undertaken for aquatic macroinvertebrates (spring, summer and autumn) and two for fish (spring and autumn). The spring survey visit was delayed until early July due to restrictions related to the Covid 19 outbreak. Desk study data was obtained from the Sussex Biological Records Centre and the Environment Agency on behalf of Ecus.

The desk study returned one record from 2013 of the shining ram's-horn snail *Segmentina nitida* within the study section on the River Mole (TQ 25623 40908). The species is nationally scarce, a UK Priority Species under the UK Post 2010 Biodiversity Framework and listed on the Sussex Rare Species Inventory. It was not recorded during the surveys for this study, although the survey section did not coincide with the reach in which the snail was recorded. The desk study returned records of two fish species for the River Mole; bullhead *Cottus gobio* and brown trout *Salmo trutta subsp. fario*.

River Mole - A mean of 19.3 macroinvertebrate taxa were recorded at the River Mole site across the three survey visits. Biotic indices measuring water quality (Biological Monitoring Working Party (BMWP) score and Average Score per Taxon) indicate moderately polluted conditions in the River Mole. Lotic invertebrate Index for Flow Evaluation (LIFE) scores suggest that the aquatic macroinvertebrate community is characteristic of sluggish flow conditions and low Proportion of Sediment intolerant Invertebrates (PSI) scores indicate heavily sedimented conditions.

A total of 415 fish were caught on the River Mole in spring after three survey 'runs' compared with only 28 fish caught in autumn with the same level of effort. Roach *Rutilus rutilus* were the most abundant fish species identified (252) in spring and in autumn (13). The study stretch on the River Mole lies within open floodplain grassland with no shading which means that water temperature, and therefore dissolved oxygen (DO), fluctuated considerably. Extensive stands of submerged and emergent macrophyte plants occur through the study section and their decomposition are likely to be contributing to low DO in the autumn. These dissolved oxygen conditions coupled with organic pollution from within the catchment is considered to be influencing the composition and abundance of both the macroinvertebrate and fish community. Predatory fish such as pike *Esox lucius* are able to exploit the dense macrophyte stands and are further reducing populations of cyprinid fish.

Gatwick Stream - Environment Agency data from 3 sites on the Gatwick Stream indicate that the study section is of moderate to poor water quality, with sluggish flow and sedimented condition. Fewer macroinvertebrate taxa were recorded at the two Gatwick Stream sites compared with River Mole (mean of 10 taxa per visit). BMWP and ASPT scores indicate moderate water quality conditions at the upstream and poor to very poor at the downstream site. A high LIFE score for the upstream site during the spring visit suggests that velocities are high in the early part of the season and decline through the summer and

autumn. PSI scores for the upstream site fluctuated considerably across the three season, from only slightly sedimented conditions in spring to sedimented condition in autumn.

A total of 300 and 317 fish were caught in spring and autumn respectively at the Gatwick Stream site after three survey ‘runs’. Chub *Squalis cephalus* was the most abundant species in the spring survey and dace *Leucisus leucisus* in the autumn. Shading of the channel by overhanging trees meant that both water temperature and dissolved oxygen remained high throughout the three seasons.

Conclusions

Both watercourses supported macroinvertebrate communities indicative of moderately polluted conditions, exacerbated by relatively low flow conditions and high levels of sedimentation. Dense macrophyte growth on the River Mole is contributing to acute reductions in dissolved oxygen which are impacting on the macroinvertebrate assemblage.

The presence of one record from 2013 of shining ram’s-horn snail, an IUCN Red List species and UK species of principal importance under the 2006 NERC Act has implications for the design of the River Mole scheme. Although not recorded during the survey, there remains a possibility that the species may occur at the site of the 2013 record at the downstream end of the desk study area. A targeted survey is required to determine its potential presence.

The Gatwick Stream appears to be impacted by both organic pollution and silt deposition, possibly from a storm water discharge outlet from a nearby industrial area. Consistently high populations of fish caught in spring and in autumn are likely to be a consequence of stable temperature and DO conditions caused by shading and potentially high abundances of pollution tolerant macroinvertebrates such as *Oligochaete* worms as a food source.

Key Recommendations

The main recommendations are set out below:

River Mole

- Undertake survey to establish presence/absence of shining ramshorn snail. Survey to focus initially on the site of the 2013 record and if found to be present, extended to incorporate the whole study section. Surveys should be scoped and undertaken by a specialist mollusc ecologist.
- If shining ramshorn snail found to be absent from main channel, undertake vegetation removal/dredging from the central channel/thalweg of the River Mole in selected sections. Marginal berms should be retained on alternate sides of the channel throughout the dredged section for the re-establishment of emergent vegetation. Brushwood faggots or fascines anchored with wooden stakes can be used to maintain the riverward edge of the berm and prevent silt from slumping into the main channel.
- Off-line scrapes and shallow pond could be created within the floodplain grassland area to provide habitat for wetland birds. If shining ramshorn snail is found to be present this recommendation can be adapted to incorporate new, permanently wet ditches supporting dense emergent reed vegetation.
- If shining ramshorn snail is found to be absent it is advised that some level of routine maintenance of macrophyte and bankside vegetation is undertaken annually under an appropriate management plan.
- Before any in-channel works begin it is advised that a fish rescue and exclusion or translocation is undertaken to safeguard fish populations.
- Stop nets should be installed at either end of the site proposed for in-channel works to prevent access by any fish species whilst the works are on-going.

Gatwick Stream (Brook)

- Identify point sources of pollution from industrial area associated with Crawley STW, including storm drains and surface water discharges points from roads and urban areas.
- Consider a Sustainable Drainage System (SuDS) scheme to address these discharges, including settlement ponds and reedbed treatment systems which would have additional biodiversity benefit.

Before any in-channel works begin on either watercourse it is advised that a fish rescue survey is undertaken to safeguard fish populations in the affected area. It will also be necessary to install stop nets at either end of the reach where in-channel works will be undertaken to prevent access by any other fish species whilst the works are ongoing.

Hydrometric surveys should be undertaken at various points along both rivers to better understand present hydrological conditions and inform plans to modify the channels.

1. Introduction

1.1 Development Background

1.1.1 Two watercourses, the River Mole and Gatwick Stream (Brook), will be directly affected by proposals for a surface water management and flood alleviation scheme to the east and west of Gatwick Airport. The scheme may include proposals to re-meander the River Mole close to where it emerges from beneath the airport runway and create new flood attenuation areas to the west of the watercourse. New flood storage has already been created to the west of the Gatwick Stream, with further areas likely planned within the floodplain to the east of the watercourse.

1.1.2 The study area encompasses two watercourses; a 1.3 km stretch of the River Mole immediately downstream of where it emerges from under the runway at Gatwick Airport and a 750 m stretch of the Gatwick Stream (a tributary of the River Mole) upstream of the Crawley sewage works.

1.2 The Objectives

1.2.1 RPS commissioned ECUS in May 2020 to undertake fish and aquatic macroinvertebrate surveys of the two rivers within the proposed study area. The objectives were to:

- Determine baseline populations for both fish and aquatic macroinvertebrates in these two watercourses over the course of a year (2020).
- Carry out a targeted desk study for the surrounding areas of both sites including a 1 km perimeter.
- Provide a report on the surveys giving the methods and results of the surveys, with recommendations, including opportunities for enhancement, mitigation and further survey recommendations.

1.3 Background to the Watercourses

1.3.1 The River Mole rises in Baldhorns Copse in West Sussex and discharges into the River Thames at the town of Molesey in Surrey. The Mole catchment flows over the Wealden and London clays, however, between Dorking and Leatherhead, the river cuts its way through the North Downs chalk. In this area part of the river water disappears through holes in the underlying chalk feeding into the groundwater aquifers before flowing back into the river near to Leatherhead. This action has been suggested as the origin to the name of this river, but is more likely attributed to the fact it meets the Thames at Molesey.

1.3.2 Approximately 7 miles downstream of the source, the River Mole reaches the boundary of Gatwick Airport where is passes beneath the runway in a culvert. The reach that will be affected by the proposed flood alleviation scheme extends 1.3 km downstream from where the river emerges from beneath the airport runway (see Figure 1a, in **Appendix 1**). The survey stretch on the Gatwick Stream surveyed (TQ 291 398) lies upstream of the Crawley sewage works (see Figure 1b, in **Appendix 1**).

2. Methodology

2.1 Aquatics Desk Study

2.1.1 A study area was defined as an area that encompassed the site and all land within 1 km of the perimeter of each of the sites, (see Figures 2a and 2b, in **Appendix 1**). Records of designated sites and protected and/or otherwise notable species were then sought for both study areas.

2.1.2 Sources of information were as state in Error! Reference source not found..

Table 3-1: Sources of data

Data Type	Source
Statutory sites for nature conservation related to the river environment	Multi-Agency Geographical Information for the Countryside (MAGIC) (https://magic.defra.gov.uk/magicmap.aspx)
Non-statutory sites for nature conservation, protected and notable species and invasive and non-native species (fish and macroinvertebrates only)	Sussex Biodiversity Records Centre
Background information on Water Framework Directive status Aquatic macroinvertebrate, fish and invasive and non-native species data	https://environment.data.gov.uk/catchment-planning Environment Agency data request (EA Analysis and Reporting)

2.1.3 A request for information was sent to the Sussex Biological Records Centre in October 2020. The boundaries of any designated site and records of species were sought for part of the study area encompassing the site and within 1 km of the perimeter of each of the sites.

2.1.4 The records included in this report are those relating to fish and macroinvertebrates. Records over 10 years old have been excluded.

2.2 Survey: Aquatic Macroinvertebrates

2.2.1 A representative 100m section on each watercourse was identified from a walkover survey conducted prior to the spring sampling visit. Two sampling locations were identified on the Gatwick Stream, one at the upstream and one at the downstream end of the 100 m section (Figure 1a and 1b, **Appendix 1**). Only one sampling at the upstream end of the reach was safely accessible on the River Mole.

2.2.2 Samples were collected at each of the sites using the Whalley Hawkes Paisley Trigg (WHPT) method comprising of a standard three-minute kick sample using a long-handled pond net with 1 mm mesh size, which was supplemented by a one-minute hand search (Environment Agency, 2017). Sampling of habitats within the three-minute kick/sweep sampling were in proportion to their occurrence. Samples were then preserved in industrial methylated spirits (IMS) for processing in the laboratory to the requirements outlined in EA Operational Instruction 024_08 Freshwater macroinvertebrate analysis of riverine samples (Environment Agency, 2014).

2.2.3 Macroinvertebrates were identified to Mixed Taxon Level 5, to enable evaluation of the macroinvertebrate community and calculation of the relevant biotic indices including Biological Monitoring Working Party (BMWP), Average Score Per Taxon (ASPT) and Lotic-Invertebrate index for Flow Evaluation (LIFE). Proportion of Sediment-sensitive Invertebrates (PSI) and Community Conservation Index (CCI).

2.2.4 Aquatic Macroinvertebrate sampling was undertaken in spring, summer and autumn on the dates presented in **Table 3-2**.

Table 3-2: Aquatic Macroinvertebrate survey dates.

Aquatic Macroinvertebrate survey visit	Date
Spring	04/06/2020
Summer	29/07/2020
Autumn	29/09/2020

2.3 Aquatic Macroinvertebrate Data Analysis

2.3.1 The macroinvertebrate abundance data collected during the field surveys and background data from the Environment Agency has been analysed using a range of biotic indices. Each of the indices used in the analyses are summarised below.

Biological Monitoring Working Party (BMWP) Score

2.3.2 The BMWP score is a method for indexing river water quality in England and Wales using macroinvertebrate families. Originally published in the early 1980's, the system was updated in 2013 based on a more robust baseline data set (Paisley *et al*, 2013). A score of between 1 and 10 is assigned to families found within a sample based on their tolerance to organic pollution, with a score of 1 indicating high tolerance, and 10 indicating low tolerance. Low scoring families include worms (*Oligochaeta*) and midge larvae (*Chironimidae*), whilst the presence of mayfly (*Ephemeroptera*) and stonefly (*Plecoptera*) larvae is indicative of clean water conditions. The scores for each family recorded in the sample are summed to give the overall BMWP site score. Since the overall site score is influenced by the number of families as well as the scores of the individual families in the sample, an average is taken by dividing the overall BMWP score by the number of families/taxa in the sample. This is termed the Average Score per Taxon (ASPT).

2.3.3 **Table 3-3** provides an interpretation of the BMWP scoring system.

Table 3-3: BMWP scoring system

BMWP score	Category	Interpretation
0 – 10	Very poor	Heavily polluted
11 – 40	Poor	Polluted or impacted
41 – 70	Moderate	Moderately impacted
71 – 100	Good	Clean but slightly impacted
> 100	Very good	Unpolluted, un-impacted

River Invertebrate Classification Tool (RICT)

2.3.4 BMWP and ASPT has largely be superseded by the River Invertebrate Classification Tool (RICT), which is one of the parameters used for classifying rivers according to their ecological status under the Water Framework Directive (WFD). The scores derived for an individual site under RICT are compared with those expected under unpolluted conditions (known as reference conditions) in order to give an Environmental Quality Ratio (EQR). This aims to take account of the variability of macroinvertebrate families in rivers resulting from environmental parameter such as altitude, underlying geology and proximity to the river source.

Lotic invertebrate Index for Flow Evaluation (LIFE) Score

2.3.5 The LIFE score system links flow conditions in rivers, and specifically flow velocity, with commonly identified macroinvertebrate species and families (Extence *et al.*, 1999). Macroinvertebrates are assigned to one of 6 groups depending on their tolerance to low flow conditions. The groups range from 'I' comprising taxa associated with rapid flow conditions (>100 cm s^{-1}) to 'VI' including those associated with drying or drought impacted sites. A flow score is obtained for each species/taxon by combining the flow category with an estimated abundance score as described by Extence *et al.* (1999). The LIFE score for a sample is obtained by summing the individual flow scores for each taxon by the number of taxa in the sample. LIFE scores range from 1 to 12, with scores of 8 or above indicating moderate to high flow conditions, and scores of 7 or below indicating sluggish conditions.

Proportion of Sediment sensitive Invertebrates (PSI)

2.3.6 The PSI index provides an indication of the extent to which watercourses have been impacted by the deposition of fine sediment (Extence *et al.*, 2017). Following the same principle as the LIFE score system, invertebrates are assigned to one of four groups depending on their sensitivity to fine sediment, with Group A comprising highly sensitive taxa, and Group D those that are highly insensitive. The method also requires a log abundance category to be estimated for all taxa identified in a sample (1–9, 10–99, 100–999 and 1000+ individuals present). Scores range from 80 -100 for un-sedimented sites down to 0-20 for highly sedimented sites (**Table 3-4**).

Table 3-4: Interpretation of PSI scores

PSI score	Riverbed condition
81 – 100	Minimally sedimented/un-sedimented
61 – 80	Slightly sedimented
41 – 60	Moderately sedimented
21 – 40	Sedimented
0 – 20	Heavily sedimented

Community Conservation Index (CCI)

2.3.7 The CCI combines the rarity of constituent species in a sample with the diversity of the community, or community richness, to give a single integrated score which can be used as the basis for site evaluating (Chadd & Extence, 2004). Species identified from a survey site or area are given a Conservation Score (CS), based on standard rarity categories, with Red Data Book 1 (Endangered) species scoring 10, and very common species scoring 1. The sum of each of the conservation scores in the sample is then divided by the number of contributing species to give the overall CCI score.

2.4 Survey: Fish

2.4.1 The surveys were undertaken using the catch depletion method in order to assess species composition, age structure and to estimate population size. Surveys were undertaken by an accredited electric fishing team comprising three members of staff. Surveys and analysis conformed to the relevant guidance outlined in BS EN 14011:2003 Water Quality: Sampling of Fish with Electricity (British Standards, 2003). An FR2 consent (application to use fishing instruments other than rod and line) was sought from the Environment Agency prior to conducting the survey.

2.4.2 The survey was undertaken over a 100 m reach and there was one survey reach per watercourses, coinciding with the macroinvertebrate survey locations on both watercourses. Stop nets were installed across the channel at either end of the reach to prevent fish entering or leaving the survey area. Holding containers for captured fish were established in a small boat with an aerator installed to provide oxygen to captured fish.

2.4.3 The survey was undertaken using an electrofishing box alternating between a single anode and two anodes depending on the width of the river in order to maximise catch efficiency. One surveyor, operating the electrofishing anode waded from downstream to upstream and a second surveyor netted any stunned fish. In areas where the rivers was wider the second surveyor also operated an anode. The operatives were followed by an additional surveyor pulling a small boat with the electrofishing box and holding tank on board, and also equipped with a hand net to maximise the catch rate. At the end of each run all caught fish were identified, measured and placed in a submerged holding net to facilitate their recovery and prevent re-capture.

2.4.4 Two survey visits were undertaken, one in spring (04/06/2020) and one in autumn (29/09/2020) to establish a baseline of the species composition on the two watercourses. Undertaking the autumn visit in September ensured that air temperatures are above the minimum of 10 °C and minimise the risk of high flow conditions. It would also avoid risk of disturbance to salmonid spawning habitat, should it be present.

2.5 Limitations

2.5.1 Only one macroinvertebrate sample could be retrieved from the downstream River Mole site, due to various access issues, such as dense bankside vegetation creating a barrier to the river and steep banks, which prevented safe access and egress to the river.

2.5.2 The River Mole has exceptionally high coverage of aquatic plants, which made electrofishing difficult. In spring the filamentous algae blanket weed *Cladophera agg* was found in dense clumps making progress slow, as the anode became blanketed by the filamentous algae each time it was placed in to the water and needed regular clearing in order to progress. In addition to this, the macroinvertebrate surveys were difficult due to the dense macrophyte growth and deep waters preventing more than one macroinvertebrate sample being taken using the WHPT method.

2.5.3 The timing of the spring survey was delayed by a nationwide lockdown related to the COVID-19 outbreak.

3. Results

3.1 Aquatics Desk Study

River Mole

Environment Agency: Water Framework Directive Status

3.1.1 Under the Water Framework Directive (WFD) rivers and standing waters are termed waterbodies and are classified according to their ecological status. Ecological status is classified using five categories of high, good, moderate, poor and bad and is measured and classified via a range of inter-linked biological, physico-chemical and physical (morphological) parameters. The classification process is based primarily on the biological quality elements of the water body but considered alongside support elements covering physico-chemical standards and hydromorphological quality elements. Each of these supporting elements is assigned to a status category (i.e. high to bad). The overall status of the waterbody is based on the status category of the worst supporting element.

3.1.2 The affected reach of the River Mole falls within the WFD waterbody named 'Mole Upstream of Horley (GB106039017481)'. There is little information relating to the stretch of the River Mole. It was first classified as good under the WFD classification system in 2015, although the most recent classification in 2019 designates it as moderate. Although the biological quality elements are classified as good (based on fish data only), one of the physico-chemical quality elements (phosphorous) is classified at moderate status, and therefore the overall waterbody status is classed as moderate.

3.1.3 No Environment Agency background records were received for the River Mole.

Sussex Biological Records Centre Data

3.1.4 A total of 3 records of fish species were returned from the Sussex Biological Records Centre for the River Mole within 1 km of the study section, comprising one record of bullhead approximately 0.5 km downstream from the study section in 2014, and a record of 2 adult brown trout within the survey section in 2016. Bullhead is listed as a non-priority species under Annexe 2 of the EU Habitats Directive and listed on the Sussex Rare Species Inventory. Brown trout is a UK Priority Species under the UK Post 2010 Biodiversity Framework, and Section 41 of the Natural Environment and Rural Communities Act 2006.

3.1.5 There is one record of the shining ram's-horn snail within the study section (TQ 25623 40908; Figure 3, **Appendix 1**) from February 2013. The species was recorded as being 'u/s Pond M and Tributary. The shining ram's-horn snail is nationally scarce, a UK Priority Species under the UK Post 2010 Biodiversity Framework and listed on the Sussex Rare Species Inventory.

3.1.6 One notable dragonfly species, common darter *Sympetrum striolatum* was recorded within 1 km of the site. The species is listed in the UK Red Data Book. A total of 44 observations were made of the species in the vicinity of the Gatwick airport, with a number of them within the study section. There are no records of the larvae in the River Mole, either from the Sussex Biological Records Centre or the Environment Agency and therefore breeding sites are unclear.

3.1.7 A number of invasive and non-native invertebrate and aquatic plant species occur within 1 km of the River Mole study section. Three records of signal crayfish *Pacifastacus leniusculus* were returned from within 1 km of the study section between 2011 and 2013. Two of the sites were on the River Mole within the study section and the third north of the Gatwick runway within a tributary of the River Mole. Signal crayfish is listed on Schedule 9 of the Wildlife and Countryside Act. Under Section 14 of the Act it is an offence 'to release or allow to escape into the wild' any species listed under Schedule 9'.

