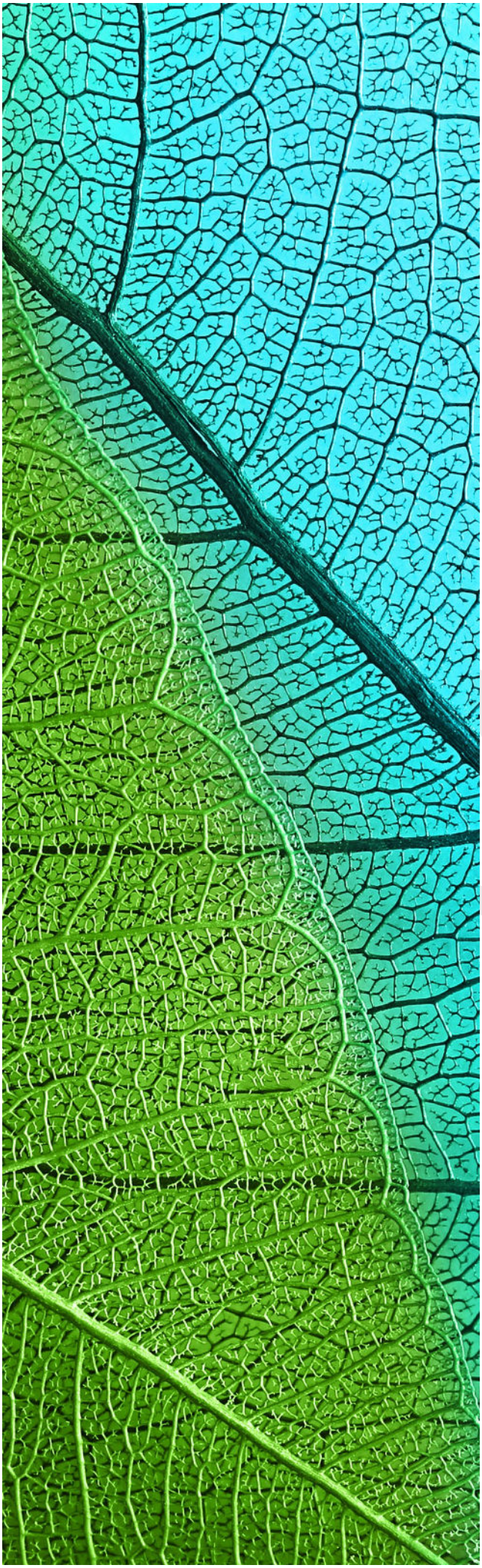


Hexham Wind Farm

Bat and Avifauna Management Plan DRAFT

Prepared for
Hexham Wind Farm Pty Ltd

November 2025
Report No.18088.23 (1.4)

Nature Advisory
5/61-63 Camberwell Road
Hawthorn East, VIC 3123
PO Box 337, Camberwell VIC 3124
(03) 9815 2111
www.natureadvisory.com.au

Nature Advisory acknowledges the traditional owners and sovereign custodians of the land on which we work from – the Wurundjeri people of the Woi Wurrung language group. We extend our respect to their Ancestors and all First Peoples and Elders, past and present.

Document History

The following table outlines the revisions made to this document.

Version	Date	Description	Prepared By	Reviewed by	Approved by
1.0	10/04/2025	First Draft	Kylie Patrick	Sergio Nolazco Plasier; Inga Kulik	Inga Kulik
	20/05/2025	Second Draft	Kylie Patrick	Inga Kulik	Inga Kulik
	11/06/2025	Third draft	Kylie Patrick	Inga Kulik	Inga Kulik
	03/07/2025	Minor updates	Inga Kulik		Inga Kulik
1.1	14/08/2025	Updates based on TRG comments	Inga Kulik Sergio Nolazco Plasier	Inga Kulik	Inga Kulik
1.2	22/10/2025	Updates based on DCCEEW, DEECA and IAU (DTP) comments	Inga Kulik Sergio Nolazco Plasier	Inga Kulik	Inga Kulik
1.3	07/11/2025	Updates based on DCCEEW, DEECA comments	Sergio Nolazco Plasier	Andrew Lewis	Inga Kulik
1.4	25/11/2025	Minor updates in response to AGL comments	Andrew Lewis		Inga Kulik

DRAFT

Authorisation

In making this declaration, I am aware that Section 491 of the *Environment Protection and Biodiversity Conservation Act 1999* (Cwth) (EPBC Act) makes it an offence in certain circumstances to knowingly provide false or misleading information or documents to specified persons who are known to be performing a duty or carrying out a function under the EPBC Act or the *Environment Protection and Biodiversity Conservation Regulations 2000* (Cth). The offence is punishable on conviction by imprisonment or a fine, or both. I am authorised to bind the approval holder to this declaration and that I have no knowledge of that authorisation being revoked at the time of making this declaration.

Signed _____

Full name (please print) _____

Organisation (please print) _____

Date _____

DRAFT

Acronyms/Abbreviations

BACI	Before-After-Control-Impact
BAM Plan	Bird and Avifauna Management Plan
BF	Black Falcon
BUS	Bird utilisation survey
BWP	Blue-winged Parrot
Cwth	Commonwealth
CRM	Collision Risk Model
DEECA	(VIC) Department of Energy, Environment and Climate Action (previously DELWP)
DELWP	(VIC) Department of Environment, Land, Water and Planning (dissolved)
DCCEEW	(Cwth) Department of Climate Change, Energy, the Environment and Water
DTP	(VIC) Department of Transport and Planning.
EES	Environment Effects Statement
EPBC Act	(Cwth) *Environment Protection and Biodiversity Conservation Act 1999*
FFG Act	(VIC) *Flora and Fauna Guarantee Act 1988*
FTS	Fork-tailed Swift
GHFF	Grey-headed Flying-fox
HWF	Hexham Wind Farm
MNES	Matters of national environmental significance under the EPBC Act
OH&S	Occupational Health and Safety
RSA	Rotor swept area (64-260 m)
SBWB	Southern Bent-wing Bat
WTE	Wedge-tailed Eagle
WTG	Wind turbine generator
WTNT	White-throated Needletail
YBSB	Yellow-bellied Sheath-tail Bat

DRAFT

Glossary

Carrion	The dead and decaying flesh of an animal that serves as a food source for scavengers such as some raptors.
Commissioning	All activities, including turning of turbines, after the components of the wind turbines are installed.
Construction	The period between the commencement of works on site and the commissioning of the last wind turbine, and the commencement of full operation of the wind farm
Full operation/operation	Once all wind turbines are commissioned and can operate simultaneously.
Listed species	Any bird/bat species listed as threatened or migratory under the EPBC Act or listed as threatened under the FFG Act.
Non-listed species	Any bird/bat species not listed as threatened or migratory under the EPBC Act or not listed as threatened under the FFG Act/NC Act.
No Net Impacts	Population viability of threatened species or species of concern will not be impacted.
Suitably qualified bird and bat ecologist	A person who has relevant professional qualifications and at least three years of work experience undertaking bird and bat utilisation surveys in Australia and can give an authoritative assessment and advice on bird and bat utilisation surveys using relevant protocols, standards, methods, and/or literature.
Suitably qualified ecologist	A person who has relevant professional qualifications and at least three years of work experience preparing and implementing management plans for the conservation of and habitat improvement for the MNES relevant to the management plan which they are preparing and can give an authoritative assessment and advice on the habitat requirements of that/those MNES using relevant protocols, standards, methods and/or literature.

DRAFT

Contents

DRAFT

Tables

DRAFT

Figures

Appendices

DRAFT

1. Introduction

1.1. Background

Hexham Wind Farm Pty Ltd engaged Nature Advisory Pty Ltd to develop a Bat and Avifauna Management Plan (BAM Plan) for the proposed Hexham Wind Farm (HWF). This draft BAM Plan will accompany the Environment Effects Statement (EES) and permit application to demonstrate the measures proposed to mitigate the identified collision risk. Any approval conditions will be incorporated into the final BAM Plan.

HWF operations aim to have no net impact on the population viability of threatened species or species of concern. This BAM Plan will help achieve this objective by:

- Establishing monitoring protocols
- Establishing investigation and reporting protocols
- Proposing actions to mitigate the risk of avifauna colliding with turbines based on a mitigation hierarchy
- Establishing an adaptive management approach that responds to triggers and collision events, the results of monitoring programs (e.g., fauna surveys, carcass searches, etc.), and relevant changes to legislative or regulatory requirements (Figure 1).

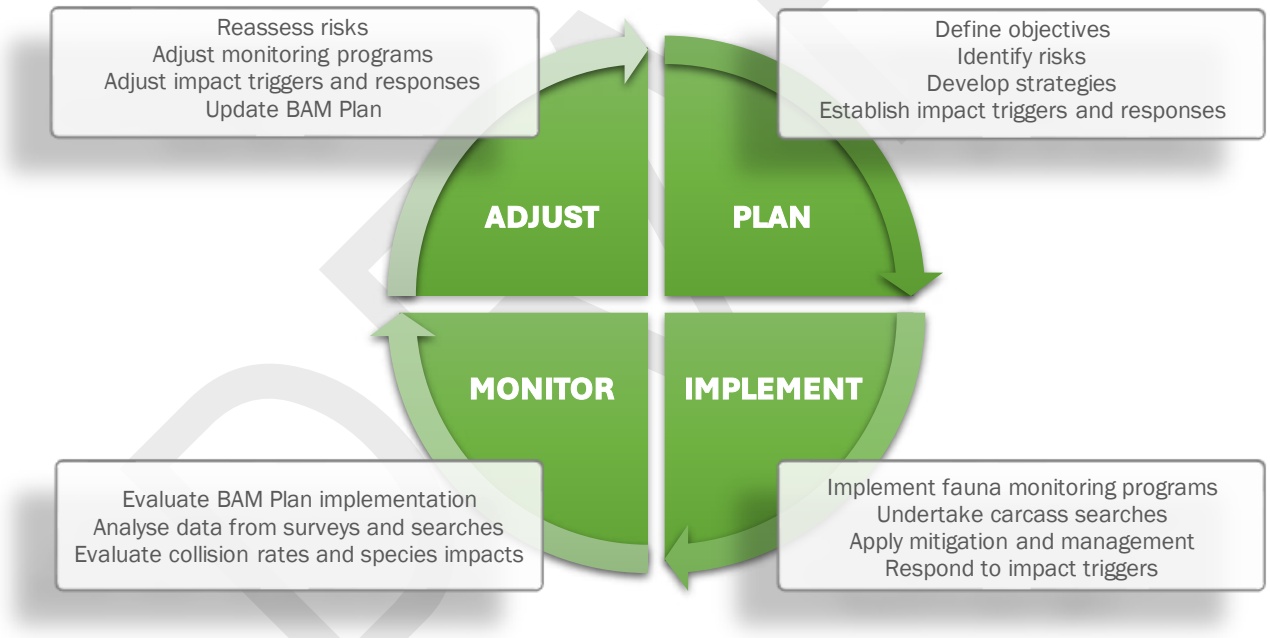


Figure 1: The adaptive management approach adopted for Hexham Wind Farm.

1.1.1. Project background

The proposed HWF comprises approximately 16,000 ha of land in the south-western Victorian localities of Hexham, Caramut, Ellerslie, Minjah and Woolsthorpe, approximately 20 km west of Mortlake and 200 km west of Melbourne's CBD. The HWF site is bound by Hamilton Highway to the north, Woolsthorpe-Hexham and Hexham-Ballangeich roads to the east, Gordons Lane to the south and Warrnambool-Caramut Road to the west. (Figure 2).

1.2. Environmental Outcomes

This BAM Plan aims to achieve the following environmental outcomes:

- Minimise the impacts from the HWF on threatened fauna listed under the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and/or the Victorian *Flora and Fauna Guarantee Act 1988* (FFG Act);
- An informed understanding of the turbine collision risk to listed threatened fauna that occurs on-site;
- An informed understanding of how threatened fauna use of the site changes in response to wind farm construction and operation;
- Monitoring for the timely identification of turbine collisions and the timely collection and analysis of data;
- Responsive updates to, and regular validation of, the impact assessment framework for listed fauna regularly recorded on site, using monitoring data to support a robust adaptive management approach to reducing impacts, where possible;
- Support the systematic collection and reporting of data to improve understanding of the local and cumulative impacts of the Hexham Wind Farm on bird and bat species, thereby contributing to broader knowledge that can improve future decisions in relation to wind energy facilities;
- Where applicable, the development and implementation of tangible, on-ground management actions to promote a long-term collision risk reduction on listed threatened and migratory bird and bat species.

The monitoring program detailed in this BAM Plan will help achieve these environmental outcomes.

This BAM Plan specifically addresses the following key species of concern identified during baseline assessments:

- Blue-winged Parrot (*Neophema chrysostoma*; EPBC Act: Vulnerable)
- White-throated Needletail (*Hirundapus caudacutus*; EPBC Act: Vulnerable, Migratory)
- Fork-tailed Swift (*Apus pacificus*; EPBC Act: Migratory)
- Brolga (*Grus rubicunda;* FFG Act: Endangered)
- Black Falcon (*Falco subniger*; FFG Act: Critically Endangered)
- Wedge-tailed Eagle[1] (*Aquila audax*; not listed).
- Grey-headed Flying-fox (*Pteropus poliocephalus*; EPBC Act: Vulnerable, FFG Act: Vulnerable)

[1] Not listened as a threatened species under Victorian or Commonwealth legislation, however, it is known as Bunjil by central and west-Victorian Aboriginals, who hold a strong connection to the species significance as the ultimate form of the creator of the land, water, animals and sky (DELWP 2022).

DRAFT

- Southern Bent-wing Bat (*Miniopterus orianae bassanii*; EPBC Act: Critically Endangered, FFG Act Critically Endangered)
- Yellow-bellied Sheath-tailed Bat (*Saccolaimus flaviventris*; FFG Act: Vulnerable)

1.3. BAM Plan structure

This BAM Plan details the objectives and strategies required and is divided into the following sections:

Section 2 details the pre-construction baseline monitoring undertaken to date.

Section 3 details the monitoring program, operational phase bird and bat monitoring and the carcass search program.

Section 4 defines impact triggers and procedures for listed and non-listed fauna, mitigation, compensatory measures, and the adaptive decision-making framework for these triggers.

Section 5 provides species-specific management strategies for target species.

Section 6 describes the reporting and review process.

Section 7 details the management actions and report timing.

Section 8 describes the roles and responsibilities for BAM Plan implementation.

This BAM Plan was prepared in line with the Environmental Management Plan Guidelines (DCCEEW 2024c) and the Commonwealth Onshore Wind Farm Guidance (DAWE 2022 and DCCEEW 2024d (in consultation)) by a team of suitably qualified ecologists from Nature Advisory Pty Ltd. This plan will be further informed and updated throughout the HWF approval process and the results of post-construction ecological surveys. Any conditions that are required upon approval will be added to the BAM Plan for approval by the responsible authority.

