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London Luton Airport Expansion

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5.02 Appendix 8.4 Bird Strike Risk Assessment

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**London Luton Airport Expansion Development Consent
Order 202x**

**5.02 ENVIRONMENTAL STATEMENT APPENDIX 8.4 BIRD STRIKE
RISK ASSESSMENT**

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1 INTRODUCTION

1.1 Background

- 1.1.1 Luton Rising (a trading name of London Luton Airport Limited) ('the Applicant') is proposing to expand London Luton Airport by submitting a Development Consent Order (DCO) application for works that will build on the current operational airport with the construction of a new passenger terminal and additional aircraft stands on land owned by the Applicant, which will take the overall passenger capacity from 18 million passengers per annum (mppa) to 32 mppa (hereby referred to as the 'Proposed Development').
- 1.1.2 An Environmental Statement (ES) has been prepared as part of the suite of documents prepared and submitted to support the application for development consent. The ES provides an assessment of the likely significant effects of the Proposed Development on the environment. There has been an iterative design process to minimise impacts to ecological features that has included stakeholder liaison, which is further detailed in **Chapter 8 Biodiversity of the ES [TR020001/APP/5.01]** and this document in an appendix to that chapter.
- 1.1.3 The Proposed Development is located to the immediate east and north east of the existing airport. New infrastructure would be predominately located within Luton Borough, with earthworks, construction activities and replacement open space extending into north Hertfordshire. The Proposed Development comprises the Main Application Site (as defined in **Chapter 2 The Site and Surroundings of the ES [TR020001/APP/5.01]** and shown on **Figure 2.2** in the **ES [TR020001/APP/5.03]**), broadly centred on National Grid Reference TL125215, which covers the existing airport infrastructure and previously undeveloped, predominantly arable land, with hedgerows, trees and shrub-lined margins to the east. The Proposed Development also includes Off site Highway Interventions, Offsite Car Park works and Off site Planting areas outside of the Main Application Site, also defined in **Chapter 2** of the **ES [TR020001/APP/5.01]**.
- 1.1.4 The Proposed Development would result in an increase in the number and frequency of aircraft movements within the airspace associated with the airport. It is assumed that the increase in the number and frequency of aircraft within the approaches to the existing runway may increase the bird strike risk and there is therefore a requirement to ensure the operation of the aerodrome (taken to be any area of land or water designed, equipped, set apart, commonly used or in prospective use for affording facilities for the landing and departure of aircraft) is safeguarded from any increased risk.
- 1.1.5 Bird strike risk is the risk of a collision between an aircraft and one or more birds. It arises from the interaction between aircraft movements and bird movements, which can cause damage to aircraft and potentially cause accidents. However, minimisation of the probability of bird strike risk can be achieved following the implementation of appropriate bird deterrence measures.

1.2 Policy, legislation and guidance

- 1.2.1 Development concerns, as set out in Department for Transport Circular 1/2003 (Ref. 1), are those which, in part, would increase the risk of bird strike to aircraft. Civil Aviation Publication (CAP) 738 Safeguarding of Aerodromes (Ref. 2) details the requirement for relevant planning authorities to consult the relevant consultee before granting planning permission for any development within 13km of a certified aerodrome (referred to as the 'safeguarding area') which is likely to attract birds.
- 1.2.2 The relevant planning authority will need to consider not only the individual potential bird attractant features of the Proposed Development but also whether, in combination with existing land features, they would make the whole or parts of a safeguarding area more attractive to birds and/or create regularly used commuting/dispersal routes across aircraft flight paths.
- 1.2.3 In accordance with rules defined by the European Aviation Safety Agency (EASA) and aligned with EU legislation (Ref. 3), certified aerodrome operators shall:
- a. assess and monitor the wildlife hazard on and in the surroundings of the aerodrome;
 - b. establish means and procedures to minimise the risk of collisions between wildlife and aircraft to an acceptable level; and
 - c. notify the appropriate authority if a wildlife risk assessment indicates conditions in the surroundings of the aerodrome that are conducive to a wildlife hazard problem.
- 1.2.4 Furthermore, the aerodrome operator should, in accordance with CAP 168 Licensing of Aerodromes (Ref. 4), Annex II to ED Decision 2021/003/R Acceptable Means of Compliance (AMC) and Guidance Material (GM) to Authority, Organisation and Operations Requirements for Aerodromes (Ref. 5) and CAP 772 Wildlife Hazard Management at Aerodromes (Ref. 6):
- a. participate in the national wildlife strike hazard reduction programme;
 - b. establish procedures to record and report to the appropriate authority wildlife-strikes to aircraft that have occurred at the aerodrome in close cooperation with organisations operating, or providing services, at the aerodrome;
 - c. ensure that wildlife hazard assessments are made by competent personnel;
 - d. establish, implement and maintain a wildlife risk management programme;
 - e. conduct a risk assessment using strike data for each species, as well as information on the presence of species, the number of individuals, and their biology, and update this regularly;
 - f. take into account the number of wildlife-strikes for each species and the severity of damage arising from those strikes; and

- g. identify management actions on those species which are present with the highest frequency and create the greatest damage.

1.2.5 A Wildlife Strike Hazard Reduction Plan (WSHRP) is used by London Luton Airport Operations Limited (LLAOL) (the Operator) as a guidance document to continually assess and manage bird strike risk to aircraft is maintained at a tolerable level (Ref. 7).

1.2.6 For this assessment, hazardous bird species are those which pose a risk to aircraft safety because their size/weight, flocking behaviour and flight height are likely to result in mortality or injury from collision with, and potentially cause damage to, an aircraft as defined in CAP 772: Wildlife Hazard Management at Aerodromes (Ref. 6).

1.3 Report purpose

1.3.1 Any development that alters the bird species and/or number of birds likely to be present or their dispersal patterns has the potential to change the level of bird strike risk. For example, this could be affected by creating woodland, hedgerows, grassland or waterbodies or conversely by removing such features. Airport expansion/development may increase or decrease the attractiveness of an area to certain types of bird or alter regularly used dispersal routes. This report provides an assessment of bird strike risk at the airport as a result of the Proposed Development, using desk and field-based studies to determine the types of bird related hazards to aircraft that exist under current conditions.

2 METHODOLOGY

2.1 Wildlife strike reduction plan

2.1.1 The annual WSHRP (Ref. 7) was reviewed to understand the following reported issues both on and in the vicinity of the airport aerodrome:

- a. sites within 13km of the airport's aerodrome safeguarding area (as defined within CAP 738 Safeguarding of Aerodromes) that may support hazardous bird species (Ref. 2);
- b. bird strike/near miss events 2017 to 2021;
- c. the effectiveness of bird deterrent methods utilised; and
- d. details of on-going monitoring.

2.2 Hazardous site verification

2.2.1 Recent aerial imagery (Ref. 8) was reviewed to identify habitats within 13km of the Proposed Development (referred to as the future safeguarding area within this report), which are known or have the potential to attract hazardous birds, such as woodlands, hedgerows, waterbodies, grassland and landfill sites.