3.1.8 Records of several invasive aquatic/ riparian plant species were also recorded within 1 km of the site including Nuttall's pond-weed *Elodea nuttallii*, Japanese knotweed *Fallopia japonica* and Himalayan balsam *Impatiens glandulifera*.

Gatwick Stream

Environment Agency: Water Framework Directive Status

3.1.9 The Gatwick Stream is a tributary of the River Mole and is approximately 12km in length. It, rises near Three Bridges and joins the River Mole near the centre of Horley. It falls within the Tilgate Stream and Gatwick Stream at Crawley WFD waterbody (GB106039017500). The overall waterbody status has remained moderate since 2013, although the biological quality elements are assigned bad status on the basis of fish data. This is a deterioration from poor status in 2016. Macroinvertebrates were classified at poor status in 2019 and have remained at that classification since 2013. Sewage discharges and the invasive signal crayfish are given by the Environment Agency as the reasons for poor biological quality in the brook.

Environment Agency: Macroinvertebrate Data

3.1.10 Macroinvertebrate data was received from the Environment Agency for 3 sites on the Gatwick Stream that lie within the study area (U/S Crawley STW (TQ 29160 39780); Downstream Tinsley Bridge (Flylife site) (TQ 29129 39864) and at Tinsley Bridge, Tinsley Green (TQ 29150 39800)). One sample was collected at U/S Crawley STW in October 2017, and duplicate samples were collected at Downstream Tinsley Bridge (Flylife site) and at Tinsley Bridge, Tinsley Green) in March 2019 (Figure 1b, **Appendix 1**). The Environment Agency have provided feedback that the 2019 samples were taken in response to a pollution incident and that the duplicate sample from both sites with lower number of taxa recorded was sorted on the bank. In comparing the data with this study only the laboratory sorted sample has been considered, although the results for both samples are presented in **Table 4-1**.

3.1.11 A total of 13 families were recorded during the survey at the U/S Crawley STW site in October 2017. The freshwater shrimp *Gammarus pulex*, a species indicative of moderate water quality, was the most numerous. However, the site also supported relatively high numbers of *Oligochaete* worms, a family highly tolerant of low oxygen conditions. BMWP and ASPT scores have been calculated since none were provided by the Environment Agency (**Table 4-1**). This site had a BMWP score of 43 with an ASPT of 4.3 indicating moderate to poor water quality.

3.1.12 Of the two duplicate samples taken at the Downstream Tinsley Bridge (Flylife site) (TQ 29129 39864) on 14th March 2019 a total of 22 families were recorded in one sample and 7 in the other. Midge larvae (*Chronomidae*) and *Oligochaete* worms were present in relatively high numbers in the second sample indicating poor water quality. Based on the second sample the site had a BMWP of 47 and ASPT of 3.92.

3.1.13 At the most upstream site at Tinsley Bridge (TQ 29150 39800) site a total of 8 families were recorded in one of the duplicate samples and 21 in the second. In general, the samples supported pollution tolerant families and species such as *Oligochaeta* (20 and 40 individuals respectively) and the water louse *Asellus aquaticus* (30 individuals in the second sample. However, the site also supported the damselfly larvae *Calopteryx* sp., a relatively pollution sensitive family. The second sample at this site had a BMWP of 48 and ASPT of 4.

Table 4-1: EA Macroinvertebrate Biotic Scores for Gatwick Stream

Site	U/S Crawley STW	Downstream Tinsley Bridge (Flylife Site)	Downstream Tinsley Bridge (Flylife Site)	At Tinsley Bridge, Tinsley Green	At Tinsley Bridge, Tinsley Green
Date	12/10/2107	14/03/2019	14/03/2019	14/03/2019	14/03/2019
BMWP (TL1)	43	15	47	20	48
ASPT	4.3	3.00	3.92	3.33	4
LIFE	7.5	7.0	7.11	7.00	7.00
PSI	40.00	28.57	36.00	36.36	32.14
CCI	1.00	N/A	1.00	N/A	1.00

3.1.14 LIFE scores for each of the 3 sites ranged from 7.0 to 7.5 indicating sluggish to moderate flow conditions. PSI scores for all three sites indicate sedimented conditions, although the U/S Crawley STW site is close to moderately sedimented with a score of 40. CCI scores of 1 indicate low conservation value.

Sussex Biological Records Centre Data

3.1.15 Records of two fish species, bullhead and brown trout were returned for Gatwick Stream, from the Sussex Biological Records Centre. One adult bullhead was recorded within the study section in October 2015 and a brown trout in a similar location in July 2016.

3.1.16 A total of 15 records of adult common darter dragonflies were returned for the study section on the Gatwick Stream between 2012 and 2017, although there are no records of the larvae. Six records of the downy emerald dragonfly *Cordulia aenea* and 2 of the brilliant emerald dragonfly *Somatochlora metallica* were returned from within the past 10 years. Downy emerald dragonfly is a Red List species on the IUCN Red List and a Priority Species on the UK Post 2010 Biodiversity Framework. The downy emerald dragonfly is listed on the Sussex Rare Species Inventory. None of the records were on the Gatwick Stream and there are no records of the larvae.

3.1.17 There were three records of the invasive signal crayfish from within the study section on the Gatwick Stream in 2017. The invasive aquatic plant, Nuttall's pond weed was recorded within the study section in 2016 and there are records of Japanese knotweed and Himalayan balsam.

Environment Agency: Fish data (River Mole and Gatwick Stream)

3.1.18 Data provided by the Environment Agency indicates that both the Gatwick Stream and River Mole were stocked in 2018 and 2019 with Roach, Barbel *Barbus barbus*, Dace and Chub. In 2018, 3200 fish were added to the lower Gatwick Stream in response to a pollution event which occurred in 2017.

3.1.19 In 2019, 3600 fish were stocked in the River Mole in response to a prolonged dry weather event in 2018, which occurred as a result of low flows and first flush effect, which was estimated to have affected approximately 2000 fish.

3.2 Field Data

River Mole

Water Quality

3.2.1 A maximum temperature of 17.6°C was recorded at the sampling site on the River Mole during the summer visit on 29th July 2020 (**Table 4-2**). The temperature was only slightly lower on the first visit (16.4°C on 1st July), which was delayed due to Covid 19 restrictions. Water temperature dropped to 13.8°C by the autumn visit on 29th September 2020. DO concentrations dropped sharply between the first and second visits, from 60.8% in early July to 17% on 29th July, before recovering slightly to 28.7% by end of September. Both conductivity and turbidity increased progressively through the season. Conductivity increased from 358.5 to 471µS/cm, whilst turbidity increased from 3.78 to 4.3NTU.

Table 4-2: Water Quality Data Recorded at River Mole Sampling Site

Season	Temperature (°C)	Dissolved oxygen (%)	Dissolved oxygen (mg/l)	pH	Conductivity (µS/cm)	Turbidity (NTU)
Spring	16.4	60.8	5.94	7.30	358.5	3.78
Summer	17.6	17.0	1.60	7.19	341.0	4.02
Autumn	13.8	28.2	3.03	8.38	471.0	4.30

Aquatic Macroinvertebrates

3.2.2 A mean of 19.3 taxa were recorded at the River Mole site across the three visits. There was relatively little variation in the number of taxa recorded on each visit, with the maximum of 21 in the spring/early summer sample, and a minimum of 17 in the summer sample (**Table 4-3**). Of these, 12 taxa/species occurred in all three samples, including the water shrimp, the pea mussel *Sphaereum corneum* and the mayfly larvae *Cloeon dipterum*. However, abundances of individual taxa within the samples varied considerably across the 3 visits, with the crustacean *Cladocera* the most abundant in the early summer samples 01/07/20, replaced by the water boatman, *Coroxidae* one month later. The most abundance taxa in the autumn samples was the Isopod *Asellus aquatica* (waterlouse). These changes in abundance are likely to be driven by seasonal changes in life stage from early to later (larger, and therefore more readily sampled) larval instars as well as the availability of food resources.

Table 4-3: Number of Macroinvertebrate Species/Taxa Recorded at River Mole and Gatwick Stream Sites

Site	Spring	Summer	Autumn
River Mole	21	17	20
Gatwick Stream upstream	12	10	13
Gatwick Stream downstream	8	8	9

3.2.3 The consistent occurrence of low BMWP scoring (i.e. 3 or below) species and taxa such as the waterlouse, *Chironimidae* and *Oligochaeta* on all three visits, suggest that the watercourse is affected by organic pollution. This is confirmed by BMWP scores of 44, 46 and 49 and ASPT of 3.73, 3.45 and 3.43 in the spring, summer and autumn samples respectively indicating moderately polluted conditions.

3.2.4 LIFE scores for the River Mole ranged from 6.25 in the spring/early summer sample, 6.1 in the summer sample and 5.87 in the autumn sample, indicating sluggish flow conditions (**Table 4-4**). The decline in LIFE scores over the summer period are likely to be primarily a result of low flow conditions due to low summer rainfall, although extensive macrophyte beds in the channel may also be impeding flow. Low PSI scores of less than 20 also indicate heavily sedimented conditions. This correlates with low flow velocities in the channel indicated by the LIFE scores and is likely to be exacerbated by the extensive macrophyte plant beds.

3.2.5 CCI scores of between 5 and 10 indicate that the macroinvertebrate community is of moderate conservation value. The presence of *Sigara limitata*, a species of water boatman, contributed to a slightly higher score of 9.62 in the autumn sample.

Table 4-4: Macroinvertebrate Biotic Indices

Biotic Index	*Spring*			*Summer*			*Autumn*		
	U/S River Mole	***Gatwick Brook U/S***	***Gatwick Brook D/S***	***River Mole U/S***	***Gatwick Brook U/S***	***Gatwick Brook D/S***	***U/S River Mole***	***Gatwick Brook U/S***	***Gatwick Brook D/S***
	01/07/2020	***01/07/2020***	***01/07/2020***	***27/07/2020***	***27/07/2020***	***27/07/2020***	***29/09/2020***	***29/09/2020***	***29/09/2020***
BMWP (TL1)	44	46	14	46	37	29	49	41	20
LIFE (TL5)	6,25	8,17	7,5	6,10	7,40	7,75	5,87	6,75	8
ASPT (TL2)	3,73	4,92	3,50	3,45	4,53	3,91	3,43	4,13	2,88
PSI (TL5)	10,00	66,67	14,29	5,00	41,67	50,00	6,25	21,05	33,33
CCI (TL5)	5,50	4,50	0	4,00	5,00	1,00	9,62	1,20	1

Fish

3.2.6 A total of 415 fish were caught on the River Mole in spring after three survey 'runs' compared with only 28 fish caught in autumn with the same level of effort. Roach were the most abundant fish species identified (252) in spring and in autumn (13).

3.2.7 The size range of species caught on the electrofishing surveys in spring (**Table 4-5**) suggests that there are multiple age classes of each species, ranging from juveniles to mature adults. The stretch of the River Mole sampled in this study appears to be a good breeding and spawning environment for roach and perch *Perca fluviatilis*, due to its slow flow environment and dense vegetation. The mean size data in spring would suggest that this stretch also appears to be a good environment for juvenile and sub-adult chub and dace as well as providing optimal foraging habitat for predatory fish species such as pike.

Table 4-5: River Mole Fish Survey Data

River Mole					
Spring					
Species	Latin name	Abundance	Mean size (mm)	Min size (mm)	Max size (mm)
Chub	*Squalis cephalus*	45	166.55	77	386
Roach	*Rutilus rutilus*	252	106.91	45	256
Dace	*Leucisus luecisus*	37	127.86	59	203
Pike	Esox lucius	14	344.86	108	595
Perch	*Perca fluviatilis*	46	130.00	73	258
Bream	*Abramis brama*	3	72.33	62	79
Tench	*Tinca tinca*	2	89.0	85	93
Gudgeon	*Gobio gobio*	13	93.1	82	109
Rudd	*Scardinus erythroplathalamus*	2	138.50	81	196
Roach/ Bream Hybrid		1	143	143	143
Autumn					
Species	Latin name	Abundance	Mean size (mm)	Min size (mm)	Max size (mm)
Chub	*Squalis cephalus*	3	217.67	181	289
Roach	*Rutilus rutilus*	13	123	64	200
Tench	*Tinca tinca*	7	198	153	248
Pike	Esox lucius	4	121	110	127
Perch	*Perca fluviatilis*	1	86	86	86

Gatwick Stream

Water quality

3.2.8 Water temperature at the two Gatwick Stream sites remained relatively consistent across the three seasons (**Table 4-6**), peaking at 16.7°C at the downstream site during the summer visit on 29th July. The lowest temperature was recorded at the upstream site (14.8°C) at the end of September. The sites are moderately shaded by overhanging trees, which will help to buffer water temperature. DO concentrations also remained relatively high at over 70% throughout the three seasons, reaching a maximum of 78.7% at the downstream site in autumn. Turbidity was relatively high compared with the River Mole site, with a minimum of 5.95 NTU at the upstream site in autumn and a maximum of 11.85 NTU at the upstream site in summer.

Table 4-6: Water Quality Data for Gatwick Stream

Spring						
Site	**Temperature (°C)**	**Dissolved oxygen (%)**	**Dissolved oxygen (mg/l)**	**pH**	**Conductivity (µS/cm)**	**Turbidity (NTU)**
Gatwick Stream US	15.4	73.5	7.34	7.53	276.2	11.21
Gatwick Stream DS	16.7	71.7	7.37	7.76	333.9	10.74
Summer						
Site	**Temperature (°C)**	**Dissolved oxygen (%)**	**Dissolved oxygen (mg/l)**	**pH**	**Conductivity (µS/cm)**	**Turbidity (NTU)**
Gatwick Stream US	16.5	72.0	7.04	7.68	280.1	11.85
Gatwick Stream DS	16.7	73.5	7.13	8.00	269.1	10.92
Autumn						
Site	**Temperature (°C)**	**Dissolved oxygen (%)**	**Dissolved oxygen (mg/l)**	**pH**	**Conductivity (µS/cm)**	**Turbidity (NTU)**
Gatwick Stream US	14.8	76.8	7.73	7.46	413.9	5.95
Gatwick Stream DS	16.0	78.7	7.73	8.20	387.8	11.64

Aquatic Macroinvertebrates

3.2.9 Fewer taxa were recorded at the two Gatwick Stream sites compared with River Mole (mean of 10 taxa per visit, compared with 19.3) (**Table 4-3**). As with the River Mole, the number of taxa recorded per visit remained relatively consistent, with a maximum of 13 in the autumn sample and a minimum of 10 in the summer sample at the upstream site. Eight taxa were recorded at the downstream site during spring and summer and 9 in the autumn.

3.2.10 BMWP scores indicate moderate water quality conditions for the upstream site at the Gatwick Stream in spring and autumn (46 and 41 respectively) but were classed as poor in summer (37) (**Table 4-4**). The boundary between moderate and poor lies at 40 and therefore the difference between the three visits is unlikely to be significant and is due to the smaller number of taxa recorded. However, an additional three species were recorded in the autumn sample, including the coloniser species *Asellidae* (isopod crustaceans) and the caddisfly *Polycentropus flavomaculatus*, suggesting an increase in water quality at this location, although both species were found in low abundance. The ASPT for the upstream site is similar across the three visits and is lowest in the autumn sample (4.92, 4.53 and 4.13 for the spring, summer and autumn visit respectively).

3.2.11 At the downstream site of the Gatwick Stream the BMWP scores are classified as poor across all three visits, with the score of 14 for the spring visit being close to very poor (**Table 4-4**). The ASPT is also consistently lower for this site than the upstream site (3.50, 3.91 and 2.88 for the spring, summer and autumn visit respectively) over all three visits indicating the presence of pollution tolerant taxa only.

3.2.12 The PSI scores for the upstream site fluctuated considerably across the three season, with the maximum score of 66.67 in the spring indicating only slightly sedimented conditions (**Table 4-4**). However, the scores dropped progressively at this site through the season to 41.67 in the summer (moderately sedimented conditions) and then to 21.05 (sedimented conditions) in the autumn. Assuming no changes in the inputs of sediment upstream of the site, this suggests that flow velocity dropped through the season, leading to increased sediment deposition. A high LIFE score for the upstream site of 8.17 during the spring visit also suggests that velocities are high in the early part of the season.

3.2.13 The PSI scores for the downstream site indicated heavily sedimented conditions during the spring season (score of 14.29), with a change to moderately sedimented conditions (score of 50) in the summer and a return to sedimented conditions in the autumn (score of 33.33). LIFE scores remained relatively high and consistent across the three seasons at the downstream site (7.5, 7.75 and 8 at the spring, summer and autumn visit respectively) suggesting relatively consistent flow velocities (**Table 4-4**).

3.2.14 CCI scores for both of the Gatwick Stream sites were relatively low indicating that rare and/or notable species are absent from the macroinvertebrate assemblage. Although scores for both sites were below 5 on all sampling occasions, the upstream site had scores of 4.5 and 5 in the spring and summer respectively, whilst the scores for the downstream site was either 1 or 0 on all occasions. This indicates that the assemblage at the upstream site is of marginally higher conservation value.

Fish

3.2.15 A total of 300 and 317 fish were caught in spring and autumn respectively in the Gatwick Stream after three survey ‘runs’. Chub were the most abundant fish species identified (111) in spring on the Gatwick Stream, whereas dace were the most abundant fish species identified (137) in autumn (**Table 4-7**).

3.2.16 The size range of species caught during the electrofishing surveys carried out on the Gatwick Stream in spring suggests that there are multiple age classes of each species, ranging from juveniles to mature adults all year round.

Table 4-7: Gatwick Stream Fish Survey Data

Gatwick Brook					
Spring					
Species	Latin name	Abundance	Mean size (mm	Min size (mm)	Max size (mm)
Chub	*Squalis cephalus*	111	194.50	52	360
Dace	*Leucisus luecisus*	74	145.35	63	220
Perch	*Perca fluviatilis*	36	85.05	65	156
Roach	*Rutilus rutilus*	11	105.45	72	153
Bream	*Abramis brama*	6	146	92	279
Gudgeon	*Gobio gobio*	57	107.24	75	197
Stone Loach	*Barbatula barbatula*	3	127.33	97	179
Autumn					
Species	Latin name	Abundance	Mean size	Min size (mm)	Max size (mm)
Chub	*Squalis cephalus*	85	211.56	71	436
Dace	*Leucisus luecisus*	137	149.38	50	204
Roach	*Rutilus rutilus*	28	111.32	71	156
Perch	*Perca fluviatilis*	21	113.14	80	213
Bream	*Abramis brama*	10	158	132	284
Gudgeon	*Gobio gobio*	36	118.55	52	146
Stone Loach	*Barbatula barbatula*	3	86	65	98

4. Discussion

4.1 River Mole

4.1.1 The study stretch on the River Mole lies within open floodplain grassland with no shading from trees. This means that water temperatures and therefore DO, fluctuate considerably since oxygen is less soluble in warm water. Bacterial activity associated with organic pollution also depletes DO levels and therefore macroinvertebrate taxa which occur in organically polluted conditions are tolerant of low DO conditions. Both factors are likely to be influencing the macroinvertebrate community at the River Mole site.

4.1.2 Extensive stands of macrophyte plants covered approximately 90% of the channel surface, including submerged species such as water crowfoot *Ranunculus aquatilis* and the invasive non-native Canadian pondweed *Elodea canadensis*. Emergent species such as branched bur-reed *Sparganium erectum*, old world arrowhead *Sagittaria sagittifolia* and reed sweet-grass *Glyceria maxima* also dominated the channel. Although this channel vegetation will have contributed DO to the water during the summer through photosynthesis, their decay in autumn will contribute to organic pollution in reducing DO (28.2% and 3.03 mg/l during the autumn visit). Significant increases in conductivity such as those seen on the River Mole from spring to autumn (358 – 471 µS/cm) (**Table 4-2**) are likely attributed to the decay of macrophytes and the release of ions such as phosphorous.

4.1.3 Submerged and emergent macrophyte stands are also contributing to reduced flow velocity and increased sedimentation, reflected in the low LIFE and PSI scores for this reach.

4.1.4 The presence of one record from 2013 of shining ram's-horn snail, an IUCN Red List species and UK species of principal importance under the 2006 NERC Act has implications for the design of the scheme (Figure 2, **Appendix 1**). Once abundant in ditch networks in the UK, the species has declined steeply and now only occurs in a restricted number of sites in Norfolk Broads, Pevensey Levels, Lewis Levels and East Kent (Clarke, 2011). The reasons for its decline are not fully understood, but are thought to be over-frequent ditch clearance, eutrophication due to fertiliser run-off and conversion of grazing levels to arable farming with associated water table lowering (Suffolk Biological Information Service, 2003).