DRAFT

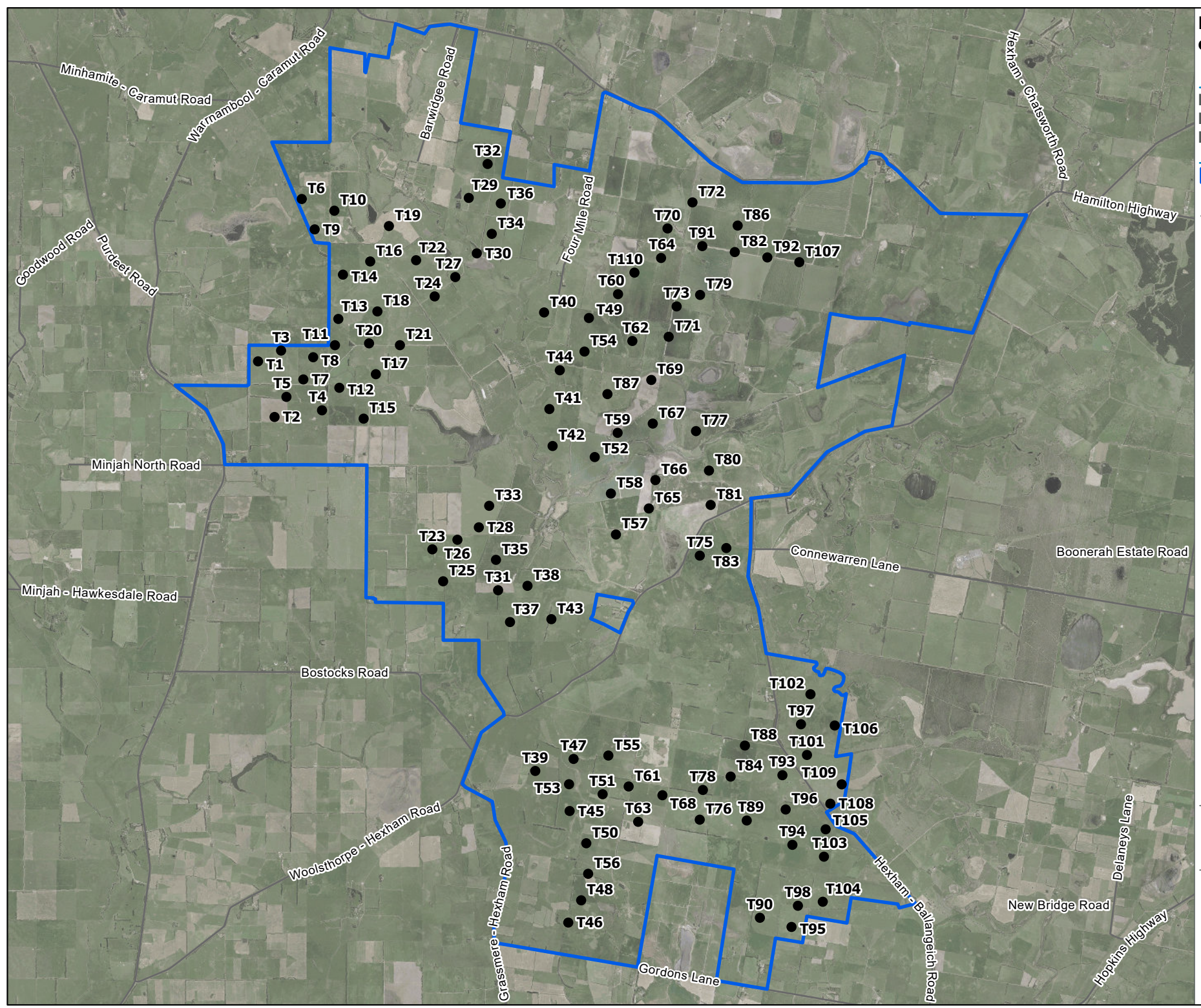


Figure 2: Proposed Layout of Hexham Wind Farm

Project No: 18088_23
Project: Hexham Wind Farm, VIC
Date: 19/12/2025

- Wind farm boundary
- Turbine
- Roads

N

Kilometres

0 1 2 3 4

Nature Advisory
PO Box 337, Camberwell, VIC 3124, Australia
www.natureadvisory.com.au
03 9815 2111 - info@natureadvisory.com.au

2. Baseline pre-construction monitoring

This section summarises the baseline (pre-construction) surveys conducted at the HWF and surrounding areas to date (Table 1).

Table 1: Baseline bird and bat monitoring completed up to, and including, September 2025.

Survey – field assessment	Date
Bird studies	
Bird utilisation surveys (BUS)	▪ 2011: 28 Nov–2 Dec ▪ 2012: 20–22 Feb ▪ 2018: 29 Oct–2 Nov ▪ 2019: 4–8 Mar ▪ 2024: 19-25 Aug; 25-29 Nov ▪ 2025: 24-28 Feb; 7-11 Apr; 4-7 Aug; 16-19 Sep
Migratory water bird habitat assessment and targeted surveys	▪ 2018: 18–20 Dec ▪ 2019: 9–11 Jan; 30–31 Jan; 26–28 Feb; 27–29 Feb
White-throated Needletail surveys	▪ 2022: 5–9 Dec ▪ 2023: 6–10 Feb; 22–25 Mar
Wedge-tailed Eagle nest surveys	▪ 2023: 20-23 Jun
Brolga aerial surveys	▪ 2019: 25 Sep; 3 Oct; 14 Oct
Brolga habitat assessment	▪ 2024: 23-25 Sep
Brolga flocking surveys	▪ 2020: 21-22 Jan
Brolga breeding surveys	▪ 2019: 14-17 Oct; 11-14 Nov; 9-12 Dec ▪ 2020: 27-28 Jul ▪ 2022: 22 Sep; 24-26 Oct; 22-26 Nov; 28-30 Dec ▪ 2023: 17-19 Jul; 15-17 Aug; 13-15 Sep; 16-18 Oct; 11-13 Dec ▪ 2024: 29 Jul-1 Aug; 19-22 Aug; 16-19 Sep; 21-24 Oct; 18-21 Nov; 16-19 Dec
Bat studies	
Bat utilisaton surveys	▪ 2010: 21 Oct-23 Nov ▪ 2011: 10 Feb-31 Mar ▪ 2018: 25 Oct- 18 Dec ▪ 2019: 5 Feb- 25 Apr ▪ 2020: 18 Feb-1 May ▪ 2023: 1 Mar-1 May
Targeted flying-fox surveys	▪ 2022: 14-16 Feb; 15-16 Mar; 22-23 Mar ▪ 2023: 7-9 Mar; 16-17 Mar

All methods and results related to the pre-construction ecological surveys completed are detailed in the *Hexham Wind Farm Flora and Fauna Assessment* report prepared for Hexham Wind Farm Pty Ltd in November 2024 (report reference: 18088 (10.9) as well as separate Bat and Brolga impact assessment reports (report references: 18088.10(1.6) and 18088(8.11)).

Before and After Control Impact Design

The pre-construction surveys are designed to be statistically robust, adhering to the guidelines for studies on birds and bats outlined in *Appendix 7: Ecological Assessments of the Best Practice Guidelines for the Australian Wind Industry* (CEC, 2018). Specifically, the BUS is designed for a 'Before

and After Control Impact' (BACI) analysis, using quantitative data from both reference (control) and impact (treatment) predetermined locations. Reference sites are at a sufficient distance from the proposed turbine locations to obtain data outside the zone of influence of the turbines. Each fixed point is assessed twice during four daily periods (early morning, late morning, early afternoon, and late afternoon), resulting in eight observation periods per site per survey. Fixed points were in habitats representative of those across the HWF site. Post-commissioning surveys will occur at the same locations for two years using the same methodology, which is described Section 3.1. The comparative analysis will provide descriptive and quantitative analysis on changes in species diversity and abundance from before to after construction.

DRAFT

3. Operational monitoring program

This section describes the methods for the operational phase bird and bat monitoring program once the HWF is commissioned and operational including carcass monitoring.

3.1. Operational phase bird and bat surveys

3.1.1. Bird utilisation surveys

Following the two years of pre-construction BUS already undertaken, post-construction BUS (also known as operational phase BUS) will commence once the HWF is fully commissioned. Post-construction BUS will occur over two years to replicate the pre-construction surveys. These surveys aim to identify changes, if any, in fauna use of the site compared to the pre-construction period and if any turbines pose a particular risk to listed species.

Relevant details of the post-construction BUS include:

- The timing of the surveys will be agreed with the regulator.
- Surveys will be undertaken at the same survey points and reference points used in the pre-construction surveys, using the same methodology.
- BUS will provide a context for the carcass searches and elucidate the indirect effects of the wind farm on bird use of the site by comparing the bird abundance and diversity recorded during post-construction surveys with the baseline BUS data.

After completion of the initial two years of operational BUS, subsequent BUS will be undertaken every five years for the lifetime of the wind farm, during spring, as this season represents a period of high activity and detectability for bats, birds, and particularly species of concern. These surveys differ in purpose from the initial four-season BUS, as they aim to identify any changes in the presence or abundance of species of concern or other listed species not previously recorded, and to assess whether the level of risk has increased (e.g., due to a significant rise in numbers or emerging spatial patterns compared to previous BUS results).

Findings from the initial two-year BUS, together with data from targeted surveys and carcass searches, will inform decisions on the need for additional targeted or species-specific monitoring. The intermittent five-year BUS will then serve to detect any new or increased risks and guide subsequent decision-making. The need, scope, and timing of further surveys or monitoring will be agreed between DEECA, the proponent/operator, and other relevant stakeholders, based on the findings.

3.1.2. Microbat surveys

Post-construction microbat surveys will occur, if required, once the wind farm is fully commissioned and during its first year of operation and will replicate the methodology of the initial pre-construction surveys. These surveys aim to identify changes, if any, in microbat use of the site compared to the pre-construction period and if any turbines pose a particular risk to listed species.

Relevant details of the microbat surveys are presented below:

- Surveys will be undertaken at approximately the same survey points and timing used in the pre-construction surveys, using the same methodology. Locations used in the most recent surveys completed in 2023 will be referenced for this.
- The bat surveys will provide a context for the carcass searches and elucidate the indirect effects of the wind farm on bat use of the site.

DRAFT

- Bat surveys will specifically concentrate on any impacts to the species of concern identified during pre-construction bat surveys and the bird and bat risk assessment.

During call analysis, ambient conditions, principally wind speed and temperature, will be analysed to identify any correlations in bat activity. Analysis can also identify trends in activity over time of night and seasons. Initial analysis of these variables with Southern Bent-wing Bat (SBWB) calls as part of the pre-construction monitoring indicated that SBWB activity increases with temperature, decreases with wind speed, and is slightly reduced with greater distance to treed habitat, with significant variation across sites and dates (Nature Advisory, 2025). It should be noted that SBWB calls can be difficult to assess, and therefore any complex call[2] should be treated as a potential indicator of presence. The ongoing monitoring and analysis of bat activity will help inform the adaptive management approach.

3.1.3. Wedge-tailed Eagle and Black Falcon surveys

Post-construction targeted surveys for Wedge-tailed Eagle (WTE) and Black Falcon will be conducted once the wind farm is fully commissioned and during the first two years of operation. Surveys will include stick nest inspections and roaming surveys in June, July, and October, covering the critical breeding periods for both species. June and July surveys aim to identify nests early in the season, while October surveys allow detection of late nesters or re-nesting attempts following potential failures. Surveys will be conducted across the wind farm and immediate surroundings, prioritising areas near turbines.

The primary aim of these surveys is preventive: (a) to identify nest locations and apply temporary nesting buffers as required (see Section 4.2.1), and (b) to identify areas of potential risk. In addition, due to the conservation status of Black Falcon, raptor monitoring will be incorporated into the initial two-year monthly carcass monitoring program. This will involve observing Black Falcon from turbine search sites during searches (one scan approximately every minute) and incidental recording of other raptors of interest, including WTE and listed species, when moving between sites.

At a minimum, the following information will be recorded:

- Date, location, and duration of observation
- Time and duration of flight
- Flight height
- Distance from observer
- Count of individuals
- Sex, age, and moult status (where discernible)
- Occasional behaviours such as feeding, territorial displays, fighting, and perching

Black Falcon flight paths will be plotted as accurately as possible. All nests identified during operational monitoring, including those found during pre-construction surveys, will be recorded and revisited monthly as nests may be occupied across multiple years if intact (Debus 2023). Active Black

[2]Complex calls recorded during surveys refer to those that could not be confidently assigned to a single species and are attributed to multiple species.

DRAFT

Falcon nests used for breeding will be monitored monthly throughout the breeding period (autumn to late spring) by qualified ecologists to record breeding activity and outcomes.

3.2. Carcass monitoring

3.2.1. Purpose of carcass monitoring

Ongoing monitoring of blade strike mortality at HWF will:

1. provide data that can inform adaptive management of the collision risk (i.e., patterns of mortality related to seasonal changes, local conditions, or turbine operating periods), and
2. detect and estimate the general mortality of listed and non-listed fauna, which can be used to understand actual impacts.

Recorded mortality during carcass searches of a listed species may indicate spatial variation in risk levels based on the location and frequency of the carcasses found. Specifically, repeated collisions at the same or adjacent turbines (but not at others) are useful in identifying high-risk turbines or clusters.

3.2.2. Definition of 'mortality'

Mortality is defined as any dead bird or bat detected within the specified search radius (Figure 3). Detection occurs during formal carcass searches (designed to generate an estimate in accordance with a statistically rigorous sampling design) or at other times (incidental observation, often by operational staff). A protocol is triggered whenever a carcass is found to collect consistent and useful data on the fatality event (see sections 3.2.4 to 3.2.6).

In the absence of any other cause of death, any carcass or bird feather spot (defined as a clump of five feathers or more), detected beneath an operating turbine will be categorised as a turbine blade collision. Feather spots are assumed to be remains of a bird carcass after scavenging and the scavenger correction factor will not be applied (see Appendix 1).

3.2.3. Overview of approach

The HWF carcass monitoring program will consist of the following two methods:

- **Incidental carcass detection**; and
- **Full carcass searches** – to be implemented after all turbines are operational and generating electricity. This program will run for at least five years.

3.2.4. Incidental carcass detection

A low bird and bat collision risk exists during the commissioning phase, once turbine components are installed but not operating. At this stage, the HWF is an active construction site and subject to strict safety requirements which can restrict formal carcass searches. Therefore, during this time there will be increased worker activity on and around turbine hardstands and surrounding areas as commissioning activities are occurring.

The wind farm operator's approved personnel and contractors will conduct incidental carcass detection around the hardstands as follows:

- Any carcasses detected during this period will be recorded in accordance with the incidental carcass protocol as described in Section 3.2.5. Awareness training will be provided to the wind farm operator and contractor teams to ensure effective protocol implementation;
- The incidental carcass detection will continue as the primary carcass detection method until the full carcass search program commences, this will ensure impacted birds and bats can be recorded

DRAFT

before the implementation of the full carcass search program, despite site access still being limited by construction activities; and

- Incidental carcass detection will continue for the duration of the wind farm's operation and will occur as per the Carcass Detection Protocol and the Bird and Bat Handling Protocol outlined in Appendix 1.

3.2.5. Incidental carcass protocol

Personnel working at the HWF site, during all project stages, may incidentally find carcasses. In response, carcass handling will occur as per the Carcass Detection Protocol and Bird and Bat Handling Protocol outlined in Appendix 1. These protocols will be detailed to construction and operation personnel during site training and induction programs.

3.2.6. Formal carcass search program

The formal carcass search program will commence within three months of the commissioning of all project activities, including turning of turbines/within one month of the completion of reliability tests of all turbines and the wind farm is in full operation and generating electricity. This post-commissioning monitoring program will be undertaken for a minimum of five years. Following this, a detailed report will be prepared to review the mortality detection program and to provide recommendations in response to any identified issues (see Section 6) for reporting requirements. The regulator will review this report to determine how the monitoring program aligns with the identified issues and whether additional monitoring is necessary after the initial five-year period, based on the species triggers reached.

The HWF carcass monitoring program aims to provide reliable estimates of fauna mortality rates with an estimate of sampling precision.

3.3. Scavenger Trials and Searcher Efficiency Estimates

Several factors, such as carcass scavenging and carcass detectability, can affect mortality rate estimates and will be included in any estimate of overall mortality rates. Estimates of carcass removal by scavengers are used to correct for the fact that scavenging reduces the number of detected bird and bat carcasses under wind turbines. This BAM Plan adopts the findings of the Symbolix report 'Post construction bird and bat monitoring at wind farms in Victoria' (2020), see Table 2 and Table 3. As such, no project-specific Scavenger Trials or Searcher Efficiency Trials are proposed.

