Luton Rising
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February 2023

London Luton Airport Expansion

Planning Inspectorate Scheme Ref: TR020001

Volume 5 Environmental Statement and Related Documents

5.02 Appendix 8.8 Ecological Mitigation Strategy - Bat

Application Document Ref: TR020001/APP/5.02
APFP Regulation: 5(2)(a)

The Planning Act 2008

The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

London Luton Airport Expansion Development Consent Order 202x

5.02 ENVIRONMENTAL STATEMENT APPENDIX 8.8 ECOLOGICAL MITIGATION STRATEGY - BAT

Regulation number:	Regulation 5(2)(a)
Planning Inspectorate Scheme Reference:	TR020001
Document Reference:	TR020001/APP/5.02
Author:	Luton Rising

Version	Date	Status of Version
Issue 01	February 2023	Application issue

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1 INTRODUCTION

1.1 Background

1.1.1 This Bat Mitigation Strategy has been prepared by Luton Rising (a trading name of London Luton Airport Limited (the Applicant) to inform the Environmental Impact Assessment (EIA) in support of the application for development consent for the proposed expansion of London Luton Airport, hereby referred to as the 'Proposed Development'.

1.1.2 The Proposed Development seeks to construct a new terminal and associated infrastructure to increase the capacity of the airport. The permitted capacity is currently 18 million passengers per annum (mppa) and consent is being sought to increase this to 32mppa. A full description of the Proposed Development can be found in **Chapter 4** of the Environmental Statement (ES) **[TR020001/APP/5.01]**.

1.1.3 The Proposed Development is located at London Luton Airport (the airport), Bedfordshire and adjacent lands, at approximate OS grid reference TL 12478 21377 and shown on **Figure 1** of **Appendix A** of this document.

1.1.4 The Main Application Site (as defined in **Chapter 2** of the ES **[TR020001/APP/5.01]**) covers approximately 428ha which in addition to the airport infrastructure comprises previously undeveloped, predominantly arable land, with hedgerows, trees and shrub-lined margins. Occasional woodland blocks, copses, tree belts, areas of scrub, rough grassland, ruderal vegetation, and arable field margins are also present. Winch Hill Wood County Wildlife Site (CWS) and Local Wildlife Site (LWS) ancient woodland are present to the south east of the Main Application Site.

1.1.5 Wigmore Valley Park lies east of the airport (within the Main Application Site) and comprises outdoor public space with amenity grassland and public facilities to the north, and Wigmore Park CWS to the south, which has developed partly over previous landfill, with neutral and calcareous grassland, hedgerows, scattered scrub and woodland.

1.1.6 The airport is dominated by hardstanding with amenity grassland and scattered small patches of scrub. Dairyborn Scarp District Wildlife Site (DWS) lies to the western side of the airport (within the Main Application Site) which was formerly part of a larger site called Dairyborn Scarp CWS (with additional grassland interest that is no longer present), and comprises a steep chalk scarp dominated by ruderal vegetation and scrub, with a small remnant of ancient woodland to the north of Dairyborn Scarp DWS.

1.1.7 In addition, the Proposed Development also includes Off-site Highway Interventions, Off-site Car Parks and Off-site Planting areas outside of the Main Application Site (also defined in **Chapter 2 [TR020001/APP/5.01]** and shown on **Figure 2.2.** of the ES **[TR020001/APP/5.03]**). The Off-site Highway Interventions are restricted to within existing highway boundaries with the exception of works at junction 10 of the M1, where areas of vegetation clearance would be required.

1.1.8 The proposed Off-site Car Parks are located to the west of the airport within brownfield areas, comprising access roads, temporary buildings, area of ephemeral/short perennial vegetation, grassland margins and areas of landscaping predominantly consisting of scrub and trees. However, a small area of car park in this western area overlaps with Luton Parkway Verges DWS, recognised for its calcareous and neutral grassland.

1.1.9 The Off-site Planting areas are located to the north east of the Main Application Site and comprise arable, grassland field margins and hedgerows.

1.1.10 This document sets out the avoidance, mitigation and enhancement measures to be implemented to safeguard local bat populations during construction and operation of the Proposed Development. These measures are designed to ensure that the favourable conservation status of all bat species are maintained.

1.1.11 This Mitigation Strategy comprises the following sections:

a. **Section 1** - Introduction;
b. **Section 2** - Purpose and conservation objectives;
c. **Section 3** - Summary of current baseline;
d. **Section 4** - Mitigation strategy;
e. **Section 5** - Management and monitoring;
f. **Section 6** - Timetable for implementation; and
g. **Section 7** - Conclusion.

1.1.12 The content of this document should be read in conjunction with relevant sections of the ES including;

a. **Chapter 8**, Biodiversity **[TR020001/APP/5.01]**;
b. **Appendix 8.1** Ecology Baseline Report **[TR020001/APP/5.02]**;
c. **Appendix 8.2** Outline Landscape and Biodiversity Mitigation Plan **[TR020001/APP/5.02]**;
d. **Appendix 8.4** Bird Strike Risk Assessment **[TR020001/APP/5.02]**;
e. **Appendix 8.5** Biodiversity Net Gain (BNG) Report **[TR020001/APP/5.02]**;
f. **Chapter 4** The Proposed Development **[TR020001/APP/5.01]** which describes the works, the location of which is also shown on **Figures 4.1 to 4.3 [TR020001/APP/5.03]**, and timings associated with each assessment phase;
g. **Figures 14.11** to **14.13** Landscape Mitigation **[TR020001/APP/5.03]**.
h. site clearance and demolition requirements are described in the Construction Method Statement and Programme Report provided as **Appendix 4.1** to this ES **[TR020001/APP/5.02],** along with the site clearance drawings; and
i. **Appendix 4.2** the Code of Construction Practice (CoCP) **[TR020001/APP/5.02].**

1.2 Legislation and biodiversity context

1.2.1 All native bat species and the sites that they use for breeding or resting are afforded protection through the provisions within Schedule 5 of the Wildlife and Countryside Act 1981 (Ref. 1) (as amended) and Schedule 2 of the Conservation of Species and Habitat Regulations 2017 (as amended) (Ref. 2). It is therefore an offence, without a derogation licence from Natural England, to intentionally or recklessly kill or injure bats; to disturb, obstruct, damage or destroy their roosts (including when those roosts are empty); or to take, possess or trade in bats and their parts (alive or dead).

1.2.2 Licences are available from Natural England to permit activities that would otherwise cause an offence under the legislation, including for the purpose of development. A licence can usually only be granted if the development is in receipt of full planning permission (with relevant conditions discharged). The conditions of an issued licence would include proportional measures to mitigate potential effects as a result of the Proposed Development.

1.2.3 Species of principal importance for the purpose of conserving biodiversity in England are listed under the provisions of Section 41 of the Natural Environment and Rural Communities (NERC) Act 2006 (Ref. 3). These include species in England that were previously identified as requiring action in the UK Biodiversity Action Plan (UK BAP) (Ref. 4) and continue to be regarded as conservation priorities in the subsequent UK Post-2010 Biodiversity Framework (Ref. 5) and updates up to and including in 2018 (Ref. 6).

1.2.4 The following bat species are classified as ‘UK Priority Species’ requiring conservation action within the UK:

a. greater horseshoe bat (*Rhinolophus ferrumequinum*);
b. lesser horseshoe bat (*Rhinolophus hipposideros*);
c. Bechstein’s bat (*Myotis bechsteinii*);
d. noctule (Nyctalus noctula);
e. soprano pipistrelle (*Pipistrellus pygmaeus*);
f. brown long-eared bat (*Plecotus auritus*); and
g. barbastelle *(Barbastella barbastellus)*.

1.2.5 The Bedfordshire & Luton (Ref. 7) and Hertfordshire (Ref. 8) Local Biodiversity Action Plans (LBAPs) detail actions to help maintain or enhance the nature conservation status of species of local conservation concern. For bat species, this includes Natterer’s bat (*Myotis nattereri*) within Hertfordshire’s LBAP.

2 PURPOSE AND CONSERVATION OBJECTIVES

2.1 Purpose of this strategy

2.1.1 This Mitigation Strategy sets out the avoidance, mitigation and enhancement measures to be delivered as part of the Proposed Development to safeguard bats during the course of the works and, moreover, to ensure that the favourable conservation status of these animals is maintained post-development.

2.1.2 The purpose of this Mitigation Strategy is as follows:

a. To summarise the current ecological baseline at the Proposed Development in respect of bats, taking into account the findings of all bat survey work undertaken up to the time of writing this Mitigation Strategy (last surveys undertaken in October 2021).

b. To provide detail of the avoidance, mitigation and enhancement measures, which are outlined within sections 8.8 and 8.10 of **Chapter 8** Biodiversity of the ES **[TR020001/APP/5.01]**, to be delivered as part of the Proposed Development to appropriately safeguard the local bat populations, namely:

i. details of further surveys that will be undertaken to ensure continued applicability of proposals set out within this mitigation strategy;
ii. details of proposed habitat creation and enhancement measures of benefit to bat species;
iii. details of specific enhancement prescriptions for bat species within the Order Limits of the Proposed Development;
iv. details of the management objectives and prescriptions to be adopted to manage habitats within the Order Limits of the Proposed Development for the benefit of bat species;
v. details regarding the proposed timescale for mitigation works (linked to the delivery of the proposed development), and responsibilities for delivery of mitigation and management measures as far as they are currently known;
vi. outline monitoring proposals and arrangements for undertaking remedial works, should these be necessary; and
vii. demonstrate that, with the implementation of the measures outlined within this mitigation strategy, the proposed development will avoid a deterioration in the favourable conservation status of populations of bat species in the local area.