4.1.5 In a study of the associations of the species with ditch vegetation communities Clarke (2011) only found the species in ditches supporting the *Carex-Juncus-Eleocharis-Oenanthe* community of emergent vegetation. Although a full macrophyte survey was not undertaken during this study, incidental recording of macrophytes at the sampling location was undertaken and this community type was not present. However, the entire stretch from the boundary with Gatwick airport to the end of the study reach is heavily vegetated and largely impenetrable. More suitable habitat may therefore exist further downstream towards the location where it was recorded in 2013. Recommendations for further survey to determine the potential presence of the species within the study section are presented in Section 6.

4.1.6 The extensive macrophyte growth on the River Mole throughout the year made electrofishing difficult. In spring the filamentous algae, *Cladophora* created dense mats, which surrounded the anode each time it was placed into the water, making progress slow as the anodes regularly needed to be brought to the surface and cleared of the algae. In some cases, *Cladophora* can be beneficial to an ecosystem by providing a food source to aquatic organisms and providing a buffer to nutrification. However, excessive growth of *Cladophora* prevents aeration of deeper waters as the dense mats prevent circulation of water, which is detrimental to an ecosystem.

4.1.7 The high variability and remarkably low concentration of DO in the waters of the River Mole, likely contributed to the low catch in autumn where only 28 fish were caught in comparison to 415 in spring. The slow/sluggish flow of the River Mole, in combination with higher water temperatures in summer (17.6°C) could be causing DO to disassociate faster from the water. The increased presence of tench *Tinca tinca* in the River Mole in autumn acted as an in-field indicator of low DO conditions, as tench are able to tolerate much lower DO conditions than most other UK fish species.

4.1.8 The abundance of predatory fish in summer such as pike and perch, may have been having a disproportionate impact on prey species on the River Mole. The prevalence of these predators has likely contributed to the significant decline in the fish population from 417 in summer to 28 in autumn. In total 14 pike were caught in summer ranging in size from 108 mm – 595 mm indicating the full range of age classes. Pike are very effective freshwater hunters and as ambush predators are aided by the abundant macrophyte growth. In addition to this 46 perch were caught in summer and ranged in size from 73 mm – 258 mm, also suggesting a full range of age classes. Perch also utilise macrophytes to aid in their hunting techniques, however, they are more temperature sensitive, retreating to deeper waters throughout the autumn and winter months, which has likely contributed to their decline in the area to one individual in autumn on the River Mole.

4.2 Gatwick Stream

4.2.1 The downstream site of the Gatwick Stream appears to be suffering from poorer biological water quality than the upstream site, with the LIFE and PSI scores indicating an influx of organic pollution somewhere between these sites. This is supported by the absence of *Asellidae* (isopod crustaceans), which suggests that organic pollution is chronic and there has been no recovery between Spring and Autumn. Crawley sewage treatment works lies immediately east of the Gatwick Stream and although the discharge is directly into the River Mole, it is possible that storm water discharges from the associated industrial area enter the Gatwick Stream between the two sites. Relatively high turbidity levels of between 5.95 and 11.85 NTU compared with a maximum of 4.3 NTU at the River Mole site.

4.2.2 Differences in habitat quality and diversity between the two Gatwick Stream sites may also have influenced the macroinvertebrate community. Both sites were moderately shaded by overhanging trees, but the upstream sites was located on a tight bend with a small riffle section on the outer side of the bend and a shallow berm on the inside edge. These microhabitats are likely to support distinct macroinvertebrate communities, with the more pollution sensitive species present in the riffle section.

4.2.3 The considerable variation in PSI score between the three seasonal visits at the upstream sites (maximum of 66.67 in spring compared to a minimum of 21.05 in autumn) may indicate that the macroinvertebrate community at this site is sensitive to changes on sediment deposition. Equally, it may have resulted from small differences in sampling effort in each of the microhabitats leading to a higher number of sediment sensitive taxa in the spring sample. Limited conclusions can be drawn with only one sample per visit and data from a single visit and further sampling would be required to determine any trends in the data. Overall, both sites are moderately to heavily sedimented with likely potential storm water discharges resulting in greater sedimentation at the downstream site.

4.2.4 The invasive New Zealand mud snail *Potamopyrgus antipodarum* was identified at both sites except for the Gatwick Stream downstream site in autumn. The New Zealand pond snail is now one of the most common gastropods in the UK, its ability to avoid desiccation and its tolerance for a range of conditions enables it to dominate native gastropods, which may lead to disruptions in the food chain and effect native fish species. Currently the Gatwick Stream upstream site hosts the largest population of New Zealand mud snail, where abundances increased from 12 to 40 from spring to autumn in the samples collected. Signal crayfish were observed in relatively high numbers at both the Gatwick Stream sites during each of the visits.

4.2.5 The macroinvertebrate results from this study compare favourably with the Environment Agency data collected in 2017 and 2019 (**Table 4-1**). A slightly higher ASPT score of 4.92 was obtained for the upstream site in early July compared with values of 3.92 and 4.0 for the 'At Tinsley Bridge, Tinsley Green' and 'Downstream Tinsley Bridge (Flylife Site)' in March 2019. However, this may reflect seasonal changes in the macroinvertebrate community between March and July. LIFE and PSI scores for both data sets indicate relatively sluggish and sedimented conditions.

4.2.6 The Gatwick Stream on first appearances seemed to be poor for fish species, but surprisingly a consistently healthy population of fish were caught in spring (300) and in autumn (317). This is likely due to the Gatwick Stream maintaining a relatively consistent water temperature (14.8-16.7°C) across all three seasons and dissolved oxygen concentrations >71%. Furthermore, although the macroinvertebrate community is poor on the Gatwick Stream, the abundance of *Chironomids*, *Oligochaetes* and *Gastropods* provide an excellent food source. There is also a diverse range of microhabitats present, such as shaded pools and undercut banks, interspersed with roots providing shelter for fish.

4.2.7 As a point of interest, a roach – bream *Abramis brama* hybrid was identified in spring. Hybridisation between these two species is not uncommon as hybridisation between members of cyprinids is more widespread than in any other group of freshwater fish.

5. Conclusions and Recommendations

5.1 Conclusions

5.1.1 There are no Environment Agency WFD monitoring sites on this stretch of the River Mole and therefore no background data to compare the field data collected in this study with. Data from a single site on a single year, albeit across three seasons, does not enable a comprehensive assessment of trends in the macroinvertebrate assemblage. However, based on the analysis of macroinvertebrate data collected for this study, the River Mole exhibits moderate biological water quality. Dense macrophyte growth within the channel, exacerbated by organic pollution are causing acute reductions in DO are likely to be impacting on the macroinvertebrate assemblage.

5.1.2 The record from 2013 of shining ramshorn snail, an IUCN Red List species and UK species of principal importance under the 2006 NERC Act has implications for the design of the surface water management and flood alleviation scheme. The species was not recorded during the surveys for this study, although the survey section did not coincide with the reach in which the snail was recorded.

5.1.3 A targeted survey for the species is required to determine its presence or absence (Section 6.2). If the species is found to be present the marginal and channel macrophyte vegetation and flow conditions will need to be preserved in the section of the river in which the population occurs. Creation of new habitat, possibly in the form of off-line ditches supporting dense emergent vegetation is likely to be a requirement of the scheme if the species is found to be present.

5.1.4 The structure and abundance of the cyprinid fish community in the River Mole appears to be driven by sluggish flow conditions and high summer water temperatures which favour species such as tench. The dense stands of submerged and emergent macrophytes provide foraging habitat for predatory species such as pike. Periodic dredging of the macrophyte beds would help to establish larger areas of open and deeper water thus providing refuges for prey species, improving flow conditions and creating areas of deeper, cooler water.

5.1.5 Based on macroinvertebrate biotic scores the Gatwick Stream has biological quality ranging from moderate at the upstream site to poor at the downstream site. Nevertheless, it retains a natural sinuous course with a variety of microhabitats supporting a range of macroinvertebrate and fish species. However, the watercourse appears to be impacted by both organic pollution and silt deposition, possibly from a storm water discharge from a nearby industrial area.

5.1.6 The invasive New Zealand mud snail was identified at the River Mole and Gatwick Stream sites, and signal crayfish were observed at both the Gatwick Stream sites during each visit.

5.2 Recommendations

5.2.1 Both the Gatwick Stream and the River Mole retain natural sinuous channels characteristic of lowland rivers. It will be important to maintain and enhance this characteristic in both watercourses. The following recommendations for each watercourse are based on the findings from this study and will need refinement in light of the design of the surface water management and flood alleviation scheme and in the case of the River Mole, the findings of the survey for shining ramshorn snail. However, the habitat improvement measures recommended below are largely consistent with the requirements for this species.

River Mole

- Undertake survey to establish presence/absence of shining ramshorn snail. Survey to focus initially on the site of the 2013 record and if found to be present, extended to incorporate the whole study section. Surveys should be scoped and undertaken by a specialist mollusc ecologist.

- If shining ramshorn snail found to be absent from main channel, undertake vegetation removal/dredging from the central channel/thalweg of the River Mole in selected sections. Marginal berms should be retained on alternate sides of the channel throughout the dredged section for the re-establishment of emergent vegetation. Brushwood faggots or fascines anchored with wooden stakes can be used to maintain the riverward edge of the berm and prevent silt from slumping into the main channel.
- Off-line scrapes and shallow pond could be created within the floodplain grassland area to provide habitat for wetland birds. If shining ramshorn snail is found to be present this recommendation can be adapted to incorporate new, permanently wet ditches supporting dense emergent reed vegetation.

Gatwick Stream

- Identify point sources of pollution from industrial area associated with Crawley STW including storm drains and surface water discharge points from roads and urban areas. Consider a SuDS scheme to address these discharges, including settlement ponds and reedbed treatment systems which would have additional biodiversity benefit.

5.2.2 Before any in-channel works begin it is advised that a fish rescue survey is undertaken to safeguard fish populations in the affected area. It will also be necessary to install stop nets at either end of the reach where in-channel works will be undertaken to prevent access by any other fish species whilst the works are ongoing.

5.2.3 Currently the River Mole is choked with submerged and emergent macrophyte plant growth, which is impeding flow, increasing deposition of sediment and reducing the circulation of deeper waters preventing aeration and creating low DO conditions. It is therefore advised that there is some level of routine maintenance of macrophyte and bankside vegetation to aid in reducing the effects of flooding and contribute to increasing the biological water quality.

5.3 Further Survey

5.3.1 It is recommended that further macroinvertebrate and fish surveys are carried out on both the River Mole and the Gatwick Stream to provide a more robust baseline of community assemblage and therefore better advice on any schemes in the future.

5.3.2 To provide additional insight into the hydrological conditions of these rivers, it is recommended that further investigations are carried out to monitor the flow velocity and the discharge rates in order to better advice on any schemes in the future, which could include the installation of level loggers.

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Appendix 1: Aquatics Team Report with Figures



Electrofishing and Aquatic Macroinvertebrates Surveys

Gatwick Fish and Aquatic Macroinvertebrate Surveys

Final Report

For

ECUS Ltd

Project No.: A-ECU-101/001

June 2021

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Contents

1. Summary and Main Recommendations 5
    1.1 Summary 5
    1.2 Conclusions 6
    1.3 Main Recommendations 7
2. Introduction 8
    2.1 Development Background 8
    2.2 The Brief and Objectives 8
    2.3 Background to Watercourses 8
3. Methodology 12
    3.1 Desk study 12
    3.2 Survey: Macroinvertebrates 12
    3.3 Macroinvertebrate data analysis 13
    3.4 Survey: Fish 15
    3.5 Limitations 16
4. Results 18
    4.1 Desk study 18
    4.2 Field data 22
    Fish 27
5. Discussion 28
6. Conclusions and recommendations 31
    6.1 Conclusions 31
    6.2 Recommendations 32
    6.3 Further Survey 33
7. References 34
Appendix 1 35

Figure 1a: Sampling locations on R Mole

Figure 1b: Sampling locations on Gatwick Stream

Figure 2a: River Mole 1km desk study search area and priority habitats

Figure 2b: Gatwick Stream 1km desk study search area and priority habitats

Figure 3: Location of shining ramshorn snail (*Segmentina nitida*) record

1. Summary and Main Recommendations

1.1 Summary

1.1.1 ECUS Ltd are undertaking Ecological Assessment work for a proposed surface water management and flood alleviation scheme that will affect two sites close to Gatwick Airport, one on the River Mole and the other on the Gatwick Stream. The River Mole may be re-meandered and land close to the river may be re-profiled to increase flood storage. The Gatwick Stream has already had some surrounding land re-profiled for flood storage, however this area may be expanded to encompass both sides of the river. Thomson Environmental Consultants Aquatics Team were commissioned by ECUS to undertake aquatic macroinvertebrate and fish baseline surveys and a desk study, to inform the proposals.

1.1.2 The study area encompasses two watercourses; a 1.3km stretch of the River Mole immediately downstream of where it emerges from under the runway at Gatwick Airport and a 750m stretch of the Gatwick Stream (a tributary of the River Mole) upstream of the Crawley sewage works. A 100m survey section was identified on each watercourse from an initial walkover survey conducted in June 2020. Three survey visits during 2020 were undertaken for aquatic macroinvertebrates (spring, summer and autumn) and two for fish (spring and autumn). The spring survey visit was delayed until early July due to restrictions related to the Covid 19 outbreak. Desk study data was obtained from the Sussex Biological Records Centre and the Environment Agency on behalf of Ecus.

1.1.3 The desk study returned one record from 2013 of the shining ram's-horn snail (*Segmentina nitida*) within the study section on the River Mole (TQ 25623 40908). The species is nationally scarce1, a UK Priority Species under the UK Post 2010 Biodiversity Framework and listed on the Sussex Rare Species Inventory. It was not recorded during the surveys for this study, although the survey section did not coincide with the reach in which the snail was previously recorded. The desk study returned records of two fish species for the River Mole; bullhead and brown trout.

1.1.4 **River Mole** - A mean of 19.3 macroinvertebrate taxa were recorded at the River Mole site across the three survey visits. Biotic indices measuring water quality (Biological Monitoring Working Party (BMWP) score and Average Score Per Taxon) indicate moderately polluted conditions in the River Mole. Lotic invertebrate Index for Flow Evaluation (LIFE) scores suggest that the macroinvertebrate community is characteristic of sluggish flow conditions and low Proportion of Sediment intolerant Invertebrates (PSI) scores indicate heavily sedimented conditions.

1.1.5 A total of 415 fish were caught on the River Mole in spring after three survey 'runs' compared with only 28 fish caught in autumn with the same level of effort. Roach (*Rutilus rutilus*) were the most abundant fish species identified (252) in spring and in autumn (13). The study stretch on

[1] Occurring in 16-100 hectads in Great Britain. Excludes rare species qualifying under the main IUCN criteria. This category replaces Notable, Notable A and Notable B.

the River Mole lies within open floodplain grassland with no shading, which means that water temperature and therefore dissolved oxygen (DO), fluctuated considerably. Extensive stands of submerged and emergent macrophyte plants occur through the study section and their decomposition are likely to be contributing to low DO in the autumn. These DO conditions coupled with organic pollution from within the catchment is considered to be influencing the composition and abundance of both the aquatic macroinvertebrate and fish communities present. Predatory fish such as pike are able to exploit the dense macrophyte stands and are further reducing populations of cyprinid fish.

1.1.6 Gatwick Stream - Environment Agency data from 3 sites on the Gatwick Stream indicate that the study section is of moderate to poor water quality, with sluggish flow and sedimented condition. Fewer macroinvertebrate taxa were recorded at the two Gatwick Stream sites compared with River Mole (mean of 10 taxa per visit). BMWP and ASPT scores indicate moderate water quality conditions at the upstream and poor to very poor at the downstream site. A high LIFE score for the upstream site during the spring visit suggests that velocities are high in the early part of the season and decline through the summer and autumn. PSI scores for the upstream site fluctuated considerably across the three seasons, from only slightly sedimented conditions in spring to sedimented condition in autumn.

1.1.7 A total of 300 and 317 fish were caught in spring and autumn respectively at the Gatwick Stream site after three survey 'runs'. Chub was the most abundant species in the spring survey and dace in the autumn. Shading of the channel by overhanging trees meant that water temperature was relatively consistent and dissolved oxygen remained high throughout the three seasons.

1.2 Conclusions

1.2.1 Both watercourses supported macroinvertebrate communities indicative of moderately polluted conditions, exacerbated by relatively low flow conditions and high levels of sedimentation. Dense macrophyte growth on the River Mole is contributing to acute reductions in dissolved oxygen which are impacting on the macroinvertebrate assemblage.

1.2.2 The presence of one record from 2013 of shining ram's-horn snail, an IUCN Red List species and UK species of principal importance under the 2006 NERC Act, has implications for the design of the River Mole scheme. Although not recorded during the survey, there remains a possibility that the species may occur at the site of the 2013 record at the downstream end of the desk study area. A targeted survey is required to determine its potential presence.

1.2.3 The Gatwick Stream appears to be impacted by both organic pollution and silt deposition, possibly from a storm water discharge outlet from a nearby industrial area. Consistently high populations of fish caught in spring and in autumn are likely to be a consequence of stable temperature and dissolved oxygen conditions caused by shading and potentially high abundances of pollution tolerant macroinvertebrates such as Oligochaete worms as a food source.

1.3 Main Recommendations

1.3.1 The main recommendations are set out below:

River Mole

- Undertake survey to establish presence/absence of shining ramshorn snail. Survey to focus initially on the site of the 2013 record and if found to be present, extended to incorporate the whole study section. Surveys should be scoped and undertaken by a specialist mollusc ecologist.
- If shining ramshorn snail found to be absent from main channel, undertake vegetation removal/dredging from the central channel/thalweg of the River Mole in selected sections. Marginal berms should be retained on alternate sides of the channel throughout the dredged section for the re-establishment of emergent vegetation. Brushwood faggots or fascines anchored with wooden stakes can be used to maintain the riverward edge of the berm and prevent silt from slumping into the main channel.
- Off-line scrapes and shallow ponds could be created within the floodplain grassland area to provide habitat for wetland birds. If shining ramshorn snail is found to be present this recommendation can be adapted to incorporate new, permanently wet ditches supporting dense emergent reed vegetation.
- If shining ramshorn snail is found to be absent it is advised that some level of routine maintenance of macrophyte and bankside vegetation is undertaken annually under an appropriate management plan.
- Before any in-channel works begin, it is advised that a fish rescue and exclusion or translocation is undertaken to safeguard fish populations.
- Stop nets should be installed at either end of the site proposed for in-channel works to prevent access by any fish species whilst the works are on-going.

Gatwick Stream

- Identify point sources of pollution from industrial area associated with Crawley STW, including storm drains and surface water discharge points from roads and urban areas.
- Consider SUDS scheme to address these discharges including settlement ponds and reedbed treatment systems which would have additional biodiversity benefit.

1.3.2 Before any in-channel works begin it is advised that a fish rescue survey is undertaken to safeguard fish populations in the affected area. It will also be necessary to install stop nets at either end of the reach where in-channel works will be undertaken to prevent access by any other fish species whilst the works are ongoing.

1.3.3 Hydrometric surveys should be undertaken at various points along both rivers to better understand present hydrological conditions and inform plans to modify the channels.

2. Introduction

2.1 Development Background

2.1.1 Two watercourses, the River Mole and Gatwick Stream will be directly affected by proposals for a surface water management and flood alleviation scheme to the east and west of Gatwick Airport. The scheme may include proposals to re-meander the River Mole close to where it emerges from beneath the airport runway and create new flood attenuation areas to the west of the watercourse. New flood storage has already been created to the west of the Gatwick Stream, with further areas likely planned within the floodplain to the east of the watercourse.

2.1.2 The study area encompasses two watercourses; a 1.3km stretch of the River Mole immediately downstream of where it emerges from under the runway at Gatwick Airport and a 750m stretch of the Gatwick Stream (a tributary of the River Mole) upstream of the Crawley sewage works.