Table 2: Searcher Efficiency

Observer/Searcher	Species Type	Searcher Efficiency	Confidence Interval
Human	Bird	88%	[85%, 91%]
Human	Bat	52%	[44%, 61%]
Dog	Bat / Bird	84%	[80%, 88%]

Table 3: Carcass loss to scavenge

Category	Average number of days to loss	Lower and upper bound
Bat	2.7	[2.1, 3.4]
Bird - general	5.7	[4.8, 6.8]
Large bird (Wedge-tailed Eagle)	287.3	[130.1, 634.5]

3.3.1. Turbine selection

Given that HWF is a large project, comprising up to 106 turbines, a subset of 30% of the turbines will be searched monthly once the project is commissioned. Turbines will be selected using spatially stratified random sampling to ensure even distribution across the site (i.e., avoiding clustering). Some selected turbines may be substituted with more accessible turbines or where on-ground conditions make it unsafe to cover the full search radius. The selection of the turbines to be included in the search will be made prior to the commencement of the first monthly search and they will remain the same for the duration of carcass monitoring to reduce sampling error, enabling the most accurate estimates of bird and bat mortality rates. This approach, consistent with advice from Symbolix Pty Ltd, considers a 25–30% turbine sample to be statistically robust for estimating mortality rates while balancing practical constraints on search effort.

Note that the results of any turbine searches outside the core randomly selected fixed turbines (i.e., incidental findings or in response to impact triggers; Sections 3.2.5 and 5) will not be used in the mortality estimates. These searches depart from the rigorously designed statistical sampling framework and would render any estimate invalid.

Information collected at each turbine will include the species and number of carcasses found, location, any relevant details on vegetation and habitats, and any relevant observations indicating risk behaviours involving listed species.

3.3.2. Search protocol

All searches will be undertaken by qualified ecologists or personnel trained in carcass searches and regularly assessed by the supervising ecologist.

Carcass searches for all sizes of carcasses will be conducted within a 130 m radius of the turbine hardstands. An inner and outer circular search zone has been designated. The inner zone, with a 70 m radius and transects spaced every 6 m, targets the detection of bats and small birds (Figure 3). The outer zone covers the area between the 70 m and 130 m radii and focuses on larger birds, which may fall further from turbines, though larger or smaller birds may also be recorded in the inner zone. Search transects in the outer zone are spaced at 12 m and carried out from the edge of the inner zone out to the edge of the outer zone.

To maximise detectability, particularly for species prone to quicker scavenging than larger ones, such as small birds and bats, a secondary ‘pulse’ search will be undertaken every month during the monitoring program. Pulse searches entail searching in the same way the ‘inner zone’ is searched (out to 70 m) again after the initial search. This ensures most species of concern are unlikely to be missed during a search round and helps to promptly identify any collisions at the start of wind farm operations, enabling efficient and timely responses if needed. After the initial 12-month pulse search period, the requirement for another 12 months of pulse searches will be reviewed in the first annual report depending on the species and numbers of carcasses found

All selected turbines, once operational, will be searched once per month. Each search and carcasses found will be documented in the form provided in Appendix 2.

DRAFT

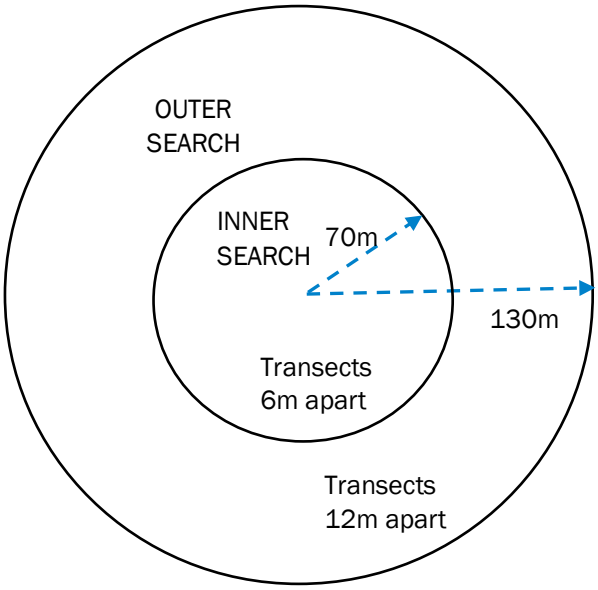


Figure 3: Inner and outer carcass search zones underneath the turbines

3.3.3. Scent dog option

This section has been added to allow more flexibility for HWF and aligns with industry practice. Detection dog searches are the recommended methodology for mortality surveys, as they are proven to be more effective than human-only searches, particularly for microbat and smaller bird carcasses (reviewed by Lentini et al. 2025) and improve confidence in mortality estimates (Moloney et al., 2019). Their use will be the primary option but will depend upon the availability of trained dogs and dog handlers both familiar with the territory and with the appropriate skills to undertake the searches.

If dogs are used for the searches, a suitable method will be developed in conjunction with their handler. This will generally involve the dogs working on a reference transect line from downwind to upwind. The handler will start downwind of the turbine and walk in the direction of the wind, allowing the dog to freely zig zag across the searcher's transects, using whistle commands to control how far the dog moves to each side of the transect (i.e. 30 m). This will ensure all scent cone areas will be encountered (Figure 4). The dog does not 'look' for carcasses but finds them via scent. Therefore, it does not need to cover as much ground as if it were looking with its eyes. It only needs to cover enough ground to encounter all possible 'scent cones' within the search radius. Carcasses found outside the defined search area will be recorded and collected as an incidental find.

The scent cone is the area downwind of the target, in this case a carcass, in which the scent will drift with the wind. So, if the wind is strong, the scent will drift further but in a narrower scent cone, and if the wind is light, the scent cone will be wider but will not drift as far. In the case of strong wind, transects will need to be narrow to ensure scent cone areas are encountered. Whereas transects approximately 30 m wide will be adequate to cover an area in moderate wind conditions, this will be reduced to 10 to 20 m in conditions with no wind or strong wind.

A GPS collar will be fitted to the dog which will allow the handler to track movements in real time and allow the handler to ensure the entire search area has been effectively covered by the dog. Search areas will be loaded onto GPS prior to commencing searches to allow the handler to see the exact borders of the area and the dog's movements within it. GPS data will be made available to regulators on request.

Dog handler(s) must have demonstrated the capacity to identify bird and bat species of southeast Australia.

DRAFT

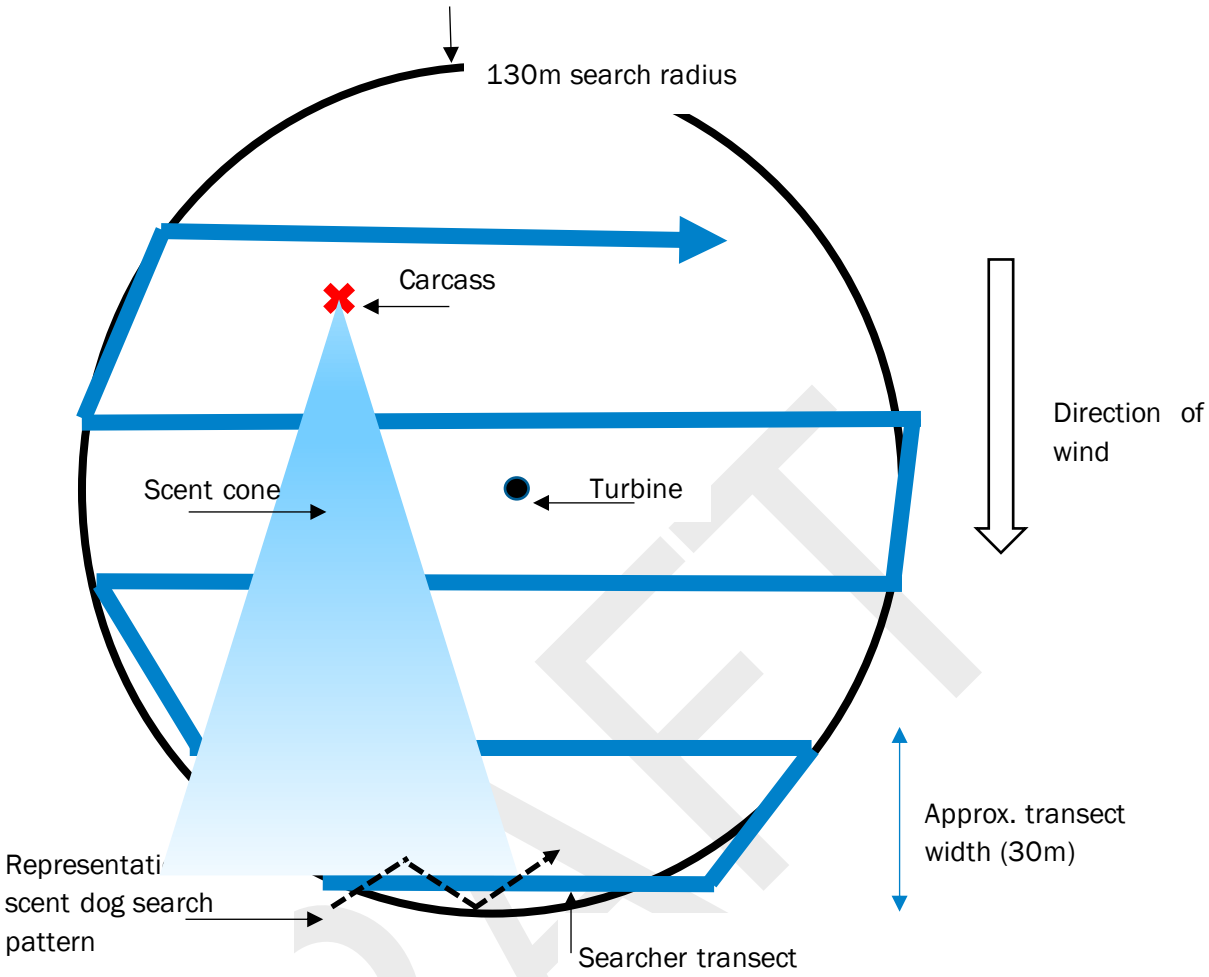


Figure 4: Search pattern for scent dog – across the wind turbine search radius

3.3.4. Estimating annual mortality due to collision

The results of the carcass searches will be analysed to provide information on:

- The species, number, age, and sex (if possible) of birds and bats being struck by the turbine blades;
- Scavenger and detectability estimates;
- Separate estimated annual mortality rates for all birds and all bats (and for listed species with available data), including an estimate of the number of carcasses per turbine per year; and
- Any detected spatial or temporal variation in the number of bird and bat strikes.

The search results will be detailed in the first annual report. In addition to cumulative search results, the analysis and mortality estimates will be detailed in the second annual report, a fourth-year report and a final five-year report. The latter will also identify if further investigations or mitigation measures are required. This may result in ongoing regular, or periodic, carcass monitoring for the duration of wind farm operations if deemed necessary following the five-year monitoring period.

In addition to the annual reports, an incident report will be prepared and provided to the Commonwealth Department of Climate Change, Energy, Environment and Water (DCCEEW) and DEECA if an EPBC Act-listed species is found dead or injured during carcass searches. If no on-site data is available to estimate mortality rates (e.g., a dead individual of a listed species is found during the first carcass search), mortality rate estimates will be derived from median estimates of searcher

efficiency and scavenger loss rates collected from wind farm data across Victoria. The median annual mortality rates will be used as the benchmark to determine whether a specific impact threshold has been reached. Upper and lower confidence bounds and the likelihood that an adaptive management trigger is reached will be also reported.

Mortalities will be estimated with a Horvitz-Thompson style estimator (Huso 2011), with an extract of the equations provided below.

$$\hat{M}_{ij} \cong \frac{C_{ij}}{(\hat{g}_{ij})} \quad (1)$$

where

- $\hat{M}_{ij}$ is the estimated mortalities at turbine i during search j
- C_{ij} is the number of carcasses found
- $\hat{g}_{ij}$ is the estimate of the detection probability for that search and turbine

For a given turbine, $\hat{g}_{ij}$ is a function of

$$\hat{g}_{ij} \cong a_i r_{ij} p_{ij} \quad (2)$$

- a_i is the fraction of total carcasses within the searched area (note this is *not* the same as the fraction of area searched)
- r_{ij} is the fraction of the carcasses that arrived at turbine i but have not been lost to scavenge or decay before search j
- p_{ij} is the probability that an existing carcass will be detected by the searcher

Therefore, a robust mortality program requires the following components:

- a formal mortality monitoring survey where found carcasses are recorded, to determine C_{ij}
- an estimate of the fall zone of carcasses to determine a_i (this also accounts for potentially only searching a subset of all turbines)
- scavenger trials to estimate r_{ij}
- searcher efficiency trials to estimate p_{ij}

4. Adaptive Management

This adaptive management section aims to achieve environmental outcomes by establishing effective and timely response measures. The key points include:

- Impact trigger definitions for listed and non-listed species;
- Implementation of an adaptive decision-making framework for these triggers;
- Establishment of a framework that integrates investigations, monitoring, and reporting; and
- Adoption of management measures, including corrective actions and compensatory measures, to ensure environmental outcomes are achieved.

4.1. Impact triggers

This section identifies the circumstances that will result in notification, further investigation, and additional mitigation for impact triggers, as well as reporting to DEECA and DCCEEW. The procedure to respond adaptively to impact triggers documented in this section will apply for the duration of the HWF life cycle.

In response to a triggered impact, the cause will be investigated, and more frequent carcass monitoring will occur to determine if the impact is ongoing or a one-off occurrence. Additional mitigation measures, informed by the evidence, may also occur.

The approval holder will be responsible for BAM Plan implementation with technical support provided by an approved expert.

4.1.1. Impact triggers for listed bird and bat species

Definition of impact trigger

An **impact trigger** for a listed species occurs if a single bird or bat (or recognisable parts thereof) listed as threatened and/or migratory under the EPBC Act or FFG Act is found dead or injured within the specified search radius during any mortality search or incidentally during commissioning or operation. Once triggered, the decision-making framework detailed in Figure 5 is applied.

In addition to the standard protocols for listed species, strategies are provided for key species of concern (Section 5) identified during the pre-construction studies.

Operational procedure

If a listed species **impact trigger** occurs, the decision-making framework detailed in Figure 5 is applied, with responses scaled according to species' listing status, likelihood of further occurrence, and risk level. This ensures that triggers, investigations, and mitigation measures are defined early to allow prompt and effective responses. The following general strategy will be applied:

1. Immediate reporting to the HWF Site Manager, who will report it to DEECA/DCCEEW within two business days.
2. Immediate investigation (within 10 business days) by an appropriately qualified ecologist to identify any particular risk behaviours that could have led to the collision or could lead to further collisions. This investigation aims to:
    - Determine the actual cause of death/injury.
    - Focus on determining the likelihood of further occurrences (e.g., through engagement with key species experts, undertaking a literature review, assessment of habitat, etc).

DRAFT

- Identify suitable mitigation measures for immediate implementation.

3. If the fatality is deemed to be a one-off occurrence (e.g., an extremely unlikely occurrence given a species' usual behaviour) or unlikely to result in a significant impact, no further action will be necessary.
4. If the cause of the impact trigger is unclear, onsite investigation of risk behaviours and evaluation of likely re-occurrence will be required for up to six weeks. If these investigations suggest that the impact trigger was a one-off or unlikely to result in a significant impact, no further action will be necessary.
5. If the onsite investigation suggests that the impact trigger may be a regular occurrence or it is likely to result in a significant impact, species-specific monitoring may be required. During the monitoring period, periodic (three-monthly at first) reports will be provided to DEECA/DCCEEW.
6. Responsive mitigation measures will be promptly developed and implemented as needed in consultation with DEECA/DCCEEW. Examples of mitigation measures may include but are not limited to those outlined in Section 4.2.
7. If mitigation measures are not possible or effective, compensatory measures will be implemented, as outlined in Section 4.3. In some circumstances, both mitigation and compensation may be required.

Following a trigger, the assessment of potential impacts will, where possible, consider estimated mortality of individuals across the whole wind farm (not only carcasses observed or those found within the sampling area).

All investigations and subsequent decision-making will be undertaken in consultation with DEECA/DCCEEW.

