

# Mineral Products Association

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## Mineral Sites and Bird Strike Hazard and Risk: Practice Guide for Mineral Development and Restoration within Aerodrome Safeguarding Areas

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## Overview

This Guide was developed following a workshop held in 2013 organised by the Mineral Products Association (MPA) that aimed to exchange information, experience and good practice between aerodrome operators, the minerals industry, mineral planning authorities and nature conservation groups. This aims to build on the existing guidance and literature available on minerals restoration and bird strike including that referenced in the *Further Reading* section at the end of this document. Its production has been overseen by the MPA's Biodiversity and Nature Conservation Group.

The Guide considers how minerals can be worked and sites restored to deliver biodiversity gains within aerodrome safeguarding areas while reducing and managing bird strike *hazard* (as a potential source of harm) and *risk* (the likelihood of harm due to the hazard) to levels acceptable to aerodrome operators and mineral planning authorities.

## Context

Birds can be a hazard to aircraft and, if struck, can cause serious and expensive damage that in catastrophic cases can lead to the aircraft crashing and loss of life. There have been over 100 serious aircraft bird strike incidents to date. The vast majority (around 90%) of recorded bird strike incidents occur within the perimeter of the aerodrome itself and at low altitudes.

Working and restoration of minerals sites offer the potential to deliver biodiversity gains. Many sites have been and are being restored to wetland and grassland habitats, which can attract large numbers of species that may in certain circumstances pose a hazard to aircraft.

## Aerodrome Safeguarding Zones

Safeguarding is the means by which an aerodrome operator assesses the impact that a proposed or existing development may have on the safety of flight operations on, or in the vicinity of, the aerodrome.

In order to comply with international standards, each aerodrome, whether military or civil, is surrounded by a 13km air safeguarding zone. This zone is based on a statistic that 95% of bird strikes occur below 2000ft, and that an aircraft approaching an aerodrome on a normal approach would descend below 2000ft approximately 13km from the runway<sup>1</sup>, reflecting historic angles of take-off and approach.

The aerodrome safeguarding process involves planning applications located within this 13km zone with the potential to increase the risk of bird strike being referred by the Local/Mineral Planning Authority to the Defence Infrastructure Organisation (DIO) or civil aerodrome operator for comment (see 'Hazard and risk assessment' below). Safeguarding maps defining the 13 km radius are lodged with local planning authorities.

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<sup>1</sup> CAA (2002) CAP 660 Aerodrome Bird Control.

## Coincidence of Mineral Working and Safeguarding Zones

Around 40% of England is covered by aerodrome safeguarding zones, with over 50% of sand and gravel workings occurring with these safeguarding zones<sup>2</sup>. Given the wide distribution of aerodromes across the country this overlap is not surprising, particularly given that aerodromes are often located on flat open areas, frequently around river floodplains<sup>3</sup> rich in sand and gravel deposits (*see figure below*). Minerals can only be worked where they occur. Extraction and restoration of sites in river valleys has often been to open water and/or grassland that can result in attraction of numbers and species of birds that can pose a strike hazard to aircraft. Restoration design and habitat management can reduce the potential hazard and risk. Examples of how this may be achieved are illustrated in the case studies in the appendix.