2.2 Conservation objectives

2.2.1 The conservation objectives that underpin this Mitigation Strategy are as follows:

a. To ensure that the Proposed Development avoids deterioration in the favourable conservation status of populations of bat species, by safeguarding, maintaining and/or enhancing:

i. existing and potential roosting sites for bat species;
ii. the extent, distribution and connectivity of foraging and commuting habitats and routes for bat species; and
iii. the quality and value of suitable foraging and commuting habitats for bat species within the site and local area.

3 SUMMARY OF CURRENT BASELINE

3.1.1 This section provides an overview of the surveys that have been undertaken and summary of the current baseline for bat species within the Main Application Site, used to inform the principles of this Mitigation Strategy. The study area of the Bat Survey is limited to the Main Application Site and the off-site mitigation planting areas (off-site planting areas only for ground based tree inspections as these areas will not be adversely affected by the Proposed Development) as habitats within the Off-site Highway Intervention works and car park locations are not considered suitable for roosting bats and were scoped out of further survey. Full details of methodologies, surveys that have been undertaken, limitations and results can be found in the section 5 of the Ecology Baseline Report **Appendix 8.1** of the ES **[TR020001/APP/5.02]**.

3.2 Methodology and results

Desk Study

3.2.1 Information about non-statutory designated nature conservation sites and protected or otherwise notable species of bat, recorded from within the last 10 years, were obtained from Bedfordshire & Luton Biodiversity Recording & Monitoring Centre (BRMC) and Herts Environmental Records Centre (HERC) in February 2018 and updated in November 2020 for a search area covering a 2km radius from the Main Application Site, which includes the majority of the Off-site Highway Interventions, Car Parks and Planting. A further updated desk study was undertaken in June 2022 for the Main Application Site, excluding the off-site highway interventions. This is not considered to be a significant limitation given that the majority of Off-site Highway Interventions are restricted to areas of existing hardstanding and those areas highlighted as not being hardstanding such as the M1 compound location have been subject to a walkover survey.

3.2.2 Locations and details of statutory designated nature conservation sites within 2km of the Main Application Site was obtained from the Government's Multi-Agency Geographic Information for the Countryside (MAGIC) website (Ref. 9), on 03 May 2019, 14 September 2021 and 15 August 2022. Maps and aerial photographs were also reviewed to ascertain the location of habitats likely to support bats.

Phase 1 Habitat Survey

3.2.3 An extended Phase 1 Habitat Survey, including an initial protected species assessment, was undertaken during 2018, 2019 and updated in 2020 following standard methods as described in the Guidelines for Preliminary Ecological Appraisal (Ref. 10) and the Phase 1 Habitat Survey Methodology (Ref. 11).

3.2.4 The Phase 1 Habitat Surveys covered areas within the Order Limits, including the Main Application Site and Off-site Planting areas. A site walkover was undertaken at each of the Off-site Highway Intervention locations, however full Phase 1 Habitat Surveys were not undertaken as the works are restricted to within existing highway boundaries. The exception to this is the proposed works

at junction 10 of the M1, where vegetation clearance would be required for a temporary construction compound.

3.2.5 The surveys of the study area were conducted by two experienced ecologists over six days between 21 May and 29 June 2018 with an additional small area surveyed on 18 May 2019. An updated extended Phase 1 Habitat Survey was conducted on all land within the Main Application Site on four dates between 21 May and 2 June 2020. Additionally, to account for alterations to Proposed Development design incorporating previously un-surveyed areas, extended Phase 1 Habitat Surveys were conducted at the Junction 10 compound site and the Airport Access Road (AAR) area. These surveys were conducted on the 8 August and 16 September 2020 respectively. A walkover survey was also conducted in 2021 and 2022 to verify that the habitats remained as previously recorded, noting and mapping any changes.

3.2.6 The survey included:

a. Mapping of the habitats present on the Main Application site and recording characteristic plant species, with target notes used to identify particular areas, potentially important or otherwise notable habitats or plant species; and

b. Searches for non-native invasive plant species listed on Schedule 9 of the Wildlife and Countryside Act 1981 (as amended) (Ref. 1), and the Invasive Alien Species (Enforcement and Permitting) Order 2019 (Ref. 12).

3.2.7 For further details on the survey methodology refer to the Ecology Baseline Report, **Appendix 8.1** of the ES **[TR020001/APP/5.02]**.

Roost identification

3.2.8 For full details on the surveys undertaken and methodologies used, refer to section 5.2 of the Ecology Baseline Report, **Appendix 8.1** of the ES **[TR020001/APP/5.02]**.

Ground based assessment of potential roost features

3.2.9 Preliminary ground level bat roost suitability assessments of buildings and trees located within the Main Application Site and Off-site Planting areas were undertaken in 2016 by experienced ecologists. These assessments were carried out in accordance with the Bat Conservation Trust (BCT) Good Practice Guidelines (Ref. 13) applicable at the time, and focussed on trees and buildings that may be affected by the Proposed Development.

3.2.10 All ground level assessments of trees were updated in 2020, to reconfirm roosting suitability, with the addition of external inspections of buildings that fall within the footprint of the AAR (as described in **Chapter 4** of the ES **[TR020001/APP/5.01]**). An internal inspection of these buildings was not possible due to access constraints.

3.2.11 In 2020, five buildings within the Main Application Site were classified as having moderate bat roost suitability. Two buildings (Pillbox and Winch Hill Cottage (2)) were subsequently confirmed as roosts. The remaining 12 buildings, which fall

within the footprint of the AAR were assessed in 2020 as providing either negligible (six buildings) or low (six buildings) roost suitability. These buildings have not been subject to any subsequent dusk emergence/dawn re-entry surveys and do not form part of the basis for this Mitigation Strategy. Low suitability buildings were excluded from the survey strategy as the focus was placed on areas being impacted. These buildings lie within a heavily urbanised and well lit area that isn't impacted by the Proposed Development.

3.2.12 Locations of buildings with moderate, high and confirmed roosting suitability are highlighted on **Figure 1** – Bat roost potential and confirmed roost plan, in **Appendix A** of this document. Low potential buildings were only present within the AAR.

3.2.13 Fourteen trees with low, 14 with moderate and eight with high suitability (of which two were later confirmed as roosts) for bat roosting were identified across the Main Application Site, particularly within mature woodlands and standard trees along existing and defunct field boundaries.

3.2.14 The ridgeline woodland in the centre of the Proposed Development, see **Figure 1** in **Appendix A** of this document, is largely coniferous however it included one tree with moderate suitability (later confirmed as a roost), and nine with low in 2020. These trees were not subject to dusk emergence/dawn re-entry surveys; however, this woodland was included in bat back-tracking (following bats back to roosts) surveys and will be retained.

3.2.15 The ancient woodland (Winch Hill Wood LWS) included three trees with high suitability for bat roosting, nineteen with moderate and four with low in 2020. These trees were not subject to dusk emergence/dawn re-entry surveys; however, this woodland was included in bat back-tracking and trapping surveys and will be retained.

3.2.16 Locations of trees, with the exception of those in the ridgeline woodland and the ancient woodland (Winch Hill Wood LWS), with low, moderate and high bat roost suitability are highlighted on **Figure 1** – Bat roost potential and confirmed roost plan, in **Appendix A** of this document.

Tree climbing inspections

3.2.17 Tree climbing surveys were carried out by suitably qualified ecologists (each holding at least a Natural England Bat Class Licence, Level 2) in 2018 to inspect the potential roosting features (PRF) on all trees classified as having moderate or high suitability for roosting bats within the Main Application Site and the off-site mitigation planting areas. The results of the tree climbing surveys were used to refine the results of the initial 2016 ground-based assessment of tree suitability for roosting bats, with trees re-categorised as low, moderate or high suitability once inspected by the climber.

3.2.18 Of the sixteen trees found to have high or moderate PRF during the ground-based assessments in 2016, nine were subjected to tree climbing inspections. The remaining seven trees were deemed unsafe to climb but were re-inspected from ground level at the time (2018) and the roost potential ascertained during the ground-based assessments was used to decide the number of subsequent

emergence or return surveys, in accordance with the BCT guidelines (Ref. 13). No confirmed bat roosts were identified during the tree climbing surveys. These surveys were followed, where necessary, by the emergence and re-entry surveys and subsequent updated ground level assessments were conducted in 2020. No further tree climbing surveys were deemed to be required as the potential of these trees to have roosts is unlikely to change significantly.

Emergence & re-entry surveys

3.2.19 Following the identification of buildings and trees within the Main Application Site with suitability to support roosting bats, dusk emergence and dawn re-entry surveys were undertaken to ascertain the presence or absence of bat roosts. The number of surveys were planned in accordance with BCT guidelines (Ref. 13) , as follows:

a. any buildings with **low** roosting suitability were subjected to one emergence and/or re-entry survey;

b. any buildings and trees with **moderate** roosting suitability were subjected to two emergence and/or re-entry surveys;

c. any buildings and trees with **high** roosting suitability were subjected to three emergence and/or re-entry surveys; and

d. where a bat roost was confirmed within a building or tree, additional surveys were undertaken as required to allow characterisation of the type of roost present.

3.2.20 Surveys of buildings were carried out between 2016 and 2018, with a further two residential buildings surveyed in 2019. Surveys of trees were carried out between 2016 and 2018. All trees of high and moderate suitability following the updated ground level tree assessment were subject to resurvey during 2020. All emergence/re-entry surveys were carried out during the peak bat activity period between May and September.

3.2.21 Two buildings (Pillbox (B001) and Winch Hill Cottage (2) (B005)) were confirmed as roosts in 2016 and 2017 for the Pillbox (but not during surveys in 2018 and 2019 for Winch Hill Cottage (2). The Proposed Development does not directly impact these buildings, and both will be retained.

3.2.22 Two trees were confirmed to support bat roosts in 2020 (T104 and T126), with a further two trees (T120 and T124) confirmed to support bats in previous years, but not upon resurvey in 2020.

3.2.23 All confirmed roosts are considered occasional summer day roosts used by low numbers of common pipistrelles (*Pipistrellus pipistrellus*), though internal inspections of the buildings could not be conducted and consequently hibernation potential could not be ruled out.