4.1.2. Impact triggers for non-listed bird and bat species

Definition of impact trigger

An **impact trigger** for a non-listed species occurs if a total of four or more carcasses of the same species of a bird or bat (or recognisable parts thereof) is found dead or injured in two successive searches at the same turbine. Once triggered, an appropriate response is initiated, and reporting requirements outlined in the decision-making framework, as outlined in Figure 6.

An impact trigger for non-listed species **will not apply to ravens, magpies or introduced species** such as Eurasian Skylark; however, any detected mortalities for these species will still be reported as part of the annual reporting process.

Operational procedure

If a non-listed species **impact trigger** occurs, the decision-making framework detailed in Figure 6 is applied and the following occurs:

1. DEECA/DCCEEW will be notified within seven business days of recording the event.
2. An appropriate scale to consider population effects (e.g., local, regional, entire population) will be agreed between DEECA/DCCEEW and the wind farm operator on a case-by-case basis with consideration given to the species in question.
3. A report on the investigation will be delivered to DEECA/DCCEEW within three weeks.

DRAFT

4. If the evaluation indicates that the event was a one-off occurrence (i.e., an isolated event that is not part of a recurring, seasonal, or intensive pattern) or is unlikely to have a significant impact at a relevant population scale for the species in question, no further action will be necessary.
5. If the event is deemed to be a potentially regular occurrence or likely to be a significant impact at a relevant population scale for the species in question, species-specific monitoring may be required.
6. If further monitoring confirms that impacts are likely to be significant at a relevant population scale, mitigation measures will be required. Potential mitigation measures are outlined in Section 4.2, however species-specific mitigation measures will be determined based on the investigation outcomes.

Following a trigger, the assessment of potential impacts will, where possible, consider estimated mortality of individuals across the whole wind farm (not only carcasses observed or those found within the sampling area).

All investigations and subsequent decision-making will be undertaken in consultation with DEECA/DCCEEW.

DRAFT

Figure 5: Decision-making framework for identifying and mitigating impact triggers for threatened species.

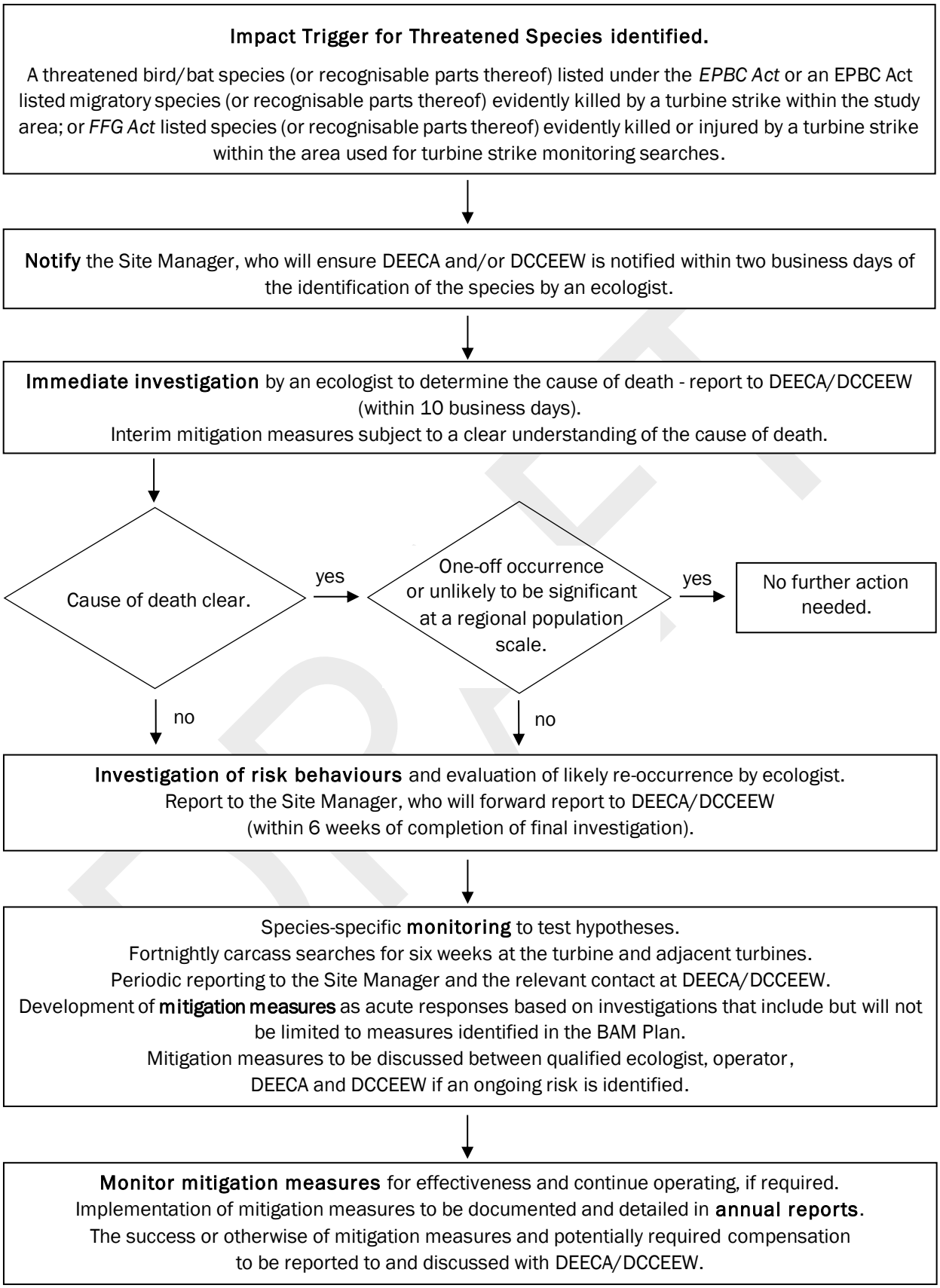
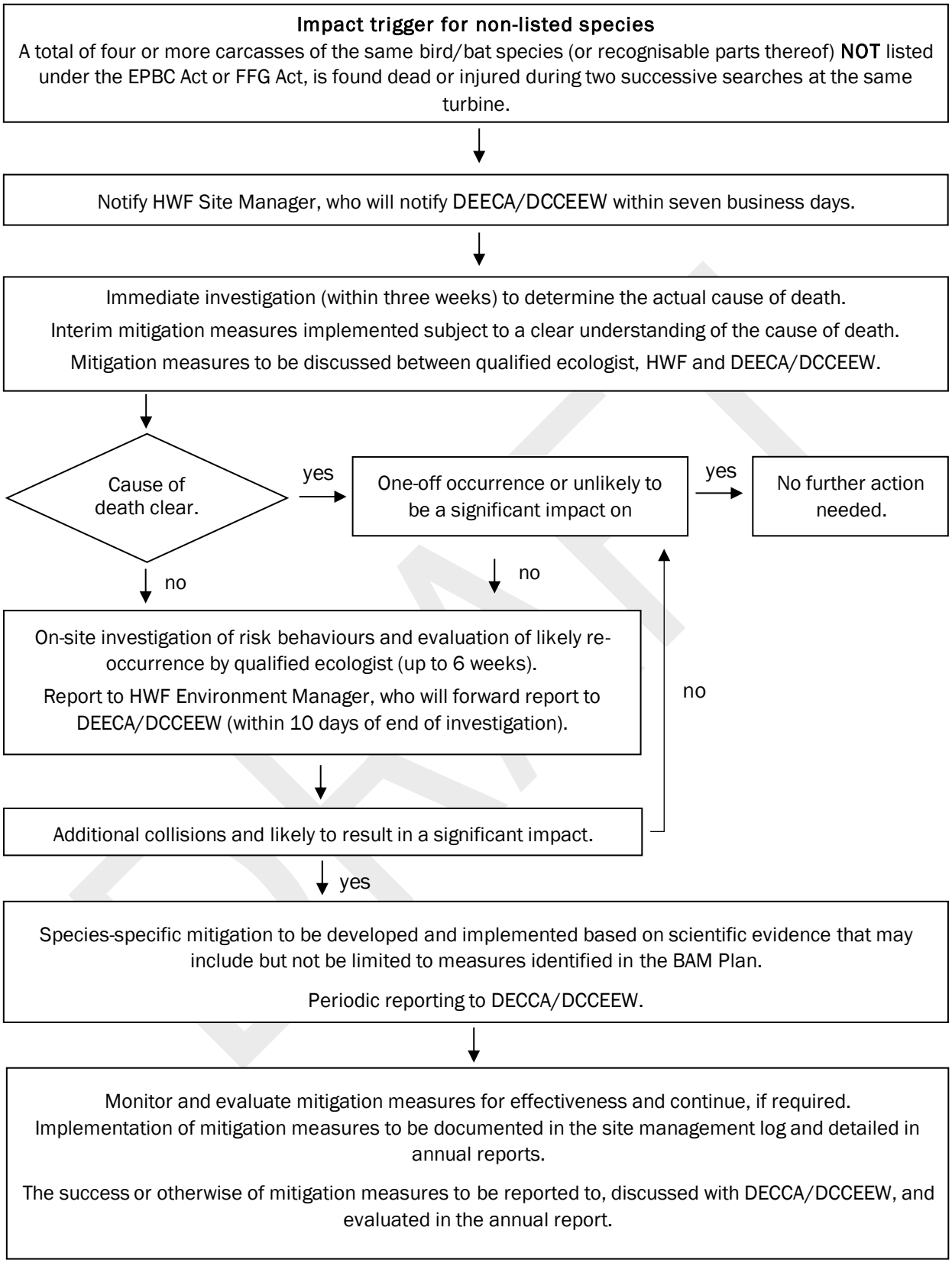


Figure 6: Operational procedure for mitigating impacts for non-listed species.



4.2. Mitigation

Mitigation aims to ensure that the environmental outcomes listed in Section 1.2 will be achieved. Any evaluation of impacts and decisions regarding mitigation and investigations will be undertaken in consultation with DEECA and DCCEEW. Annual reports will detail the effectiveness of mitigation applied and the outcomes of any investigations completed.

Depending on the nature, cause and significance of the impact trigger, mitigation and compensation may be required. The objective of mitigation and compensatory measures is to ensure that the HWF does not lead to significant impacts on listed or non-listed bats and/or birds over the life of the wind farm. This approach aims to pursue a neutral net impact of the project on birds and bats, especially threatened species, in accordance with the Victorian *Planning Guidelines for Development of Wind Energy Facilities* (DTP 2023).

Mitigating the collision risk at HWF will adopt a hierarchical approach that prioritises avoidance measures in the first instance (e.g. buffering), then active mitigation (e.g. curtailment), followed by compensatory measures. Underpinning this approach will be ongoing monitoring and assessment that will inform any changes to the mitigation applied.

Appropriate mitigation will be developed and implemented and guided by the results of monitoring outcomes, mortality estimates, and/or impact triggers. Mitigation may include, but not be limited to, the following:

- Habitat modification, vegetation planting/removal;
- Changes in land use practices (including stock management, stock grain-feeding) near turbines, subject to negotiation with landowners;
- Cessation or reduction of cropping/sowing around or near turbines (subject to negotiation with landowners);
- Early breeding season surveys of Black Falcon and Wedge-tailed Eagle to detect nest locations and daytime curtailment of select turbines within 300 m of nest sites until juveniles are fully fledged or breeding failure confirmed;
- Increasing turbine and powerline detectability (e.g. visual or audio deterrents);
- Changes to turbine lighting (noting the general requirements below);
- Temporary turbine curtailment for high-risk periods/locations[3];
- Using ultrasonic deterrents to deter bats at night; and
- Bird protection systems that automatically curtail turbines on approach to reduce raptor fatalities.

[3] High-risk periods in this context refer to any defined time of year, day, or set of environmental conditions during which the likelihood of bird or bat collision with turbines is significantly elevated. This may include for example: seasonal migration periods, breeding and fledging seasons, environmental or weather driven conditions. High risk locations in this context are specific areas within or around the wind farm where the likelihood of bird or bat collision is elevated compared to the rest of the site. These periods or locations would be guided through the results of trigger events and monitoring outcomes.

DRAFT

Immediate mitigation will be implemented (within seven days) if a significant impact is detected and the cause is evident (e.g., a particular land use practice). Further investigation will commence where the cause is not evident. If investigations indicate that the available mitigation is incongruent, compensatory measures will be implemented (Section 4.3).

The final BAM Plan will include the required investigations and recommended mitigation consistent with the consent conditions of the Planning Permit Approval. Mitigation effectiveness will be assessed using data collected from a monitoring program of appropriate duration and frequency.

4.2.1. Avoidance

Most mitigation will be triggered by collisions, however the following preventive strategies to avoid and reduce the risk of an impact trigger occurring will be implemented. Refer to the Bat Impact Assessment report for further details.

Southern Bent-wing Bat

Buffering

HWF will site turbines based on avoiding and minimising potential SBWB habitat and recorded activity within 269 m of a turbine, using the following categories:

- High-priority avoidance - Creeks, wetlands, remnant native woodland, forestry plantations, and higher number of SBWB-definite or complex calls per night relative to other sites surveyed during the pre-construction surveys.
- Medium-priority avoidance - Planted windrows and eucalypts, farm dams, and medium number of SBWB-definite or complex calls per night relative to other sites surveyed during the pre-construction surveys.
- Low-priority avoidance - Scattered trees, isolated wind rows (100 m away from other trees), and low/very low number of SBWB-definite or complex calls per night.

This formed a baseline design that was used to then microsite turbines relative to higher and medium priority areas based on habitat and known SBWB activity. This approach aimed to reduce the area of SBWB habitat within 269 m of turbines. Each turbine was given a rank of *higher*, *moderate*, *low* or *minimal impact* prior to and following micro-siting. These categories were identified using the following strategy:

- Higher risk – turbine buffers which overlap with any high priority avoidance habitat and/or have medium, high or very high (greater than 4.5 calls per night) numbers of SBWB or SBWB complex calls per night.
- Moderate risk – more than 2.5% of the turbine buffer covers medium priority habitat.
- Low risk – less than 2.5% of the turbine buffer overlaps with medium or low priority avoidance habitat.
- Minimal risk – buffers do not overlap with any SBWB habitat or areas of SBWB activity.

Turbine low-windspeed cut-in

To mitigate the collision risk for the SBWB, HWF will increase the nighttime low-windspeed cut-in to 4.5 m/s. This will be applied:

- To all turbines categorised as moderate or higher risk;
- Between September to April (inclusive) to coincide with known SBWB activity in the region; and

- From 30 minutes before sunset to 30 minutes after sunrise.

Post-construction monitoring will provide additional data relating to SBWB activity and behaviours. This may include bat activity relevant to ambient conditions such as temperature and wind speed. This data will help inform the adaptive management approach relating to modifying these curtailment parameters.

Curtailment will be implemented hierarchically following impact-based triggers at turbines, even if these were not previously classified as moderate or higher risk, including increased cut-in wind speeds for SBWB and YBSB (Yellow-bellied Sheath-tailed Bat), as detailed in Table 9. The effectiveness of these measures will be monitored to support adaptive management and guide potential future application at additional turbine locations, or where further mitigation is required to ensure the overall effectiveness of measures across the wind farm.

The Hexham Wind Farm Bat Impact Assessment report provides more details on the surveys and results that informed the avoidance approach.

Acoustic deterrents

Ultrasonic acoustic deterrent systems may reduce activity of echolocating bats to mediate bat-human conflicts (Zeale et al., 2016), including close to wind turbines. These systems generate ultrasonic sound within the frequency range used by bats that is designed to mask returning echoes from the bat's echolocation signal, forcing them to leave the airspace (Arnett et al., 2016). Findings presented by Weaver et al. (2020) and Good et al. (2022) provide promising evidence that ultrasonic acoustics deterrents can reduce bat collisions, but the effectiveness appears to be species-specific. While this technology has the potential to play a role in impact reduction for at least some bats species, its efficacy for reducing impacts to Australian bats needs to be systemically tested.