2.2.2 Ground truthing survey visits were undertaken during June 2022, which comprised assessment for the presence of key risk habitats at locations identified from aerial imagery. This included sites identified in the WSHRP (Ref. 7) within 13 km of the existing the airport's aerodrome as having potential to support hazardous bird species. This information was used to determine which sites have potential to attract hazardous birds within the 13km of the Proposed Development (hazardous sites).

2.2.3 Standard bird surveys were also undertaken to gather baseline data for both breeding and wintering bird species within and around the Proposed Development. The following baseline surveys have been completed:

- a. Monthly surveys were undertaken across two transect routes (within the Main Application Site and further suitable habitats up to 500m beyond) to record wintering birds between December 2017 and February 2018 and October 2018 and March 2019.
- b. Four wintering bird surveys were undertaken along one transect route (within the Main Application Site, focusing on remaining options to the north of the runway) to record birds between November 2021 and February 2022.
- c. Four Breeding bird Surveys were undertaken between April and July 2018 across two transect routes devised to include the main habitat types present that are likely to be important for breeding birds within the Main Application Site and land up to 500m.
- d. Four Breeding Bird Surveys were undertaken between April and June 2021 along a single transect (focussing solely on the north eastern transect previously surveyed in 2018 due to changes to the Proposed

Development which made the southern transect less relevant in terms of potential impacts on breeding birds).

- e. Schedule 1 Bird Surveys during 2019 – focussing on red kite (*Milvus milvus*) and barn owl (*Tyto alba*) within 1.5km of the Main Application Site were undertaken between April and June 2019 to identify active and potential nest sites, including nest verification surveys.

2.2.4 The surveys were conducted at various times of day and during different weather conditions. During the wintering and breeding bird surveys, locations where hazardous bird species congregate and their associated flight lines between such places were recorded to determine collision risk to aircraft, in particular where:

- a. regularly used flight lines of hazardous bird species cross the aircraft flight paths associated with the existing runway; and
- b. regularly used locations that support assemblages of hazardous bird species within and adjacent to the aircraft flight paths associated with the existing runway.

2.2.5 Further information on the findings of these baseline surveys is provided in the Ecology Baseline Report provided as **Appendix 8.1** of the ES [TR020001/APP/5.02].

2.3 Bird strike analysis

Contextual information

2.3.1 The method applied to this assessment is consistent with that used in the routine control of bird strike risk to aircraft at UK airports (Ref. 6). This method assesses the probability of a bird strike incident arising from a particular species, against the severity, given as a percentage of strikes that cause damage to aircraft.

2.3.2 As there is no established criteria for assessing the significance of change in bird strike risk, this assessment has been based on professional judgment of the authors of this report.

2.3.3 There is no set definition of what constitutes a bird strike hazard. Research indicates that, in strikes involving birds weighing more than 1,000g, damage is caused to the aircraft in 22.5% of strikes. Regardless of the weight of the species involved, if more than ten birds are reported struck in one incident, 40% of strikes cause damage (Ref. 9).

2.3.4 Furthermore, the location of bird strike impact on an aircraft, such as engine, cockpit or fuselage will also influence severity and extent to which safety is compromised. Generally, medium to large birds, particularly if they form flocks, are considered to pose the greatest risk to aircraft. The severity of aircraft strikes based on bird body weight is summarised in **Table 2.1**.

Table 2.1: Severity of bird strike damage to aircraft

Bird species weight range (kg)	Bird strikes resulting in aircraft damage (%)	Severity of aircraft damage
>2.5 (e.g. Canada goose)	>20	Very High
0.6 to 2.5 (e.g. buzzard)	10 to 20	High
0.2 to 0.59 (e.g. woodpigeon)	6 to 9.9	Moderate
0.05 to 0.19 (e.g. black-headed gull)	2 to 5.9	Low
<0.05 (e.g. meadow pipit)	<2	Very Low

- 2.3.5 The actual species that cause a hazard varies between airports, depending on the local situation, and those contributing most to bird strike risk may change over time. Bird management at the airport is targeted at the species identified in the WSHRP (Ref. 7) as having been or likely to be involved in bird strikes at the airport over a rolling five-year monitoring period.
- 2.3.6 The most recent data available from the Civil Aviation Authority (CAA) (Ref. 10) indicates that the number of reported bird strikes across the UK between 2012 and 2016 were as follows:
- a. 6,019 individuals (approximately 85%) within 'Zone A' (under 61m [200ft] Above Ground Level (AGL) on landing or under 153m [500ft] AGL on take-off);
 - b. 867 individuals (approximately 12%) within 'Zone B' (between 153m [500ft] and 458m [1,500ft] AGL);
 - c. 215 individuals (approximately 3%) within 'Zone C' (above 458m [1,500ft] AGL); and
 - d. an additional 5,720 individuals were also reported, but the height above ground level and phase of flight were not stated.
- 2.3.7 This data indicates that 97% of aircraft bird strikes nationwide occurred up to 458m (approximately 1,500ft) AGL (within 6km of an aerodrome), which is generally where aircraft are on final approach to or on take-off from a runway.
- 2.3.8 The systems and methods of bird monitoring and control exercised by LLAOL are regularly audited by bird control specialists on behalf of the CAA as aerodrome licensing authority. That process includes an independent annual assessment of overall bird strike risk, using methods and categorisations agreed with the CAA.
- Bird strike risk assessment**
- 2.3.9 An assessment of bird strike risk and the effect of airport expansion/development on that risk requires knowledge of the numbers and types of birds in the airport area and the likelihood of them crossing the aircraft flight paths. That knowledge is gained from field observations and experience of/research

into bird behaviour. Based on this information, risks are assessed from the likelihood of a strike and its likely damaging effect.

- 2.3.10 To take into account differences of behaviour and damaging effect, the risk assessment for the Proposed Development has been completed separately for each species, based on those species known to be present from baseline survey data and the WSHRP. This allows comparison of risks between baseline, construction and operation phases, targeting measures to reduce effects. Only hazardous species have been considered in the risk assessment as strikes with small non-controlled species such as skylarks (*Alauda arvensis*) and swallows (*Hirundo rustica*) are to be expected and rarely result in damage to the aircraft. Therefore, these species have not been monitored or included in the risk assessment.
- 2.3.11 Bird strike risk is expressed as the rate of strikes per aircraft movement and is, therefore, independent of the volume of aircraft activity. Traffic growth will not itself have any effect on the level of risk. However, if the level of risk remains the same but air traffic volume increases, the number of bird strikes will also increase.
- 2.3.12 This risk assessment process categorises species into low, medium or high bird strike risk, based on the frequency with which the species is hit and the percentage damage rating for that species.
- 2.3.13 Strike frequency has been calculated using the airport's average annual bird strike records from 2017 to 2021 (existing bird strike rate – also highlighting locally hazardous species) as well as a combination of several other factors. These include the frequency with which each species or species group was observed to be crossing the runway arrival/departure flight paths, the local populations and the observed behaviour of that species recorded during the baseline surveys outlined in **paragraph 2.2.3**.
- 2.3.14 The likely strike frequency was then factored against the damage rating for each species, to give an overall indicator of bird strike risk (low, medium or high). The damage rating is the percentage of strikes with that species or species group that result in damage. This was calculated from the CAA bird strike statistics from 1976 to 1996.
- 2.3.15 This risk assessment was then compared to the levels of use of the existing runway, as calculated from the average number of strikes per year from 2017 to 2022 for each species (existing bird strike rate as reported in the WSHRP) to consider likely changes as a result of the Proposed Development.