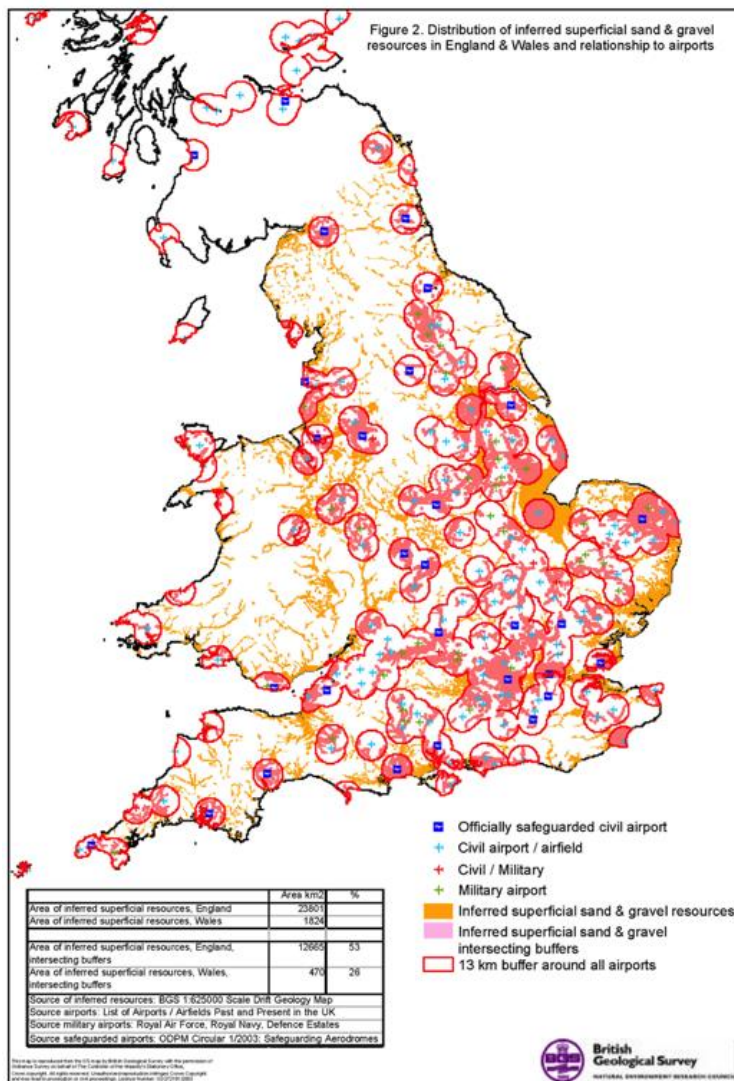


Figure 1. Aerodrome Safeguarding Areas and sand and gravel resources

<sup>2</sup> QPA (2006) *The need for inert wastes to restore aggregate mineral workings*

<sup>3</sup> Allan, J. Taking account of aviation hazards in the development of a wetland vision for England. Annex 3 of the Wetland Vision Technical Document.

## Regulatory Context

The key international standards and recommended practices are specified within Annex 14 to the *Convention on International Civil Aviation* (1944), published by the International Civil Aviation Organisation. Aerodrome operators are obliged to meet the requirements of the Convention and *'take action to eliminate or to prevent the establishment of ... any such other source attracting bird activity on, or in the vicinity of, an aerodrome unless an appropriate aeronautical study indicates that they are unlikely to create conditions conducive to a bird hazard problem.'*

The term "in the vicinity" is taken to be land or water within 13 km of the aerodrome reference point. An "appropriate aeronautical study" is taken to be a study that focuses on the potential flight safety implications at the relevant aerodrome(s) that an existing or proposed bird attractant development may cause. Such a study should consist of the overall assessment of the ambient bird strike risk at the aerodrome and a site-specific risk assessment relating to any development or site in the vicinity.

In the UK, the aerodrome licence holder is required to take all reasonable steps to secure that the aerodrome and the airspace within which its visual traffic pattern is normally contained are safe at all times for use by aircraft<sup>4</sup>. The licence holder is therefore responsible for the development and implementation of bird strike risk control measures.

At a UK level, the Civil Aviation Authority has published the guidance note - CAP 772: Wildlife Hazard Management at Aerodromes (2014). Although aimed predominantly at management of hazard on aerodromes, the guidance is relevant to consultations with landowners and developers in safeguarding zones and beyond. It is for individual aerodrome operators and planning authorities, rather than the CAA, to operate the safeguarding procedure.

## National Planning Policy

The National Planning Policy Framework (NPPF) for England advises that mineral planning authorities should put in place policies to ensure that worked land is reclaimed at the earliest opportunity, taking account of aviation safety, and ensure that high quality restoration and aftercare of mineral sites takes place, including for biodiversity (para 143). It also advises that when determining applications planning authorities should ensure in granting permission for mineral development, that there are no unacceptable adverse impacts on aviation safety (para 144).