3.2.24 The locations of all confirmed building and tree roosts are shown in **Figure 1** – Bat roost potential and confirmed roost plan, in **Appendix A** of this document.

Bat back-tracking surveys

3.2.25 Two nights of bat back-tracking surveys were undertaken on 18 and 27 August 2020. The first was carried out in the ridgeline woodland in the centre of the Order Limits and the second in the ancient woodland (Winch Hill Wood LWS) immediately east of the airport boundary. The aim of these surveys was to gather visual observations of bats commuting back to their roosts at sunrise and attempt to track them back to their roosts. In accordance with BCT guidelines (Ref. 13), dawn back tracking surveys are carried out under the following principles:

a. The closer to sunrise a bat is seen, the closer it is likely to be to its roost (exact timing dependant on species).

b. At sunrise, bats fly towards their roosts, so surveyors can follow bats at this time to locate their roosts. And

c. At sunrise, some bat species will swarm around roost access points, providing a window of opportunity for surveyors to find and identify roosts.

3.2.26 During the back-tracking surveys one common pipistrelle was successfully tracked back to its roost in tree T126 (later confirmed by a dusk emergence survey) on the western edge of the conifer woodland. No bat roosts were found during the dawn back-tracking survey carried out in the ancient woodland (Winch Hill Wood).

Activity Monitoring

3.2.27 For full details on the surveys undertaken, methodologies used, and transect routes followed/static detector locations used, refer to section 5.2 of the Ecology Baseline Report, **Appendix 8.1** of the ES **[TR020001/APP/5.02]**.

Bat activity transect surveys

3.2.28 In accordance with the BCT guidelines for sites of moderate habitat suitability, monthly bat activity transect surveys were undertaken between April and September 2018. As described within the BCT guidelines (Ref. 13), five predefined transect routes of similar lengths (approximately 3km) were utilised, focussing on suitable bat foraging and commuting habitats. These bat activity transect surveys have not been repeated due to the low activity, however static detector deployment has been updated to reconfirm bat activity levels across the site remain at similar levels to those previously recorded in 2018-2020.

3.2.29 Low levels of common pipistrelle foraging and commuting activity was recorded in all months except April on Transect 1 and 3 where no bats were recorded. Activity was mostly concentrated near the woodlands and Someries Castle to the south of the Main Application Site. Soprano pipistrelle activity was less frequent, with some months showing no bats, such as April and May on Transect 4. A single *Myotis* species was observed during the June survey of Transect 3, occasional passes of noctule bat were observed during the July survey of Transect 4, and a single pass of barbastelle bat was recorded during the September surveys of Transect 4. No bats were recorded (heard or seen)

along the perimeter of the airport, likely due to high levels of noise and light disturbance.

Bat activity static surveys

3.2.30 To gain longer-term data and increase the likelihood of detecting the species of bats using the Main Application Site, static bat detectors were deployed each month from April to September 2018. Ten static bat detectors in ten separate strategic locations, were deployed for at least five consecutive nights across the six monthly monitoring periods in 2018.

3.2.31 Sampling locations for the static detectors were selected using a subjective approach based on knowledge of the habitats and previous bat surveys since 2016, considering the main areas with potential to be impacted by the Proposed Development. Locations were selected based on likely bat commuting routes, taking into account the connectivity of the habitats, and the large extent of arable/pasture areas. Updated static detector surveys were then undertaken from April to October 2021 to reconfirm bat activity levels across the site.

3.2.32 The assemblage of bat species recorded during the static bat detector surveys comprised at least nine different species. A summary of the findings for each species/genera recorded during all surveys between 2018 and 2021is as follows:

a. Common pipistrelle and pipistrelle sp. (*Pipistrellus* sp.) were recorded at relatively low activity in all months across all locations. Highest concentrations of activity were north of the runway adjacent to the ancient woodland (2018 and 2021), north of the runway between Wigmore Valley Park and Winch Hill (2018) near to the Pillbox (B001) (2018), and in the south east of the site (2021).

b. Soprano pipistrelle were recorded at very low levels of activity in the majority of months from all locations across the Main Application Site. Highest concentrations of activity were east of the runway in the south west of the runway (2018 and 2021).

c. Myotis sp. were recorded at very low levels across the majority of months (most limited during April in 2018 and 2021) from all locations across the Main Application Site. Highest concentrations of activity were at Winch Hill (2018 and 2021) and south west of the runway (2021).

d. Noctule and Leisler's bat (*Nyctalus sp*) were recorded at very low levels of activity in all months across the majority of the Main Application Site, excluding the far south east in 2018. Highest concentrations of activity were east of the runway in both 2018 and 2021.

e. Barbastelle were recorded sporadically in most months at a limited number of locations in 2018 and in all months at almost all locations in 2021, with very low levels of activity. Recordings of barbastelle at each location do not correspond to expected emergence times and therefore do not indicate barbastelle emerging from nearby roosts. Highest concentrations of activity remained in very low numbers and were north

of the runway, south of Wigmore Valley Park (2018) and the south east of the site (2021).

f. Brown long-eared bat were recorded sporadically at very low levels of activity in most months in multiple locations in 2018 and all locations in 2021. Limited passes indicate the species passing through in low numbers in 2018, with marginally higher levels in 2021. Highest concentrations of activity were east of the runway in 2018 and the north of the site, between Wigmore Valley Park and Winch Hill in 2021.

g. Nathusius' pipistrelle (*Pipistrellus nathusii*) were recorded on a single night in each of May and September at Winch Hill and east of the runway respectively in 2018. In 2021 they were recorded in five locations in very low numbers with the highest being recorded four times in July 2021 in the north of the site, between Wigmore and Winch Hill.

h. Serotine (*Eptesicus serotinus*) were recorded on a single night in August 2018, east of the runway, and in July and August in 2021 in four locations, with the highest number immediately north of the runway, adjacent to the ancient woodland block.

Bat trapping surveys

3.2.33 In order to supplement the activity surveys described above, advanced bat trapping techniques were employed in an effort to survey elusive species that can be difficult to survey via other methods (e.g. tree-roosting or quiet-echolocating species, and sensitive bat populations such as Annex II bat species of the Habitats Directive (Ref. 14)). Each survey involved the deployment of four harp traps (in combination with AT100 lures) and a triple-high mist net.

3.2.34 Two nights of bat trapping were undertaken in total during July and August 2018 by suitably qualified ecologists (lead surveyor holds Natural England Level 3 and 4 Class Licences for bats). Surveys were focused on the ridgeline woodland in the centre of the Main Application Site and the ancient woodland (Winch Hill Wood) immediately east of the airport boundary.

3.2.35 Low numbers of bats were recorded during both trapping surveys, with a peak count of four bats in August. Species diversity was also low with only two common bat species encountered, common pipistrelle and brown long-eared bat. In total, over the two nights, three bats were caught in each of the two sites, comprising two common pipistrelles in the ridgeline woodland in July, and one common pipistrelle caught in each site and two brown long-eared bats caught in the ancient woodland in August.

3.3 Summary of key findings

3.3.1 As detailed above, key findings of the suite of bat surveys conducted from 2016 to 2021 include a small number of confirmed roosting locations in both buildings and trees, as well as activity for at least nine species across the Main Application Site (**Figure 1, Appendix A** of this document, and Ecology Baseline Report, **Appendix 8.1** of the ES **[TR020001/APP/5.02]**).

3.3.2 All confirmed roosts were classified as summer day roosts for small numbers of common pipistrelle bats. Hibernation potential at Winch Hill Cottage (2) cannot be ruled out due to it not being possible to carry out an internal inspection. It is notable that both identified building roosts, and one of the confirmed tree roosts (T126), will be retained, with limited disturbance to these locations anticipated.

3.3.3 Whilst the suite of activity surveys identified the presence of a number of notable species within the Main Application Site – particularly barbastelle, serotine and Nathusius' pipistrelle – recordings of notable species were limited in number and varied in location. This sporadic activity indicates that the habitats present within the Main Application Site are unlikely to support these species for significant foraging or commuting resources.

3.3.4 The vast majority of activity was attributable to common species across the suitable habitats within the Main Application Site, though relatively high levels of activity in the site context were associated with the ridgeline woodland and wooded habitats within Wigmore Valley Park and the treeline north of the runway. Given this context, impacts arising from the loss of suitable foraging and commuting habitats throughout the Main Application Site are generally considered at an aggregation level, though where particular species of note are associated with habitats this is defined in the relevant sections.

3.3.5 In the absence of any avoidance, mitigation and enhancement measures, the Proposed Development would negatively impact bat species through damage/loss/disturbance of roosting, foraging and commuting bats.

3.3.6 The below aims to briefly summarise work packages and timing at construction of each assessment phase of relevance to bats.

3.4 Predicted impacts

3.4.1 This section briefly summarises works and timing at each assessment phase of relevance to bats and the predicted impacts of the Proposed Development. Site clearance and demolition requirements for each assessment phase are described in the Construction Method Statement and Programme Report provided as **Appendix 4.1** to this ES **[TR020001/APP/5.02]**, along with the site clearance drawings.

Assessment Phase 1

3.4.2 Initial works are anticipated to begin in 2025, lasting until 2027. Key works assumed to be delivered in this assessment phase are:

a. the construction of additional airport stands serving Terminal 1 within the airport complex;
b. localised expansions of Terminal 1;
c. modifications to existing car parks and additional temporary car parks;
d. elements of the AAR and Off-site Highway Interventions; and

e. the provision of open space, through enhancement and replacement of lost open space for Wigmore Valley Park, Habitat Creation Areas, and Off-site Planting (hedgerow restoration and screening).