2.4 Assumptions and limitations

- 2.4.1 In terms of the assessment of bird strike risk, it has been assumed that the bird control regime (described in WSHRP) currently applied by LLAOL at the airport and within the surrounding area would be extended to include the Proposed Development. These measures are certified and audited by the CAA and represent best practice in minimising levels of bird strike risk.

- 2.4.2 It has been assumed that the aerodrome safeguarding system, which operates through the local planning process, would ensure that no significant bird attracting developments take place within 13km of the Proposed Development. The airport operator has a statutory right to be consulted about any such development and may object if it is considered a threat to the adequate control of bird activity.
- 2.4.3 It has also been assumed that the measures specified in the WSHRP to minimise the attraction of birds to the area or changes in bird behaviour that would increase bird strike risk, will be properly monitored and enforced. These cover such areas as the treatment of spoil heaps, seeding, temporary surface drainage and the disposal of food waste. Many of these measures should be considered as construction best practice within the safeguarding area to any aerodrome. It has also been assumed that requirements for the airport bird control personnel to access the works for operational and inspection purposes will also be complied with.
- 2.4.4 It is assumed that the bird situation is not significantly affected by external factors, examples of which might include climate change or major changes in the agricultural regime outside of the Proposed Development.
- 2.4.5 Apart from the assumptions set out above, no limitations have been identified that will materially affect this assessment.

3 BASELINE

3.1 Hazardous sites

3.1.1 Existing sites where hazardous bird species were recorded during survey visits between 2017 and 2022 within 6km of the Proposed Development are included in **Table 3.1** and shown in **Figure 1** in **Appendix A** to this report.

Table 3.1: Hazardous Sites identified within 6 km* of the Main Application Site (distances given from existing runway)

Site Name	Habitat
Breachwood Green	Woods and farmland between 2km and 3km east of the runway regularly attract large flocks of woodpigeon during the winter, gamebirds and corvids.
Chiltern Hall	Pastures to the south of the airport that regularly attract flocks of starling, thrushes and other small passerines, particularly during the winter.
Luton Hoo Park	Open water approximately 500m south west of the runway regularly supports large water-birds and flocks of medium sized water-birds, particularly during the winter.
Land adjacent to Someries Castle	Woods and farmland to the south west of the airport regularly attracts large flocks of woodpigeon during the winter, gamebirds and corvids.
Wigmore Park	Amenity grassland to the north east of the airport that regularly attracts flocks of large and small gulls, particularly during the winter.
Winch Hill	Woods and farmland within 1km east of the runway regularly support large flocks of woodpigeon during the winter, gamebirds and corvids.

* Any hazardous sites identified within the wider 13km safeguarding zone are not included within this table due to reduced risk (only 3% bird strikes are above 458m AGL).

3.2 Hazardous species

3.2.1 Hazardous species recorded during survey visits within 6km of the Main Application Site include those typically more than 200g and/or regularly occurred or have potential to form flocks of more than 10 individuals. These hazardous species are listed in **Table 3.2**.

Table 3.2: Hazardous bird species recorded (2017-2021 surveys) within 6km* of the Main Application Site

Species group	Regularly recorded locations
Large water-birds (particularly Canada Goose, Mute Swan, Grey Heron, Little Egret and Cormorant)	Open water associated with the River Lea at Luton Hoo Park (500m south west of the airport).
Medium water-birds (particularly Mallard, Tufted Duck and Coot)	Open water associated with the River Lea at Luton Hoo Park (500m south west of the airport).
Game birds (particularly Red-legged Partridge and Pheasant)	Farmland and woodland (within 3km of the airport).
Large raptors (particularly Red Kite and Buzzard)	Farmland and woodland (within 3km of the airport).
Small gulls (black-headed gull and common gull)	Amenity grassland at Wigmore Valley Park (adjacent to the airport).
Large gulls (herring gull, yellow-legged gull and lesser black-backed gull)	Amenity grassland at Wigmore Valley Park (adjacent to the airport).
Pigeons (particularly woodpigeon and feral pigeon)	Farmland and woodland (within 3km of the airport).
Barn owl	Grassland (within and adjacent to the airport).
Corvids (particularly rook, carrion crow, jackdaw and magpie)	Farmland and woodland (within 3km of the airport).
Starling	Farmland, particularly pastures at Chiltern Hall (adjacent to the airport).
Thrushes (particularly fieldfare and redwing)	Farmland, particularly pastures at Chiltern Hall (adjacent to the airport).
Small passerines (particularly pied wagtail, meadow pipit, chaffinch, linnet, goldfinch and yellowhammer)	Farmland, particularly pastures at Chiltern Hall and arable margins east of Wigmore Valley Park (adjacent to the airport).

* Any hazardous bird species identified within the wider 13km safeguarding zone are not included within this table due to reduced risk (only 3% bird strikes are above 458m AGL).

3.2.2 The probability of bird strike (strike severity) is based on the average number of LLAOL reported aircraft collisions and near misses by species over a rolling five-year period at the airport. The severity of bird strike is linked to body weight and determined by data submitted to CAA about the percentage of strikes resulting in aircraft damage by species. The baseline bird strike risk assessment matrix is provided in **Table 3.3** and is adapted from the WSHRP bird strike/near miss monitoring data for 2017-2021.

Table 3.3: Bird strike risk severity assessment at baseline (WSHRP bird strike data 2017-2021)

Severity of Bird Strike (Damage Rating)	Probability of Bird Strike (Strike Frequency)				
	Very High	High	Moderate	Low	Very Low
Very High					
High				Red Kite	Pheasant Lesser Black-backed Gull Buzzard
Moderate		Woodpigeon		Red-Legged Partridge Racing Pigeon	Feral Pigeon
Low			Black Headed Gull Barn Owl		Starling Golden Plover Kestrel Short Eared Owl Woodcock
Very Low		Meadow Pipit	Skylark	Hobby Swift	Little Owl

Red = high bird strike risk, yellow = medium bird strike risk and green = low bird strike risk

- 3.2.3 Wintering and breeding bird survey findings for the period between December 2017 and February 2022 were reviewed to determine flight lines that were regularly used by hazardous bird species, in particular where they cross aircraft flight paths on and within the approaches to the runway. The regularly used flight lines of hazardous species with a ‘high’ strike probability are shown on **Figure 2**, provided in **Appendix A** of this report.
- 3.2.4 During the winter, large flocks of woodpigeon (*Columba palumbus*) (which present a ‘high’ bird strike risk) were recorded flying between the woods around Winch Hill and on the east side of Breachwood Green. These woods are respectively located within 1km and between 2km and 3km along the aircraft flight path east of the runway and present a ‘high’ bird strike risk to aircraft.
- 3.2.5 Wintering flocks of gulls, including black-headed gull (*Chroicocephalus ridibundus*) (which was the most abundant species), were regularly recorded at Wigmore Valley Park. However, no regularly used flight line was recorded. Flocks of black-headed gull present a ‘moderate’ strike probability to aircraft.
- 3.2.6 In line with the WSHRP, red kite and buzzard (*Buteo buteo*) were regularly recorded around the airport, including several nesting locations for each species within woodland to the south of the Proposed Development (Ref. 7). Both species usually occurred as individuals and did not appear to have regularly

used flight paths. Red kite and buzzard therefore present a 'low' strike probability to aircraft.