In response to the impact triggers detailed in this BAM Plan, Hexham Wind Farm Pty Ltd is committed to trialling acoustic deterrent and evaluating their deployment as a mitigation measure. It is acknowledged that as an emerging technology, the application and effectiveness of these devices is largely inconclusive, particularly for specific species such as SBWB. However, it is also recognised that efficacy trials of available technologies may yield acceptable results for future implementation.

Hexham Wind Farm Pty Ltd is committed to considering the feasibility of these types of devices in response to impacts triggers detailed in Table 9.

Visual deterrents

Blade painting has been shown to reduce bird strikes by over 70% by increasing rotor visibility (e.g., painting one blade), with particularly high effectiveness for raptors as a visual deterrent (Garcia-Rosa & Tande 2023, May et al. 2020). This passive measure offers advantages beyond listed raptors, as it benefits multiple species and may also reduce the risk of triggering further regulatory scrutiny. In controlled experiments, McIsaac (2001) found that American Kestrels detected turbine blades more readily when painted with two thick black bands across the width, whereas narrow bands or longitudinal stripes provided little to no improvement. Ongoing research continues to investigate how blade painting influences bird avoidance behaviour in operational wind farms.

Hexham Wind Farm Pty Ltd is committed to considering the feasibility of this mitigation measure in response to impacts triggers detailed in Table 5, 6 and 7.

Other emerging technologies

Potential methods for deterring bats from airspace within turbine RSAs include light, radar and sound (Werber et al., 2023). Most technologies in the active deterrent space appear to be in early testing

phases, with limited evidence of efficacy when implemented at-scale at operational wind facilities. Consequently, while there are some promising developments, most of these technologies are not yet commercially available as off-the-shelf products ready for use at operational wind farms. These include:

- Electromagnetic radiation produced by marine radar as a deterrent (Gilmour et al., 2020).
- Using drones to disturb wildlife (Kuhlmann et al., 2022; Werber et al., 2023).
- Creating ultrasonic noise by ejecting compressed air from nozzles as a supersonic jet (Romano et al., 2019).
- Attaching passive ultrasonic whistle directly onto turbine blades (Zeng and Sharma, 2023).
- Attaching miniaturised speakers directly onto turbine blades (Cooper et al., 2020).
- Visual deterrents, such as dim ultraviolet light (Gorresen et al., 2015).
- Automated monitoring systems incorporating thermal video, radar and/or echolocation to trigger short-term curtailment when target species are detected approaching a turbine (McClure et al., 2021; Rabie et al., 2022).

The evolution of these emerging technologies may help manage collision risk and residual impacts on bat-threatened species but will require assessment. An adaptive monitoring and management approach, in line with intervening developments in scientific research, government policy and mitigation technologies, is proposed for this project. This includes the systematic evaluation of any emerging technologies, including acoustic deterrents, if implemented, to generate empirical evidence and support site-specific adaptation at the HWF.

Wedge-tailed Eagle

No guidelines for WTE nest buffers exist in Victoria, but case studies suggest a minimum buffer of 450 m upon experience with nests in Bacchus Marsh in 1999-2000, where eagles were seen showing natural behaviours when observed from such distance (Foster *et al.* 2010). HWF has established a 500 m buffer around WTE nests to any turbine blade tip, any overhead cabling infrastructure, or any project-related building. If a nest is identified during the operational phase, temporary daytime curtailment of the turbine(s) within a 300 m buffer will be implemented for the duration of the breeding attempt, until fledging or confirmed nest failure, to minimise disturbance and collision risk.

Brolga

Brolga buffers represent the area around a Brolga breeding wetland, beyond which a wind turbine tower can be placed to avoid impacts on Brolga breeding success from collision or disturbance. The turbine-free buffer areas were designed to protect Brolga breeding wetlands from potential impact both during construction (i.e., disturbance) and operation (i.e., collision with wind turbines).

Turbine-free buffers encompass a habitat-based home range developed for HWF that considers the key habitats that support breeding, as listed below:

- Confirmed or valid historical breeding wetlands used for breeding and night roosting;
- Non-wetland areas around breeding wetlands used for foraging;
- Wetlands providing habitat used for foraging and/or alternate night-time roosting within two km of breeding wetlands; and
- Movement corridors between breeding wetlands and other wetlands.

The home range around each breeding wetland was informed by:

DRAFT

- Known Brolga movements around breeding wetlands from several observational studies of Brolga flight behaviour by Nature Advisory;
- Observations of the movements of Brolga breeding at the Macarthur Wind Farm since 2012;
- Breeding wetland home range mapping published in the EES Referrals for the Penshurst (Biosis Research, 2011) and Mount Fyans Wind Farms (Biosis, 2017); and
- Satellite tracking studies undertaken by Veltheim *et al.* (2019).

Turbine-free buffers include the following:

- The 600 m home range of the Brolga (defined based on movement patterns of the species according to Veltheim *et al*. (2019) and based on flight data collected on breeding pairs in south-western Victoria); and
- An extra area comprising a 300 m disturbance buffer plus the 95 m turbine blade length buffer.

Black Falcon

Black Falcon collisions with wind turbines have been reported in Victoria (Moloney et al., 2019). DEECA suggests that stubble burning may attract these birds to the area. Nature Advisory agrees and has also observed Black Falcons being drawn to certain farming activities, such as tractor operations in cropped paddocks, which flush out small birds, providing hunting opportunities. The occurrence of stubble burning and tractor activity that disturbs birds could potentially be a concern. The wind farm operator will liaise with relevant landowners to minimise these activities close to turbines, and to establish protocols to communicate burning activities. No construction activities are to be conducted within 200 m of confirmed nest sites until fledging or confirmed nest failure. If an active Black Falcon nest is identified during the operational phase, temporary daytime curtailment of the turbine(s) within a 300m buffer will be implemented for the duration of the breeding attempt, until fledging or confirmed nest failure, to minimise disturbance and collision risk.

Blade feathering

Blade feathering will consist of adjusting the angle of the rotor blades to limit rotation, typically to approximately one rotation per minute, when wind speeds are below the manufacturer's or adjusted cut-in speed, to prevent freewheeling (Whitby et al. 2024). Feathering will be applied across all turbines, operating daily from 30 minutes before sunset to 30 minutes after sunrise from September to April, covering SBWB and other microbat activity.

Research has shown that blade feathering may reduce bat fatalities (Whitby et al. 2024, Wellig et al. 2018; Rydell et al. 2010; Horn et al. 2008). Young et al. (2011) showed the average number of bat fatalities decreased in response to feathering blades in the first half of the night (0.05 bats/turbine) or the second half (0.09 bats/turbine) compared to 0.18 bats/turbine for turbines with unfeathered blades. A similar study (Good et al. 2012) showed a 36% reduction in bat fatalities when turbine blades were feathered. This study also indicated that blade feathering, coupled with increasing cut-in speeds to 4.5 m/s, lowers bat fatalities by 59%.

Carrion removal

Carrion removal will reduce the attractiveness of the site to scavenging raptors, including species of concern such as Wedge-tailed Eagle and Black Falcon, reducing the risk of collision with this bird group and other scavengers. Procedures will include:

- A designated Carrion Removal Coordinator will ensure:

- Weekly inspections of the entire HWF site by on-site personnel are undertaken to locate any deceased animals;
- The weekly inspections are undertaken via a vehicle or motorbike and searches of the entire HWF site prioritise the area within 250 m of turbines; and
- During lambing season, any lamb carcasses are immediately removed.

- Any incidental finds of birds and bats will follow the Incidental Carcass Protocol (depending on carcass location; Section 3.2.4).
- Any carrion and/or remains found will be reported immediately to the site manager who will organise for the immediate collection and disposal of the carcass.
- Carrion will be disposed of in treed areas, or pits, at least 500 m from the nearest turbine.
- All carcass and carrion occurrence and removal will be recorded in a logbook maintained by site personnel.
- The annual report will summarise all carcass and carrion occurrences and removals for the reporting period.

Lighting avoidance or reduction

Turbine lighting will be restricted to the requirements defined by the regulatory authority, and facility lighting will be minimised within 500 m of turbines. Minimising lighting will help reduce the bird and bat attraction by reducing insect activity.

4.3. Significant impacts and compensation

In the unlikely event that a significant impact occurs to any EPBC Act-listed species due to HWF operations, compensatory measures may be required. The EPBC Act Environmental Offset Policy 2012 (DSEWPaC 2012) will guide any required compensation and will be developed in consultation with, and approved by, DCCEEW.

Significant impact triggers for key species are tabulated below. The 0.1% population threshold is derived from the EPBC Act policy statement on listed migratory species and the definition of an important population at a national level (Commonwealth of Australia 2017). These thresholds will be updated if revised population estimates become available.

Table 4: Annual significant impact thresholds that trigger compensation.

Species	Threshold of significant impact (mortality estimates)
Southern Bent-wing Bat	>0.1% of the population affected (or 35 individuals)
Grey-headed Flying-fox	>0.1% of the population (or 320 individuals)
White-throated Needletail	>0.1% of the population (or 41 individuals)

Where the annual threshold is estimated to be reached for these species, the required level of contribution for compensatory measures will be determined in consultation with DCCEEW and using the Department's offsets calculator to ensure alignment with the EPBC Act Environmental Offset Policy 2012. The offsets calculator and related policy guidance are available at:

https://www.dcceew.gov.au/environment/epbc/publications/epbc-act-environmental-offsets-policy

For other EPBC listed species with unknown population sizes, no thresholds can be estimated. Compensation measures would be agreed upon with DCCEEW on a case-by-case basis.

The suitability of compensatory measures will be considered on a case-by-case basis, including whether they achieve ecological equivalence and contribute effectively to species conservation outcomes. Compensatory measures and calculated values generated using the offsets calculator will be discussed and agreed with DCCEEW.

In addition to these policy-aligned requirements, HWF has committed to the following financial compensatory measures in response to EPBC-listed species, particularly the Southern Bent-wing Bat (SBWB):

1. If there is a mortality event at an individual wind turbine which exceeds Trigger 3 (Table 8, Section 5.5.1) or 8 or more SBWB are found during the course of formal mortality searches or incidentally across the wind farm a one-off contribution of $50,000 will be made to a SBWB species recovery or research program.
2. Following 6 months of commercial operation and generation of electricity to the grid a one-off contribution of $250,000 will be made to a general biodiversity and/or species preservation program(s) for species that may be affected by the Hexham Wind Farm project. At the time of preparing this draft BAMP the details of how the funding will be allocated have not been developed. It is anticipated that the allocation will be adaptive and priority given to species recovery or research programs of species impacted by the Hexham Wind Farm project and would be discussed further with DEECA/DCCEEW.
   If population-level impacts on the SBWB are identified an allocation from this funding may be used to provide further compensation. This would be discussed with DEECA/DCCEEW to identify the appropriate type and value (Table 8, Trigger 3, Section 5.5.1)

Some examples of possible compensation for Southern Bent-wing Bat impacts could include contributing funds to:

- Habitat restoration projects. Including those designated for private land via organisations such as Trust for Nature;
- The Southern Bent-wing Bat Recovery Team (SBWBRT) to help fund research and management objectives;
- Research programs designed to improve the knowledge base about SBWB (e.g. diet, reproduction, flight dynamics, etc.);
- Funding measures to maintain or improve known SBWB roosts; and
- Technologies to better monitor populations and their activity.

The potential for financial contributions from the wind industry toward an offset fund are described as follows (Department of Environment, Land, Water and Planning, 2020):

"Offset requirements from wind farm developments may have positive benefits to local communities or landholders if funding was provided to implement on-ground management actions, such as cleaning rubbish out of caves."

Further, Section 6.2 of the Recovery Plan states that (Department of Environment, Land, Water and Planning, 2020):

"Develop a site-specific register of projects related to on-ground habitat management on both public and private land, and research/monitoring requirements for the Southern Bent-wing Bat. Prioritise the projects to direct funding to the most urgent tasks. The register could also be used to respond to requests for potential offsets resulting from wind farm developments."

The Conservation Advice also outlines several priority conservation and management actions that could potentially be funded by contributions from wind farm proponents under an offset agreement (Threatened Species Scientific Committee, 2021):

- *Implement management actions to increase the condition and extent of foraging habitat, especially within foraging range of key roosting sites.*
- *Establish conservation covenants or management agreements on private land containing important roost or foraging sites.*
- *Investigate and trial options for restoring caves previously used by the Southern Bent-wing Bat but rendered unsuitable due to guano mining or other anthropogenic activities.*

There are also a number of conservation actions detailed in the SBWB Action Statement (Department of Energy, Environment and Climate Action, 2023b, pp 4-6) that may benefit from industry support and offsetting measures, including programs relating to:

- Community engagement and awareness
- Controlling feral cats and foxes
- Identifying and protecting key habitat
- Investigating voluntary agreements and/or covenants
- Managing built infrastructure
- Managing public access
- Research into pathogens and disease
- Restoration and/or revegetation
- Surveys and monitoring

In any instance SBWB compensation is being considered, DEECA/DCCEEW and the SBWBRT will be consulted.

DRAFT

5. Species-specific management strategies

The following management strategies have been developed for the following species of concern:

- Blue-winged Parrot (*Neophema chrysostoma*; EPBC Act: Vulnerable)
- White-throated Needltail (*Hirundapus caudacutus*; EPBC Act: Vulnerable, Migratory)
- Fork-tailed Swift (*Apus pacificus*; EPBC Act: Migratory)
- Brolga (*Grus rubicunda;* FFG Act: Endangered)
- Black Falcon (*Falco subniger*; FFG Act: Critically Endangered)
- Wedge-tailed Eagle (*Aquila audax*; not listed).
- Grey-headed Flying-fox (*Pteropus poliocephalus*; EPBC Act: Vulnerable, FFG Act: Vulnerable)
- Southern Bent-wing Bat (*Miniopterus orianae bassanii*; EPBC Act: Critically Endangered, FFG Act Critically Endangered)
- Yellow-bellied Sheath-tailed Bat (*Saccolaimus flaviventris*; FFG Act: Vulnerable)

These strategies will focus management efforts and improve mitigation effectiveness in response to impact triggers for those species identified as matters of concern, aiming to avoid significant impact at the population level.

5.1. Blue-winged Parrot/White-throated Needletail/Fork-tailed Swift strategy

White-throated Needletail

The WTNT is a summer migrant to Australia, undertaking a trans-equatorial migration to breed in the Northern Hemisphere summer and to feed in the Southern Hemisphere summer. Each year, the WTNTs generally arrive in Australia in October before migrating north in March and April. Numbers peak in Victoria in late summer and early autumn, which, based on advice from DEECA/DCCEEW, coincides with most recorded wind turbine collisions. Any risk-mitigation measures for the WTNT presented in this management strategy will only apply during the times they are likely to be in Victoria, i.e. from November to April.

Blue-winged Parrot

Throughout much of their range, they inhabit grasslands and grassy woodlands and forests. The estimated population of BWP is 10,000 individuals (Garnet and Baker 2021, DCCEEW 2023). BWP mortalities from turbine collisions have been reported in small numbers (Symbolix 2020). However, given that they occasionally fly at RSA height, there is a risk of collision with turbines

Fork-tailed Swift

The Fork-tailed Swift, due to its aerial behaviour, faces a similar risk of collision with wind turbines as the White-throated Needletail. Therefore, a targeted management strategy has been developed in conjunction with that of the White-throated Needletail—including monitoring—as both species share similar flying behaviour and migratory periods.

5.1.1. Impact triggers and mitigation responses

This species-specific management strategy (Table 5) outlines a hierarchical set of trigger responses to mitigate the impacts of the operational HWF on Blue-winged Parrot (BWP), White-throated Needletail (WTNT), and Fork-tailed Swift (FTS). Reporting will follow the requirements in Section 6, as

well as incident-specific correspondence and reports to DEECA/DCCEEW, which will require discussion and feedback from the Department.

Whilst this section covers three species together, the management strategy will be applied to each species independently, consistent with other multi-species strategies.

Table 5 details the specific trigger actions in response to mortalities involving these species of concern.