2.2 The Brief and Objectives

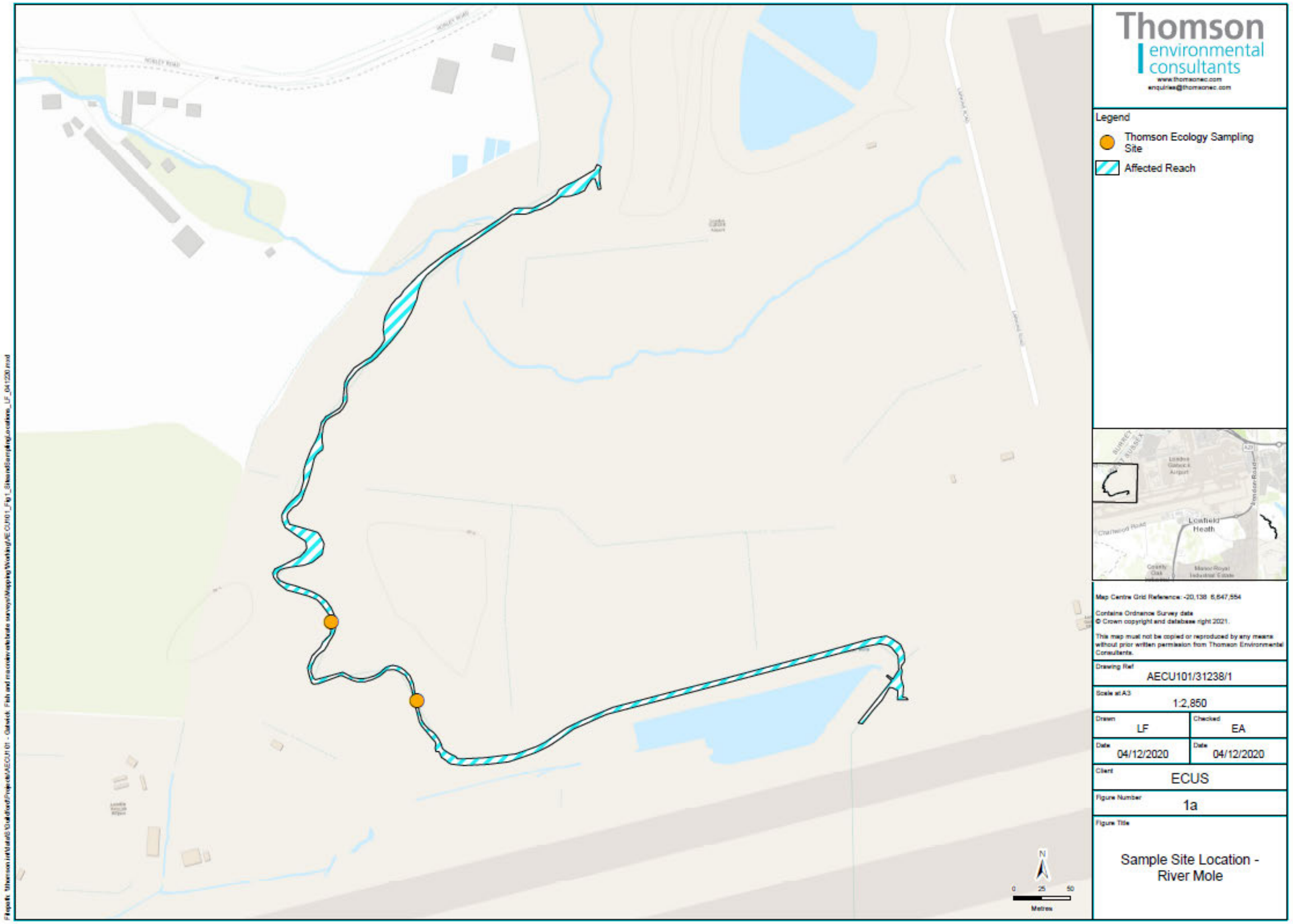
2.2.1 ECUS Ltd commissioned Thomson Environmental Consultants Aquatic Team in May 2020 to undertake fish and aquatic macroinvertebrate surveys of the two rivers within the proposed site. The brief was to:

- To determine baseline populations for both fish and aquatic macroinvertebrates in these two watercourses over the course of a year.
- Carry out a desk study for the surrounding areas of both sites including a 1km perimeter.
- Provide a report on the surveys giving the methods and results of the surveys, with recommendations, including opportunities for enhancement, mitigation and further surveys.

2.3 Background to Watercourses

2.3.1 The River Mole rises in Baldhorns Copse in West Sussex and discharges into the River Thames at the town of Molesey in Surrey. The Mole catchment flows over the Wealden and London clays, however, between Dorking and Leatherhead, the river cuts its way through the North Downs chalk. In this area part of the river water disappears through holes in the underlying chalk feeding into the groundwater aquifers before flowing back into the river near to Leatherhead. This action has been suggested as the origin to the name of this river, but is more likely attributed to the fact it meets the Thames at Molesey,

2.3.2 Approximately 7 miles downstream of the source, the River Mole reaches the boundary of Gatwick Airport where is passes beneath the runway in a culvert. The reach that will be affected by the proposed scheme extends 1.3km downstream from where the river emerges from beneath the airport runway (Figure 1a). The survey stretch of the Gatwick Stream surveyed (TQ291398) lies upstream of the Crawley sewage works (Figure 1b).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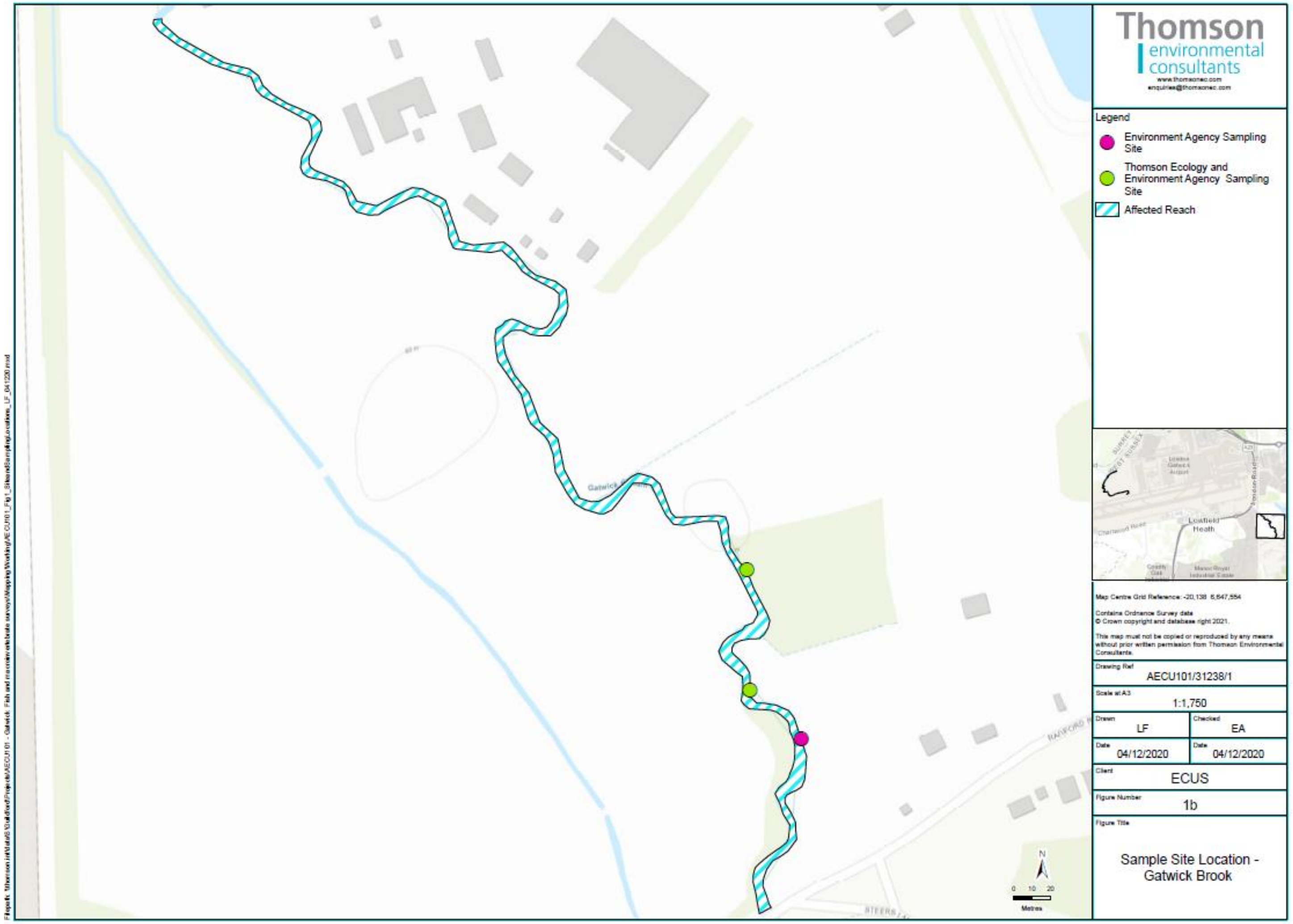
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Sample Site Location - Gatwick Brook

3. Methodology

3.1 Desk study

3.1.1 A study area was defined as an area that encompassed the site and all land within 1 km of the perimeter of each of the sites, (Figures 2a and 2b). Records of designated sites and protected or otherwise notable species were then sought for both study areas.

3.1.2 Sources of information were as state in Table 3-1.

Table 3-1: Sources of data

Data type	Source
Statutory sites for nature conservation related to the river environment	Multi-Agency Geographical Information for the Countryside (MAGIC) (https://magic.defra.gov.uk/magicmap.aspx
Non-statutory sites for nature conservation, protected and notable species and invasive and non-native species (fish and macroinvertebrates only)	Sussex Biodiversity Records Centre
Background information on Water Framework Directive status Macroinvertebrate, fish and invasive and non-native species data	https://environment.data.gov.uk/catchment-planning Environment Agency data request (EA Analysis and Reporting)

3.1.3 A request for information was sent to the Sussex Biological Records Centre on 07/10/2020 with responses requested by 20/10/2020. The boundaries of any designated site and records of species were sought for part of the study area encompassing the site and within 1km of the perimeter of each of the sites.

3.1.4 The records included in this report are those relating to fish and macroinvertebrates. Records over 10 years old have been excluded.

3.2 Survey: Macroinvertebrates

3.2.1 A representative 100m section on each watercourse was identified from a walkover survey conducted prior to the spring sampling visit. Two sampling locations were identified on the Gatwick Stream, one at the upstream and one at the downstream end of the 100m section (Figure 1a and 1b). Only one sampling at the upstream end of the reach was safely accessible on the River Mole.

3.2.2 Samples were collected at each of the sites using the Whalley Hawkes Paisley Trigg (WHPT) method comprising of a standard three-minute kick sample using a long-handled pond net with 1mm mesh size, which was supplemented by a one-minute hand search (Environment Agency, 2017). Sampling of habitats within the three-minute kick/sweep sampling were in proportion to their occurrence. Samples were then preserved in industrial methylated spirits (IMS) for processing in the laboratory to the requirements outlined in EA Operational Instruction 024_08 Freshwater macroinvertebrate analysis of riverine samples (Environment Agency, 2014).

3.2.3 Macroinvertebrates were identified to Mixed Taxon Level 5, to enable evaluation of the macroinvertebrate community and calculation of the relevant biotic indices including Biological Monitoring Working Party (BMWP), Average Score Per Taxon (ASPT) and Lotic-Invertebrate index for Flow Evaluation (LIFE). Proportion of Sediment-sensitive Invertebrates (PSI) and Community Conservation Index (CCI).

3.2.4 Macroinvertebrate sampling was undertaken in spring, summer and autumn on the dates presented in Table 3-2.

Table 3-2: Macroinvertebrate survey dates.

Macroinvertebrate survey visit	Date
Spring	04/06/20
Summer	29/07/20
Autumn	29/09/20

3.3 Macroinvertebrate data analysis

3.3.1 The macroinvertebrate abundance data collected during the field surveys and background data from the Environment Agency has been analysed using a range of biotic indices. Each of the indices used in the analyses are summarised below.

Biological Monitoring Working Party (BMWP) score

3.3.2 The BMWP score is a method for indexing river water quality in England and Wales using macroinvertebrate families. Originally published in the early 1980's, the system was updated in 2013 based on a more robust baseline data set (Paisley et al, 2013). A score of between 1 and 10 is assigned to families found within a sample based on their tolerance to organic pollution, with a score of 1 indicating high tolerance, and 10 indicating low tolerance. Low scoring families include worms (Oligochaeta) and midge larvae (Chironimidae), whilst the presence of mayfly (Ephemeroptera) and stonefly (Plecoptera) larvae is indicative of clean water conditions. The scores for each family recorded in the sample are summed to give the overall BMWP site score. Since the overall site score is influenced by the number of families as well as the scores of the individual families in the sample, an average is taken by dividing the overall BMWP score by the number of families/taxa in the sample. This is termed the Average Score Per Taxon (ASPT).

Table 3-3 provides an interpretation of the BMWP scoring system.

Table 3-3: BMWP Scoring System

BMWP score	Category	Interpretation
0-10	Very poor	Heavily polluted
11-40	Poor	Polluted or impacted
41-70	Moderate	Moderately impacted
71-100	Good	Clean but slightly impacted
>100	Very good	Unpolluted, unimpacted

River Invertebrate Classification Tool (RICT)

3.3.3 BMWP and ASPT has largely be superseded by the River Invertebrate Classification Tool (RICT), which is one of the parameters used for classifying rivers according to their ecological status under the Water Framework Directive (WFD). The scores derived for an individual site under RICT are compared with those expected under unpolluted conditions (known as reference conditions) in order to give an Environmental Quality Ratio (EQR). This aims to take account of the variability of macroinvertebrate families in rivers resulting from environmental parameter such as altitude, underlying geology and proximity to the river source.

Lotic invertebrate Index for Flow Evaluation (LIFE) Score

3.3.4 The LIFE score system links flow conditions in rivers, and specifically flow velocity, with commonly identified macroinvertebrate species and families (Extence *et al*. 1999). Macroinvertebrates are assigned to one of 6 groups depending on their tolerance to low flow conditions. The groups range from I comprising taxa associated with rapid flow conditions (>100cm s^{-1}) to VI including those associated with drying or drought impacted sites. A flow score is obtained for each species/taxon by combining the flow category with an estimated abundance score as described by Extence *et al* (1999). The LIFE score for a sample is obtained by summing the individual flow scores for each taxon by the number of taxa in the sample. LIFE scores range from 1 to 12, with scores of 8 or above indicating moderate to high flow conditions, and scores of 7 or below indicating sluggish conditions.

Proportion of Sediment sensitive Invertebrates (PSI)

3.3.5 The PSI index provides an indication of the extent to which watercourses have been impacted by the deposition of fine sediment (Extence et al, 2017). Following the same principle as the LIFE score system, invertebrates are assigned to one of four groups depending on their sensitivity to fine sediment, with Group A comprising highly sensitive taxa, and Group D those that are highly insensitive. The method also requires a log abundance category to be estimated for all taxa identified in a sample (1-9, 10-99, 100-999 and 1000+ individuals present). Scores range from 80 -100 for unsedimented sites down to 0-20 for highly sedimented sites (Table 3-4).

Table 3-4:- Interpretation of PSI scores

PSI score	River bed condition
81-100	Minimally sedimented/unsedimented
61-80	Slightly sedimented
41-60	Moderately sedimented
21-40	Sedimented
0-20	Heavily sedimented

Community Conservation Index (CCI)

The CCI combines the rarity of constituent species in a sample with the diversity of the community, or community richness, to give a single integrated score which can be used as the basis for site evaluating (Chadd and Extence, 2004). Species identified from a survey site or area are given a Conservation Score (CS), based on standard rarity categories, with Red Data Book 1 (Endangered) species scoring 10, and very common species scoring 1. The sum of each of the conservation scores in the sample is then divided by the number of contributing species to give the overall CCI score.

3.4 Survey: Fish

3.4.1 The surveys were undertaken using the catch depletion method in order to assess species composition, age structure and to estimate population size. Surveys were undertaken by an accredited electric fishing team comprising three members of staff. Surveys and analysis conformed to the relevant guidance outlined in BS EN 14011:2003 Water Quality: Sampling of Fish with Electricity (British Standards, 2003). An FR2 consent (application to use fishing instruments other than rod and line) was sought from the Environment Agency prior to conducting the survey.

3.4.2 The survey was undertaken over a 100m reach and there was one survey reach per watercourses, coinciding with the macroinvertebrate survey locations on both watercourses. Stop nets were installed across the channel at either end of the reach to prevent fish entering or leaving the survey area. Holding containers for captured fish were established in a small boat with an aerator installed to provide oxygen to captured fish.

3.4.3 The survey was undertaken using an electrofishing box alternating between a single anode and two anodes depending on the width of the river in order to maximise catch efficiency. One surveyor, operating the electrofishing anode waded from downstream to upstream and a second surveyor netted any stunned fish. In areas where the rivers was wider the second surveyor also operated an anode. The operatives were followed by an additional surveyor pulling a small boat with the electrofishing box and holding tank on board, and also equipped with a hand net to maximise the catch rate. At the end of each run all caught fish were identified, measured and placed in a submerged holding net to facilitate their recovery and prevent re-capture.

3.4.4 Two survey visits were undertaken, one in spring (04/06/20) and one in autumn (29/09/20) to establish a baseline of the species composition on the two watercourses. Undertaking the autumn visit in September ensured that air temperatures are above the minimum of 10 degrees and minimise the risk of high flow conditions. It would also avoid risk of disturbance to salmonid spawning habitat, should it be present.

3.5 Limitations

3.5.1 Only one macroinvertebrate sample could be retrieved from the downstream River Mole site, due to various access issues, such as, dense bankside vegetation creating a barrier to the river and steep banks, which prevented safe access and egress to the river.

3.5.2 The River Mole has exceptionally high coverage of aquatic plants, which made electrofishing difficult. In spring the filamentous algae blanket weed (*Cladophera* agg.) was found in dense clumps making progress slow, as the anode became blanketed by the filamentous algae each time it was placed in to the water and needed regular clearing in order to progress. In addition to this, the macroinvertebrate surveys were difficult due to the dense macrophyte growth and deep waters preventing more than one macroinvertebrate sample being taken using the WHPT method.

3.5.3 The timing of the spring survey was delayed by a nationwide lockdown related to the COVID-19 outbreak.

Figure 2a. River Mole 1km desk study search area and priority habitats

Figure 2b. Gatwick stream 1km desk study search area and habitats priority habitats

4. Results

4.1 Desk study

River Mole

Environment Agency: Water Framework Directive status

4.1.1 Under the Water Framework Directive (WFD) rivers and standing waters are termed waterbodies and are classified according to their ecological status. Ecological status is classified using five categories of high, good, moderate, poor and bad and is measured and classified via a range of inter-linked biological, physico-chemical and physical (morphological) parameters. The classification process is based primarily on the biological quality elements of the water body but considered alongside support elements covering physico-chemical standards and hydromorphological quality elements. Each of these supporting elements is assigned to a status category (i.e. high to bad). The overall status of the waterbody is based on the status category of the worst supporting element.

4.1.2 The affected reach of the R Mole falls within the WFD waterbody named 'Mole Upstream of Horley (GB106039017481)'. There is little information relating to the stretch of the River Mole. It was first classified as good under the WFD classification system in 2015, although the most recent classification in 2019 designates it as moderate. Although the biological quality elements are classified as good (based on fish data only), one of the physico-chemical quality elements (phosphorous) is classified at moderate status, and therefore the overall waterbody status is classed as moderate.

4.1.3 No Environment Agency background records were received for the River Mole.

Sussex Biological Records Centre data

4.1.4 A total of 3 records of fish species were returned from the Sussex Biological Records Centre for the River Mole within 1km of the study section, comprising one record of bullhead (*Cottus gobio*) approximately 0.5km downstream from the study section in 2014, and a record of 2 adult brown trout (*Salmo trutta subsp. Fario*) within the survey section in 2016. Bullhead is listed as a non-priority species under Annexe 2 of the EU Habitats Directive and listed on the Sussex Rare Species Inventory. Brown trout is a UK Priority Species under the UK Post 2010 Biodiversity Framework, and Section 41 of the Natural Environment and Rural Communities Act 2006.

4.1.5 There is one record of the shining ram's-horn snail (*Segmentina nitida)* within the study section (TQ2562340908; Figure 3) from February 2013. The species was recorded as being 'u/s Pond M and Tributary. The shining ram's-horn snail is nationally scarce[2], a UK Priority Species

[2] Occurring in 16-100 hectads in Great Britain. Excludes rare species qualifying under the main IUCN criteria. This category replaces Notable, Notable A and Notable B.

under the UK Post 2010 Biodiversity Framework, and listed on the Sussex Rare Species Inventory.

4.1.6 One notable dragonfly species, common sympetrum (*Sympetrum striolatum*) was recorded within 1km of the site. The species is listed in the UK Red Data Book. A total of 44 observations were made of the species in the vicinity of the Gatwick airport, with a number of them within the study section. There are no records of the larvae in the River Mole, either from the Sussex Biological Records Centre or the Environment Agency, and therefore breeding sites are unclear.