3.2.7 Pheasants (*Phasianus colchicus*) were regularly recorded around the airport usually as individuals and flew short distances just above ground level. Similarly, flocks of red-legged partridge (*Alectoris rufa*) were recorded during the winter on the farmland around the airport and flew short distances just above ground level. Pheasant and red-legged partridge therefore have a 'low' strike probability to aircraft.

3.2.8 The open water associated with the River Lea at Luton Hoo Park attracts large and medium sized water-birds, which are more abundant during the winter. This area of open water is located approximately 500m south west of the airport and is approximately 50m below runway level. There is a 'low' bird strike risk to aircraft because the water-birds at Luton Hoo Park were recorded flying above the open water but below the runway elevation.

4 ASSESSMENT OF EFFECTS

4.1 Construction

- 4.1.1 Proposed changes to woodland and grassland areas known to regularly attract hazardous birds where they are vulnerable to aircraft collision (i.e. within the 6km of an aerodrome where aircraft are within 458m AGL to the existing runway) are included in the Proposed Development and shown on **Figure 14.11** of this ES [TR020001/APP/5.03]. The effect of the changes on the attractiveness of any given habitat to birds has been assessed; such as the elimination of woodland that regularly supports large flocks of woodpigeon during the winter or creation of amenity grassland that would attract gulls. The effect could then be assessed of such changes in attractiveness on the numbers of birds likely to gather at those locations (defined as hazardous sites for this assessment) and the frequency with which birds moving between them might cross the aircraft flight paths. This could then be used to inform categorisation of the likely strike frequency as a result of the Proposed Development presented by each species in the various cases.
- 4.1.2 The assessment of bird strike risk during construction is qualitative. It relates to the continuing use of the runway and encompasses the introduction of bird-attracting conditions due to construction, and the disturbance to and removal of existing habitats by construction activity. The predicted effects of these changes on hazardous bird species' presence, abundance, location and flight lines relative to the runway and approaches is predicted from baseline survey work and professional judgement to predict likely probability of aircraft bird strike during construction.
- 4.1.3 The changes in bird strike risk during construction considered in this assessment are those likely to be brought about by the alterations in habitats that will attract hazardous birds. It is assumed that the numbers and behaviour of birds are not significantly affected by external factors, examples of which might include climate change or major changes in the agricultural regime outside the Proposed Development.
- 4.1.4 The construction activities include vegetation clearance and earthworks. These works would remove woodland, scrub, hedgerows and grassland that currently attract birds, and so alter the numbers of birds in the area and their behaviour.
- 4.1.5 The Proposed Development would be delivered incrementally, during which construction and operation may take place simultaneously. For the purposes of assessment, three assessment phases are considered, with a summary of relevant activities provided below:
- a. **Assessment Phase 1 (Constructed 2025-2027):** Assessment Phase 1 would involve the expansion of Terminal 1 (T1) to increase capacity with the creation of additional aircraft stands. These works will include the loss of the majority of (c. 80%) of Wigmore Park County Wildlife Site (CWS). Assessment Phase 1 will also include the majority of habitat creation works, both within the existing and Replacement Open Space, and the proposed landscape restoration and habitat creation areas, to

the northern and north eastern extents of the Proposed Development respectively, as shown on **Figure 14.11** of this ES [TR020001/APP/5.03].

- b. **Assessment Phase 2a (Constructed 2033-2036):** Assessment Phase 2a would involve construction of the new Terminal 2 (T2) and associated facilities to increase capacity upon opening. Assessment Phase 2a would also involve the majority of major earthworks associated with delivery of the Proposed Development. These earthworks are centred to the north of the runway and east of the existing airport.
- c. **Assessment Phase 2b (2037-2041):** Assessment Phase 2b would involve the expansion of T2 and associated facilities. Works are scheduled to commence in 2037 and will deliver incremental capacity increases up to 32 mppa. Though further construction would be required throughout assessment Phase 2b, this would largely occur within the footprint of the earthworks completed during assessment Phase 2a and are likely to be of reduced relevance for this assessment. Following the conclusion of assessment Phase 2b, the Proposed Development is expected to reach full operational capacity by 2043.

4.1.6 Further information and accompanying plans for the activities and associated land use changes required during each of the assessment phases (including habitat creations and enhancements discussed in the following section) are provided in the Landscape and Biodiversity Management Plan (LBMP), provided as **Appendix 8.2** of the ES [TR020001/APP/5.02].

Assessment Phase 1

- 4.1.7 At the start of assessment Phase 1, creation of habitats is primarily within the Replacement Open Space and Landscape restoration, and habitat creation area (as described in **Chapter 4** The Proposed Development of the ES [TR020001/APP/5.01] and shown on **Figure 14.11** of the ES [TR020001/APP/5.03]), which includes woodland blocks, scrub, hedgerows, a small (or cluster of small) wildlife pond(s), and large grassland areas of varying characteristics and management regimes. These habitats would primarily be created from areas of lower biodiversity value arable land, retaining and incorporating valuable features such as woodlands and hedgerows. Such features could attract potentially hazardous birds, notably flocks of wood pigeon and corvids.
- 4.1.8 The landscape planting has been designed to minimise the risk of bird strike where possible. This includes the position of woodland blocks, within the north of the habitat creation areas, distant from the approach and departure flight paths and therefore avoiding exacerbation of existing hazardous wood pigeon flight lines. Additionally, two small wildlife pond(s) approximately 100m² each would be created in this area. This limited extent of the ponds is to reduce its attraction to large flocks of potentially hazardous waterfowl.
- 4.1.9 The Outline LBMP (**Appendix 8.2** of the ES [TR020001/APP/5.02]) also details enhancements to both Winch Hill Wood and Winch Hill House wood, both of which are habitats currently contributing to existing hazardous flight lines, as

highlighted in **Figure 2** in **Appendix A** of this report. These enhancements are likely to include targeted thinning of the canopy through coppicing and erection of deer fencing, but are considered unlikely to alter the current carrying load for roosting wood pigeon.