5.1.2. Incident reporting

The incident investigation following each trigger event will seek to assess any relevant attributes associated with the mortality event. An incident report is to be submitted to the Responsible Authority within 28 days of the mortality.

The report will include:

- Date and time of mortality
- Identify, if possible, wind direction and speed when the bird was struck
- Weather conditions
- Location of mortality relative to habitat, vegetation, and water sources
- Analysis of any other mortality on the site
- Conclusions of investigation regarding risk to the species and likelihood of further mortalities on site
- Recommendations for future actions to mitigate impacts on the species, and options for other mitigation including deterrents.

DRAFT

Table 5: Specific trigger actions in response to BWP/WTNT/FTS mortalities at HWF.

Impact Trigger	Actions	Description	Timing
Level 1: A single or several individuals of the species of concern are recorded dead under a turbine within a single event.	1. Label the turbine as a "high risk – impact trigger level one (T1)" turbine.	This event activates the species-specific management strategy as follows.	Immediately following mortality.
	2. Increase carcass search coverage around the trigger turbine	An additional 70 m radius searches of T1 and all turbines within 1 km of it. If one or more carcasses are detected at another turbine within a 1 km radius, the management strategy outlined in this table will apply independently. The findings of the searches will be recorded and reported to DEECA/DCCEEW within 28 days as detailed in Section 5.1.2.	Within a week of the mortality.
	3. Adaptive management and mitigation	Monthly activity monitoring over three months at T1 and all turbine locations within a 1 km radius of it (or during the remaining time that the species is expected on site). For **BWP** this should also include the closest woodland habitat (i.e., woodland patches and tree lines). Locations, movements/patterns of the species will be recorded, including the timing and possible reasons for periods of higher risk.	First monthly monitoring within two weeks of the mortality event for three months or the remaining duration of the expected time the species is present on site.
		If, for three consecutive months after the mortality event, or the remaining of the period in which migratory species are expected on site (**WTNT and FTS**), no additional fatality events occur at the T1 turbine, and it is concluded that any previous fatality was an isolated incident and that the turbine does not pose a high risk to the listed species, no further mitigation actions will be required.	Within three consecutive months from the date of the mortality.
		T1 turbine mitigation implementation If, following an investigation by a qualified ecologist, the fatality is unlikely to be a one-off event or if an ongoing impact is likely to be significant for the species, the T1 turbine will require mitigation implementation. This may include, but is not limited to, measures such as blade painting or time-bound curtailment around dawn and dusk (up to 1 hour before sunrise and after sunset) when species of	Immediately following investigation outcomes. Mitigation may be permanent or applied during high-risk periods when the species are likely present on site. Measures requiring procurement or

DRAFT

Impact Trigger	Actions	Description	Timing
		concern are particularly active, and when visibility is limited (refer to Section 4.2.1). Non-permanent adaptive measures, like curtailment, are applied only while risk is high (e.g., elevated numbers, carcass triggers, or seasonal activity).	installation will be implemented within a reasonable timeframe.
Level 2: Second strike (a single or several individuals of the species of concern are recorded dead under a turbine assigned as "high risk" under Trigger 1) during a subsequent search.	1. Label the turbine as a "high risk – impact trigger level one (T2)" turbine.	This event activates the species-specific management strategy as follows.	Immediately following mortality.
	2. Increase carcass search coverage around the trigger turbine	An additional carcass search on T2 and all turbine locations within a 1 km radius of it to assess the extent of the impact, minimise the chances of scavenging and maximise carcass detections, as outlined under Trigger 1. The findings of the searches will be recorded and reported to DEECA/DCCEEW within 28 days as detailed in Section 5.5.2.	Within a week of the mortality.
	3. Adaptive management and mitigation	*T2 turbine mitigation implementation* This may include, but is not limited to, measures such as blade painting or time-bound curtailment around dawn and dusk (up to 1 hour before sunrise and after sunset) when visibility for species of concern is limited. Non-permanent adaptive measures, like curtailment, are applied only while risk is high (e.g., elevated numbers, carcass triggers, or seasonal activity).	Mitigation may be permanent or applied during high-risk periods when the species are likely present on site. Measures requiring procurement or installation will be implemented within a reasonable timeframe; other measures to be applied immediately following mortality.
Level 3: Third strike (a single or several individuals of the species of concern are recorded dead under a turbine assigned as "high risk" under	1. Label the turbine as a "high risk – impact trigger level one (T3)" turbine.	This event activates the species-specific management strategy as follows.	Immediately following mortality.
	2. Activity monitoring across the wind farm	Conduct systematic monitoring of species' activity across the wind farm to detect the presence, abundance, and movements of the species of concern. This may include visual surveys, acoustic monitoring, or other appropriate techniques. Data collected will	Within three consecutive months from the date of the mortality or the remaining

DRAFT

Impact Trigger	Actions	Description	Timing
Trigger 2) during a subsequent search.		inform adaptive management measures, identify high-risk turbines, and guide decisions on targeted mitigation such as curtailment or deterrents.	duration of the expected time the species is present on site.
	3. Adaptive management and mitigation	*Wide-Range Mitigation Implementation* Automatic mitigation measures at the wind farm level will only be implemented if a Trigger 3 impact is reached, and at least one carcass of the same species of concern is found at another turbine more than 1 km away within 12 months of the last finding at T3, indicating potential risk across the broader wind farm. This may include previously defined measures, but is not limited to those if technological advances provide promising or proven alternatives. Such measures may also replace curtailment if successfully trialled at the wind farm level.	Measures requiring procurement or installation will be implemented within a reasonable timeframe; other measures to be applied immediately following mortality or as interim measures if needed.
		Assessment, consultation, and adaptive mitigation An assessment of population-level impacts will be conducted to evaluate the effectiveness of the applied mitigation measures and the estimated impact over the current year. The results will be presented and discussed with DEECA/DCCEEW to determine if a new set of actions is necessary, which may include curtailment or temporary shutdowns and/or other effective mitigation measures (which may include trials across the wind farm) if evidence indicates that a significant impact at the population level is anticipated. Population-level impacts may also trigger compensatory measures that will be discussed with DEECA/DCCEEW to identify the appropriate type and value (refer to Section 4.3).	Within four consecutive months from the date of the mortality.

DRAFT

5.2. Brolga strategy

Brolga

The Brolga is listed as endangered under the FFG Act. During the non-breeding season, Brolgas can form large flocks (occasionally as large as 200) but are typically seen in small groups (10 to 20 individuals). Breeding pairs can form long-term bonds and, if one of the pair dies, the remaining individual may take several seasons to find another mate (Marchant and Higgins, 1993). The Brolga's annual cycle is divided into two principal periods, as follows:

- The breeding season, (July to December), during which territorial pairs nest in shallow freshwater wetlands that are often ephemeral and hold water reliably in winter and spring.
- The flocking (non-breeding) season (December to June), when Brolga disperse from their breeding wetlands, which are drying up, to larger wetlands that are more permanent. Here, they form flocks that roost at the wetland and forage in adjacent terrestrial and wetland habitats (DSE, 2012).

Between the breeding and flocking seasons, Brolga move between their breeding and flocking sites during two migration periods that are roughly consistent with the seasons above although variations due to weather can be expected.

5.2.1. Impact triggers and mitigation responses

This species-specific management strategy outlines trigger responses to mitigate the impacts of the operational HWF on Brolga. Reporting will follow the requirements in Section 6, as well as incident-specific correspondence and reports to DEECA/DCCEEW, which will require discussion and feedback from the Department.

For Brolga, a single impact trigger is used because their low numbers, strong site fidelity, and localised habitat use make impacts predictable. While mitigation is applied locally at the affected turbine or area, investigations can be conducted across the wind farm to identify any changes in habitat utilisation or new high-risk areas, ensuring mitigation is appropriately targeted.

Table 6 details the specific trigger actions in response to avian mortalities involving this species of concern.

5.2.2. Incident reporting

The incident investigation following each trigger event will seek to assess any relevant attributes associated with the mortality event. An incident report is to be submitted to the Responsible Authority within 28 days of the mortality.

The report will include:

- Date and time of mortality
- Identify, if possible, wind direction and speed when the bird was struck
- Weather conditions
- Location of mortality relative to habitat, vegetation, and water sources
- Analysis of any other mortality on the site
- Conclusions of investigation regarding risk to the species and likelihood of further mortalities on site
- Recommendations for future actions to mitigate impacts on the species, and options for other mitigation including deterrents.

Table 6: Specific trigger actions in response to Brolga mortalities at HWF.

Impact Trigger	Actions	Description	Timing
Impact trigger: A single or several individuals of Brolga are recorded dead under a turbine within a single event.	1. Label the turbine as a "high risk – impact trigger" turbine.	This event activates the species-specific management strategy as follows.	Immediately following mortality.
	2. Increase carcass search coverage around the trigger turbine	Additional searches of all turbines within 1 km of it. If one or more carcasses are detected at another turbine within a 1 km radius, the management strategy outlined in this table will apply independently. The findings of the searches will be recorded and reported to DEECA/DCCEEW within 28 days as detailed in Section 5.2.2.	Within a week of the mortality.
	3. Adaptive management and mitigation	*Assessment across the wind farm* Intensive activity monitoring will be conducted for up to three months to determine the species home range and assess whether the impacted turbine falls within current or previously utilised areas. This investigation across the wind farm will help identify turbines at potential risk and guide the implementation of targeted, localised mitigation measures, ensuring impacts are effectively managed despite the species' low numbers and site fidelity.	Within three months from the date of the mortality.
		If, following an investigation by a qualified ecologist, the fatality is deemed as a one-off unpredictable event, and is determined that the turbine does not pose a high risk to the listed species, no further mitigation actions will be required.	Within three consecutive months from the date of the mortality.
		Adaptive mitigation implementation (as required) If, following an investigation by a qualified ecologist, the fatality is unlikely to be a one-off event or if an ongoing impact is likely to be significant for the species, the impact trigger turbine and other turbines identified from the home range analysis will require mitigation implementation. Measures may include, but are not limited to, blade painting, automated curtailment systems, or other proven or trialled technologies (refer to Section 4.2.1).	Immediately following investigation outcomes. Measures requiring procurement or installation will be implemented within a reasonable timeframe.

DRAFT

5.3. Black Falcon/Wedge-tailed Eagle strategy

Black Falcon

BF has a sparse distribution in Victoria, mainly associated with farmland, open eucalypt woodlands, mallee woodlands, and inland wetlands. BF numbers may fluctuate in Victoria due to prey availability and drought/rains further inland (Marchant and Higgins 1993). Pairs in the temperate agricultural region are believed to be mostly resident (Debus et al. 2017) although may occupy summer non-breeding territories depending on prey availability (Debus et al. 2005). The species is often drawn to croplands and observed shadowing farm machinery to hunt flushed prey when sowing, harvesting, and burning of crops is occurring (Debus 2022).

The occurrence of this species on site is expected to be very infrequent. The foraging behaviour of raptor species puts them at risk with collision above other bird groups. However, as this species is considered to occur in the area only irregularly, collisions would be expected to be highly infrequent. Therefore, it is considered unlikely that the project would make a significant contribution to cumulative impacts to the population of this species.

Wedge-tailed Eagle

WTE is Australia's largest bird of prey and is widely distributed across the Australian continent and Tasmania. WTE feeds on medium and small vertebrates and carrion of larger animals such as kangaroos, sheep and livestock (Debus and Kirwan 2020).

The WTE is known as Bunjil by central and west-Victorian Aboriginals, who hold a strong connection to the species significance as the ultimate form of the creator of the land, water, animals and sky (DELWP 2022). For this reason, WTE is included in this BAM Plan.

No studies are available to date on WTE behaviour around wind energy facilities, or the effect of new projects on existing pairs. WTE are found to collide with the moving blades of operating turbines in higher rates than other raptors due to their flight heights, soaring habits, and potential attraction by livestock and sheep carcasses found under turbines when in grazing farmland (Nature Advisory unpublished data).

Protecting existing nests will allow the existing breeding pair(s) to keep the territory and may decrease disputes with neighbouring pairs over new nesting sites, and the number of floaters occurring in the area, leading to lower risks of WTG collisions. Table 7 details the specific trigger actions in response to avian mortalities involving this species of concern.

5.3.1. Impact triggers and mitigation responses

This species-specific adaptive management strategy outlines a hierarchical set of trigger responses to mitigate the impacts of the operational HWF on Black Falcon (BF) and Wedge-tailed Eagle (WTE). Reporting will follow the requirements in Section 6, as well as incident-specific correspondence and reports to DEECA/DCCEEW, which will require discussion and feedback from the Department.

Table 7 details the specific trigger actions in response to mortalities involving these species of concern.

5.3.2. Incident reporting

The incident investigation following each trigger event will seek to assess any relevant attributes associated with the mortality event. An incident report is to be submitted to the Responsible Authority within 28 days of the mortality.

The report will include:

- Date and time of mortality
- Identify, if possible, wind direction and speed when the bird was struck
- Weather conditions
- Location of mortality relative to habitat, vegetation, and water sources
- Analysis of any other mortality on the site
- Conclusions of investigation regarding risk to the species and likelihood of further mortalities on site

Recommendations for future actions to mitigate impacts on the species, and options for other mitigation including deterrents.

DRAFT

Table 7: Specific trigger actions in response to Black Falcon/Wedge-tailed Eagle mortalities at HWF.

Impact Trigger	Actions	Description	Timing
Level 1: A single Black Falcon or Wedge-tailed Eagle is recorded dead under a turbine within a single event.	1. Label the turbine as a "high risk – impact trigger level one (T1)" turbine.	This event activates the species-specific management strategy as follows.	Immediately following mortality.
	2. Increase carcass search coverage around the trigger turbine	Additional searches of all turbines within 1 km of T1 turbine. If one or more carcasses are detected at another turbine within a 1 km radius, the management strategy outlined in this table will apply independently. The findings of the searches will be recorded and reported to DEECA/DCCEEW within 28 days as detailed in Section 5.3.2.	Within a week of the mortality.
	3. Adaptive management and mitigations	*Activity investigation and mitigation around nesting sites (as required)* Activity monitoring will be conducted within three weeks, primarily focused on T1 and nearby turbines (within 1km of T1), but also including roaming surveys to assess breeding activity and species' occurrence and utilisation patterns across the wind farm in relation to turbine locations. If an active nest of the species of concern is detected, a 300 m buffer will be applied, with turbines within this area subject to daytime curtailment until the offspring have fledged. Operational curtailment at these sites can be replaced with technological alternatives such as smart curtailment systems, if implemented.	Within three weeks of the mortality event. Curtailment to be applied as soon as an active nest is located within 300 m of any operational turbine.
		If, for three consecutive months after the mortality event no additional fatality events occur at the T1 turbine, and it is concluded that any previous fatality was an isolated incident and that the turbine does not pose a high risk to the listed species, no further mitigation actions will be required.	Within three consecutive months from the date of the mortality.

DRAFT

Impact Trigger	Actions	Description	Timing
		T1 turbine mitigation implementation (as required) If, following an investigation by a qualified ecologist, the fatality is unlikely to be a one-off event or if an ongoing impact is likely to be significant for the species, the T1 turbine will require mitigation implementation. This may include, but is not limited to, measures such as blade painting or operational/smart curtailment (refer to Section 4.2.1).	Immediately following investigation outcomes. Mitigation may be permanent or applied during high-risk periods when the species are likely to be most active on site. Measures requiring procurement or installation will be implemented within a reasonable timeframe.
Level 2: A second Black Falcon or Wedge-tailed Eagle is recorded dead under a turbine assigned as "high risk" under Trigger 1) during a subsequent search.	1. Label the turbine as a "high risk – impact trigger level one (T2)" turbine.	This event activates the species-specific management strategy as follows.	Immediately following mortality.
	2. Increase carcass search coverage around the trigger turbine	Additional carcass search at nearby turbines (within 1km) to assess the extent of the impact, minimise the chances of scavenging and maximise carcass detections, as outlined under Trigger 1. The findings of the searches will be recorded and reported to DEECA/DCCEEW within 28 days as detailed in Section 5.3.2.	Within a week of the mortality.
	3. Adaptive management and mitigation	*T2 turbine mitigation implementation* T2 turbine will require mitigation implementation. This may include, but is not limited to, measures such as blade painting or operational/smart curtailment (refer to Section 4.2.1). For **Black Falcon**, mitigation is warranted when at least two carcasses are recorded (Trigger Level 2), whereas for **Wedge-tailed Eagle**, it is warranted when three or more carcasses are recorded. The only exception for Wedge-tailed Eagle is if a nest is located within 300 m of T2, in which case mitigation should be applied as outlined under Trigger Level 1.	Measures requiring procurement or installation will be implemented within a reasonable timeframe. Interim operational mitigation measures to be implemented.