4.1.7 A number of invasive and non-native invertebrate and aquatic plant species occur within 1km of the River Mole study section. Three records of signal crayfish (*Pacifastacus leniusculus*) were returned from within 1km of the study section between 2011 and 2013. Two of the sites were on the River Mole within the study section and the third north of the Gatwick runway within a tributary of the R Mole. Signal crayfish is listed on Schedule 9 of the Wildlife and Countryside Act. Under Section 14 of the Act it is an offence 'to release or allow to escape into the wild' any species listed under Schedule 9'.

4.1.8 Records of several invasive aquatic plant species were also recorded within 1km of the site including Nuttall's pond-weed (*Elodea nuttallii*), Japanese knotweed (*Fallopia japonica*) and Himalayan balsam (*Impatiens glandulifera*).

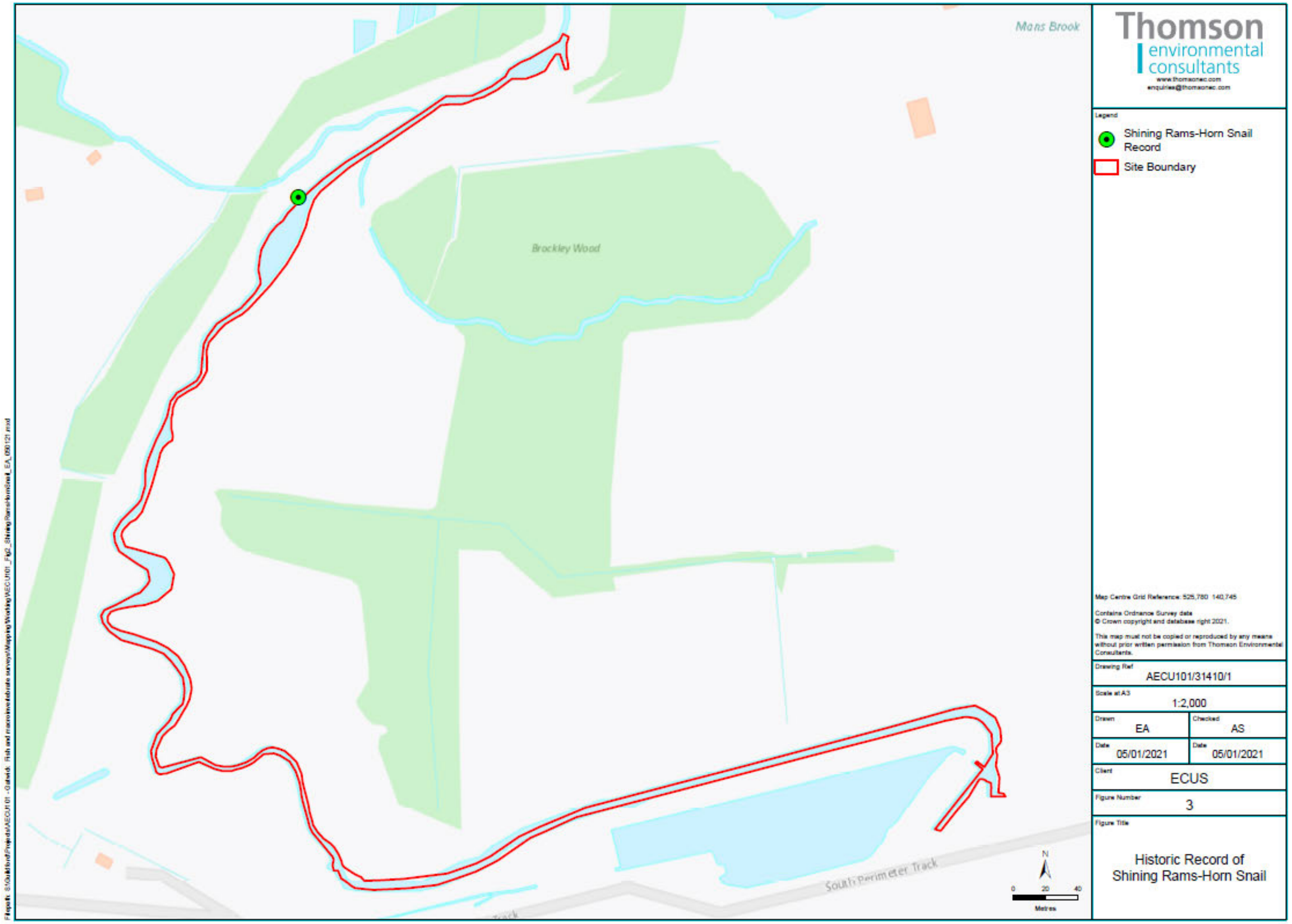
Gatwick Stream

Environment Agency: Water Framework Directive status

4.1.9 The Gatwick Stream is a tributary of the River Mole and is approximately 12km in length. It, rises near Three Bridges and joins the River Mole near the centre of Horley. It falls within the Tilgate Stream and Gatwick Stream at Crawley WFD waterbody (GB106039017500). The overall waterbody status has remained moderate since 2013, although the biological quality elements are assigned bad status on the basis of fish data. This is a deterioration from poor status in 2016. Macroinvertebrates were classified at poor status in 2019 and have remained at that classification since 2013. Sewage discharges and the invasive signal crayfish are given by the Environment Agency as the reasons for poor biological quality in the brook.

Environment Agency: Macroinvertebrate data

4.1.1 Macroinvertebrate data was received from the Environment Agency for 3 sites on the Gatwick Stream that lie within the study area (U/S Crawley STW (TQ 29160 39780); Downstream Tinsley Bridge (Flylife site) (TQ 29129 39864) and At Tinsley Bridge, Tinsley Green (TQ-29150-39800)). One sample was collected at U/S Crawley STW in October 2017, and duplicate samples were collected at Downstream Tinsley Bridge (Flylife site) and At Tinsley Bridge, Tinsley Green) in March 2019 (Figure 1b). The Environment Agency have provided feedback that the 2019 samples were taken in response to a pollution incident and that the duplicate sample from both sites with lower number of taxa recorded was sorted on the bank. In comparing the data with this study only the laboratory sorted sample has been considered, although the results for both samples are presented in Table 4-1.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Shining Rams-Horn Snail Record
Site Boundary
Map Centre Grid Reference: 525,780 140,745
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4.1.2 A total of 13 families were recorded during the survey at the U/S Crawley STW site in October 2017. The freshwater shrimp *Gammarus pulex,* a species indicative of moderate water quality, was the most numerous. However, the site also supported relatively high numbers of Oligochaete worms, a family highly tolerant of low oxygen conditions. BMWP and ASPT scores have been calculated since none were provided by the Environment Agency (Table Table 4-1). This site had a BMWP score of 43 with an ASPT of 4.3 indicating moderate to poor water quality.

4.1.3 Of the two duplicate samples taken at the Downstream Tinsley Bridge (Flylife site) (TQ-29129-39864) on 14th March 2019 a total of 22 families were recorded in one sample and 7 in the other. Midge larvae (Chronomidae) and Oligochaete worms were present in relatively high numbers in the second sample indicating poor water quality. Based on the second sample the site had a BMWP of 47 and ASPT of 3.92.

4.1.4 At the most upstream site at Tinsley Bridge (TQ-29150-39800) site a total of 8 families were recorded in one of the duplicate samples and 21 in the second. In general, the samples supported pollution tolerant families and species such as Oligochaeta (20 and 40 individuals respectively) and the water louse (*Asellus aquaticus*) (30 individuals in the second sample. However, the site also supported the damselfly larvae (*Calopteryx* sp.), a relatively pollution sensitive family. The second sample at this site had a BMWP of 48 and ASPT of 4.

Table 4-1: EA macroinvertebrate biotic scores for Gatwick Stream

Site	**U/S Crawley STW**	**Downstream Tinsley Bridge (Flylife Site)**	**Downstream Tinsley Bridge (Flylife Site)**	**At Tinsley Bridge. Tinsley Green**	**At Tinsley Bridge. Tinsley Green**
Date	12/10/2107	14/03/2019	14/03/2019	14/03/2019	14/03/2019
BMWP (TL1)	43	15	47	20	48
ASPT	4.3	3.00	3.92	3.33	4
LIFE	7.5	7.0	7.11	7.00	7.00
PSI	40.00	28.57	36.00	36.36	32.14
CCI	1.00	N/A	1.00	N/A	1.00

4.1.5 LIFE scores for each of the 3 sites ranged from 7.0 to 7.5 indicating sluggish to moderate flow conditions. PSI scores for all three sites indicate sedimented conditions, although the U/S

Crawley STW sites is close to moderately sedimented with a score of 40. CCI scores of 1 indicate low conservation value.

Sussex Biological Records Centre data

4.1.6 Records of two fish species, bullhead and brown trout were returned for the Gatwick Stream. Bullhead from Sussex Biological Records Centre. One adult bullhead was recorded within the study section in October 2015, and a brown trout in a similar location in July 2016.

4.1.7 A total of 15 records of adult common sympetrum dragonflies were returned for the study section on the Gatwick Stream between 2012 and 2017, although there are no records of the larvae. Six records of the downy emerald dragonfly (*Cordulia aenea*), and 2 of the brilliant emerald dragonfly (*Somatochlora metallica*) were returned from within the past 10 years. Downy emerald dragonfly is a Red List species on the IUCN Red List, and a Priority Species on the UK Post 2010 Biodiversity Framework. The downy emerald dragonfly is listed on the Sussex Rare Species Inventory. None of the records were on the Gatwick Stream and there are no records of the larvae.

4.1.8 There were three records of the invasive signal crayfish from within the study section on the Gatwick Stream in 2017. The invasive aquatic plant, Nuttall's pond weed was recorded within the study section in 2016, and there are records of Japanese knotweed and Himalayan balsam.

Environment Agency: Fish data (R Mole and Gatwick Stream)

4.1.9 Data provided by the Environment Agency indicates that both the Gatwick Stream and River Mole were stocked in 2018 and 2019 with Roach, Barbel, Dace, and Chub. In 2018, 3200 fish were added to the lower Gatwick Stream in response to a pollution event which occurred in 2017.

4.1.10 In 2019, 3600 fish were stocked in the River Mole in response to a prolonged dry weather event in 2018, which occurred as a result of low flows and first flush effect, which was estimated to have affected approximately 2000 fish.

4.2 Field data

River Mole

Water Quality

4.2.1 A maximum temperature of 17.6°C was recorded at the sampling site on the River Mole during the summer visit on 29th July 2020 (Table 4-2). The temperature was only slightly lower on the first visit (16.4°C on 1st July), which was delayed due to Covid 19 restrictions. Water temperature dropped to 13.8°C by the autumn visit on 29th September 2020. Dissolved oxygen concentrations dropped sharply between the first and second visits, from 60.8% in early July to 17% on 29th July, before recovering slightly to 28.7% by end of September. Both conductivity and turbidity increased progressively through the season. Conductivity increased from 358.5 to 471µS/cm, whilst turbidity increased from 3.78 to 4.3NTU.

Table 4-2: Water quality data recorded at River Mole sampling site

Season	Temperature (°C)	DO (%)	DO (mg/L)	pH	Conductivity (µS/cm)	Turbidity (NTU)
Spring	16.4	60.8	5.94	7.3	358.5	3.78
Summer	17.6	17.0	1.6	7.19	341.0	4.02
Autumn	13.8	28.2	3.03	8.38	471.0	4.3

Macroinvertebrates

4.2.2 A mean of 19.3 taxa were recorded at the River Mole site across the three visits. There was relatively little variation in the number of taxa recorded on each visit, with the maximum of 21 in the spring/early summer sample, and a minimum of 17 in the summer sample (Table 4-34-3). Of these, 12 taxa/species occurred in all three samples, including the water shrimp *Gammarus pulex,* the pea mussel, *Sphaereum corneum* and the mayfly larvae *Cloeon dipterum.* However, abundances of individual taxa within the samples varied considerably across the 3 visits, with the crustacean Cladocera the most abundant in the early summer samples 01/07/20, replaced by the water boatman, Coroxidae one month later. The most abundance taxa in the autumn samples was the Isopod *Asellus aquatica* (waterlouse). These changes in abundance are likely to be driven by seasonal changes in life stage from early to later (larger, and therefore more readily sampled) larval instars as well as the availability of food resources.

Table 4-3 Number of macroinvertebrate species/taxa recorded at River Mole and Gatwick Stream sites

	Spring	Summer	Autumn
River Mole	21	17	20
Gatwick Stream upstream	12	10	13
Gatwick Stream downstream	8	8	9

4.2.3 The consistent occurrence of low BMWP scoring (i.e. 3 or below) species and taxa such as the waterlouse *A. aquatica*, Chironimidae and Oligochaeta on all three visits suggest that the watercourse is affected by organic pollution. This is confirmed by BMWP scores of 44, 46 and 49, and ASPT of 3.73, 3.45 and 3.43 in the spring, summer and autumn samples respectively indicating moderately polluted conditions.

Table 4-4. Macroinvertebrate biotic indices

Biotic Index	Spring			Summer			Autumn		
	U/S River Mole	Gatwick Brook U/S	Gatwick Brook D/S	River Mole U/S	Gatwick Brook U/S	Gatwick Brook D/S	U/S River Mole	Gatwick Brook U/S	Gatwick Brook D/S
	01/07/2020	01/07/2020	01/07/2020	27/07/2020	27/07/2020	27/07/2020	29/09/2020	29/09/2020	29/09/2020
BMWP (TL1)	44	46	14	46	37	29	49	41	20
LIFE (TL5)	6,25	8,17	7,5	6,10	7,40	7,75	5,87	6,75	8
ASPT (TL2)	3,73	4,92	3,50	3,45	4,53	3,91	3,43	4,13	2,88
PSI (TL5)	10,00	66,67	14,29	5,00	41,67	50,00	6,25	21,05	33,33
CCI (TL5)	5,50	4,50	0	4,00	5,00	1,00	9,62	1,20	1

4.2.4 LIFE scores for the R Mole ranged from 6.25 in the spring/early summer sample, 6.1 in the summer sample and 5.87 in the autumn sample, indicating sluggish flow conditions (Table 4-44-4). The decline in LIFE scores over the summer period are likely to be primarily a result of low flow conditions due to low summer rainfall, although extensive macrophyte beds in the channel may also be impeding flow. Low PSI scores of less than 20 also indicate heavily sedimented conditions. This correlates with low flow velocities in the channel indicated by the LIFE scores, and is likely to be exacerbated by the extensive macrophyte beds.

4.2.5 CCI scores of between 5 and 10 indicate that the macroinvertebrate community is of moderate conservation value. The presence of *Sigara limitata*, a species of water boatman, contributed to a slightly higher score of 9.62 in the autumn sample.

Fish

4.2.6 A total of 415 fish were caught on the River Mole in spring after three runs compared with only 28 fish caught in autumn with the same level of effort. Roach (*Rutilus rutilus*) were the most abundant fish species identified (252) in spring and in autumn (13).

4.2.7 The size range of species caught on the electrofishing surveys in spring (Table 4-54-5) suggests that there are multiple age classes of each species, ranging from juveniles to mature adults. The stretch of the River Mole sampled in this study appears to be a good breeding and spawning environment for Roach and Perch, due to its slow flow environment and dense vegetation. The mean size data in spring would suggest that this stretch also appears to be a good environment for juvenile and sub-adult Chub and Dace as well as providing optimal foraging habitat for predatory fish species such as Pike.

Table 4-5: River Mole Fish Survey Data

River Mole					
Spring					
Species	Latin name	Abundance	Mean size (mm)	Min size (mm)	Max size (mm)
Chub	*Squalis cephalus*	45	166.55	77	386
Roach	*Rutilus rutilus*	252	106.91	45	256
Dace	*Leucisus luecisus*	37	127.86	59	203
Pike	Esox lucius	14	344.86	108	595
Perch	*Perca fluviatilis*	46	130.00	73	258
Bream	*Abramis brama*	3	72.33	62	79
Tench	*Tinca tinca*	2	89.0	85	93
Gudgeon	*Gobio gobio*	13	93.1	82	109
Rudd	*Scardinus erythroplathalamus*	2	138.50	81	196
Roach/ Bream Hybrid		1	143	143	143
Autumn					
Species	Latin name	Abundance	Mean size (mm)	Min size (mm)	Max size (mm)
Chub	*Squalis cephalus*	3	217.67	181	289
Roach	*Rutilus rutilus*	13	123	64	200
Tench	*Tinca tinca*	7	198	153	248
Pike	Esox lucius	4	121	110	127
Perch	*Perca fluviatilis*	1	86	86	86

Gatwick Stream

Water quality

4.2.8 Water temperature at the two Gatwick Stream sites remained relatively consistent across the three seasons (Table 4-74-6), peaking at 16.7°C at the downstream site during the summer visit on 29th July. The lowest temperature was recorded at the upstream site (14.8°C) at the end of September. The sites are moderately shaded by overhanging trees, which will help to buffer water temperature. Dissolved oxygen concentrations also remained relatively high at over 70% throughout the three seasons, reaching a maximum of 78.7% at the downstream site in autumn. Turbidity was relatively high compared with the River Mole site, with a minimum of 5.95NTU at the upstream site in autumn and a maximum of 11.85NTU at the upstream site in summer.

Table 4-6: Water quality data for Gatwick Stream

Spring						
Site	Temperature (°C)	DO (%)	DO (mg/L)	pH	Conductivity (µS/cm)	Turbidity (NTU)
Gatwick Stream US	15.4	73.5	7.34	7.53	276.2	11.21
Gatwick Stream DS	16.7	71.7	7.37	7.76	333.9	10.74
Summer						
Site	Temperature (°C)	DO (%)	DO (mg/L)	pH	Conductivity (µS/cm)	Turbidity (NTU)
Gatwick Stream US	16.5	72.0	7.04	7.68	280.1	11.85
Gatwick Stream DS	16.7	73.5	7.13	8.00	269.1	10.92
Autumn						
Site	Temperature (°C)	DO (%)	DO (mg/L)	pH	Conductivity (µS/cm)	Turbidity (NTU)
Gatwick Stream US	14.8	76.8	7.73	7.46	413.9	5.95
Gatwick Stream DS	16.0	78.7	7.73	8.2	387.8	11.64

Macroinvertebrates

4.2.9 Fewer taxa were recorded at the two Gatwick Stream sites compared with River Mole (mean of 10 taxa per visit, compared with 19.3)(Table 4-34-3). As with the R Mole, the number of taxa recorded per visit remained relatively consistent, with a maximum of 13 in the autumn sample and a minimum of 10 in the summer sample at the upstream site. Eight taxa were recorded at the downstream site during spring and summer, and 9 in the autumn.

4.2.10 BMWP scores indicate moderate water quality conditions for the upstream site at the Gatwick Stream in spring and autumn (46 and 41 respectively) but were classed as poor in summer (37) (Table 4-4). The boundary between moderate and poor lies at 40, and therefore the difference between the three visits is unlikely to be significant, and is due to the smaller number of taxa recorded. However, an additional three species were recorded in the autumn sample, including the coloniser species *Asellidae,* and the caddisfly, *Polycentropus flavomaculatus,* suggesting an increase in water quality at this location, although both species were found in low abundance. The ASPT for the upstream site is similar across the three visits and is lowest in the autumn sample (4.92, 4.53 and 4.13 for the spring, summer and autumn visit respectively).

4.2.11 At the downstream site of the Gatwick Stream the BMWP scores are classified as poor across all three visits, with the score of 14 for the spring visit being close to very poor (Table 4-4). The ASPT is also consistently lower for this site than the upstream site (3.50, 3.91 and 2.88 for the spring, summer and autumn visit respectively) over all three visits indicating the presence of pollution tolerant taxa only.

4.2.12 The PSI scores for the upstream site fluctuated considerably across the three season, with the maximum score of 66.67 in the spring indicating only slightly sedimented conditions (Table 4-4). However, the scores dropped progressively at this site through the season to 41.67 in the summer (moderately sedimented conditions) and then to 21.05 (sedimented conditions) in the autumn. Assuming no changes in the inputs of sediment upstream of the site, this suggests that flow velocity dropped through the season, leading to increased sediment deposition. A high LIFE score for the upstream site of 8.17 during the spring visit also suggests that velocities are high in the early part of the season.

4.2.13 The PSI scores for the downstream site indicated heavily sedimented conditions during the spring season (score of 14.29), with a change to moderately sedimented conditions (score of 50) in the summer and a return to sedimented conditions in the autumn (score of 33.33). LIFE scores remained relatively high and consistent across the three seasons at the downstream site (7.5, 7.75 and 8 at the spring, summer and autumn visit respectively) suggesting relatively consistent flow velocities (Table 4-4).