- 4.1.10 Further to the north and north east, extensive areas of hedgerow restoration and enhancement are proposed. As with the habitat creation areas described above, these are considered to be of wide benefit to a variety of bird species, primarily small passerines and raptors, this is detailed within the relevant Ecological Mitigation Strategy for birds (**Appendix 8.6 to 8.10** of the ES [TR020001/APP/5.02]). However, these enhancements are distant from the airport approach, with the nearest hedgerow located over 900m north of the runway, and not considered likely to alter aggregations of hazardous species and consequently not increase bird strike risk.
- 4.1.11 Following provision of the Replacement Open Space, land within the footprint of Wigmore Valley Park CWS would be lost, involving the loss of scrub areas, limited linear woodland, and amenity grassland. The loss of these habitats may displace hazardous bird species, such as black-headed gull, which regularly form large wintering flocks. However, these habitats are not associated with the hazardous flight lines within the airport approach and departure flight lines, with equivalent wintering habitat for gulls within the established Replacement Open Space. Therefore, loss of these habitats is not anticipated to result in an increased strike risk.
- 4.1.12 Given the above measures within the design of habitat creation and enhancement works, the predicted regularly used flight lines of hazardous species with a 'high' strike probability during assessment Phase 1 are not anticipated to alter from baseline conditions.

Phases 2a and 2b

- 4.1.13 Assessment Phase 2a would involve the greatest scale of major earthworks and associated construction activities. The Code of Construction Practice (CoCP), provided as **Appendix 4.2** of the ES [TR020001/APP/5.02] includes measures that would help to reduce attraction of birds to the Proposed Development during construction, including the treatment of topsoil stockpiles and stripped areas, drainage works and the control of waste.
- 4.1.14 Appropriate measures to mitigate bird strike risk must be agreed with the airport operator to be incorporated within an updated WSHRP. The airport operator has an existing suite of active control and dispersal measures, including distress call broadcast, pyrotechnic bird scaring cartridges, lasers, and lethal control with firearms. Coordination of the lead contractors with the airport operator will be required to ensure such measures are extended to cover the construction area of the Proposed Development.
- 4.1.15 The landfill cap at Wigmore Valley Park is anticipated to largely remain in place; however, some sections may require excavation and waste material within it processed. The organic content within the landfill is very low, but is likely to temporarily attract hazardous bird species, particularly gulls and corvids until the waste is removed.

- 4.1.16 Major earthworks during assessment Phase 2a are predicted to attract an increase in the presence and abundance of a few hazardous birds, the most significant being gulls and corvids. These species groups are likely to be attracted to broken ground, areas of land awaiting development that may develop weed growth, temporary standing water and any refuse/food waste allowed to accumulate on-site. The probability of these attractions occurring on a large construction site is fully recognised and requirements for their management are included in the CoCP.
- 4.1.17 A summary of relevant measures to prevent large aggregations of these species include:
- a. implementation of Waste Hierarchy, minimising the waste generated by construction activities where practically possible;
 - b. careful consideration of storage materials on site;
 - c. avoiding the formation of large areas of surface water;
 - d. protection of excavated areas and stockpiles; and
 - e. employment of pumps to prevent pooling water.
- 4.1.18 Assessment Phase 2b would occur largely within the footprint of land take and land use change at assessment Phase 2a, meaning further impacts on bird strike risk are likely to be minimal.
- 4.1.19 Given the measures detailed within the CoCP to prevent construction practices from attracting large aggregations of potentially hazardous bird species, the predicted regularly used flight lines of hazardous species with a 'high' strike probability during assessment Phases 2a and 2b are not anticipated to alter from baseline conditions.
- 4.1.20 It is not possible to predict with certainty how hazardous bird numbers and locations would change under the influence of the many factors at work in a natural environment. However, the CoCP measures would minimise the effects of construction, and the continued implementation of bird monitoring and control described in WSHRP are expected to keep overall bird strike risk at a minimum level (Ref. 7).
- 4.1.21 The predicted bird strike risk to aircraft during construction is indicated in **Table 4.1**.

Table 4.1: Predicted bird strike risk to aircraft during construction (with CoCP and WSHRP measures in place)

Severity of Bird Strike (Damage Rating)	Probability of Bird Strike (Strike Frequency)				
	Very High	High	Moderate	Low	Very Low
Very High					
High				Red Kite	Pheasant Lesser Black-backed Gull Buzzard Herring Gull Carrion Crow
Moderate		Woodpigeon		Red-Legged Partridge Racing Pigeon	Feral Pigeon Rook Common Gull
Low			Black Headed Gull Barn Owl		Starling Golden Plover Kestrel Short Eared Owl Woodcock
Very Low		Meadow Pipit	Skylark	Hobby Swift	Little Owl

Red = high bird strike risk, yellow = medium bird strike risk and green = low bird strike risk

4.2 Post 2041

4.2.1 The assessment of bird strike risk following the conclusion of assessment Phase 2b is also qualitative. It relates to the continuing use of the runway at 32 mppa and encompasses the establishment of permanent biophysical changes and consequent bird attracting features due to habitat creation/landscape planting. The effect of these changes on hazardous bird species presence, abundance, location and flight lines relative to the runway and approaches is informed by baseline survey work and professional judgement to predict likely probability of aircraft bird strike during operation.

4.2.2 The changes in bird strike risk considered in the assessment are those likely to be brought about by the alterations in habitats that would attract hazardous birds. It is assumed that the numbers and behaviour of birds are not influenced by external factors, examples of which might include climate change or major changes in the agricultural regime outside of the Proposed Development.

- 4.2.3 The continued operation up to 32 mppa is assessed at the point when construction is complete, all landscape planting works are complete and all the elements influencing the bird strike risk would be in place, which is estimated as the year 2041, following conclusion of all land use changing activities.
- 4.2.4 Of greatest potential to influence bird strike over time are the woodland habitats created at the start of assessment Phase 1 from 2025, as detailed in **paragraphs 4.1.7 to 4.1.12**. Whilst these creations have been planned to minimise their potential to contribute to hazardous bird strike, the newly created landscape areas would continue to change as planting matures and associated flora and fauna become established. The number of birds and bird activity is likely to continue to rise from 2025. The year 2055 has therefore been selected as the basis for further assessment because there would have been time for planted trees to approach semi-maturity, and for bird assemblages and flight lines to stabilise.
- 4.2.5 The habitat creation and enhancement within the Replacement Open Space and proposed landscape restoration and habitat creation areas have been designed following advice from bird control specialists to minimise bird strike risk to aircraft. Even with considered plant species selection, by the year 2055, woodland is likely to provide nest and roost sites for woodpigeons, jackdaws (*Corvus monedula*) and starlings (*Sturnus vulgaris*) as well as a certain amount of food for such birds. Areas of grassland would offer feeding sites for the same species and may also attract birds of prey to feed on rodents and larger insects.
- 4.2.6 It is not possible to predict with certainty how hazardous bird numbers and locations would change under the influence of the many factors at work in a natural environment. However, bird monitoring and control measures described in the WSHRP are expected to be maintained during operation, keeping overall bird strike risk at a minimum level. The predicted bird strike risk to aircraft post 2041 is indicated in **Table 4.2**.