The NPPF also advises that the planning system should contribute to and enhance the natural environment by minimising impacts on biodiversity and providing net gains in biodiversity, contributing to the Government's commitment to halt the overall decline in biodiversity (para 109), and that planning policies should promote the preservation, restoration and re-creation of priority habitats (para 117). When determining applications, planning authorities should encourage opportunities to incorporate biodiversity in and around developments (para 118).

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<sup>4</sup> Article 128(5) of the Air Navigation Order (ANO) 2005

## Biodiversity

Since the second half of the 20<sup>th</sup> century there has been a large reduction in the area of semi-natural wildlife habitats in England due to changes in agriculture, the planting of non-native conifer forests, and increasing urbanisation. The remaining areas of habitat are often small and fragmented, supporting reduced and isolated populations of plants and animals. Habitat restoration, creation and management can help reverse this loss. Existing fragments can be grown and linked making sites larger and more sustainable. New patches can be created, providing 'stepping stones' and making an otherwise intensively managed landscape more permeable to wildlife. Creating new habitat also takes some of the pressure off existing fragments, and allows people to enjoy wildlife.

This is reflected in the Biodiversity 2020 Strategy<sup>5</sup>, with the aim (by 2020);

*'to halt overall biodiversity loss, support healthy well-functioning ecosystems and establish coherent ecological networks, with more and better places for nature for the benefit of wildlife and people.'*

The Strategy identifies a series of outcomes, including of most relevance to minerals sites:

*Outcome 1B. More, bigger and less fragmented areas for wildlife, with no net loss of priority habitat and an increase in the overall extent of priority habitats by at least 200,000 hectares (by 2020);*

Minerals sites have the potential to enhance biodiversity and to provide a public benefit during their operation and particularly at the end of working through restoration and aftercare. Analysis by the RSPB and Nature After Minerals<sup>6</sup> has identified that restoration of minerals sites could deliver national biodiversity objectives for the restoration and creation of 9 UK priority habitats.

Data collected by the MPA indicates that member companies have already created and restored over 5,000 hectares of priority habitats on restored and working mineral sites, of which over 1,400 ha has been to wetland<sup>7</sup>. A further 7,000 hectares is committed to in restoration plans of which 2,000 ha is to wetland.

Mineral Planning Authorities increasingly encourage restoration to biodiversity in their planning policies and decisions reflecting the advice in the NPPF and local priorities and opportunities, including delivery of their local biodiversity plans. Therefore a balance between safeguarding, mineral development and biodiversity enhancement needs to be struck to enable continued extraction of minerals, delivery of benefit to biodiversity, while avoiding and managing hazard and risk.

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<sup>5</sup> Defra (2011) Biodiversity 2020: A Strategy for England's wildlife and ecosystem services

<sup>6</sup> Davies AM (2006) Nature After Minerals – how mineral site restoration can benefit people and wildlife. RSPB/MIRO

<sup>7</sup> Based on UK (JNCC) Priority Habitat categories: Lakes and Ponds; Lowland Fens and Reedbeds; Floodplain Grazing Marsh

## Hazard and Risk Assessment

Where a development is proposed within the safeguarding zone of a civil aerodrome, Mineral Planning Authorities should consult with the individual aerodrome operators. In the case of military aerodromes, the Defence Infrastructure Organisation (DIO) should be consulted.

The aerodrome operator, drawing on information provided by the applicant, is responsible for assessing the wildlife hazard on and in the surrounding vicinity of the aerodrome, and establishing means and procedures to minimise the risk of collisions between aircraft and wildlife. The operator notifies the competent authority if a wildlife assessment indicates conditions in the surroundings of the aerodrome are conducive to a wildlife hazard problem.

Dialogue with the aerodrome operator or DIO should inform the applicant's approach to the design of the site's management and restoration to reduce hazard and risk, and development of a Bird Management Plan (BMP) to manage residual risk.

It should be recognised that hazard and risk cannot be eliminated completely. There is a natural background of bird activity, including long distance and high altitude migration flight, and the risk assessments should consider whether mineral development (including restoration) is likely to increase the risk of bird strike and whether and how this risk may be reduced or managed to an acceptable level.