4.2.14 CCI scores for both of the Gatwick Stream sites were relatively low indicating that rare and/or notable species are absent from the macroinvertebrate assemblage. Although scores for both sites were below 5 on all sampling occasions, the upstream site had scores of 4.5 and 5 in the spring and summer respectively, whilst the scores for the downstream site was either 1 or 0 on all occasions. This indicates that the assemblage at the upstream site is of marginally higher conservation value.

Fish

4.2.15 A total of 300 and 317 fish were caught in spring and autumn respectively in the Gatwick Stream after three runs. Chub (*Squalius cephalus*) were the most abundant fish species identified (111) in spring on the Gatwick Stream, whereas Dace (*Leucisus leucisus*) were the most abundant fish species identified (137) in autumn (Table 4-7).

4.2.16 The size range of species caught during the electrofishing surveys carried out on the Gatwick Stream in spring suggests that there are multiple age classes of each species, ranging from juveniles to mature adults all year round.

Table 4-7: Gatwick Stream Fish Survey Data

Gatwick Brook					
Spring					
Species	Latin name	Abundance	Mean size (mm	Min size (mm)	Max size (mm)
Chub	*Squalis cephalus*	111	194.50	52	360
Dace	*Leucisus luecisus*	74	145.35	63	220
Perch	*Perca fluviatilis*	36	85.05	65	156
Roach	*Rutilus rutilus*	11	105.45	72	153
Bream	*Abramis brama*	6	146	92	279
Gudgeon	*Gobio gobio*	57	107.24	75	197
Stone Loach	*Barbatula barbatula*	3	127.33	97	179
Autumn					
Species	Latin name	Abundance	Mean size	Min size (mm)	Max size (mm)
Chub	*Squalis cephalus*	85	211.56	71	436
Dace	*Leucisus luecisus*	137	149.38	50	204
Roach	*Rutilus rutilus*	28	111.32	71	156
Perch	*Perca fluviatilis*	21	113.14	80	213
Bream	*Abramis brama*	10	158	132	284
Gudgeon	*Gobio gobio*	36	118.55	52	146
Stone Loach	*Barbatula barbatula*	3	86	65	98

5. Discussion

River Mole

5.1.1 The study stretch on the River Mole lies within open floodplain grassland with no shading from trees. This means that water temperatures, and therefore dissolved oxygen, fluctuate considerably, since oxygen is less soluble in warm water. Bacterial activity associated with organic pollution also depletes dissolved oxygen levels, and therefore macroinvertebrate taxa which occur in organically polluted conditions are tolerant of low dissolved oxygen conditions. Both factors are likely to be influencing the macroinvertebrate community at the River Mole site.

5.1.2 Extensive stands of macrophytes covered approximately 90% of the channel surface, including submerged species such as water crowfoot (R*anunculus aquatilis*) and the invasive non-native Canadian pondweed (*Elodea canadensis)*. Emergent species such as branched bur-reed (*Sparganium erectum),* old world arrowhead (*Sagittaria sagittifolia)* and reed sweet-grass *(Glyceria maxima)* also dominated the channel. Although this channel vegetation will have contributed dissolved oxygen to the water during the summer through photosynthesis, their decay in autumn will contribute to organic pollution in reducing dissolved oxygen (28.2% and 3.03 mg/L during the autumn visit). Significant increases in conductivity such as those seen on the River Mole from spring to autumn (358 – 471 µS/cm) (Table 4-2) are likely attributed to the decay of macrophytes and the release of ions such as phosphorous.

5.1.3 Submerged and emergent macrophyte stands are also contributing to reduced flow velocity and increased sedimentation, reflected in the low LIFE and PSI scores for this reach.

5.1.4 The presence of one record from 2013 of shining ram's-horn snail (*S. nitida)*, an IUCN Red List species and UK species of principal importance under the 2006 NERC Act has implications for the design of the scheme (Figure 2). Once abundant in ditch networks in the UK, the species has declined steeply, and now only occurs in a restricted number of sites in Norfolk Broads, Pevensey Levels, Lewis Levels and East Kent (Clarke, 2011). The reasons for its decline are not fully understood but are thought to be over-frequent ditch clearance, eutrophication due to fertiliser run-off, and conversion of grazing levels to arable farming with associated water table lowering (Suffolk Biological Information Service, 2003).

5.1.5 In a study of the associations of the species with ditch vegetation communities Clarke (2011) only found the species in ditches supporting the *Carex-Juncus-Eleocharis-Oenanthe* community of emergent vegetation. Although a full macrophyte survey was not undertaken during this study, incidental recording of macrophytes at the sampling location was undertaken and this community type was not present. However, the entire stretch from the boundary with Gatwick airport to the end of the study reach is heavily vegetated and largely impenetrable. More suitable habitat may therefore exist further downstream towards the location where it was recorded in 2013. Recommendations for further survey to determine the potential presence of the species within the study section are presented in Section 6.

5.1.6 The extensive macrophyte growth on the River Mole throughout the year made electrofishing difficult. In spring the filamentous algae, *Cladophora* created dense mats, which surrounded the anode each time it was placed into the water, making progress slow as the anodes regularly needed to be brought to the surface and cleared of the algae. In some cases, *Cladophora* can be beneficial to an ecosystem by providing a food source to aquatic organisms and providing a buffer to nutrification. However, excessive growth of *Cladophora* prevents aeration of deeper waters as the dense mats prevent circulation of water, which is detrimental to an ecosystem.

5.1.7 The high variability and remarkably low concentration of DO in the waters of the River Mole, likely contributed to the low catch in autumn where only 28 fish were caught in comparison to 415 in spring. The slow/sluggish flow of the River Mole, in combination with higher water temperatures in summer (17.6°C) could be causing DO to disassociate faster from the water. The increased presence of Tench (*Tinca tinca*) in the River Mole in autumn acted as an in-field indicator of low DO conditions, as Tench are able to tolerate much lower DO conditions than most other UK fish species.

5.1.8 The abundance of predatory fish in summer such as Pike (*Esox Lucius)* and Perch (*Perca fluviatilis)*, may have been having a disproportionate impact on prey species on the River Mole. The prevalence of these predators has likely contributed to the significant decline in the fish population from 417 in summer to 28 in autumn. In total 14 Pike were caught in summer ranging in size from 108mm – 595mm indicating the full range of age classes. Pike are very effective freshwater hunters and as ambush predators are aided by the abundant macrophyte growth, In addition to this 46 Perch were caught in summer and ranged in size from 73mm –

258mm, also suggesting a full range of age classes. Perch also utilise macrophytes to aid in their hunting techniques, however, they are more temperature sensitive, retreating to deeper waters throughout the autumn and winter months, which has likely contributed to their decline in the area to one individual in autumn on the River Mole.

Gatwick Stream

5.1.9 The downstream site of the Gatwick Stream appears to be suffering from poorer biological water quality than the upstream site, with the LIFE and PSI scores indicating an influx of organic pollution somewhere between these sites. This is supported by the absence of *Asellidae,* which suggests that organic pollution is chronic and there has been no recovery between Spring – Autumn. Crawley sewage treatment works lies immediately east of the Gatwick Stream, and although the discharge is directly into the River Mole, it is possible that storm water discharges from the associated industrial area enter the Gatwick Stream between the two sites. Relatively high turbidity levels of between 5.95 and 11.85NTU compared with a maximum of 4.3NTU at the River Mole site.

5.1.10 Differences in habitat quality and diversity between the two Gatwick Stream sites may also have influenced the macroinvertebrate community. Both sites were moderately shaded by overhanging trees, but the upstream sites was located on a tight bend with a small riffle section on the outer side of the bend, and a shallow berm on the inside edge. These microhabitats are likely to support distinct macroinvertebrate communities, with the more pollution sensitive species present in the riffle section.

5.1.11 The considerable variation in PSI score between the three seasonal visits at the upstream sites (maximum of 66.67 in spring compared to a minimum of 21.05 in autumn) may indicate that the macroinvertebrate community at this site is sensitive to changes on sediment deposition. Equally, it may have resulted from small differences in sampling effort in each of the microhabitats leading to a higher number of sediment sensitive taxa in the spring sample. Limited conclusions can be drawn with only one sample per visit and data from a single visit and further sampling would be required to determine any trends in the data. Overall, both sites are moderately to heavily sedimented with likely potential storm water discharges resulting in greater sedimentation at the downstream site.

5.1.12 The invasive New Zealand mud snail (*Potamopyrgus antipodarum*) was identified at both sites except for the Gatwick Stream downstream site in Autumn. The New Zealand pond snail is now one of the most common gastropods in the UK, its ability to avoid desiccation and its tolerance for a range of conditions enables it to dominate native gastropods, which may lead to disruptions in the food chain and effect native fish species. Currently the Gatwick Stream upstream site hosts the largest population of New Zealand mud snail, where abundances increased from 12 to 40 from spring to autumn in the samples collected. Signal crayfish (*Pacifastacus leniusculus*) were observed in relatively high numbers at both the Gatwick Stream sites during each of the visits.

5.1.13 The macroinvertebrate results from this study compare favourably with the Environment Agency data collected in 2017 and 2019 (Table 4-1). A slightly higher ASPT score of 4.92 was obtained for the upstream site in early July compared with values of 3.92 and 4.0 for the 'At Tinsley Bridge, Tinsley Green' and 'Downstream Tinsley Bridge (Flylife Site)' in March 2019. However, this may reflect seasonal changes in the macroinvertebrate community between March and July. LIFE and PSI scores for both data sets indicate relatively sluggish and sedimented conditions.

5.1.14 The Gatwick Stream on first appearances seemed to be poor for fish species but surprisingly a consistently healthy population of fish were caught in spring (300) and in autumn (317). This likely due to the Gatwick Stream maintaining a relatively consistent water temperature (14.8-16.7°C) across all three seasons and dissolved oxygen concentrations >71%. Furthermore, although the macroinvertebrate community is poor on the Gatwick Stream, the abundance of *Chironomids, Oligochaetes* and *Gastropods* provide an excellent food source. There is also a diverse range of microhabitats present, such as shaded pools and undercut banks, interspersed with roots providing shelter for fish.

5.1.15 As a matter of interest, a Roach – Bream hybrid was identified in spring. Hybridisation between these two species is not uncommon as hybridisation between members of cyprinids is more widespread than in any other group of freshwater fish.

6. Conclusions and recommendations

6.1 Conclusions

6.1.1 There are no Environment Agency WFD monitoring sites on this stretch of the River Mole and therefore no background data to compare the field data collected in this study with. Data from a single site on a single year, albeit across three seasons, does not enable a comprehensive assessment of trends in the macroinvertebrate assemblage. However, based on the analysis of macroinvertebrate data collected for this study, the River Mole exhibits moderate biological water quality. Dense macrophyte growth within the channel, exacerbated by organic pollution are causing acute reductions in dissolved oxygen are likely to be impacting on the macroinvertebrate assemblage.

6.1.2 The record from 2013 of shining ramshorn snail (S. nitida), an IUCN Red List species and UK species of principal importance under the 2006 NERC Act has implications for the design of any surface water management and flood alleviation scheme. The species was not recorded during the surveys for this study, although the survey section did not coincide with the reach in which the snail was recorded.

6.1.3 A targeted survey for the species is required to determine its presence or absence (Section 6.2). If the species is found to be present the marginal and channel macrophyte vegetation, and flow conditions will need to be preserved in the section of the river in which the population occurs. Creation of new habitat, possibly in the form of off-line ditches supporting dense emergent vegetation is likely to be a requirement of the scheme if the species is found to be present.

6.1.4 The structure and abundance of the cyprinid fish community in the River Mole appears to be driven by sluggish flow conditions and high summer water temperatures which favour species such as tench. The dense stands of submerged and emergent macrophytes provide foraging habitat for predatory species such as pike. Periodic dredging of the macrophyte beds would help to establish larger areas of open and deeper water thus providing refuges for prey species, improving flow conditions and creating areas of deeper, cooler water.

6.1.5 Based on macroinvertebrate biotic scores the Gatwick Stream has biological quality ranging from moderate at the upstream site to poor at the downstream site. Nevertheless, it retains a natural sinuous course with a variety of microhabitats supporting a range of macroinvertebrate and fish species. However, the watercourse appears to be impacted by both organic pollution and silt deposition, possibly from a storm water discharge from a nearby industrial area.

6.1.6 The invasive New Zealand mud snail was identified at the River Mole and Gatwick Stream sites, and signal crayfish were observed at both the Gatwick Stream sites during each visit.

6.2 Recommendations

6.2.1 Both the Gatwick Stream and the River Mole retain natural sinuous channels characteristic of lowland rivers. It will be important to maintain and enhance this characteristic in both watercourses. The following recommendations for each watercourse are based on the findings from this study and will need refinement in light of the design of any surface water management and flood alleviation scheme and in the case of the River Mole, the findings of the survey for shining ramshorn snail. However, the habitat improvement measures recommended below are largely consistent with the requirements for this species.

River Mole

1. Undertake survey to establish presence/absence of shining ramshorn snail. Survey to focus initially on the site of the 2013 record and if found to be present, extended to incorporate the whole study section. Surveys should be scoped and undertaken by a specialist mollusc ecologist.

2. If shining ramshorn snail found to be absent from main channel, undertake vegetation removal/dredging from the central channel/thalweg of the River Mole in selected sections. Marginal berms should be retained on alternate sides of the channel throughout the dredged section for the re-establishment of emergent vegetation. Brushwood faggots or fascines anchored with wooden stakes can be used to maintain the riverward edge of the berm and prevent silt from slumping into the main channel.

3. Off-line scrapes and shallow ponds could be created within the floodplain grassland area to provide habitat for wetland birds. If shining ramshorn snail is found to be present this recommendation can be adapted to incorporate new, permanently wet ditches supporting dense emergent reed vegetation.

Gatwick Stream

4. Identify point sources of pollution from industrial area associated with Crawley STW including storm drains and surface water discharge points from roads and urban areas. Consider SUDS scheme to address these discharges including settlement ponds and reedbed treatment systems which would have additional biodiversity benefit.

6.2.2 Before any in-channel works begin it is advised that a fish rescue survey is undertaken to safeguard fish populations in the affected area. It will also be necessary to install stop nets at either end of the reach where in-channel works will be undertaken to prevent access by any other fish species whilst the works are ongoing.

6.2.3 Currently the River Mole is choked with submerged and emergent macrophyte growth, which is impeding flow, increasing deposition of sediment and reducing the circulation of deeper waters preventing aeration and creating low DO conditions. It is therefore advised that there is some level of routine maintenance of macrophyte and bankside vegetation to aid in reducing the effects of flooding and contribute to increasing the biological water quality.

6.3 Further Survey

6.3.1 It is recommended that further macroinvertebrate and fish surveys are carried out on both the River Mole and the Gatwick Stream to provide a more robust baseline of community assemblage and therefore better advise on any schemes in the future.

6.3.2 To provide additional insight into the hydrological conditions of these rivers, it is recommended that further investigations are carried out to monitor the flow velocity and the discharge rates in order to better advise on any schemes in the future, which could include the installation of level loggers.

7. References

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Appendix 1

Table 1: Species records for Gatwick Stream derived from the desk study

Common Name	Scientific Name	HSR Sch[3] 2 or 5	WCA[4] Sch1, 5 or 8	National Priority Species[5]	Local priority/ BAP species	Red Data Book/ BoCC[6]	Other	Grid Ref.	Distance from site	Source
Birds										
Goldeneye	*Bucephala clangula*		✓			Amber				
Reed Bunting	*Emberiza schoeniclus*				✓	Amber	NERC Act			
Bearded Tit	*Panurus biarmicus*		✓							
Kingfisher	*Alcedo atthis*		✓			Amber	Annex 1 Birds Directive			
Yellow Wagtail	*Motacilla flava*				✓	Red	NERC Act			

[3] Conservation of Habitats and Species Regulations 2010, as amended
[4] Wildlife and Countryside Act 1981, as amended
[5] Species of Principal Importance within the relevant country of the United Kingdom
[6] Birds of Conservation Concern 4: the population status of birds in the United Kingdom, Channel Islands and the Isle of Man

Common Name	Scientific Name	HSR Sch[7] 2 or 5	WCA[8] Sch1, 5 or 8	National Priority Species[9]	Local priority/ BAP species	Red Data Book/ BoCC[10]	Other	Grid Ref.	Distance from site	Source
Amphibians										
Common Toad	*Bufo bufo*		✓		✓					
Common Frog	*Rana temporaria*		✓							
Palmate Newt	*Lissotriton helveticus*		✓							
Smooth Newt	*Lissotriton vulgaris*		✓							
Great Crested Newt	*Triturus cristatus*	✓	✓		✓		NERC Act			
Fish										
Bullhead	*Cottus gobio*	✓								
Brown/Sea Trout	*Salmo trutta*				✓		NERC Act			
Mammals (excluding bats)										
Reptiles										
Slow Worm	*Anguis fragilis*		✓		✓		NERC Act			
Grass Snake	*Natrix helvetica*		✓		✓		NERC Act			
Bats										
Serotine Bat	*Eptesicus serotinus*	✓	✓							
Brandt's Bat	*Myotis brandtii*	✓	✓							

[7] Conservation of Habitats and Species Regulations 2010, as amended
[8] Wildlife and Countryside Act 1981, as amended
[9] Species of Principal Importance within the relevant country of the United Kingdom
[10] Birds of Conservation Concern 4: the population status of birds in the United Kingdom, Channel Islands and the Isle of Man

Brown Long-eared Bat	*Plecotus auritus*	✓	✓		✓							

Table 2: Species records for River Mole derived from the desk study

Common Name	Scientific Name	HSR Sch[11] 2 or 5	WCA[12] Sch1, 5 or 8	National Priority Species[13]	Local priority/ BAP species	Red Data Book/ BoCC[14]	Other	Grid Ref.	Distance from site	Source
Birds										
Kingfisher	*Alcedo atthis*		✓			Amber	Annex 1 Birds Directive			
Song Thrush	*Turdus philomelos*				✓	Red	NERC Act			
Song Thrush (subspecies)	*Turdus philomelos clarkei*				✓	Red	NERC Act			
Redwing	*Turdus iliacus*		✓			Red				
Fieldfare	*Turdus pilaris*		✓			Red				
Skylark	*Aladua arvensis*				✓	Red	NERC Act			
Yellow Wagtail					✓	Red	NERC Act			
Dunnock	*Prunella modularis*				✓	Amber	NERC Act			
Black Redstart	*Phoenicurus ochruros*		✓			Red				
Nightingale	*Luscinia megarhynchos*					Red				
Marsh Tit	*Poecile palustris*				✓	Red	NERC Act			
Starling	*Sturnus vulgaris*				✓	Red	NERC Act			
House Sparrow	*Passer domesticus*				✓	Red	NERC Act			
Bullfinch	*Pyrrhula pyrrhula*				✓	Amber	NERC Act			
Hawfinch	*Coccothraustes coccothraustes*				✓	Red	NERC Act			
Yellowhammer	*Emberiza citrinella*				✓	Red	NERC Act			

[11] Conservation of Habitats and Species Regulations 2010, as amended

[12] Wildlife and Countryside Act 1981, as amended
[13] Species of Principal Importance within the relevant country of the United Kingdom
[14] Birds of Conservation Concern 4: the population status of birds in the United Kingdom, Channel Islands and the Isle of Man