Table 4.2: Predicted bird strike risk to aircraft post 2041 (with WSHRP measures in place)

Severity of Bird Strike (Damage Rating)	Probability of Bird Strike (Strike Frequency)				
	Very High	High	Moderate	Low	Very Low
Very High					
High				Red Kite	Pheasant Lesser Black-backed Gull Buzzard
Moderate		Woodpigeon		Red-Legged Partridge Racing Pigeon	Feral Pigeon
Low			Black Headed Gull Barn Owl	Jackdaw	Starling Golden Plover Kestrel Short Eared Owl Woodcock
Very Low		Meadow Pipit	Skylark	Hobby Swift	Little Owl

Red = high bird strike risk, yellow = medium bird strike risk and green = low bird strike risk

5 MITIGATION

- 5.1.1 All mitigation measures considered practicable are incorporated in the Proposed Development design, as described in **Chapter 4** of the ES **[TR020001/APP/5.01]** and shown on the Landscape Mitigation **Figure 14.9** of the ES **[TR020001/APP/5.03]**, to minimise its effect on the level of bird strike risk.
- 5.1.2 The bird monitoring, control procedures and resources currently applied at the airport, as defined in the WSHRP, will apply within the Proposed Development (Ref. 7). Measures to discourage hazardous birds from site attractants during construction are described in the CoCP (**Appendix 4.2** of the ES **[TR020001/APP/5.02]**). The Proposed Development would be monitored as part of the airport's ongoing WSHRP to ensure the effectiveness of these measures and to adapt and implement them as necessary if there is a need to disperse or discourage congregations of hazardous bird species that don't currently prevail. Specific measures to be adopted would depend upon this ongoing assessment and the feasibility of species-specific management across the Proposed Development.
- 5.1.3 To ensure that the risk remains at the minimum level both on, and in the vicinity of the aerodrome in terms of operational safety and the continuance of the airport's operating licence, further measures may be necessary in the medium and long term. However, it is not feasible at this stage to define what form such measures might take with many influences on bird behaviour, which are not confined to the airport and its immediate surroundings. Changes in climate conditions, agricultural practices and other factors affecting habitats remote from the aerodrome may, over time, affect bird numbers and behaviour in the aerodrome safeguarding area. The species, numbers and behaviour of birds attracted to areas of new planting may differ, as areas mature and are actively managed, from those anticipated in bird strike risk assessments.
- 5.1.4 One of the key objectives of airport bird strike management is to identify trends in bird activity and developing sources of risk so that they can be monitored and, if necessary, action can be taken to control them. A range of measures are available for that purpose, and the most appropriate action would depend on the nature of the source of risk identified. The continuous monitoring of bird strike risk and its management and control at a tolerable level is a condition of the airport's operating licence. It can confidently be assumed, therefore, that this risk would be properly managed.

6 RESIDUAL EFFECTS

- 6.1.1 Continued monitoring and control, combined with the specified measures detailed in the CoCP (**Appendix 4.2** of the ES [TR020001/APP/5.02]), are predicted to maintain a minimal level of bird strike risk despite land use alterations throughout the various construction stages and into operation. This is because the species present are expected to remain the same and flight paths not altered, therefore the number of species presenting a high bird strike risk are also unchanged. The risk of bird strike to aircraft during the construction stages and post 2041 is therefore predicted not to change from the baseline.

7 CONCLUSIONS

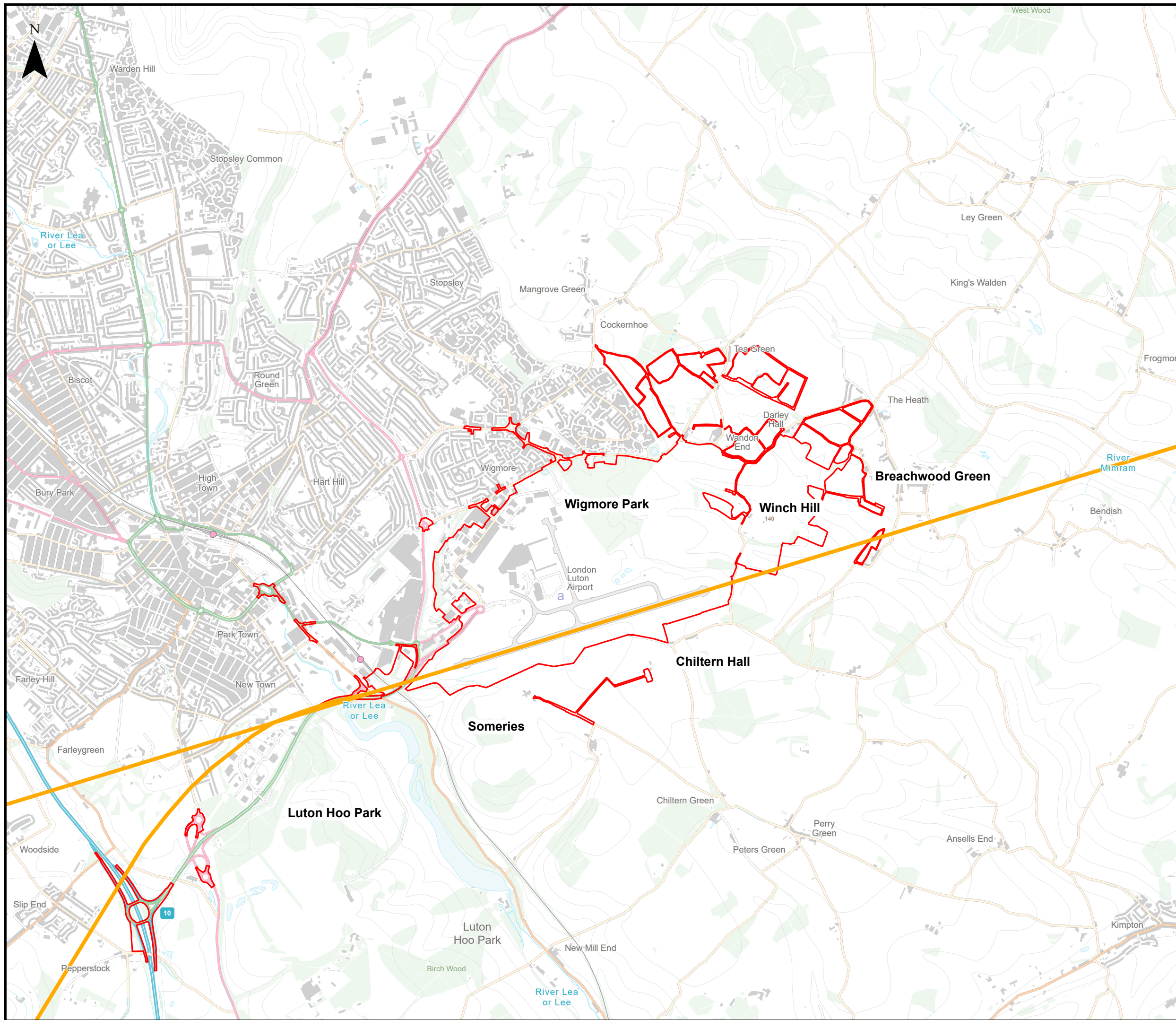
- 7.1.1 Wintering flocks of woodpigeon present a high bird strike risk (high strike frequency and moderate damage rating) to aircraft, which is predicted to remain unchanged during construction and post 2041, though reassessment should be made in 2055 within the WSHRP once created woodland habitats have reached semi-maturity and following WSHRP guidance at that time.
- 7.1.2 Barn owl and wintering flocks of black-headed gull present a medium bird strike risk (moderate strike frequency and moderate damage rating) to aircraft, which is predicted to remain unchanged during construction and post 2041. Lesser black-backed gull, herring gull (*Larus argentatus*) and carrion crow (*Corvus corone*) would present a medium bird strike risk (very low strike frequency and high damage rating) to aircraft within the same timeframe.
- 7.1.3 The level of bird strike risk does not depend on the number of aircraft movements, as it is assessed on the number and behaviour of birds in the area and the likelihood of interaction between birds and aircraft. The latter in turn depends on the spatial distribution of bird attracting features relative to the runway. In addition, there would be no change to aircraft flight paths associated with the runway as a consequence of the Proposed Development relative to areas where birds gather and to the routes they habitually follow when moving from one such location to another.
- 7.1.4 Areas of woodland, scrub, hedgerows and grassland which attract hazardous species would be removed during construction, although these are located outside of the aircraft flight paths. During construction, birds are predicted to be attracted to excavated areas, topsoil stockpiles, temporary standing water and any refuse allowed to accumulate. Measures specified in the CoCP (**Appendix 4.2** of the ES [TR020001/APP/5.02]) would be implemented to remove or minimise such features that attract hazardous birds by appropriate phasing, methods and treatment of areas. The lead contractor would liaise with the operator to ensure any emerging undesirable circumstances are monitored and managed, and measures to keep overall bird strike risk at a minimum level throughout the construction period are implemented.
- 7.1.5 The presence and abundance of hazardous birds within establishing areas of woodland and grassland associated with public amenity and biodiversity provision areas between 2025 and 2055 is predicted to increase steadily. By the year 2055 planted trees would be semi-mature and capable of providing nest sites, roost sites and foraging habitat for hazardous birds. However, the habitat creation/landscape planting measures included in the Outline LBMP (**Appendix 8.2** of the ES [TR020001/APP/5.02]) have been designed so that hazardous birds are less likely to fly across the main approach and departure flight paths. The bird monitoring and control measures described in WSHRP (Ref. 7) will continue to identify and manage any emerging undesirable circumstances to keep overall bird strike risk at a tolerable level from when the construction and landscape planting works are complete.