3.4.3 As a policy requirement accounting for the loss of public open space in Wigmore Valley Park, the provision of provision of open space must be delivered prior to the loss of the existing public open space. The provision of open space would provide replacement and enhancement to areas, including converting a large area of previously arable land into landscaped parkland, areas of woodland, scrub, neutral meadow grassland and amenity grassland. This land has been removed from arable production, with the field accounting for the majority of the space left fallow. Bat activity within this area was limited, though the retained ridgeline woodland immediately to the south recorded relatively high activity levels from more common bat species, as well as containing confirmed roost T126, Winch Hill Cottage (2) and the Pillbox north of Wigmore Valley Park (all single common pipistrelle summer day roosts), **Figure 1, Appendix A** of this document. Following landscaping, the suitability and diversity of habitats present within the provision of open space would increase, offering greater foraging opportunities for bat species, though additional roosting opportunities would not be present within establishing woodland.

3.4.4 Fields to the immediate east of Wigmore Valley Park and south of the area of provision of open space, have also been removed from arable production since the initial surveys informing the baseline reports. Rather than being left fallow, these fields now represent establishing grassland communities. These fields were at the centre of several key areas of bat activity recorded during 2018; the ridgeline woodland, woodland south of Wigmore Valley Park and the connected linear woodland north of the runway. It is anticipated that the establishment of extensive grassland with a relatively diverse sward from previously arable land will increase its suitability as a foraging resource for bats, particularly Nyctalus species. This habitat will be retained throughout assessment Phase 1.

3.4.5 Whilst the land use changes associated with the provision of open space are likely to have only positive impacts for bat species, with a greater diversity of habitats considered to constitute an overall benefit, there are also notable areas of vegetation clearance associated with assessment Phase 1. These impacts result from clearance within Wigmore Valley Park following delivery of the provision of open space. Given that no trees with moderate or high roosting suitability are located within the area for clearance and activity within this area of Wigmore Valley Park was extremely limited, impacts to bat species are not anticipated to be substantial, with establishing habitats within the provision of open space considered to offer far greater foraging opportunity.

3.4.6 The new temporary surface car parks (P6 and P7) will result in notable permanent loss of parkland and scrub from the western area of Wigmore Valley Park, and sections of the linear woodland north of the runway. The parkland area lost is primarily amenity grassland, of low suitability for foraging/commuting bats. The partial loss of linear woodland (approximately 160m) north of the runway does not impact identified roosting locations, but would result in the severance of a linear habitat feature used for commuting and foraging between

two of the areas of higher activity, the linear woodland itself and the woodland south of Wigmore Valley Park.

3.4.7 Adverse impacts for bat species during assessment Phase 1 are considered to be limited, given no roosts are anticipated to be lost and there is an overall gain in availability of suitable foraging habitat resulting from the provision of open space. However, the severance of the linear woodland north of the runway may have localised adverse impacts on bats utilising this as a foraging and commuting resource, and limited disturbance could occur to one confirmed tree roost (T126), and two building roosts in Winch Hill Cottage (2) and the Pillbox north of Wigmore Valley Park during the provision of open space (**Figure 1, Appendix A** of this document). Both structures and the tree would be surrounded by or adjacent to the land required for the assessment Phase 1 works for the provision of open space.

Assessment Phase 2a

3.4.8 Assessment Phase 2a is anticipated to be constructed from 2033 through to 2036. There would be considerable loss of habitat during assessment Phase 2a, resulting from major earthworks, the construction of Terminal 2 and creation of additional carparks, as well as supporting infrastructure.

3.4.9 The majority of land impacted is centred to the north of the runway, consisting primarily of the area occupied by establishing grassland (previously arable land), as well as further sections of the linear woodland bordering the runway. Land to the south east of the Main Application Site that would be impacted to create the required supporting infrastructure during assessment Phase 2a, is primarily still, or was, within arable production, as well as associated areas of agricultural set aside.

3.4.10 For the purposes of this strategy it is assumed that this change of land use would result in functional loss of these areas throughout assessment Phase 2a construction. With regard to bat species, this assessment Phase would result in the loss of one known tree roost, T104, and disturbance of three further known tree roosts, T120, T124 and T126, all of which are found within the woodland south of Wigmore Valley Park and the connected linear woodland (**Figure 1, Appendix A** of this document). Numerous further trees with low, moderate and high roosting suitability would also be lost.

3.4.11 Loss of these trees and woodlands would also result in the loss of foraging and commuting features, in addition to loss of the extensive establishing grasslands and several large arable fields to the east of the Main Application Site. One of these fields would be utilised for supporting infrastructure throughout assessment Phase 2a, after which it will be converted to calcareous grassland.

3.4.12 Assessment Phase 2a constitutes a greater construction impact than the other two assessment Phases to bat species resulting from the Proposed Development, both in terms of disturbance of known roosts and loss of suitable foraging and commuting habitats.

Assessment Phase 2b

3.4.13 Assessment Phase 2b would involve further earthworks and subsequent development to further increase capacity to 32mppa, anticipated to be constructed from 2037 to 2041. Relevant works include provision of additional aircraft stands, extension of Terminal 2 and further car parking areas. However, the vast majority of these works occur within the footprint of assessment Phase 2a, where the majority of habitat losses occur.

3.4.14 Construction of assessment Phase 2b would result in the loss of two common pipistrelle tree roosts, T120 and T124, within the woodland belt to the west of Winch Hill Wood, and further disturbance of a tree, T126, near to Winch Hill (**Figure 1, Appendix A** of this document).

3.4.15 Assessment Phase 2b constitutes the greatest impacts to bat species resulting from the Proposed Development, in terms of loss of known roosts, but the least impacts for loss of suitable foraging and commuting habitats.

3.4.16 Areas at the east of the Main Application Site utilised for the construction of supporting infrastructure throughout assessment Phase 2a are to be converted largely to calcareous grassland, and act as an extension to the already established mitigation within the Habitat Creation Area, described below.

Habitat enhancement and creation

3.4.17 As part of assessment Phase 1, a Habitat Creation Area would be created to the east of the provision of open space. Plans showing the broad areas covered by each of the habitat creation and enhancement proposals described are found within **Figure 2** of **Appendix A** of this document, and for each assessment phase are found within **Appendix 8.2** Outline Landscape and Biodiversity Management Plan (LBMP) of the ES **[TR020001/APP/5.02]**, and **Appendix 8.5** BNG Report of the ES **[TR020001/APP/5.02]**.

3.4.18 Establishment of this Area will involve the conversion of largely arable land into a mosaic of neutral grassland maintained by low intensity grazing, neutral meadows, planted woodland blocks and a cluster of small wildlife ponds. The proposed Habitat Creation Area would integrate existing habitats of higher biodiversity value within this landscape, such as woodland, with newly created habitats, increasing connectivity using hedgerow restoration to establish a coherent ecological network.

3.4.19 Additionally, in assessment Phase 1, Off-site Planting (hedgerow restoration and screening) would be implemented in the wider arable environment to the north and east of the Main Application Site. These are considered to offer further long-term benefits to bats within environments in the immediate vicinity of the Main Application Site, directly integrating with retained and created habitats within the proposed Habitat Creation Area. Further details of habitat creation and enhancement are provided in **section 4.6** of this Mitigation Strategy, outlining specific establishment and management practices to increase the value of this hedgerow restoration for bats.

3.4.20 During assessment Phase 2a, further arable land directly to the south of this area would also be converted to low intensity grazed neutral grassland, whilst south of Winch Hill at the south eastern extent of the Main Application Site would be converted to calcareous grassland. These created grassland areas would integrate with and increase the area covered by the wider proposed Habitat Creation Area.

3.4.21 Finally, following the completion of construction works associated with supporting infrastructure in assessment Phase 2b, another section of previously arable land would be converted into calcareous grassland, again integrating with the wider proposed Habitat Creation Area to the east, and the area of provision of open space to the north.

3.4.22 The proposed Habitat Creation Area will help to ensure the Proposed Development achieves a 10% BNG target. This, in conjunction with the provision of open space, Off-site Planting (hedgerow restoration and screening), the diversity of habitats to be created from low biodiversity value arable land and integration of more valuable habitats, will ensure these areas offer long-term benefit to bat populations.

3.4.23 Further details are provided in the following sections of this Mitigation Strategy outlining the specific role of these areas in mitigating and subsequently enhancing the Proposed Development for bat populations.

4 MITIGATION STRATEGY

4.1 Purpose and objectives

4.1.1 The purpose of this Mitigation Strategy is to outline the avoidance, mitigation and enhancement measures to safeguard the bat species identified in the baseline surveys that could be adversely impacted by the Proposed Development. In addition specific management prescriptions are set out for habitats created and enhanced as part of the Proposed Development that will be of long-term benefit to bats.

4.1.2 All proposals within this strategy have been designed to ensure that the Proposed Development mitigates potential effects on bat species, taking due regard of guidance and best practice produced by Natural England (Ref. 15).

4.2 Further survey prior to commencement of works

4.2.1 The Mitigation Strategy outlined below is based on all survey work undertaken up to the time of writing this Mitigation Strategy (last survey October 2021). It is noted that the time period between producing this Mitigation Strategy and the commencement of construction works is considerable, in particular for assessment Phases 2a and 2b. As bat populations and the location of bat activity can fluctuate over time, additional surveys and review of this strategy will be required.

4.2.2 Of particular relevance to bat species, PRFs in trees are shaped by mechanisms including disease, decay and damage, all of which are variable and can change over time. This means that PRFs that had not been confirmed as bat roosts during previous surveys may become more suitable and be occupied by bats, or new features may develop that had previously not been present. Alternatively, features may be lost to natural processes, for example, a branch cavity can be lost if the branch cracks from the main trunk.

4.2.3 Given these factors, updated roost identification surveys are proposed for trees and buildings prior to each phase of the Proposed Development. These updated surveys would largely follow the same methodology as those used to inform the baseline reports (taking into account relevant BCT guidance at the time), though would be targeted towards the particular areas to be impacted during each assessment phase, in acknowledgement of the time between construction of each assessment phase.