DRAFT

Impact Trigger	Actions	Description	Timing
Level 3: A third Black Falcon or Wedge-tailed Eagle is recorded dead under a turbine assigned as "high risk" under Trigger 2) during a subsequent search.	1. Label the turbine as a "high risk – impact trigger level one (T3)" turbine.	This event activates the species-specific management strategy as follows.	Immediately following mortality.
	2. Adaptive management and mitigation	*T3 turbine mitigation implementation* T3 turbine will require mitigation implementation to protect the species of concern. This may include, but is not limited to, measures such as blade painting or operational/smart curtailment (refer to Section 4.2.1).	Measures requiring procurement or installation will be implemented within a reasonable timeframe. Interim operational mitigation measures to be implemented.
		Mitigation implementation across the wind farm (as required) **Black Falcon**: Mitigation measures at the wind farm level will only be implemented if a Trigger 3 impact is reached, and at least one carcass of the same species of concern is found at another turbine more than 1 km away within 12 months of the last finding at T3, indicating potential risk across the broader wind farm. **Wedge-tailed Eagle**: An assessment of population-level impacts will be conducted to evaluate the estimated impact over the current year. The results will be presented and discussed with DEECA/DCCEEW to determine if a new set of mitigation actions is necessary if evidence indicates that a significant impact at the population level is anticipated. Population-level impacts may also trigger compensatory measures that will be discussed with DEECA/DCCEEW to identify the appropriate type and value (refer to Section 4.3).	Measures requiring procurement or installation will be implemented within a reasonable timeframe; other measures to be applied immediately following mortality or as interim measures if needed. Within four consecutive months from the date of the mortality.

DRAFT

5.4. Grey-headed Flying-fox (GHFF) management strategy

Grey-headed Flying-fox

The Grey-Headed Flying-fox is Australia's largest bat and is currently listed as vulnerable under the EPBC Act and the FFG Act. The species occurs in a coastal belt from south of Gladstone in central Queensland to Adelaide in South Australia (Australasian Bat Society 2025). Only a small proportion of the range is in use at any one time, as the species forages according to food availability. As a result, patterns of occurrence and relative abundance vary greatly between places, seasons and years.

The species typically commutes each day between camps and foraging areas, usually within 15–20 km of the day roost site (Tidemann 1999) but have been known to travel further in the search of food (DAWE 2021). Grey-Headed Flying-foxes have been recorded foraging up to 50 km from their roosting sites. All individuals typically leave the roosting site synchronously at dusk (Parry-Jones and Augee 1992). The species is primarily a canopy-feeding frugivore and nectivore, most commonly utilising rainforests, open forest, and closed and open woodlands.

5.4.1. Targeted monitoring

Because the GHFF is expected to appear sporadically and unpredictably at the HWF site, monitoring is anticipated to be challenging and indirect. The presence of this species is influenced by fruiting and flowering events, especially the flowering of Sugar Gum in SW Victoria, which is known to attract these bats to the region. Given these factors and the distance of HWF from permanent camps, establishing an effective regular monitoring program is not feasible. Instead, the monitoring program will follow the strategy below for the first two operational years, except database monitoring of camps, which will continue for the life of the wind farm to enable timely management and mitigation of potential impacts.

- **Habitat surveys:** Undertake annual habitat suitability assessments in and around the wind farm site (e.g., presence of flowering gums, or other fruiting trees, presence of water).
- **Species database monitoring:** Annual reviews of relevant databases, including the National Flying-fox Management Program data (available at: https://data.csiro.au/) to get up-to-date information on camp locations and numbers.
- **Community engagement:** Regular discussions with wind farm personnel, landholders, and DEECA/DCCEEW regarding the species presence, and assess its potential increase in prevalence within the site and its surroundings.

This information will guide the qualified ecologist in scheduling field visits to confirm its presence, estimate numbers, and potentially map flight paths within the wind farm layout to identify areas prompt for collisions.

5.4.2. Impact triggers and mitigation responses

This species-specific management strategy outlines trigger responses to mitigate the impacts of the operational HWF on GHFF. Reporting will follow the requirements in Section 6, as well as incident-specific correspondence and reports to DEECA/DCCEEW, which will require discussion and feedback from the Department.

For Grey-headed Flying-fox, a single impact trigger is used because their presence at the wind farm is often unpredictable in time and space. Mitigation is applied at turbines where impacts are detected, while monitoring across the wind farm helps identify areas of activity and inform targeted responses. The GHFF unpredictable presence at the site makes this strategy reliant on targeted investigations, with a response structure distinct from that for other species of concern.

DRAFT

Table 8 details the specific trigger actions in response to mortalities involving this species of concern.

5.4.3. Incident reporting

The incident investigation following each trigger event will seek to assess any relevant attributes associated with the mortality event. An incident report is to be submitted to the Responsible Authority within 28 days of the mortality.

The report will include:

- Date and time of mortality
- Identify, if possible, wind direction and speed when the bird was struck
- Weather conditions
- Location of mortality relative to habitat, vegetation, and water sources
- Analysis of any other mortality on the site
- Conclusions of investigation regarding risk to the species and likelihood of further mortalities on site
- Recommendations for future actions to mitigate impacts on the species, and options for other mitigation including deterrents.

DRAFT

Table 8: Specific trigger actions in response to GHFF mortalities at HWF.

Impact Trigger	Actions	Description	Timing
Impact Trigger: A single or several GHFF are recorded dead under a turbine within a single event (i.e. over the length of one search period or as incidental).	1. Increase carcass search coverage around the trigger turbine	Additional carcass searches of the impact trigger turbine and all turbines within 1 km of it. The findings of the searches will be recorded and reported to DEECA/DCCEEW within 28 days as detailed in Section 5.4.3..	Weekly for one month after the mortality, with the initial search undertaken within three days of the event.
	2. Investigation	Investigate the location, presence, and timing of flying fox activity to understand the factors that may have led to the collision and whether they are still occurring (e.g., weather pattern, location, food availability, active camps, etc.).	Within a week of the mortality.
	3. One-time carcass search (GHFF activity areas)	If, during the investigation, activity areas such as flowering gum hotspots or resting sites are identified within the project area, a one-off carcass search of turbines within 1 km of the identified activity areas will be conducted.	Within 10 days of the mortality.
	4. Activity monitoring and risk categorisation	If, for three consecutive months, no additional fatality events occur at the turbine, and it is concluded that any previous fatality at this turbine or additional findings at other turbines were isolated incidents and that the turbine does not pose a high risk to the listed species, no further mitigation actions will be required.	For three consecutive months following the mortality.
	5. Post- investigation (ongoing impact identified)	Targeted monitoring will be undertaken immediately to increase understanding of species movements/patterns at specific locations. Targeted monitoring will focus on known and potential camps within 50 km of HWF, and camp fly-out surveys will occur only for active camps (i.e., flying-foxes present).	Camp assessments completed within two weeks of the mortality to determine camp activity. Weekly camp assessments and fly-out surveys are completed at any active camps until the camp is inactive (i.e. no flying-foxes present).

DRAFT

Impact Trigger	Actions	Description	Timing
		Implement specific mitigation based on targeted monitoring observations (e.g., consistent 'at risk' presence is observed at a particular location, or multiple collision events occur at a turbine). Mitigation will be implemented as soon as reasonably possible depending on equipment procurement and installation timing. Mitigation may include, but not be limited to, increasing nighttime low wind-speed cut-in speed and/or targeted turbine curtailment or temporary shutdown. Alternative deterrent mitigation measures will also be implemented and trialled on-site as proven technologies become available, depending on equipment procurement and installation timing[4].	TBD (informed by targeted monitoring).
	6. Mitigation	If mitigation proves ineffective at reducing collisions, intensified mitigation measures, and/or additional mitigation will be considered and implemented, in consultation with DEECA/DCCEEW, which may include the use of remote sensing technologies such as radar, thermal imaging, etc. During this period, the wind farm operator will: ▪ Monitor and review mitigation effectiveness. ▪ Regularly consult with DEECA/DCCEEW on findings and the feasibility of mitigation. ▪ Follow the reporting protocols and lines of responsibility in Sections 6, 7and 8 of this BAM Plan.	Specific timing will be determined following discission with DEECA/DCCEEW regarding agreed course of action

[4] Refer to Appendix 3 and Section 10.5 of the *Hexham Wind Farm Bat Impact Assessment Report* for more details on these technologies.

DRAFT

5.5. Southern Bent-wing Bat/Yellow-bellied Sheath-tailed Bat strategy

Southern Bent-wing Bat

The SBWB is an obligate cave-roosting species with a restricted distribution (19,452 km^2) in south-eastern Australia that spans an area from Robe, Naracoorte and Port MacDonnell in south-east South Australia, extending eastwards to Lorne and Pomborneit in south-west Victoria (Churchill, 2008; Threatened Species Scientific Committee, 2021). There is a small area of overlap in the distribution of the SBWB and Eastern Bent-wing Bat in western Victoria, where individuals of each subspecies may roost together in some non-maternity caves (Threatened Species Scientific Committee, 2021).

SBWB is a nocturnal, aerial hawking insectivorous species with a fast, direct flight pattern (Dwyer, 1965). Where there are trees, SBWBs typically forage in open spaces above the canopy, but can fly closer to the ground in more open areas (Churchill, 2008; Threatened Species Scientific Committee, 2021). Limited radio-tracking studies have shown that SBWBs hunt in a range of habitat types, forested areas, native remnant vegetation, and over cleared agricultural and grazing land (Grant, 2004; Stratman, 2005; Threatened Species Scientific Committee, 2021). SBWB also show a preference for seasonally inundated wetlands (Stratman, 2005). DELWP (2020) state that wetlands with terrestrial vegetation occurring around the fringes and aquatic vegetation within the swamp itself are used extensively, with individuals recorded flying considerable distances from roost caves to reach these foraging areas.

SBWB were detected at HWF during pre-construction surveys. Analysis of SBWB activity showed that SBWB calls decreased with decreasing temperature and increasing wind speed. Low-windspeed cut-in (4.5 m/s) will be applied to all turbines categorised as higher or moderate risk at the time of year (September to April) and time of day (30 mins before sunset to 30 minutes after sunrise) when SBWB are most active. Post-construction monitoring will collect additional information on SBWB activity and behaviour, which will be used to refine these curtailment measures.

Yellow-bellied Sheath-tailed Bat

The YBSB is a wide-ranging species present through tropical and sub-tropical Australia. The species occurs in a wide range of habitats from wet and dry sclerophyll forests to open woodlands. It usually roosts in large tree hollows but sometimes uses buildings (Churchill, 2008; Menkhorst, 1995; NSW Office of Environment and Heritage, 2021). There is no information on the number of YBSBs that are present in Victoria, but the species is considered to be a rare visitor to southern Australia, predominantly in late summer and autumn (NSW Office of Environment and Heritage, 2021). The YBSB is an open-space adapted species that flies high and fast above the canopy of forests and woodlands (Hall and Richards, 2023).

YBSB were detected at HWF during pre-construction surveys.

5.5.1. Impact triggers and mitigation responses

This species-specific management strategy outlines a hierarchical set of trigger responses to mitigate the impacts of the operational HWF on Southern Bent-wing Bat (SBWB) and Yellow-bellied Sheath-tailed Bat (YBSB). Reporting will follow the requirements in Section 6, as well as incident-specific correspondence and reports to DEECA/DCCEEW, which will require discussion and feedback from the Department.

Table 9 details the specific trigger actions in response to mortalities involving these species of concern.

5.5.2. Incident reporting

The incident investigation following each trigger event will seek to assess any relevant attributes associated with the mortality event. An incident report is to be submitted to the Responsible Authority within 28 days of the mortality.

The report will include:

- Date and time of mortality
- Identify, if possible, wind direction and speed when the bird was struck
- Weather conditions
- Location of mortality relative to habitat, vegetation, and water sources
- Analysis of any other mortality on the site
- Conclusions of investigation regarding risk to the species and likelihood of further mortalities on site
- Recommendations for future actions to mitigate impacts on the species, and options for other mitigation including deterrents.

DRAFT

Table 9: Specific trigger actions in response to SBWB/YBSB mortalities at HWF.

Impact Trigger	Actions	Description	Timing
Level 1: A single or several individuals of SBWB or YBSB are recorded dead under a turbine within a single event.	1. Label the turbine as a "high risk – impact trigger level one (T1)" turbine.	This event activates the species-specific management strategy as follows.	Immediately following mortality.
	2. Increase carcass search coverage around the trigger turbine.	An additional one-off 70 m radius search of T1 and all turbines within 1 km of it. If one or more carcasses are detected at another turbine within a 1 km radius, the management strategy outlined in this table will apply independently. The findings of the searches will be recorded and reported to DEECA/DCCEEW within 28 days as detailed in Section 5.5.2.	Within a week of the mortality.
	3. Adaptive management and mitigation	*Low wind speed curtailment – T1-targeted* The cut-in parameters of T1 will be increased by 1.5m/s between sunset and sunrise for the October to April (inclusive) period (this being the period when bat activity is likely to be highest. This cut-in speed will remain as an operational setting unless evidence determines it is not warranted.	Immediately following mortality
		Inclusion in Carcass Monitoring Inclusion of the high-risk turbine in the monthly carcass monitoring if it is not already being monitored, with a 70 m radius search.	Immediately.
Level 2: Second strike (a single or several individuals of SBWB or YBSB are recorded dead under a turbine	1. Label the turbine as a "high risk – impact trigger level two (T2)" turbine.	This event activates the species-specific management strategy as follows.	Immediately following mortality.

DRAFT

Impact Trigger	Actions	Description	Timing
assigned as "high risk" under Trigger 1) during a subsequent search.	2. Increase carcass search coverage around the trigger turbine.	Additional carcass search on T2 and nearby turbines to assess the extent of the impact, minimise the chances of scavenging and maximise carcass detections, as outlined under Trigger 1. The findings of the searches will be recorded and reported to DEECA/DCCEEW within 28 days as detailed in Section 5.5.2.	Within a week of the mortality.
	3. Adaptive management and mitigation	*Low wind speed curtailment – T2 buffer & bat deterrents* The cut-in speed of T2 and all turbines within a 1 km radius of T2 will be increased by 1.5m/s (to a maximum of 6 m/s) between sunset and sunrise for the October to April (inclusive) period (this being the period when bat activity is likely to be highest). If T2 was running at a cut-in speed of 6 m/s it will remain at that cut-in speed. This cut-in speed will remain as an operational setting unless evidence determines it is not warranted. Acoustic deterrents will be placed on T2 and all turbines within a 1 km radius of T2. Use of ultrasound acoustic deterrents at high-risk turbines, if available and proven effective in Victoria. Note – these devices and other relevant emerging technologies (refer to Section 4.2.1) have not undergone rigorous testing at Australian wind farms to determine effectiveness. However, HWF are committed to trialling as part of this impact trigger.	Curtailment: immediately following mortality. Deterrents: within a reasonable implementation period (following procurement and installation).