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- Ref. 8 [Google Maps UK](#). Accessed online 15th August 2022.
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Appendix A

Figures



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 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
- Aircraft Flight Paths

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

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Drawing Title
 Figure 1 Hazardous Sites Location

Purpose of issue SUITABLE FOR INFORMATION				Suitability S2	
Drawn AB	Checked SM	Approved CS	Date 22/02/23	Scale 1:30,000	Size A3

DCO Application Ref. TR020001	APFP Regulation APFP 5(2)(a)	DCO Document Ref. TR020001/APP/5.02
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Drawing Number LLADCO-3C-ARP-00-00-DR-YE-0204	Revision P01
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Project - Phase - Originator - Asset/Zone - Sub Asset - Type- Discp. - Number



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Legend

- Order Limits
- Aircraft Flight Paths
- Wood Pigeon Flight Lines

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

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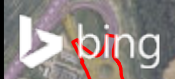
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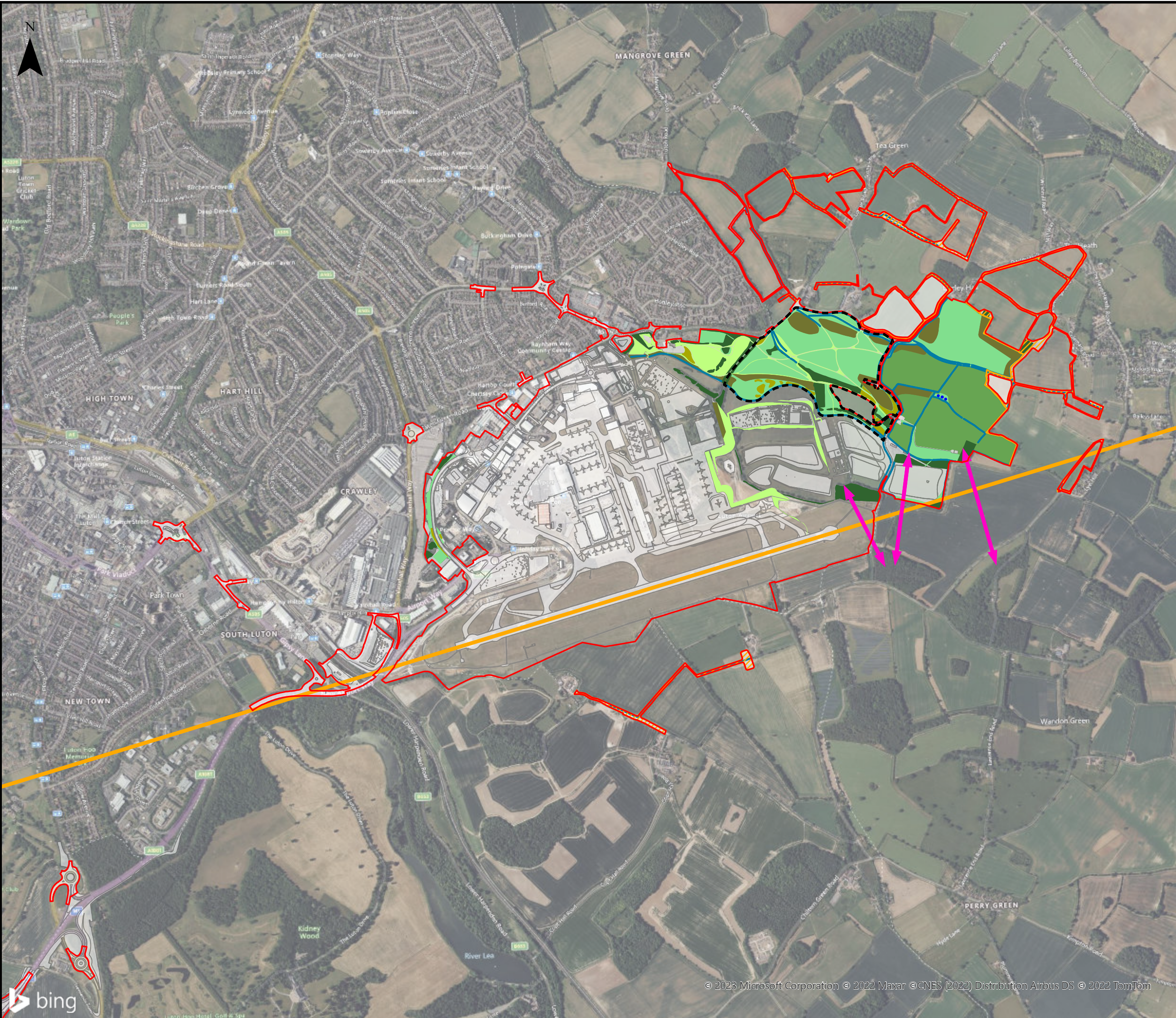
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Figure 2 Hazardous Bird Flight Lines at Baseline