4.2.4 Targeted update surveys would involve a ground level roost assessment of all trees scheduled for removal, followed by climbing surveys (detailed aerial inspection) of all trees identified to have moderate or high roost suitability where possible, following which the results of the climbing inspections would supersede the ground level roost assessment.

4.2.5 Trees identified as having moderate or high roosting suitability following tree climbing surveys, or those not considered safe to climb etc, will then be subject to dusk emergence and dawn re-entry surveys during the active season of May-September as per the previous methodology.

4.2.6 These targeted surveys would be conducted the year prior to the scheduled removal of trees for construction in each assessment phase. For instance, surveys during assessment Phase 1 construction will target trees to be removed from Wigmore Valley Park and a proportion of the linear woodland north of the runway. Detailed plans of trees scheduled for removal at construction of each assessment Phase are found within the Site Clearance Plans in **Appendix 4.1** of the ES **[TR020001/APP/5.02]**.

4.2.7 Ground level roost assessments and subsequent tree climbing surveys will be conducted during the winter prior to scheduled removal of trees, allowing time for the subsequent emergence and re-entry surveys throughout the active season. Based on current understanding of the programme, timings for each survey suite will follow:

a. Assessment Phase 1: Winter 2023/24 and summer 2024;
b. Assessment Phase 2a: Winter 2031/32 and summer 2032; and
c. Assessment Phase 2b: Winter 2035/36 and summer 2036.

4.2.8 Conducting updated surveys the year prior to removal will allow for any further roosts identified to be incorporated into subsequent mitigation proposals, and allow time for the submission of an updated licencing approach to Natural England, as described below.

4.3 Application for licences

4.3.1 Following updated surveys prior to construction of each assessment phase, a mitigation licence application will be made to Natural England in order to allow for the destruction of identified roosts with proportional mitigation measures as necessary. Based on current understanding and requirements, this is likely to fall within the scope of the Natural England Bat Low Impact Class Licence (BLICL) because all roosts observed were used by low numbers of common pipistrelle bats and therefore of low conservation significance.

4.3.2 Under the assumption that update surveys confirm or identify only further summer day roosts of more common bat species (common pipistrelle, soprano pipistrelle, brown long-eared) within trees, it is considered likely that suitable mitigation will constitute sectional/soft felling (see **section 4.4** for methodology) at an appropriate time of year. However, this would be determined during the mitigation licence application and subject to approval by Natural England. It is assumed that no further roosts in buildings are confirmed during the updated surveys, and that only disturbance to the two known roosts (small common pipistrelle day roosts) will occur as stated above.

4.3.3 The licenced ecologist or accredited agent will be present to provide an ecological watching brief during the soft felling process outlined below, and will report all activities to Natural England under the conditions of the licence.

4.3.4 Suitable types and numbers of bat boxes will be provided within nearby retained vegetation, prior to tree removal. These bat boxes will be erected under the guidance of the licenced ecologist or accredited agent prior to the destruction of the roost (see **section 4.7** for bat box prescriptions). These will be placed within

areas of nearby retained vegetation, preferably with direct connectivity to the roost. For instance, for trees lost from the treeline north of the runway (T120 and T124), a suitable location would be within the directly connected Winch Hill woodland to the east, retained throughout the Proposed Development. Indicative locations are provided in **Figure 2**, **Appendix A** of this document, however these will be reviewed following the updated surveys and detailed design to ensure that they remain appropriate.

4.3.5 This Mitigation Strategy has been developed under the assumption that updated surveys will identify broadly similar roost extents and types to those identified within the existing baseline. It is plausible that targeted resurvey could identify roosts that fall outside of these conditions, which could constitute;

a. a roost of common species of greater conservation status (e.g. maternity roost); or

b. roosts of species outside the listed commoner species.

4.3.6 In either of these eventualities, this Mitigation Strategy will be updated to proportionally reflect the conservation status of the identified roost/s to be impacted, and an updated mitigation licence application would be made to Natural England. The mitigation proposals set out within the terms of this licence would have to be accepted by Natural England prior to the commencement of the licensable activity.

4.4 Sectional/soft-felling

4.4.1 Mitigation proposals for bats throughout the Proposed Development primarily involve using a precautionary approach to the removal of trees with the potential to support roosting bats. In recognition of the potential for bats to occupy roosting features that have not been identified as roosts during emergence and re-entry surveys, this approach will be undertaken on all trees identified as having low, moderate and high roosting suitability during the targeted update surveys.

4.4.2 Trees with confirmed roosts will be felled following the methods prescribed within the Natural England mitigation licence.

4.4.3 Suitable types and numbers of bat boxes will be provided within nearby retained vegetation prior to tree removal commencement. This provides alternative roost opportunities prior to the loss of the trees, and also provides somewhere for any bats found during the tree removal to be placed by the suitably experienced ecologist (Natural England Bat Class Licence, Level 2 or above).

4.4.4 Soft felling of all trees with low, moderate or high suitability will be carried out under an ecological watching brief, with a suitably experienced ecologist (Natural England Bat Class Licence, Level 2 or above) present during the felling works. Trees will be inspected by the ecologist prior to works commencing. The tree will be felled limb by limb by experienced arborists, with each branch gently lowered to the ground using ropes before being inspected by the ecologist. The trunk will be inspected with any cracks or holes examined using an endoscope, and then cut into sections with pieces lowered to the ground using ropes. If any

bats are discovered on the felled tree these will be collected by the ecologist and placed in a new prepared bat box located on a suitable retained tree as above.

4.4.5 For timings please see refer to **Table 6.1**.

4.5 Construction practices

4.5.1 Within the Code of Construction Practice (CoCP), provided in **Appendix 4.2** of the ES **[TR020001/APP/5.02]**, a range of general environmental protection measures are set out that will provide further mitigation of impacts to bat species throughout construction of the Proposed Development. A summary of relevant measures outlined in the CoCP includes:

a. measures to reduce unnecessary habitat loss and or damage through the use of existing access routes and appropriate exclusion and buffer zones around sensitive biodiversity receptors, such as the retained ancient woodland;

b. measures to avoid pollution of sensitive habitats;

c. measures to reduce the creation of dust, noise and vibration;

d. avoidance of night-time working wherever practically possible; and

e. reducing the severance impact of vegetation removal by maintaining the feature intact as long as possible, keeping any gap to the minimum required for the purpose and considering filling gaps with brash or similar when work is not being undertaken (e.g. on a bat commuting route at night).

4.5.2 Of particular relevance to bats will be the implementation of measures to reduce the impacts of lighting. This includes measures to avoid unnecessary lighting wherever possible e.g. through the use of motion activated security lighting. Where lighting is required it will be positioned away from sensitive receptors such as the retained bat roosts, with measures to reduce light spill. Where applicable, all lighting will comply with relevant guidance, such as BCT Guidance Note 08/18 Bats and artificial lighting in the UK Bats and the Built Environment series (Ref. 16) for the reduction of lighting impacts on bat species.

4.6 Habitat creation and enhancement

Woodland enhancements

4.6.1 As detailed within the Outline LBMP, provided in **Appendix 8.2** of the ES **[TR020001/APP/5.02]**, five retained woodland blocks will be enhanced as part of the wider biodiversity plans for the Proposed Development. These include the ancient woodland (Winch Hill Wood) and the ridgeline woodland, as shown in **Figure 2, Appendix A** of this document, which was one of the areas of relatively high bat activity. Enhancement measures proposed for these woodland areas primarily centre around increasing the structural diversity of the understorey and ground layers through targeted thinning (primarily of lower

value conifers) and the installation of deer fencing (where practicable e.g. those areas not within the provision of open space).

4.6.2 Increasing the structural diversity of these woodlands will be of benefit to bat species through increasing foraging resource, whilst retaining the mature trees that are likely to provide roosting features (Ref. 17).

Provision of open space and Habitat Creation Area

4.6.3 As discussed in **section 3.4**, the establishment of the proposed Habitat Creation Area will occur in tandem with the creation of the provision of open space at the inception of assessment Phase 1. The establishment of both of these areas will involve the conversion of arable land into neutral meadow grassland, low intensity grazed neutral grassland, scrub and establishing woodland, as well as the restoration of existing hedgerows and the excavation of a cluster of small wildlife ponds. The establishment of these areas at this time period would mitigate for the loss of foraging habitats lost during assessment Phases 2a, with the diversity of habitats created replacing and enhancing an immediately adjacent environment.

4.6.4 Of particular importance to bats is the creation of woodland across these two areas. Bat species are known to benefit from the creation of an extensive network of woodland patches, even smaller patches within landscapes of little existing woodland cover (Ref. 17), as per the existing landscape within the Main Application Site. Landscaping plans within the Outline LBMP in **Appendix 8.2** of the ES **[TR020001/APP/5.02]** show the proposed woodland creation to link these smaller woodland patches within the proposed Habitat Creation Area, both to each other and to other features of interest within the landscape, such as hedgerows and the wildlife ponds. Within the provision of open space, established woodland areas would be increased in total area through additional planting, while several smaller additional woodland blocks would be created. It should be noted that the relative size, positioning and structure of woodland blocks have also been designed to align with the Applicant's Wildlife Strike Hazard Reduction Plans (including the Bird Strike Risk Assessment, **Appendix 8.4** of the ES **[TR020001/APP/5.02]**), and discourage aggregations of potential risk species, such as large flocks of wood pigeon (*Columba palumbus*) beneath flight paths.

4.6.5 Unlike within the main construction zone, existing vegetation within both the provision of open space and the proposed Habitat Creation Area will largely be retained. This will include the retention of mature and semi-mature standard trees where defunct hedgerows are to be retained, restored or enhanced. Thereby maintaining and enhancing existing commuting routes, foraging habitat and potential roosting locations throughout these areas, while increasing connectivity between these existing features through habitat creation (Ref. 17), details of which can be found within the Outline LBMP in **Appendix 8.2** of the ES **[TR020001/APP/5.02]**.