### Key Species

Different bird species pose different hazards and risks to aircraft. Understanding these may enable applicants and their landscape and ecological advisors to avoid creating habitats and landscape designs that will attract the numbers and species that may pose the greatest hazard when restoring sites within the safeguarding zone.

In general, large and/or flocking bird species are more likely to cause damage to an aircraft given the greater mass involved in the collision. Birds that weigh below 100g (smaller than a Blackbird) damage aircraft on only 2.5% of all strike incidents, whereas birds over 1kg in weight (larger than a Herring Gull) cause damage in 22% of incidents<sup>8</sup>.

The behaviour of different species will also affect the degree of hazard and risk they pose. Birds that flock also pose a greater risk than solitary species, because impacts with several individuals simultaneously (a multiple bird strike) increase the chance that a bird will hit a vulnerable part of the aircraft.

Species that move in large numbers between feeding areas, and to roosts, and which fly at altitudes where conflict with aviation interests is more likely, can also increase the hazard and risk.

Developers should determine which species are likely to be attracted and in what potential numbers. This information, in combination with the location of the development

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<sup>8</sup> Milsom T.P. & Horton N. (1995) Bird strike: An assessment of the hazard on UK civil aerodromes. Central Science Laboratory

in relation to aircraft movements will enable risk to be evaluated. Examples of the probability that a single strike with a given species will cause damage are provided below. These can be combined with the numbers present to determine potential risk.

Risk of damage	Examples of species
<b>Very High</b>	Mute Swan, Canada Goose, Greylag Goose
<b>High</b>	Herring Gull, Lesser Black-backed Gull, Mallard, Heron
<b>Moderate</b>	Lapwing, Woodpigeon
<b>Low</b>	Starling, Black-headed Gull, Golden Plover
<b>Very Low</b>	Swallow, Pied Wagtail

Figure 2. Indicative risks of damage for selected species based on Allan (2006).

Where flocks of birds may be attracted to a site, the risk of damage to aircraft from a strike may be increased e.g. from a Starling roost or Lapwing flocks. The location of the site in relation to aircraft movements will then determine likely frequency of strikes and whether this increases risk to aircraft.

## Principles for Restoration

The general principle should be to use site restoration design to reduce hazard and risk, ensuring habitat selection, design and management does not attract species of specific concern to aviation interests while delivering biodiversity benefits appropriate to the location.

The key issues to address to achieve an appropriate bird strike hazard mitigation approach include:

- **Early and on-going dialogue** between developers, planning authorities and aerodrome operators;
- **Restoration design** including landscaping, habitat creation and management to reduce and manage hazard and risk;
- **Bird Management Plan** preparation and implementation where necessary to ensure long-term residual risk management.

Bird strike Management Plans (BMPs) should be prepared to manage (residual) problems should they occur and be complementary to overall scheme design.

### Early and On-going Dialogue

Early dialogue will help achieve an outcome acceptable to all parties and should help to reduce risk of delay in the planning process, including outstanding objection from an aerodrome operator and the application being called-in. This should involve the applicant (mineral operator) and their ecological and restoration advisors, the aerodrome operator, the Mineral Planning Authority, and appropriate nature conservation organisations.

More than one aerodrome operator may be involved if the mineral site falls within multiple safeguarding areas. Dialogue should be undertaken as a planning application, including restoration scheme, is being prepared and well before the application is submitted. This is essential to inform all parties of the proposals, identifying concerns,



and aiming to resolve these through informing the restoration design. This should include the sharing of relevant information including:

- Details of the development proposal including timescale and phasing of working, and type of restoration proposed including key habitats;
- Consideration of species that may be attracted to the site following restoration;
- Species of concern to the aerodrome operator;
- Existing localities supporting or attracting populations of these species;
- The location of the proposed minerals development in relation to areas already used by species of concern;
- Features of the design of significant concern;
- Scope and options for modifying the planned restoration.

Some aerodrome operators have bird hazard stakeholder groups and mineral operators are recommended to engage with these.