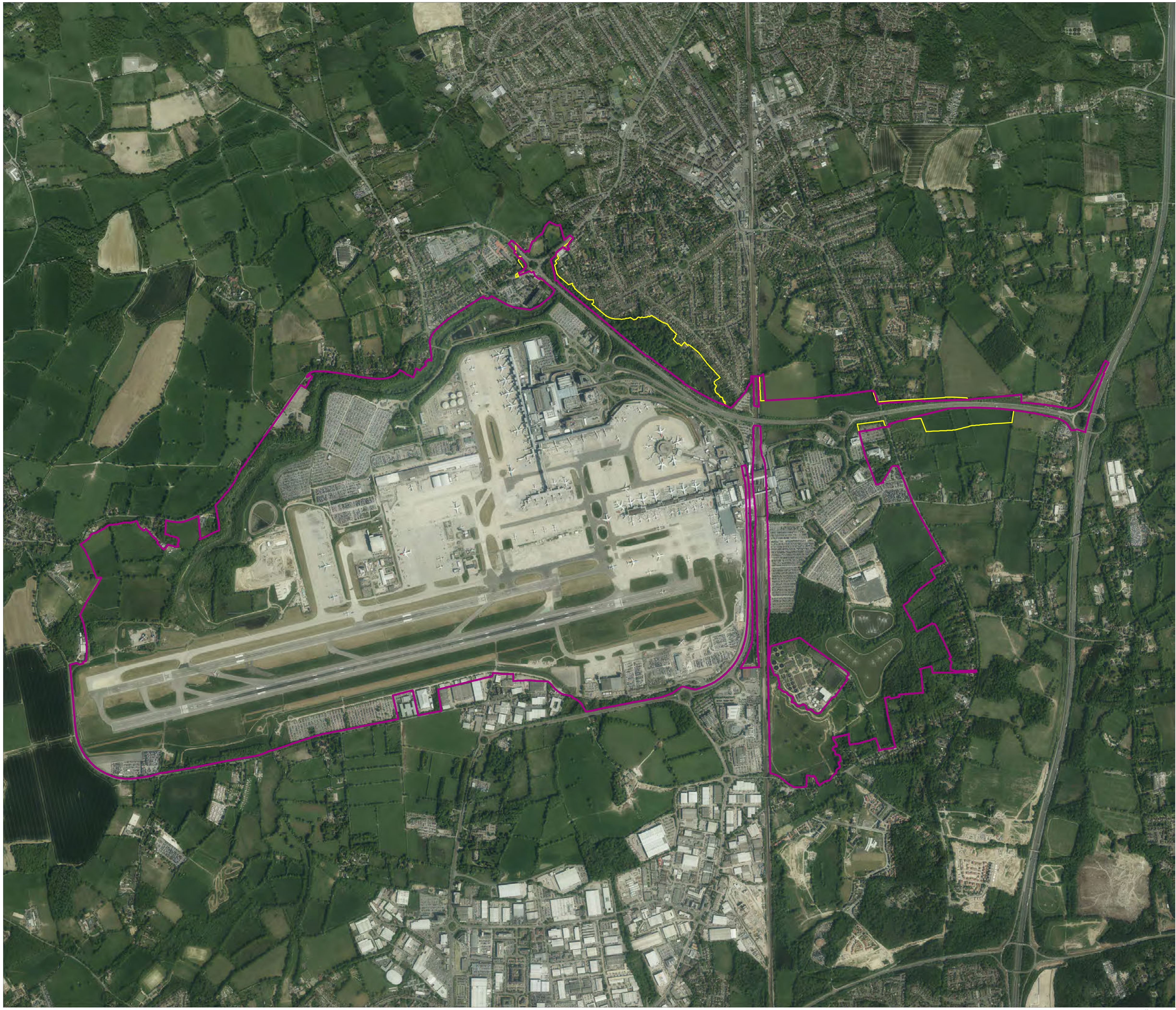
Common Name	Scientific Name	HSR Sch[15] 2 or 5	WCA[16] Sch1, 5 or 8	National Priority Species[17]	Local priority/ BAP species	Red Data Book/ BoCC[18]	Other	Grid Ref.	Distance from site	Source
Reed Bunting	*Emberiza schoeniclus*				✓	Amber	NERC Act			
Bearded Tit	*Panurus biarmicus*		✓							
Amphibians										
Smooth Newt	*Lissotriton vulgaris*		✓							
Invertebrates - Molluscs										
Shining Ram's-Horn	*Segmentina nitida*				✓		NERC Act			
Fish										
Bullhead	*Cottus gobio*	✓								
Brown Trout	*Salmo trutta*				✓		NERC Act			
Mammals (excluding bats)										
Harvest Mouse	*Micromys minutus*				✓		NERC Act			
Reptiles										
Grass Snake	*Natrix helvetica*		✓		✓		NERC Act			
Common Name	**Scientific Name**	**HSR Sch[19] 2 or 5**	**WCA[20] Sch1, 5 or 8**	**National Priority Species[21]**	**Local priority/ BAP species**	**Red Data Book/ BoCC[22]**	**Other**	**Grid Ref.**	**Distance from site**	**Source**
Bats										
Serotine Bat	*Eptesicus serotinus*	✓	✓				Annex 4 Habitats Directive			

[15] Conservation of Habitats and Species Regulations 2010, as amended
[16] Wildlife and Countryside Act 1981, as amended
[17] Species of Principal Importance within the relevant country of the United Kingdom
[18] Birds of Conservation Concern 4: the population status of birds in the United Kingdom, Channel Islands and the Isle of Man
[19] Conservation of Habitats and Species Regulations 2010, as amended
[20] Wildlife and Countryside Act 1981, as amended
[21] Species of Principal Importance within the relevant country of the United Kingdom
[22] Birds of Conservation Concern 4: the population status of birds in the United Kingdom, Channel Islands and the Isle of Man

Bechsteins Bat	*Myotis bechsteinii*	✓	✓		✓	NERC Act	Annex 4 Habitats Directive Annex 2 Habitats Directive			
Brown Long-eared Bat	*Plecotus auritus*	✓	✓		✓					
Daubenton's Bat	*Myotis daubentonii*	✓	✓				Annex 4 Habitats Directive			
Whiskered Bat	*Myotis mystacinus*	✓	✓				Annex 4 Habitats Directive			
Common Name	**Scientific Name**	**HSR Sch[23] 2 or 5**	**WCA[24] Sch1, 5 or 8**	**National Priority Species[25]**	**Local priority/ BAP species**	**Red Data Book/ BoCC[26]**	**Other**	**Grid Ref.**	**Distance from site**	**Source**
Natterer's Bat	*Myotis nattereri*	✓	✓				Annex 4 Habitats Directive			
Noctule Bat	*Nyctalus noctula*	✓	✓		✓	NERC Act	Annex 4 Habitats Directive			
Nathusius's Pipistrelle Bat	*Pipistrellus nathusii*	✓	✓				Annex 4 Habitats Directive			
Common Pipistrelle Bat	*Pipistrellus pipistrellus*	✓	✓		✓	NERC Act	Annex 4 Habitats Directive			

Soprano Pipistrelle Bat	*Pipistrellus pygmaeus*	✓	✓		✓	NERC Act	Annex 4 Habitats Directive			

[23] Conservation of Habitats and Species Regulations 2010, as amended
[24] Wildlife and Countryside Act 1981, as amended
[25] Species of Principal Importance within the relevant country of the United Kingdom
[26] Birds of Conservation Concern 4: the population status of birds in the United Kingdom, Channel Islands and the Isle of Man



YOUR LONDON AIRPORT
Gatwick

KEY

Project Site Boundary (PEIR)
Previous boundary used for survey

DOCUMENT
Preliminary Environmental Information Report Appendix 9.6.2

DRAWING TITLE
Breeding Bird Survey Area Covered

DATE
September 2021

ORIENTATION	DRAWING NO.	REVISION
N	FIGURE 2.4.1	For PEIR Issue
	DRAWN BY	PM / CHECKED BY
	CR	LM

SCALE @ A3 1:20,000

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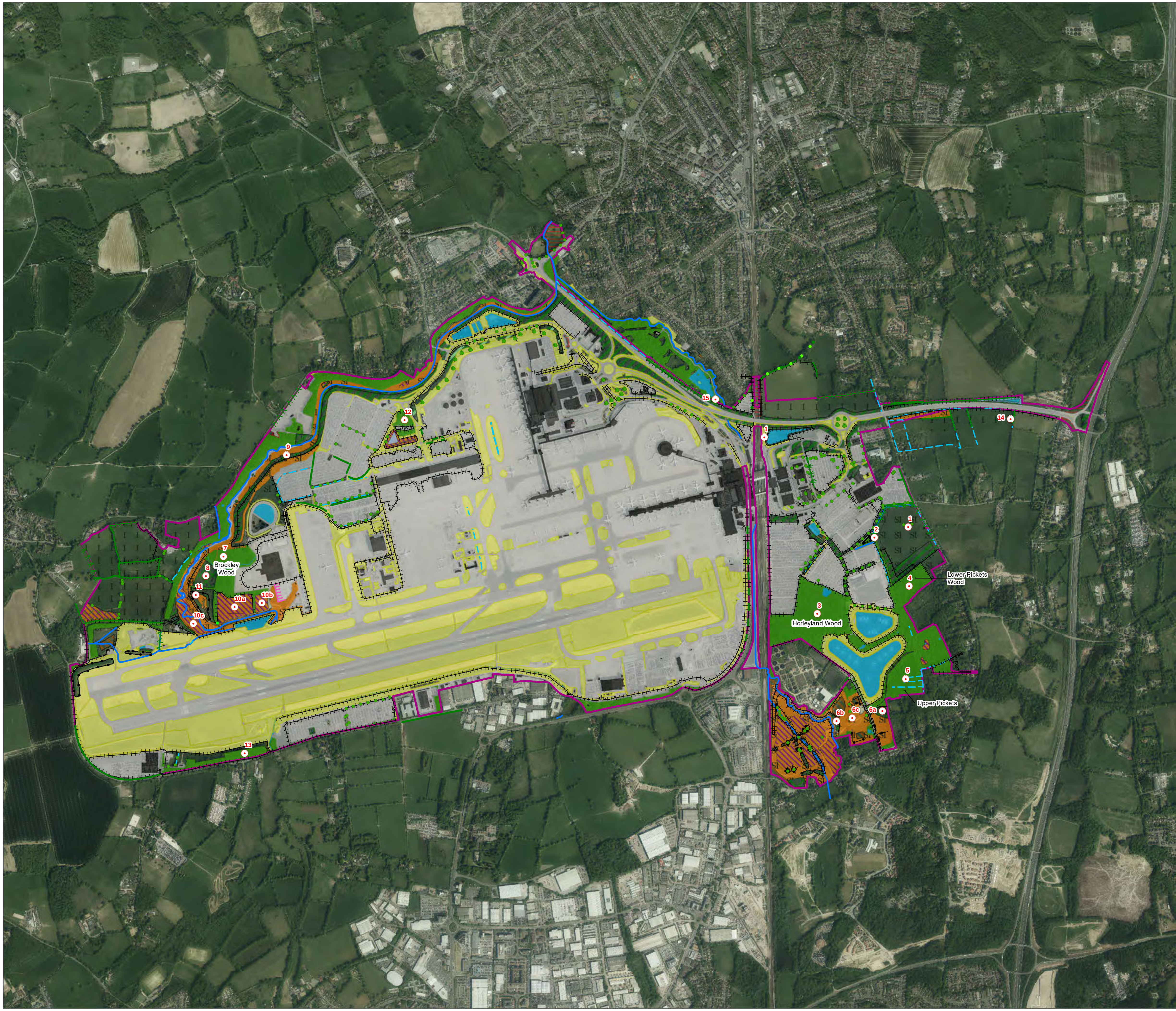

YOUR LONDON AIRPORT
Gatwick

KEY

- Project Site Boundary (PEIR)
- Phase 1 target notes
- Scattered tree - broadleaved
- Scattered tree - coniferous
- Broadleaved Parkland/scattered trees
- Mixed Parkland/scattered trees
- Intact hedge - native species-rich
- Intact hedge - species-poor
- Defunct hedge - native species-rich
- Defunct hedge - species-poor
- Hedge with trees - native species-rich
- Hedge with trees - species-poor
- Fence
- Dry ditch
- Earth bank
- Running water
- Wall
- <all other values>
- Broadleaved woodland - semi-natural
- Broadleaved woodland - plantation
- Mixed woodland - semi-natural
- Mixed woodland - plantation
- Scrub - dense/continuous
- Scrub - scattered
- Broadleaved Parkland/scattered trees
- Neutral grassland - semi-improved
- Improved grassland
- Marsh/marshy grassland
- Poor semi-improved grassland
- Tall ruderal
- Swamp
- Marginal vegetation
- Water body
- Amentiy grassland
- Ephemeral/short perennial
- Introduced shrub/ornamental planting
- Buildings
- Bare ground
- Other
- Hard standing
- No access

DOCUMENT
Preliminary Environmental Information Report Appendix 9.6.2

DRAWING TITLE
Phase 1 Habitat Survey

DATE
September 2021

ORIENTATION	DRAWING NO.	REVISION
N	FIGURE 3.1.1	For PEIR Issue
	DRAWN BY: CR	PM / CHECKED BY: LM

SCALE @ A3 1:20,000

0 250 500 1,000 m

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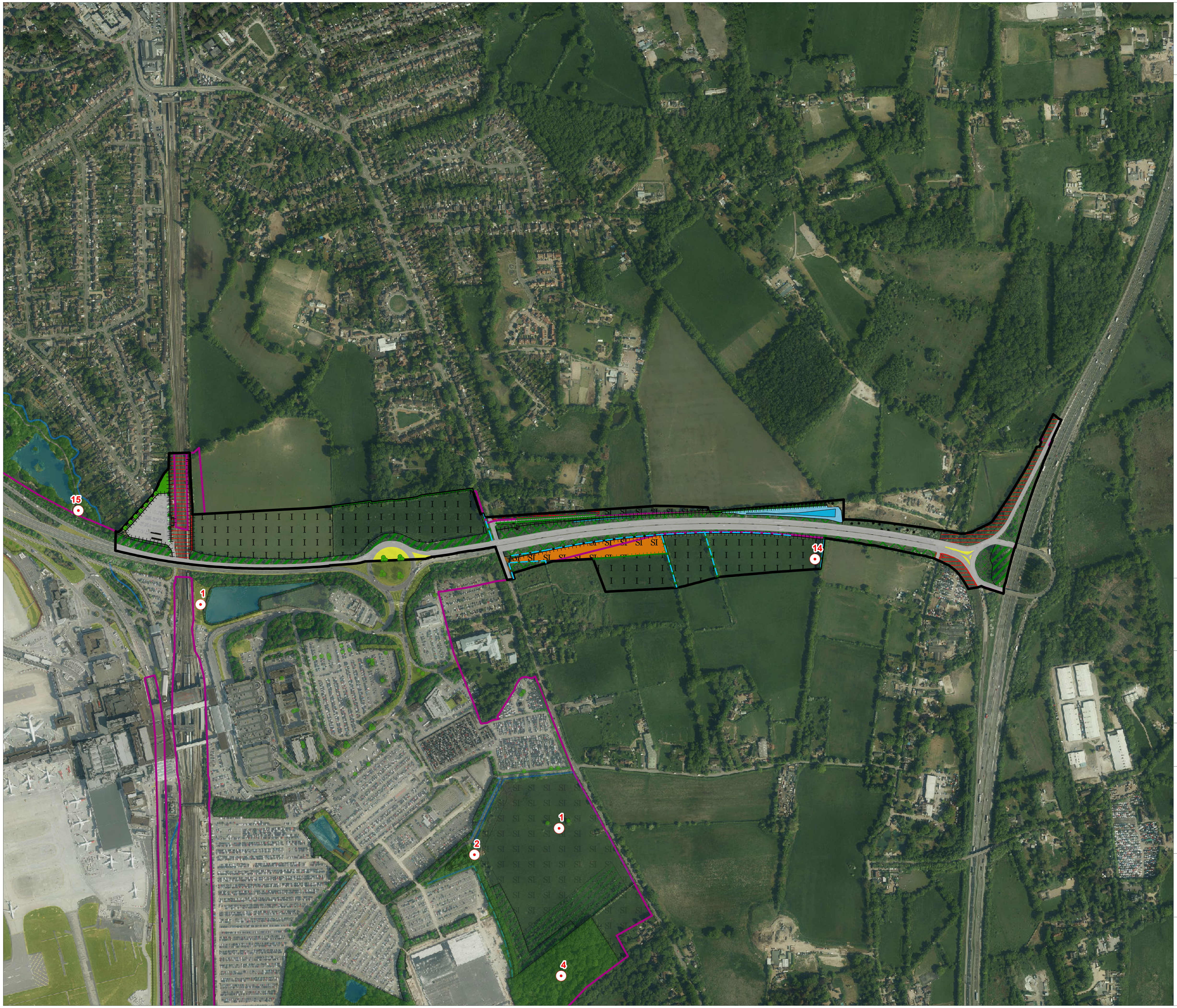

YOUR LONDON AIRPORT
Gatwick

KEY

- Project Site Boundary (PEIR)
- Ecology Parcel
- Phase 1 target notes
- Scattered tree - broadleaved
- Line of trees
- Mixed Parkland/scattered trees
- Intact hedge - native species-rich
- Intact hedge - species-poor
- Defunct hedge - native species-rich
- Hedge with trees - native species-rich
- Hedge with trees - species-poor
- Fence
- Dry ditch
- Earth bank
- Running water
- Broadleaved woodland - semi-natural
- Broadleaved woodland - plantation
- Mixed woodland - semi-natural
- Scrub - dense/continuous
- Scrub - scattered
- Broadleaved Parkland/scattered trees
- Neutral grassland - semi-improved
- Improved grassland
- Poor semi-improved grassland
- Tall ruderal
- Swamp
- Water body
- Amentiy grassland
- Introduced shrub/ornamental planting
- Buildings
- Bare ground
- Other
- Hard standing
- No access

DOCUMENT

Preliminary Environmental Information Report Appendix 9.6.2

DRAWING TITLE

Phase 1 Habitat Survey - A1 Fields north and south of M23 for construction laydown plus link to J9

DATE

September 2021

ORIENTATION	DRAWING NO.	REVISION
N	FIGURE 3.1.2a	For PEIR Issue
	DRAWN BY	PM / CHECKED BY
	CR	LM

SCALE @ A3 1:8,000

0 25 50 100 m

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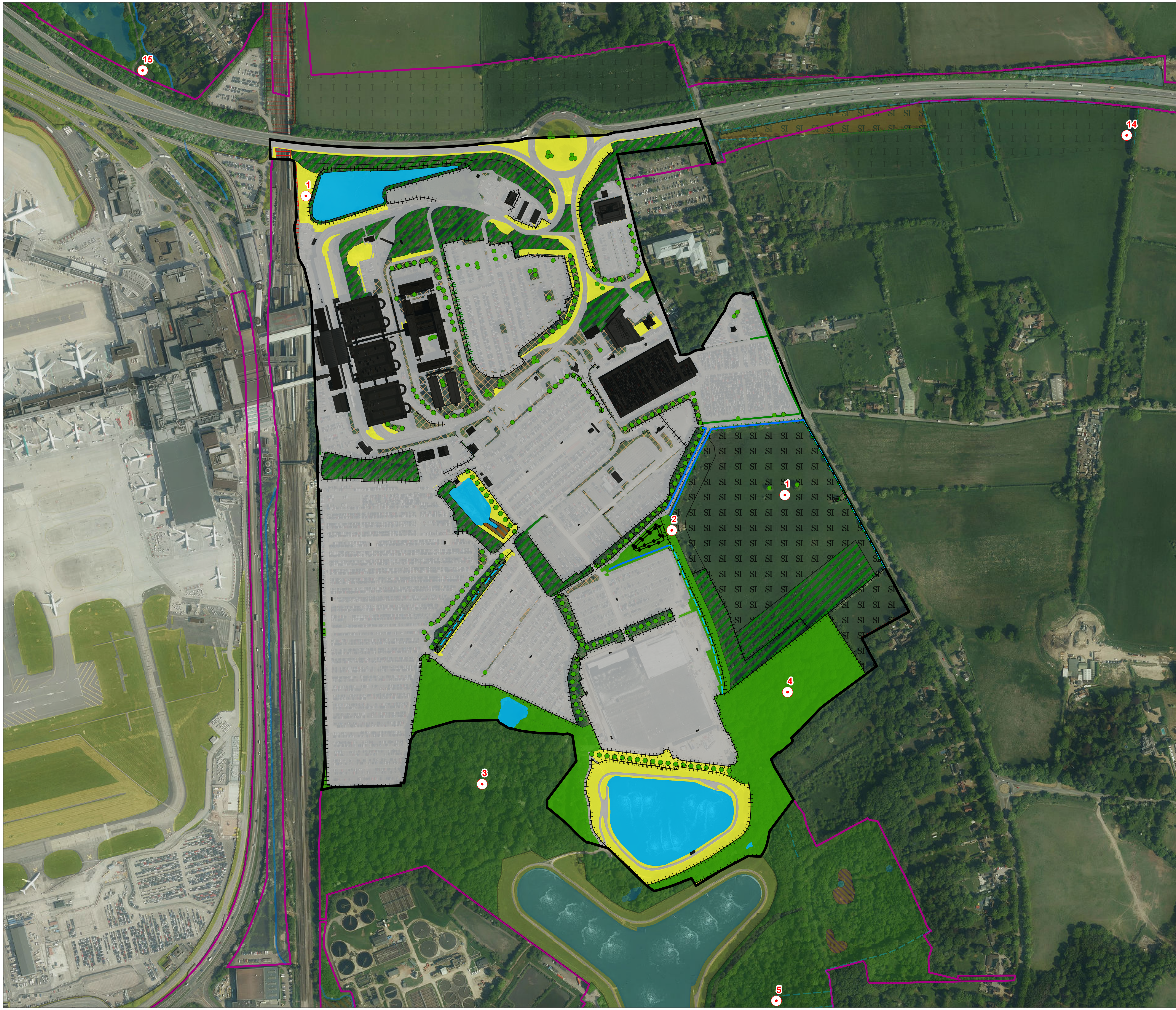