4.6.6 In order to manage restored hedgerows within the mitigation area to benefit bats (Ref. 17), consideration will be given to the species used to plant up gaps in hedges, using species of regional provenance, as detailed within the Outline

LBMP in **Appendix 8.2** of the ES **[TR020001/APP/5.02]**. Focus will be given to the creation of species rich hedgerows to maintain a diverse invertebrate foraging resource throughout the active season. Hedgerows will be trimmed in January or February to avoid destruction and disturbance to nesting birds, and will be trimmed on a three-year rotation that ensures that the hedgerow is not excessively trimmed and can be kept thick and dense to maintain variety to the linear habitat features.

4.6.7 There is also potential to translocate mature vegetative features from the main construction areas during both assessment Phase 1 and assessment Phase 2a, and integrate them into these establishing habitats. For instance, selected trees, including Category A tree T343 (**Figure 2, Appendix A** of this document), will be coppiced and moved to woodland habitat creation areas. Integration of coppice stools into restored hedgerows and woodland networks is also likely to provide a greater foraging resource for bat species, through the creation of a greater structural and age diversity.

4.6.8 Provision of monoliths or deadwood where possible, into establishing woodland would provide alternative foraging resource opportunities that would otherwise not be present within establishing woodland. This can be achieved by removing the entire crown (all the main branches) to a stem height of between 4m and 8m above ground level in the first instance, whilst ensuring the standing stem remains a balanced structure. Leaving as many stubs and branches on, as the individual tree allows (in terms of risk) helps to replicate the natural phase of dismantling that a dead tree would go through as it disintegrates.

4.6.9 Grassland management will vary sward height within different sections where practicable, aiming to encourage structural heterogeneity to the grassland for the benefit of a variety of faunal species including ground nesting bird species, maintained either by cutting/topping or low intensity grazing. It is envisaged that maintenance of this sward height under a variety of management prescriptions on a variety of soil types would also be of increased benefit to bats as foraging habitats by promoting diverse invertebrate communities. Maintaining a variety of grasslands would be of benefit to bat species which forage over open space, such as *Nyctalus* spp. Other bat species would benefit through the creation and enhancement of further habitat in close proximity to these grasslands, such as hedgerows and woodlands.

4.6.10 The conclusion of construction of assessment Phases 2a and 2b would include the conversion of previously arable land to calcareous grassland, as this land is no longer required within the construction footprint or for supporting infrastructure. These habitats would integrate into the proposed Habitat Creation Areas and the area of provision of open space following construction of assessment Phase 2a and 2b respectively, extending these areas southwards and adding to the diversity of habitats and the invertebrate communities present, thereby further improving the foraging potential for bats.

Off-site Planting - hedgerow restoration and screening

4.6.11 Of additional significance to bat species is the extensive Off-site Planting (hedgerow restoration and screening) within the wider arable environment to the

north and east of the Main Application Site. This will help to ensure connectivity of the grassland and woodland habitats within the provision of open space at Wigmore Valley park and the proposed Habitat Creation Area to the wider arable landscape.

4.6.12 Specific management practices for enhanced and restored hedgerows will ensure that hedgerows within the wider landscape are enhanced as foraging and commuting resources for bats. A number of these hedgerows also contain mature standard trees which have not been subject to roost identification surveys and are likely to provide roosting opportunities for bats. Management practices to thicken the surrounding hedgerows as part of the restoration and enhancement (as detailed within the Outline LBMP, **Appendix 8.2** of the ES **[TR020001/APP/5.02]**) will help to protect these potential roosts (Ref. 17).

4.6.13 A grassed strip of at least one metre, but preferably wider, separating the hedge from the arable crop will be maintained to help buffer the hedgerow from intensive spraying of crops, whilst also providing further foraging opportunity for bats.

4.7 Specific enhancement prescriptions

Bat boxes

4.7.1 At the time of preparing this Mitigation Strategy, loss of roosts from the Proposed Development is limited to a small number of summer day roosts within trees for low numbers of pipistrelle species. As part of the licencing approach for such roosts from Natural England, it is envisaged that appropriate bat boxes will be provided within nearby retained habitat, such as Winch Hill Woodland.

4.7.2 Additionally, within the proposed Habitat Creation Area a number of bat boxes will be installed within created woodland blocks in order to increase their suitability for use by bats. This is of particular importance within these establishing habitats where suitable roosting features are not likely to develop naturally for a number of decades.

4.7.3 Specifications of bat boxes to represent summer day roosts (Ref. 17) will include:

a. draught-proof and made of thermally stable materials such as untreated wood, woodcrete, brick or stone;
b. several internal chambers; and
c. a small entry slit at the bottom (20mm in width) with a roughened landing strip.

4.7.4 Positioning of bat boxes is a key factor in determining occupancy and will be carefully considered within establishing habitats. It is recommended that bat boxes are positioned in small clusters with varying orientations to increase the diversity of available microclimates, but all should receive full/partial sunlight (Ref. 17). Boxes will be positioned a minimum of 2m above the ground, though a greater height of 5-7m is preferable. Priority will be given to locating boxes on

existing mature trees. Where this is not possible, such as in areas of newly planted woodland, boxes may be required to be temporarily placed on poles until the trees are of sufficient size and condition to support the boxes, which may be a number of years following planting. This will also increase the suitability of the establishing woodland to act as a foraging resource and increase the likelihood of occupancy.

4.7.5 Establishing woodland habitats will be assessed by a suitably experienced ecologist prior to the erection of bat boxes in order to determine the suitability of the habitat and the optimal positioning.

4.7.6 At least ten durable woodcrete or woodstone style bat boxes and ten wooden bat boxes will be installed throughout the appropriate areas, see **Figure 2**, **Appendix A** of this document for indicative locations. In addition, five larger boxes including maternity and hibernacula will be installed within areas such as Winch Hill Wood. Examples of suitable boxes, which mainly comprise maintenance free boxes (droppings can fall out of the box rather than accumulating at the bottom and require cleaning out), would include:

a. Durable Woodcrete/Woodstone Bat Boxes:
    i. Miramare Woodstone Bat Box;
    ii. Schwegler 1FF Flat Bat Box; and
    iii. Schwegler 1FFH Bat Box.

b. Wooden Bat Boxes:
    i. Chavenage Cavity Bat Box;
    ii. Vincent Pro Bat Box; and
    iii. Double Chamber Hardwood Bat Box.

c. Maternity/Hibernation Bat Boxes:
    i. Schwegler 1FW Hibernation Bat Box;
    ii. Schwegler 3FF Bat Colony Box With Inspection Hatch; and
    iii. Causa Maternity Bat Box.

4.7.7 Some of these boxes will also be suitable for rarer species such as barbastelle.

4.7.8 Bat boxes will not be erected within the provision of open space as this area will be subject to increased disturbance with the potential for increased vandalism.

Translocation of features

4.7.9 Where practicable, consideration will be made to attaching felled sections of trees with existing suitable features, to retained mature trees in areas away from public access.

4.7.10 During clearance works, any sections of trunks and limbs on felled trees identified by the ecologists as having suitable features for use by bats will be translocated to the Habitat Creation Area. These will be securely strapped to suitable (sound and healthy) mature trees in appropriate locations, which are currently lacking in features in order to retain the features that could be used by bats in the future. These will be attached at the appropriate height and orientation, as stated for the bat boxes above.

4.7.11 The features would then be available for use by bats until such time that the section of limb/trunk decays, which may only last a couple of years, but would retain features until new ones are created naturally in the retained trees/woodland.

4.7.12 The method of attachment will be bespoke for the tree being used, and the size and shape of the limb/trunk. This will need to take into account the changes in tree load, dynamics, and attachment point or material failure (Ref. 18), and will require advice and assistance from the arboriculturist involved in soft felling the original tree.

5 MANAGEMENT & MONITORING

5.1.1 All habitats created or enhanced as part of the Proposed Development will be managed by the Applicant or their nominated agent for 50 years.

5.1.2 Plans showing the broad areas covered by each of the habitat creation and enhancement proposals are found within **Figure 2** of **Appendix A** of this document, and within the Outline LBMP **Appendix 8.2** of the ES **[TR020001/APP/5.02]**, and the BNG Report **Appendix 8.5** of the ES **[TR020001/APP/5.02]**.

5.1.3 Under the current Mitigation Strategy, assuming that a low impact licence remains appropriate following pre construction survey results, there would be no licencing requirement for ongoing monitoring of mitigation measures or their effectiveness. However, it should be noted that the habitat creation and enhancement options described previously form part of the commitment to deliver a 10% BNG, in addition to their function in providing mitigation for a variety of species, including bats.

5.2 Monitoring

5.2.1 As described in **section 4.2**, pre-construction surveys will be undertaken prior to each assessment phase to confirm the bat activity of the site at that time and whether any changes to proposed mitigation would be required.

5.2.2 In addition to the pre-construction surveys, post construction monitoring will be required to establish the effectiveness of the mitigation and ensure that the conservation status of bats within the site has been maintained. This will include the following surveys:

a. monitoring of bat boxes (and attached limbs with features if done) annually for five years following installation (commencing 2026 assuming installed in early 2025), with the frequency subject to review at this point; and

b. updated bat activity surveys in the active season (April to September) of each year for two years following construction of each assessment phase (commencing 2028, 2037 and 2042), where this does not already occur for updated baseline of the next assessment phase.

5.2.3 Transect surveys of suitable habitats, and use of static detectors for five consecutive suitable nights per survey, will be repeated within the Main

Application Site to provide data on the use of the site following construction. This will be undertaken during the active season (April to September) for two years following the completion of each assessment phase (commencing 2028, 2037 and 2042), where this does not already occur for updated baseline surveys of the next assessment phase. Ideally this would follow the previously used five bat survey transects where possible, in order to be able to compare the results for pre and post construction, however changes are likely to be required.