### *Restoration design*

Restoration design, through landscaping, habitat selection and management is the most effective method to reduce bird strike hazard and risk. It is possible to design wetlands that are less attractive to particular types of hazardous bird that are of concern to aerodrome managers and reduce the hazard and risk over the long term. However, it is not possible to eliminate risk.

The nature of design measures required will depend on the species that need to be deterred, those that can be safely attracted, and the conservation, flood alleviation or other objectives of the habitat creation proposal.

Figure 3 below illustrates some examples of design features of a restoration scheme and the associated hazard and risk they may pose in attracting bird species of concern such as those identified in Figure 2. However a balance may be struck and the aim should be to maximise biodiversity benefits while managing hazard and risk, and some of these design approaches may not be conducive to a wildlife-rich restoration, particularly for certain bird species (Figure 2), and so should only be used where high bird strike hazard and risk is demonstrated and cannot otherwise be overcome.

The best examples of restoration in safeguarding zones, including those included as case studies in the appendix, deliver wildlife benefits while reducing potential bird strike hazard and risk.



Figure 3. Relative hazard and risk that may be generated by different site design and indication of general biodiversity value. Developed from 'Taking account of aviation hazards in the development of a Wetland Vision for England'<sup>9</sup>

### **Bird Management Plan**

The restoration design and habitat management should design-out as much potential hazard and risk as possible such that a bird management plan is used only as a last resort, and is not relied on as a matter of course.

In the event that an aerodrome operator demonstrates there to be a problem from the restoration proposed for a site that has not been designed-out to their satisfaction, then a Bird Management Plan (BMP) should be in place that can be implemented by the mineral site operator, to prevent an unacceptable risk developing. The BMP will detail a number of procedures that can be put in place should a perceived threshold be reached (for example number of a specific species) and the controls that need to be initiated.

There is no set template or formula for BMPs, in part due to the differences between developers, aerodrome operators and local authorities around the country. It is important that the BMP has the scope to be reviewed regularly and the ability to be modified to fit changing circumstances. Some principles for BMPs are proposed below:

<sup>9</sup> [http://www.wetlandvision.org.uk/userfiles/File/Annex3\\_Airports%20and%20WetlandsOverview.pdf](http://www.wetlandvision.org.uk/userfiles/File/Annex3_Airports%20and%20WetlandsOverview.pdf)

- The BMP should be secured to the land title so to ensure that the site and aerodrome operator is compliant with reducing risk for the lifetime of the aerodrome.
- If the BMP is a requirement of a Section 106 agreement, then the signatories should be the mineral operator, the aerodrome operator, the local planning authority where relevant, and the land owner (if not the mineral operator).
- The BMP should be integrated within the operations management plan for the site.
- A monitoring regime should be part of the BMP

The MPA is considering preparing further guidance specifically on Bird Management Plans.

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## Further Advice and Reading

There is a large amount of published material on birdstrike risk and its management. This Guide does not attempt to summarise or duplicate this. The following key titles provide some helpful context to biodiversity, quarrying and birdstrike risk management.

Allan, J.R. (2006). A Heuristic Risk Assessment technique for Birdstrike Management at Airports. Risk Analysis Vol 26 No.3.

Nature After Minerals <http://afterminerals.com/habitatadvise.aspx?p=AirSafeGuarding>

Wetland Vision (Allan, J.) *Taking Account of Aviation Hazards in the Development of a Wetland Vision for England* Annex 3 of the Wetland Vision Technical Document.  
[http://www.wetlandvision.org.uk/userfiles/File/Annex3\\_Airports%20and%20WetlandsOverview.pdf](http://www.wetlandvision.org.uk/userfiles/File/Annex3_Airports%20and%20WetlandsOverview.pdf)

Civil Aviation Authority (2014) *Wildlife Hazard Management at Aerodromes* CAP772  
<http://www.caa.co.uk/docs/33/CAP%20772%20Final.pdf>

Freshwater Habitats Trust *Supplementary Advice Sheet - Designing Wildlife Ponds to Minimise the Risk of Bird strike* <http://www.freshwaterhabitats.org.uk/wordpress/wp-content/uploads/2013/09/BIRDSTRIKE.pdf>

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