Purpose of issue SUITABLE FOR INFORMATION				Suitability S2	
Drawn AB	Checked SM	Approved CS	Date 22/02/23	Scale 1:20,000	Size A3

DCO Application Ref. TR020001	APFP Regulation APFP 5(2)(a)	DCO Document Ref. TR020001/APP/5.02
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Drawing Number LLADCO-3C-ARP-00-00-DR-YE-0204	Revision P01
Project - Phase - Originator - Asset/Zone - Sub Asset - Type- Discp. - Number	





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Legend

- Order Limits
- Replacement Open Space
- Off-site Hedgerow Restoration and Screening
- Aircraft Flight Paths
- ↘ Wood Pigeon Flight Lines
- Airport Infrastructure Layout - Assessment Phase 2a

Landscape Mitigation Assessment Phase 2a

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

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

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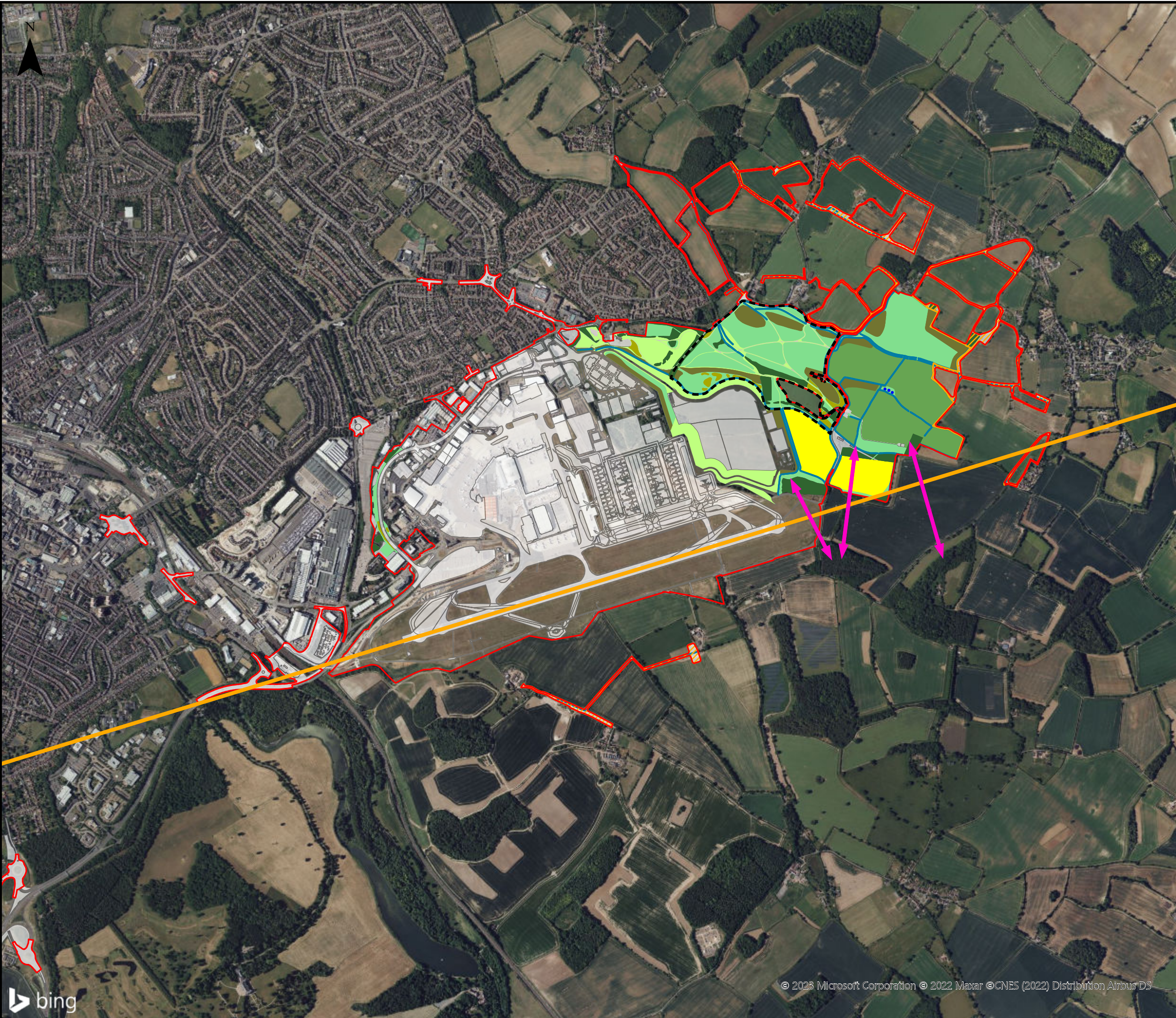
Drawing Title
Figure 3 Hazardous Bird Flight Lines During Construction

Purpose of issue SUITABLE FOR INFORMATION				Suitability S2	
Drawn AB	Checked SM	Approved CS	Date 22/02/23	Scale 1:20,000	Size A3

DCO Application Ref. TR020001	APFP Regulation APFP 5(2)(a)	DCO Document Ref. TR020001/APP/5.02
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Drawing Number LLADCO-3C-ARP-00-00-DR-YE-0203	Revision P01
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Legend

- Order Limits
- Aircraft Flight Paths
- Wood Pigeon Flight Lines
- Replacement Open Space
- Off-site Hedgerow Restoration and Screening

Landscape Mitigation Assessment Phase 2b

- Calcareous grassland – low intensity grazing
- Arable area
- Existing vegetation
- Neutral meadow grassland
- Amenity grassland
- Wildlife ponds
- Neutral grassland – low intensity grazing
- Proposed scrub
- Proposed woodland
- Hedgerow restoration
- Airport Infrastructure Layout - Assessment Phase 2b

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

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Drawing Title
Figure 4 Hazardous Bird Flight Lines During Operation

Purpose of issue SUITABLE FOR INFORMATION				Suitability S2	
Drawn AB	Checked SM	Approved CS	Date 22/02/23	Scale 1:20,000	Size A3

DCO Application Ref. TR020001	APFP Regulation APFP 5(2)(a)	DCO Document Ref. TR020001/APP/5.02
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Project - Phase - Originator - Asset/Zone - Sub Asset - Type- Discp. - Number	