5.2.4 Bat boxes installed, and any limb/trunks attached to receptor trees, will be checked annually for the first five years by the appointed ecologist, to ensure that they remain in place and in good condition and identify and remedial measures that may be required, with the frequency subject to review at this point. Each box entrance will be checked that they remain open and accessible (i.e. not blocked) and free from dropping build up. Any maintenance and/or cleaning required will be conducted by a suitable bat licence holder. It would be beneficial at the same time to check boxes for use by bats.

5.3 Habitat creation

5.3.1 The Outline LBMP in **Appendix 8.2** of the ES **[TR020001/APP/5.02]** describes the various prescriptions and timescales in which the habitat creation and enhancement measures will be required in order to reach the target condition, during which time there will be a requirement for monitoring to ensure this target will be achieved within the agreed timespan. These monitoring visits will vary in regularity and content based on the time period over which the habitat will take to reach its target condition, as well as when the habitat management prescriptions begin. For instance, for created lowland mixed deciduous woodland, the time to target condition would be 30+ years.

5.3.2 Whilst not direct monitoring for bat species, this broader habitat monitoring will help to ensure that the proposals described in the previous section are delivered using the specified management practices of benefit to bat species.

Remedial measures

5.3.3 If after five years there is no evidence of use by bats of certain boxes installed, it may be prudent to move some of these to alternative suitable locations and continue to monitor as required.

5.3.4 Where bat boxes are lost or damaged, remedial measures will include providing replacements which will be installed as necessary. The purpose of using wooden boxes is to more closely replicate natural features within the trees, and it is anticipated that these would eventually rot and be lost in line with this occurring to natural features within trees themselves. Following this it is anticipated that existing trees would have begun to develop suitable features naturally and therefore lost wooden boxes would not require replacements after 10 years, subject to review as part of the Outline LBMP.

5.3.5 Remedial measures required to be undertaken to ensure that the habitats created and enhanced are progressing as designed, are outlined within the Outline LBMP in **Appendix 8.2** of the ES **[TR020001/APP/5.02]**.

5.4 Reporting

5.4.1 Reports of works conducted under the licence, and any relevant monitoring bat surveys, will be reported to Natural England under the requirements of the licence granted for the Proposed Development.

5.4.2 In addition, an annual monitoring report will be compiled to summarise the results of all biodiversity monitoring visits across the site. This will be submitted to the Applicant in December each year as part of the Contractors Environmental Management Systems (EMS) and contract requirements and outlined within the Outline LBMP, **Appendix 8.2** of the ES **[TR020001/APP/5.02]**. This annual monitoring report will record any corrective actions taken and monitor the condition of habitats against that prescribed within the ES **[TR020001/APP/5.01]**. A five year summary report, including a review of proposed subsequent review periods will also be completed by the Applicant and their appointed Contractor.

6 TIMETABLE FOR IMPLEMENTATION

6.1.1 This section outlines a proposed timetable for implementation of the avoidance, mitigation and enhancement measures proposed for bat species, as outlined above. The key activities that comprise the various elements of this mitigation strategy are detailed within **Table 6.1**.

6.1.2 It should be noted that where these relate to assessment phases, the timing of the delivery of key features should be taken as a guide, as the precise phasing and dates for delivery would be confirmed during detailed design and implementation.

Table 6.1: Details for indicative timings of key activities for bat mitigation described within this Mitigation Strategy

Works/Activity	Timing	Description/Requirement
Habitat Creation and Enhancement	At commencement of construction of assessment Phase 1 in 2025	Habitat creation and enhancement works associated with the provision of open space, proposed Habitat Creation Area and Off-site Planting areas. To be maintained and managed by the Applicant or nominated agent for 50 years.
Creation of calcareous grassland	Following construction of assessment Phases 2a and 2b	Creation of calcareous grassland to extend the Habitat Creation Area following use of the land for construction. To be maintained and managed by the Applicant or nominated agent for 50 years.
Updated bat roost assessment surveys of trees and buildings identified as being lost or disturbed.	Throughout all assessment phases – One year prior to removal of trees and buildings at each assessment phase (2023/24, 2031/32, 2035/36), allowing time for the subsequent emergence and re-entry surveys throughout the active season	Ground level roost assessment, and subsequent tree climbing surveys within footprint of vegetative loss to inform mitigation and licencing requirements.
Updated emergence surveys of trees and	Active survey season (April to September) prior to	Emergence & re-entry surveys within footprint of

Works/Activity	Timing	Description/Requirement
buildings identified as having suitability and as being lost or disturbed.	removal of trees and buildings of each assessment phase (years 2024, 2032, 2036), to allow amendment of Natural England licence.	vegetative loss to inform mitigation and licencing requirements.
Submission of licence application to Natural England for destruction of roosts	Following each updated roost identification survey suite (2024, 2032, 2036) the year prior to construction of each assessment phase.	Update of Bat Mitigation Strategy and mitigation proposals. If a bat licence is required, or changes to an existing licence are necessary, then these must be produced and be in place prior to the commencement of licensable activities.
Installation of bat boxes	Prior to sectional/soft felling of trees for construction of assessment Phase 1, in particular of confirmed day roosts as a licensable activity. Within appropriate areas of woodland habitats within the habitat creation and enhancement areas, and/or within retained mature trees as per indicative locations within **Figure 2**, **Appendix A** of this document.	Provision of bat boxes within areas of retained suitable habitat with connectivity to the roost to be lost. To be erected in suitable location under supervision of bat ecologist. Provision of suitable bat boxes (**Section 4.7**) within retained woodland and hedgerows, within suitable trees or on poles where trees planted have not matured sufficiently to house a bat box . To be directed by a suitably qualified ecologist, who will also direct positioning of bat boxes.
Sectional/soft felling	Throughout construction of all assessment phases – to be completed only following updated roost identification surveys within area to be impacted.	Precautionary sectional/soft felling of all trees classified as low, moderate, high and confirmed following resurvey. Avoiding summer (April to September) due to the identification of summer day roosts on site, and where deemed appropriate for specific trees (potentially those of moderate and high

Works/Activity	Timing	Description/Requirement
		quality) by the suitably qualified ecologist, avoiding hibernation (November to February) periods. Low, moderate and high suitability trees to be felled under guidance of suitability experienced ecologist. Confirmed roosts to be felled following methods within approved Natural England mitigation licence.
Monitoring of installed bat boxes and limbs with features attached to other trees (if done)	Checked annually for the first five years following installation (commencing 2026 assuming installed in early 2025 as the first year of construction of assessment Phase 1), with the frequency subject to review at this point.	Ensure that the box entrances remain open and accessible (i.e. not blocked) and free from dropping build up. Check current status of use by bats.
Updated bat activity surveys	Active survey season (April to September) of each year for two years following construction of each assessment phase (commencing 2028, 2037 and 2042), where this does not already occur for updated baseline of the next assessment phase.	Transect surveys of suitable habitats, and use of static detectors within the Main Application Site (areas not yet constructed for each assessment phase) to provide data on use of the site following construction.

7 CONCLUSION

7.1.1 With the adoption of the measures set out in this Mitigation Strategy, it is considered that the Proposed Development would not result in adverse impacts to bat populations during construction, and that significant long-term adverse effects to bats would be avoided, with an overall favourable conservation status for local bat populations achieved following conclusion of construction.

7.1.2 All proposals within this strategy have been designed to ensure that the Proposed Development mitigates potential effects on bat species, taking due regard of guidance and best practice (Ref.13, Ref.15).

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Ref 5. JNCC and Defra (on behalf of the Four Countries' Biodiversity Group (4CBG)) (2012). UK Post-2010 Biodiversity Framework. July 2012. Available from: http://jncc.defra.gov.uk/page-6189
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Ref 18. Mullholland, J. (2015) Soft Felling and Translocating Bat Roosts in Trees – Arboricultural Considerations. CIEEM In Practice, Issue 89, September 2015.