YOUR LONDON AIRPORT
Gatwick

KEY

- Project Site Boundary (PEIR)
- Ecology Parcel
- Phase 1 target notes
- Scattered tree - broadleaved
- Line of trees
- Mixed Parkland/scattered trees
- Intact hedge - native species-rich
- Intact hedge - species-poor
- Defunct hedge - native species-rich
- Defunct hedge - species-poor
- Hedge with trees - native species-rich
- Hedge with trees - species-poor
- Fence
- Dry ditch
- Earth bank
- Running water
- Broadleaved woodland - semi-natural
- Broadleaved woodland - plantation
- Mixed woodland - semi-natural
- Scrub - dense/continuous
- Scrub - scattered
- Broadleaved Parkland/scattered trees
- Neutral grassland - semi-improved
- Improved grassland
- Marsh/marshy grassland
- Poor semi-improved grassland
- Tall ruderal
- Swamp
- Water body
- Amentiy grassland
- Introduced shrub/ornamental planting
- Buildings
- Bare ground
- Other
- Hard standing
- No access

DOCUMENT
Preliminary Environmental Information Report Appendix 9.6.2

DRAWING TITLE
Phase 1 Habitat Survey - A2 Eastern carparking and associated surface water features

DATE
September 2021

ORIENTATION	DRAWING NO.	REVISION
N	FIGURE 3.1.2b	For PEIR Issue
	DRAWN BY	PM / CHECKED BY
	CR	LM

SCALE @ A3 1:6,000

0 25 50 100 m

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YOUR LONDON AIRPORT
Gatwick

KEY

- Project Site Boundary (PEIR)
- Ecology Parcel
- Phase 1 target notes
- Scattered tree - broadleaved
- Line of trees
- Intact hedge - species-poor
- Defunct hedge - species-poor
- Fence
- Dry ditch
- Earth bank
- Running water
- Broadleaved woodland - semi-natural
- Broadleaved woodland - plantation
- Scrub - dense/continuous
- Scrub - scattered
- Neutral grassland - semi-improved
- Marsh/marshy grassland
- Poor semi-improved grassland
- Tall ruderal
- Water body
- Amentiy grassland
- Introduced shrub/ornamental planting
- Buildings
- Bare ground
- Hard standing
- No access

DOCUMENT
Preliminary Environmental Information Report Appendix 9.6.2

DRAWING TITLE
Phase 1 Habitat Survey - A3 Land East of the Railway Line

DATE
September 2021

ORIENTATION	DRAWING NO.	REVISION
N	FIGURE 3.1.2c	For PEIR Issue
	DRAWN BY	PM / CHECKED BY
	CR	LM

SCALE @ A3 1:5,000

0 25 50 100 m

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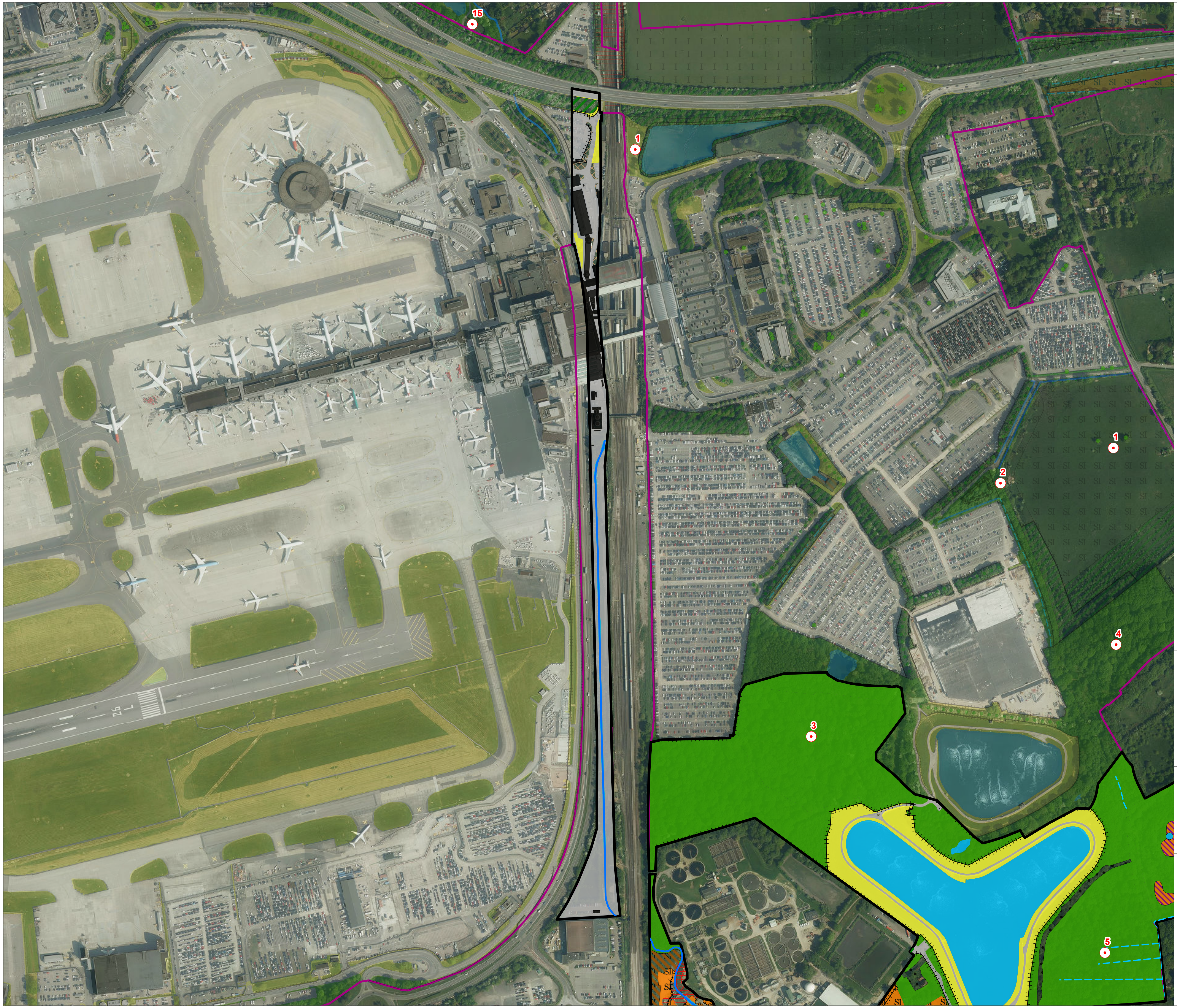

YOUR LONDON AIRPORT
Gatwick

KEY

- Project Site Boundary (PEIR)
- Ecology Parcel
- Phase 1 target notes
- Scattered tree - broadleaved
- Line of trees
- Mixed Parkland/scattered trees
- Intact hedge - native species-rich
- Intact hedge - species-poor
- Defunct hedge - native species-rich
- Defunct hedge - species-poor
- Hedge with trees - native species-rich
- Hedge with trees - species-poor
- Fence
- Dry ditch
- Earth bank
- Running water
- Broadleaved woodland - semi-natural
- Broadleaved woodland - plantation
- Scrub - dense/continuous
- Scrub - scattered
- Broadleaved Parkland/scattered trees
- Neutral grassland - semi-improved
- Improved grassland
- Marsh/marshy grassland
- Poor semi-improved grassland
- Tall ruderal
- Water body
- Amentiy grassland
- Introduced shrub/ornamental planting
- Buildings
- Bare ground
- Other
- Hard standing
- No access

DOCUMENT
Preliminary Environmental Information Report Appendix 9.6.2

DRAWING TITLE
Phase 1 Habitat Survey - A3 Land East of the Railway Line

DATE
September 2021

ORIENTATION	DRAWING NO.	REVISION
N	FIGURE 3.1.2d	For PEIR Issue
	DRAWN BY	PM / CHECKED BY
	CR	LM

SCALE @ A3 1:6,000

0 25 50 100 m

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YOUR LONDON AIRPORT
Gatwick

KEY

- Project Site Boundary (PEIR)
- Ecology Parcel
- Phase 1 target notes
- Scattered tree - broadleaved
- Scattered tree - coniferous
- Line of trees
- Mixed Parkland/scattered trees
- Intact hedge - native species-rich
- Intact hedge - species-poor
- Defunct hedge - species-poor
- Hedge with trees - native species-rich
- Hedge with trees - species-poor
- Fence
- Dry ditch
- Earth bank
- Running water
- Wall
- Broadleaved woodland - semi-natural
- Broadleaved woodland - plantation
- Mixed woodland - semi-natural
- Mixed woodland - plantation
- Scrub - dense/continuous
- Scrub - scattered
- Broadleaved Parkland/scattered trees
- Neutral grassland - semi-improved
- Improved grassland
- Marsh/marshy grassland
- Poor semi-improved grassland
- Tall ruderal
- Marginal vegetation
- Water body
- Amentiy grassland
- Ephemeral/short perennial
- Introduced shrub/ornamental planting
- Buildings
- Bare ground
- Other
- Hard standing
- No access

DOCUMENT

Preliminary Environmental Information Report Appendix 9.6.2

DRAWING TITLE

Phase 1 Habitat Survey - A4 Airside

DATE

September 2021

ORIENTATION	DRAWING NO.	REVISION
N	FIGURE 3.1.2e	For PEIR Issue
	DRAWN BY	PM / CHECKED BY
	CR	LM

SCALE @ A3 1:14,000

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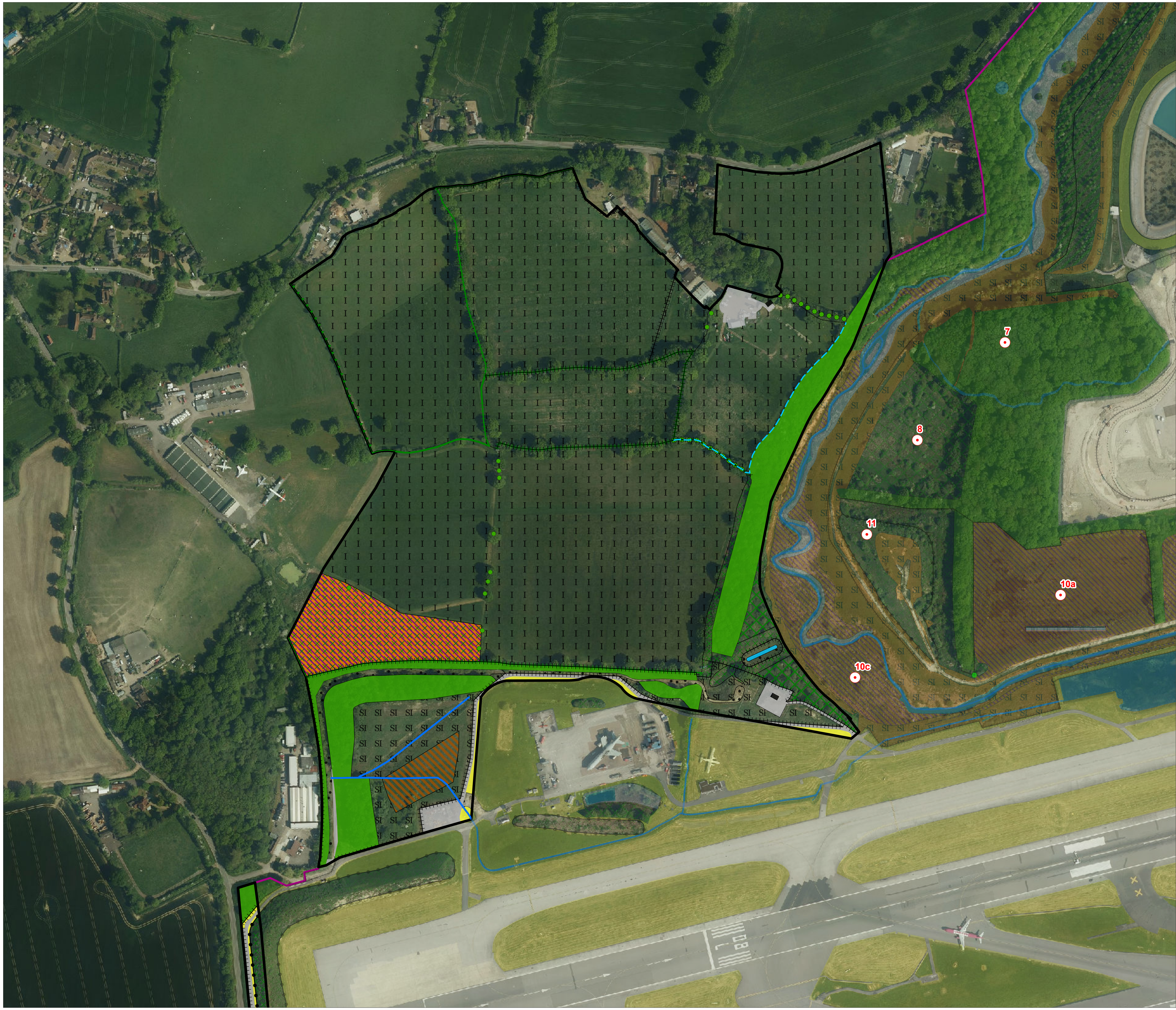

YOUR LONDON AIRPORT
Gatwick

KEY

- Project Site Boundary (PEIR)
- Ecology Parcel
- Phase 1 target notes
- Scattered tree - broadleaved
- Scattered tree - coniferous
- Line of trees
- Intact hedge - native species-rich
- Intact hedge - species-poor
- Hedge with trees - native species-rich
- Hedge with trees - species-poor
- Fence
- Dry ditch
- Earth bank
- Running water
- Broadleaved woodland - semi-natural
- Broadleaved woodland - plantation
- Scrub - dense/continuous
- Scrub - scattered
- Broadleaved Parkland/scattered trees
- Neutral grassland - semi-improved
- Improved grassland
- Marsh/marshy grassland
- Poor semi-improved grassland
- Tall ruderal
- Marginal vegetation
- Water body
- Amentiy grassland
- Buildings
- Bare ground
- Other
- Hard standing

DOCUMENT

Preliminary Environmental Information Report Appendix 9.6.2

DRAWING TITLE

Phase 1 Habitat Survey - A5 Non-Airside South and Land East of the Aviation Museum

DATE

September 2021

ORIENTATION	DRAWING NO.	REVISION
N	FIGURE 3.1.2f	For PEIR Issue
	DRAWN BY	PM / CHECKED BY
	CR	LM

SCALE @ A3 1:4,000

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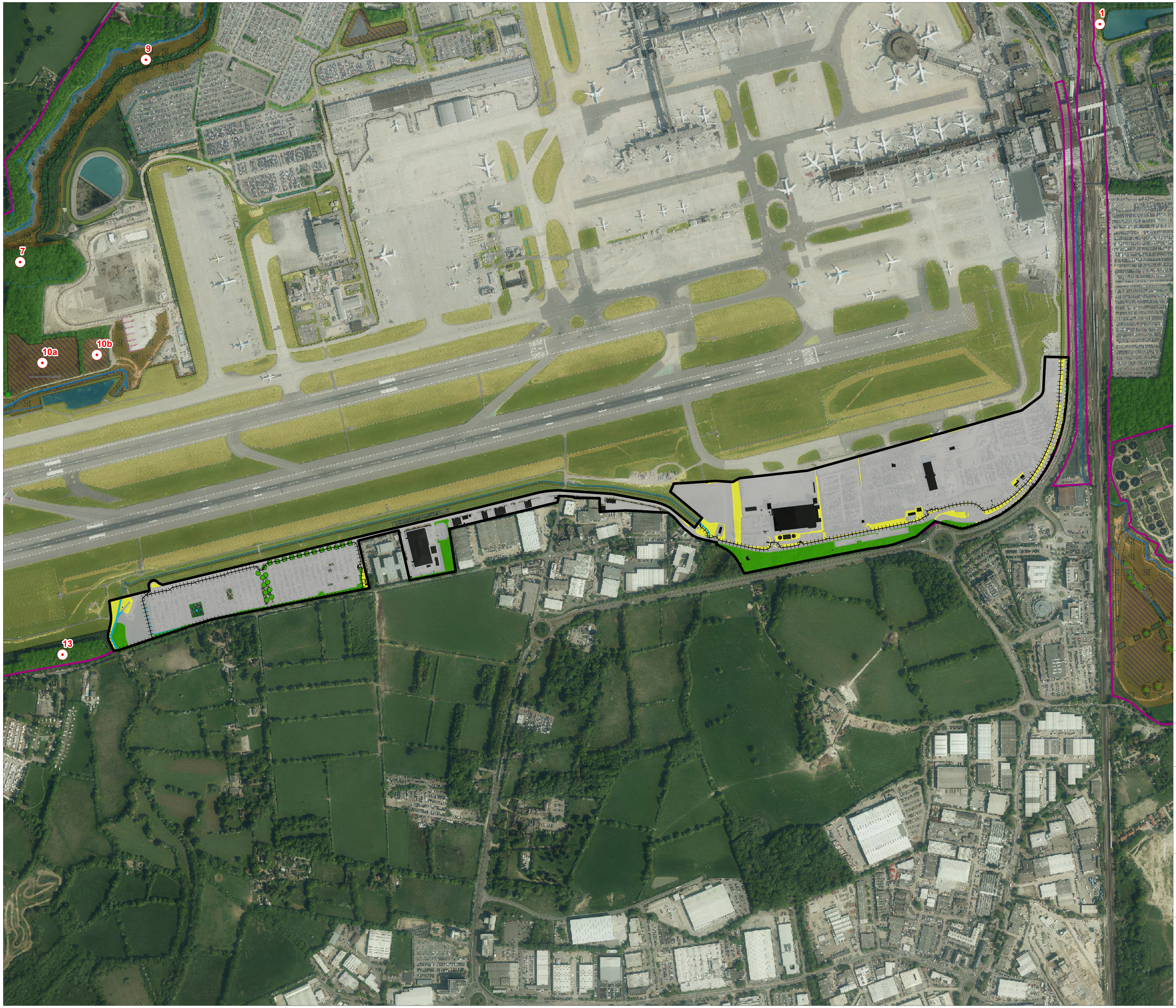

YOUR LONDON AIRPORT
Gatwick

KEY

- Project Site Boundary (PEIR)
- Ecology Parcel
- Phase 1 target notes
- Scattered tree - broadleaved
- Scattered tree - coniferous
- Line of trees
- Intact hedge - native species-rich
- Intact hedge - species-poor
- Defunct hedge - species-poor
- Fence
- Dry ditch
- Earth bank
- Running water
- Wall
- Broadleaved woodland - semi-natural
- Broadleaved woodland - plantation
- Scrub - dense/continuous
- Scrub - scattered
- Broadleaved Parkland/scattered trees
- Neutral grassland - semi-improved
- Improved grassland
- Marsh/marshy grassland
- Poor semi-improved grassland
- Tall ruderal
- Marginal vegetation
- Water body
- Amentiy grassland
- Ephemeral/short perennial
- Introduced shrub/ornamental planting
- Buildings
- Bare ground
- Other
- Hard standing
- No access

DOCUMENT

Preliminary Environmental Information Report Appendix 9.6.2

DRAWING TITLE

Phase 1 Habitat Survey - A5 Non-Airside South and Land East of the Aviation Museum

DATE

September 2021

ORIENTATION	DRAWING NO.	REVISION
N	FIGURE 3.1.2g	For PEIR Issue
	DRAWN BY	PM / CHECKED BY
	CR	LM

SCALE @ A3 1:10,000

0 25 50 100 m

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YOUR LONDON AIRPORT
Gatwick

KEY

- Project Site Boundary (PEIR)
- Ecology Parcel
- Line of trees
- Intact hedge - native species-rich
- Intact hedge - species-poor
- Fence
- Dry ditch
- Earth bank
- Running water
- Broadleaved woodland - semi-natural
- Scrub - dense/continuous
- Scrub - scattered
- Poor semi-improved grassland
- Tall ruderal
- Marginal vegetation
- Water body
- Amentiy grassland
- Introduced shrub/ornamental planting
- Buildings
- Bare ground
- Other
- Hard standing

DOCUMENT
Preliminary Environmental Information Report Appendix 9.6.2

DRAWING TITLE
Phase 1 Habitat Survey - A5 Non-Airside South and Land East of the Aviation Museum

DATE
September 2021

ORIENTATION
N

DRAWING NO.
FIGURE 3.1.2h

REVISION
For PEIR Issue

DRAWN BY
CR

PM / CHECKED BY
LM

SCALE @ A3 1:3,000

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