GLOSSARY AND ABBREVIATIONS

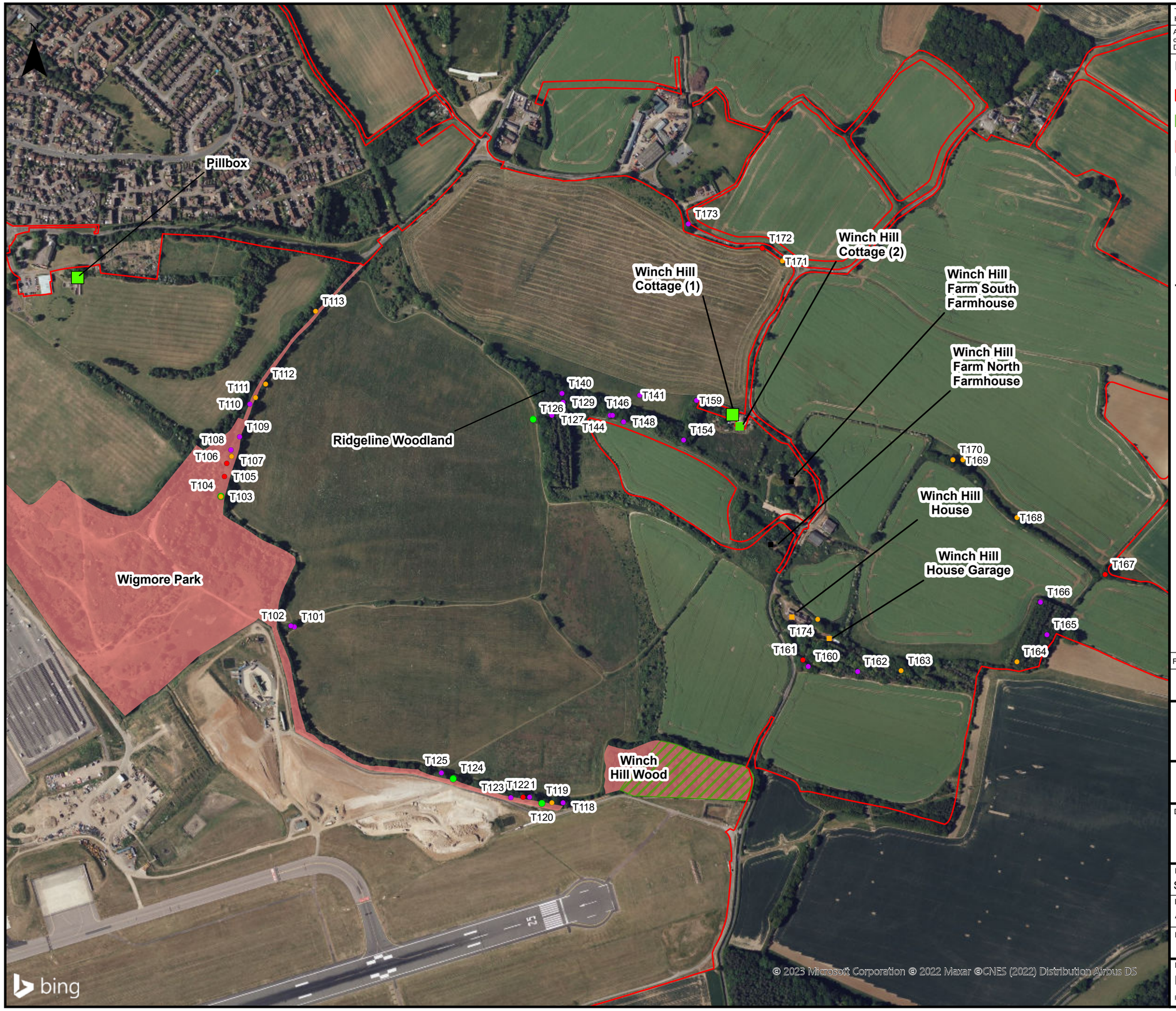
Term	Definition
AAR	Airport Access Road
BAP	Biodiversity Action Plan
BCT	Bat Conservation Trust
BLICL	Bat Low Impact Class Licence
BNG	Biodiversity Net Gain
BRMC	Bedfordshire & Luton Biodiversity Recording & Monitoring Centre
CoCP	Code of Construction Practice
CWS	County Wildlife Site
DCO	Development Consent Order
DWS	District Wildlife Site
EIA	Environmental Impact Assessment
EMS	Environmental Management Systems
ES	Environmental Statement
ha	Hectares
Habitat Creation Area	The Habitat Creation Area comprises an area to the east of the Main Application Site of existing arable land owned by the Applicant, which will be converted to create an area of improved habitat value including broadleaved woodland, neutral meadow grassland, and hedgerows with trees, to mitigate for loss of habitats as part of the Proposed Development and secured as part of the Proposed Development.
HERC	Herts Environmental Records Centre
km	Kilometre
JNCC	Joint Nature Conservation Committee
LBAP	Local Biodiversity Action Plan
LBMP	Outline Landscape and Biodiversity Management Plan
LWS	Local Wildlife Site
m	metre
MAGIC	Multi-Agency Geographic Information for the Countryside
mm	millimetre
mppa	million passengers per annum
NE	Natural England

Term	Definition
NERC	Natural Environment and Rural Communities
OS	Ordnance Survey
PRF	Potential Roosting Features
UK BAP	UK Biodiversity Action Plan

APPENDIX A

Figure 1 – Bat survey results plan

Figure 2 – Bat mitigation plan



All structure positions are indicative. The proposed works will be subject to detailed design development. The changes will be within limits of deviation specified in the Development Consent Order.

Legend

- Order Limits
- Ancient Woodland
- Wildlife Sites

Building Roost Assessment

- Confirmed
- Moderate
- Demolished in 2019 after earlier bat surveys

Tree Roost Assessment 2020

- Confirmed Roost
- High
- Moderate
- Low

Revision History	Drawn	Checked / Approved	Date	Rev.
First Issue	AB	NL / CS	22/02/23	P01

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Drawing Title

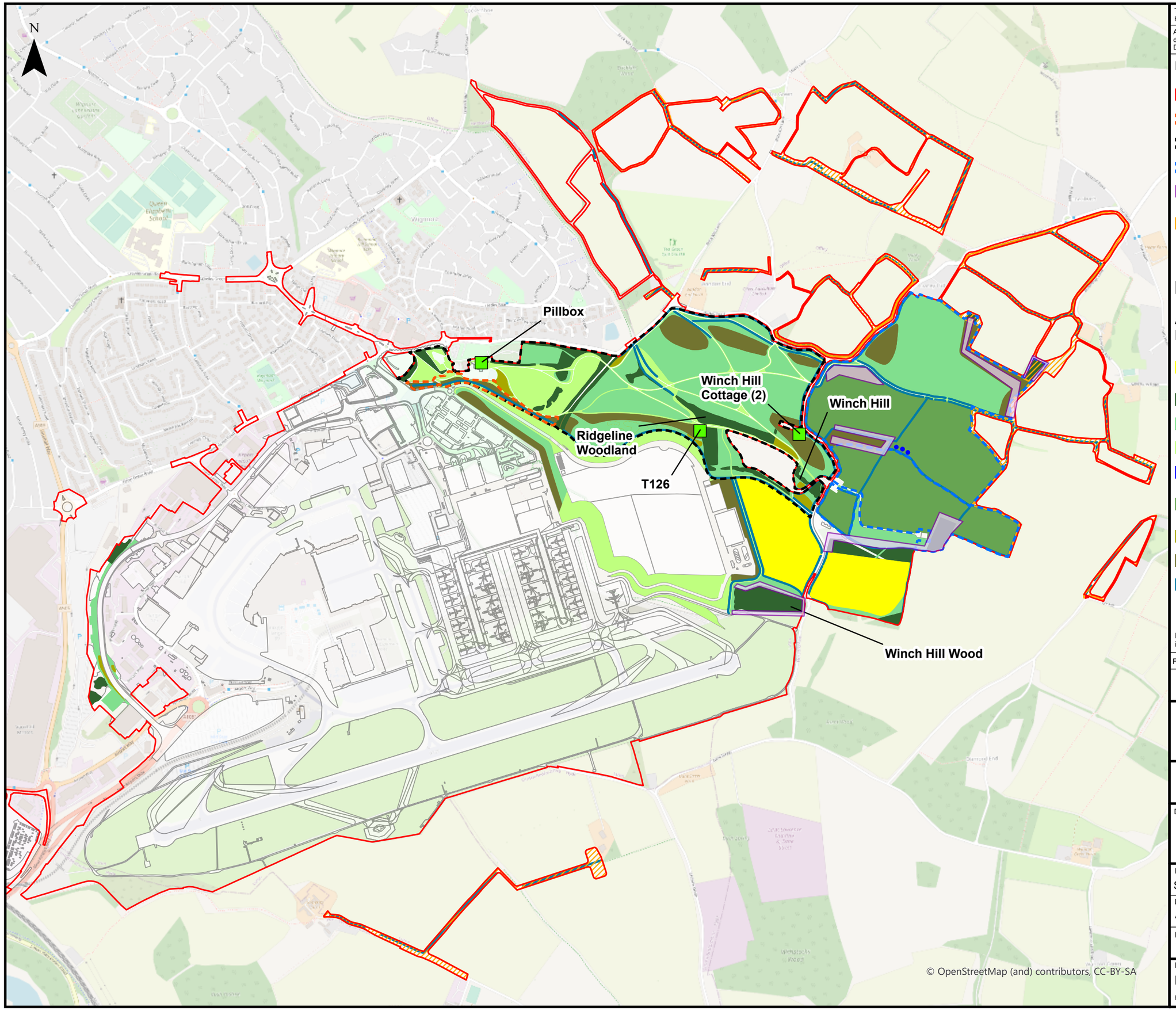
Figure 1 Survey results plan

Purpose of issue	Suitability	Drawn	Checked	Approved	Date	Scale	Size
SUITABLE FOR INFORMATION	S2	AB	NL	CS	22/02/23	1:6,000	A3

DCO Application Ref.	APFP Regulation	DCO Document Ref.
TR020001	APFP 5(2)(a)	TR020001/APP/5.02

Drawing Number	Revision
LLADCO-3C-ARP-00-00-DR-YE-0256	P01

Project - Phase - Originator - Asset/Zone - Sub Asset - Type- Discp. - Number



All structure positions are indicative. The proposed works will be subject to detailed design development. The changes will be within limits of deviation specified in the Development Consent Order.

Legend

- Order Limits
- Landscape Earth Bund
- Replacement Open Space
- Habitat Creation Area
- Indicative areas for bat boxes
- Off-site Hedgerow Restoration and Screening
- Retained bat roosts
- Airport Infrastructure Layout - Assessment Phase 2b

Assessment Phase 2b Landscape Mitigation

- Calcareous grassland – low intensity grazing
- Existing vegetation
- Neutral meadow grassland
- Amenity grassland
- Wildlife pond
- Neutral grassland – low intensity grazing
- Proposed scrub
- Proposed woodland
- Hedgerow restoration

Note: Further bat boxes could be installed within suitable retained trees in the restored hedgerows within the Habitat Creation Area

Revision History	Drawn	Checked / Approved	Date	Rev.
First Issue	AB	NL / CS	22/02/23	P01

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Drawing Title

Figure 2 Mitigation Plan

Purpose of issue	Suitability
SUITABLE FOR INFORMATION	S2

Drawn	Checked	Approved	Date	Scale	Size
AB	NL	CS	22/02/23	1:12,500	A3

DCO Application Ref.	APFP Regulation	DCO Document Ref.
TR020001	APFP 5(2)(a)	TR020001/APP/5.02

Drawing Number	Revision
LLADCO-3C-ARP-00-00-DR-YE-0257	P01

Project - Phase - Originator - Asset/Zone - Sub Asset - Type- Discp. - Number