DRAFT

Impact Trigger	Actions	Description	Timing
Level 3: Third strike (a single or several individuals of SBWB or YBSB are recorded dead under a turbine assigned as "high risk" under Trigger 2) during a subsequent search.	1. Label the turbine as a "high risk – impact trigger level three (T3)" turbine.	This event activates the species-specific management strategy as follows.	Immediately following mortality.
	2. Increase carcass search coverage around the trigger turbine	Additional carcass search on T3 and nearby turbines to assess the extent of the impact, minimise the chances of scavenging and maximise carcass detections, as outlined under Trigger 1. The findings of the searches will be recorded and reported to DEECA/DCCEEW within 28 days as detailed in Section 5.5.2.	Within a week of the mortality.
	3. Adaptive management and mitigation	*Low wind speed curtailment – across the wind farm & bat deterrents* Automatic low wind speed curtailment and bat deterrents at the wind farm level will only be implemented if a Trigger 3 impact is reached, and at least one carcass of the same species of concern is found at another turbine more than 1 km away within 12 months of the last finding at T3, indicating a potential risk across the broader wind farm. All turbines where listed microbat carcasses have been found will have bat deterrents installed. All turbines, including those not currently included in formal carcass searches, will have their cut-in speed increased by 1.5 m/s (to a maximum of 6 m/s) from the manufacturer's baseline between sunset and sunrise from October to April, the period when bat activity is likely to be highest. A trial of bat deterrents will be conducted across the wind farm, including both treatment and control turbines, with different cut-in speeds established during a one-year trial to assess effectiveness for all microbat species. This trial is intended not only to determine deterrent effectiveness but also to inform whether localized or farm-wide deployment is warranted, and whether the combination of increased cut-in speeds and acoustic deterrents is effective, which may allow for a reduction in cut-in speeds when deterrents are incorporated.	Curtailment: within a week of the mortality. Deterrents: within a reasonable implementation period (following procurement and installation)

DRAFT

Impact Trigger	Actions	Description	Timing
		Assessment, consultation, and adaptive mitigation An assessment of population-level impacts will be conducted after a T3 impact trigger to evaluate the effectiveness of the applied mitigation measures and the estimated impact over the current year. The results will be presented and discussed with DEECA/DCCEEW to determine if a new set of actions is necessary, which may include further curtailment or temporary shutdowns if evidence indicates that a significant impact at the population level is anticipated. Population-level impacts may also trigger compensatory measures that will be discussed with DEECA/DCCEEW to identify the appropriate type and value (refer to Section 4.3).	Within four consecutive months from the date of the mortality.

DRAFT

6. Reporting and review

This section of the plan outlines the reporting arrangements for this BAM Plan. Further to the schedule detailed in Table 10, the wind farm operator, in consultation with the qualified ecologist and/or the regulator, may convene reporting and reviewing meetings as required.

Table 10: HWF BAM Plan reporting and review.

Report Type	Timing	Detail	Who
First annual report	Within 3 months of the first year of mortality monitoring.	This will present the results from carcass monitoring and will include, but not be limited to, the following. ▪ Summary of post-construction carcass search results and total survey days. ▪ Discussion of any identified seasonal or yearly variation in the number of bird or bat strikes within the first year. ▪ Summary of bird utilisation surveys, microbat surveys, and targeted monitoring. ▪ Summary of any additional targeted monitoring surveys required (if relevant) as part of mitigation measures or species-specific monitoring in response to impact triggers. ▪ Changes to protocols and methods (e.g., changed duration, frequency, and areas sampled). ▪ Raw data will be amended to the annual report. **Submitted to**: DEECA/DCCEEW and the Responsible Authority.	Qualified ecologist, in consultation with the wind farm operator
		Once available, this report will be presented at a review meeting with the Regional Manager at DEECA/DCCEEW (or their delegate) and the Responsible Authority. The results of the carcass searches will be reviewed and refinements to the monitoring program (if necessary) will be agreed.	Qualified ecologist Wind farm operator DEECA/DCCEEW Responsible Authority
Second annual report, fourth-year report, and final report	Within 3 months of the second, fourth, and fifth years of mortality monitoring.	This will present the results from carcass monitoring and will include, but not be limited to, the following: ▪ Detailed monitoring methods (including a list of observers, dates, and times of observations). ▪ Summary of post-construction carcass search results and total survey days. ▪ Overall mortality estimates for birds and bats, including estimates by size classes and for specific species where statistically possible, analysed by a suitably qualified statistician, and detected numbers for all species recorded during the carcass searches.	Qualified ecologist, in consultation with the wind farm operator

DRAFT

Report Type	Timing	Detail	Who
		▪ Any other mortality recorded on site but not during designated carcass searches (i.e., incidental records by site personnel, etc.). ▪ Comparison of bird utilisation surveys with pre-construction surveys, and a summary of microbat and targeted monitoring. ▪ Summary of any additional targeted monitoring surveys that were required (if relevant) as part of mitigation measures or species-specific monitoring in response to impact triggers. ▪ A discussion of the results, including the following: – Whether the level of mortality was ecologically significant or affected listed species of birds or bats (including species of concern to DEECA/DCCEEW). If a Population Viability Assessment exists for the affected species, it will be used in consultation with species experts to provide an objective and quantifiable approximation of the consequences of impacts. – Any differences between years that may have arisen due to wet and dry conditions. – Any recommendations for reducing mortality, if necessary. – Any mitigation or compensatory measures implemented, and the success or otherwise of these measures. ▪ Raw data will be amended to the annual report. **Submitted to**: DEECA/DCCEEW and the Responsible Authority.	
Impact trigger notification	Within 2 working days for listed species; or 7 working days for non-listed species	If an impact trigger is detected, HWF will notify via email of the impact trigger being recorded, as per Section 4 of this BAM Plan. **Submitted to**: DEECA/DCCEEW.	Wind farm operator
Investigation reports	Within 3 weeks of investigation conclusion	Following the investigation, a report will be prepared that will aim to: ▪ Determine the actual cause of death/injury. ▪ Focus on determining the likelihood of further occurrences (e.g., through engagement with key species experts, undertaking a literature review, assessment of habitat, etc). ▪ Identify suitable mitigation measures for immediate implementation. **Submitted to**: DEECA/DCCEEW and the Responsible Authority.	Qualified ecologist, in consultation with the wind farm operator

DRAFT

Following the completion of five years of monitoring, results will be reviewed by DEECA and DCCEEW to determine if further monitoring and reporting are required. This may result in ongoing regular, or periodic, carcass monitoring for the duration of wind farm operations if deemed necessary following the five-year monitoring period. If it is deemed the program should continue as is, the methodology and scope will be similar to that outlined in this report. If changes are required, an amended method will be developed in consultation with and approval of DEECA and DCCEEW.

DRAFT

7. Management actions

Management actions and survey details for post-construction bird and bat impact monitoring are summarised in Table 11.

Table 11: Timeline for surveys and reporting to DEECA/DCCEEW and the Responsible Authority after turbine commissioning at HWF.

Management action	Details	Report timing	Responsible
Carcass searches	30% of turbines will be searched every month, for a five-year period. The methodology will be subject to a review after a year with any refinements to the method implemented in consultation with and with the approval of DEECA/DCCEEW. Continuation of searches beyond five years would, if needed, likely be limited to intermittent spot searches, depending on the extent of significant impacts on bird and bat populations of concern.	Annual reports.	Qualified ecologist

DRAFT

8. Roles and responsibilities

Table 12 identifies all stakeholders involved in the implementation and oversight of this BAM Plan and their respective responsibilities.

Table 12: HWF BAM Plan implementation – roles and responsibilities.

Organisation	Responsible for
Hexham Wind Farm Pty Ltd (wind farm operator)	Implementation of all aspects of this BAM Plan and related decisions, with technical support provided by a qualified ecologist
Qualified ecologist	Provide advice on and oversee BAM Plan implementation.
	Prepare all technical reports for DEECA/DCCEEW.
	Assist in the development and implementation of mitigation and consult with DEECA/DCCEEW on the suitability and feasibility of management approaches.
DEECA and DCCEEW	Review reports from the wind farm operator arising from the routine (e.g., annual reports or reports of listed species impacts) or impact trigger response reporting.
	Provide feedback to the operator on BAM Plan implementation and wind farm operations.
	Participate in discussions about proposed mitigation and comment on their suitability and effectiveness.
Minister for Planning (responsible authority)	Determine the acceptability of impact mitigation and compensatory measures.
	Review reports from the wind farm operator arising from the routine (e.g., annual reports or reports of listed species impacts) or impact trigger response reporting.

DRAFT

References

Arnett, E.B., Baerwald, E.F., Mathews, F., Rodrigues, L., Rodríguez-Durán, A., Rydell, J., Villegas-Patraca, R., Voigt, C.C., 2016. Impacts of wind energy development on bats: a global perspective, in: Voigt, FC.C., Kingston, T. (Eds.), Bats in the Anthropocene: Conservation of Bats in a Changing World. Springer International Publishing, Cham, Switzerland, pp. 295–323.

Australasian Bat Society - BatMap. *Pteropus poliocephalus* at http://ausbats.org.au/batmap. Accessed 22/10/2025.

Biosis 2017. Mount Fyans Wind Farm. Brolga Report. Consultant's Report for Hydro Tasmania.

Biosis Research 2011. Penshurst Wind Farm: Targeted fauna assessment report. Consultant's Report for RES Australia Pty Limited.

Churchill, S., 2008. Australian Bats. Allen & Unwin, Australia.

Clean Energy Council (CEC) (2018) Best Practice Guidelines for the Australian Wind Industry. https://assets.cleanenergycouncil.org.au/documents/advocacy-initiatives/community-engagement/wind-best-practice-implementation-guidelines.pdf

Commonwealth of Australia 2017 EPBC Act Policy Statement 3.21 – Industry guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species. Commonwealth of Australia, Canberra.

Cooper, D., Green, T., Miller, M., Rickards, E., 2020. Bat impact minimization technology: an improved bat deterrent for the full swept rotor area of any wind turbine. California Energy Commission, United States. https://doi.org/10.2172/1608253

Debus, S. 2022, Australian Falcons: Ecology, Behaviour and Conservation.

Debus, S. 2023, Black Falcon (*Falco subniger*), version 2.0. In Birds of the World (S. M. Billerman, Editor). Cornell Lab of Ornithology, Ithaca, NY, USA.

Debus, S. and G. M. Kirwan 2020. Wedge-tailed Eagle (Aquila audax), version 1.0. In Birds of the World (J. del Hoyo, A. Elliott, J. Sargatal, D. A. Christie, and E. de Juana, Editors). Cornell Lab of Ornithology, Ithaca, NY, USA. Accessed 15/07/2024 https://birdsoftheworld.org/bow/species/weteag1/cur/introduction

Debus, S. J. S., A. L. Bauer, and G. I. Mitchell 2017, Breeding biology, behaviour and foraging ecology of the Black Falcon Falco subniger near Tamworth, New South Wales. Corella 41:71–82.

Debus, S. J. S., T. S. Hatfield, G. S. Olde, and A. B. Rose. 2005, Breeding behaviour and diet of a pair of Black Falcons Falco subniger in northern New South Wales. Australian Field Ornithology 22:165–181.

Department of Agriculture, Water and Environment (DAWE) 2022, Onshore Wind Farms – interim guidance on bird and bat management.

Department of Climate Change, Energy, the Environment and Water 2023 *Conservation Advice for Neophema chrysostoma (Blue-winged Parrot).* Department of Climate Change, Energy, the Environment and Water, Canberra.

Department of Environment, Land, Water and Planning 2022, Living with Wedge-tailed Eagles, Our Wildlife Fact Sheet. Melbourne. Accessed 15/07/2024 https://www.wildlife.vic.gov.au/__data/assets/pdf_file/0022/606181/Living-with-Wedge-tailed-Eagles-PDF.pdf

DRAFT

Department of Environment, Land, Water and Planning, 2020. National Recovery Plan for the Southern Bent-wing Bat *Miniopterus orianae bassanii*. Victorian Government, Melbourne.

Department of Transport and Planning (DTP) 2023, Planning Guidelines for Development of Wind Energy Facilities, published by Victorian Government Department of Transport and Planning.

Department of Sustainability, Environment, Water. Populations and Communities (DSEWPaC) 2012. Environment Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy, Commonwealth of Australia, Canberra.

Department of Sustainability and Environment (DSE) 2012, *Interim Guidelines for the Assessment, Avoidance, Mitigating and Offsetting of Potential Wind Farm Impacts on the Victorian Brolga Population,* Victorian Government (DSE), Melbourne, Australia.

Dwyer, P.D., 1965. Flight patterns of some eastern Australian bats. Victorian Naturalist 82, 36–41.

Emison, WB, Beardsell, CM, Norman, FI Loyn, RH, & Bennett, SC 1987, *Atlas of Victorian Birds.* Department of Conservation, Forests and Lands & Royal Australasian Ornithologists Union, Melbourne.

Foster, A.D.A.M. and Wallis, R., 2010. Breeding diet of the Wedge-tailed Eagle Aquila audax in southern Victoria. Corella, 34, pp.45-48.

Garcia-Rosa, P.B. and Tande, J.O.G., 2023, Mitigation measures for preventing collision of birds with wind turbines, *EERA DeepWind Conference*, 2626, 12072.Garnett, S., and Baker, G. 2021 *The Action Plan for Australian Birds 2020*. CSIRO Publishing, Clayton South.

Gilmour, L.R.V., Holderied, M.W., Pickering, S.P.C., Jones, G., 2020. Comparing acoustic and radar deterrence methods as mitigation measures to reduce human-bat impacts and conservation conflicts. PLoS ONE 15, e0228668. https://doi.org/10.1371/journal.pone.0228668

Good, R.E., Iskali, G., Lombardi, J., McDonald, T., Dubridge, K., Azeka, M., Tredennick, A., 2022. Curtailment and acoustic deterrents reduce bat mortality at wind farms. The Journal of Wildlife Management 86, e22244. https://doi.org/10.1002/jwmg.22244

Good R.E., Erickson W., Merrill A., Simon S., Murray K., Bay K. & Fritchman C. 2012, Bat monitoring studies at the Fowler Ridge Wind Energy Facility, Benton County, Indiana, April 1 – October 31, 2011. Western EcoSystems Technology, Inc. (WEST) report.

Gorresen, P.M., Cryan, P.M., Dalton, D.C., Wolf, S., Johnson, J.A., Todd, C.M., Bonaccorso, F.J., 2015. Dim ultraviolet light as a means of deterring activity by the Hawaiian hoary bat *Lasiurus cinereus semotus*. Endangered Species Research 28, 249–257. https://doi.org/10.3354/esr00694

Grant, C., 2004. Radiotracking of *Miniopterus schreibersii* at Naracoorte, South Australia. Department of Environment and Heritage (South Australia), Mt Gambier.

Hall, L.S., Richards, G.C., 2023. Yellow-bellied Sheath-tail Bat *Saccolaimus flaviventris* (Peters, 1867), in: Strahan's Mammals of AUstralia. Reed New Holland Publishers, NSW, Australia, pp. 577–578.

Higgins, PJ (ed) 1999, Handbook of Australian, New Zealand and Antarctic Birds, Volume 4: Parrots to Dollarbird, Oxford University Press, Melbourne.

Horn J.W., Arnett E.B. & Kunz T.H. 2008, Behavioral responses of bats to operating wind turbines. *The Journal of Wildlife Management,* 72, 123–132.

DRAFT

Hull, C.L. and Muir, S, 2010, Search areas for monitoring bird and bat carcasses at wind farms using a Monte-Carlo method. *Australasian Journal of Environmental Management* 17: 77–87.

Hull, C.L., Stark, E.M., Peruzzo, C. & Sims, C.C. 2013, Avian collisions and two wind farms in Tasmania, Australia. *New Zealand Journal of Zoology* 40(1):47–62.

Huso, M., 2011, An estimator of wildlife fatality from observed carcasses. *Environmetrics* 22(3):318–329.

Kennedy, SJ & Tzaros, CL 2005, Foraging ecology of the Swift Parrot *Lathamus discolor* in the Box-ironbark forests and woodlands of Victoria, *Pacific Conservation Biology* 11(3): 158–173.

Kuhlmann, K., Fontaine, A., Brisson-Curadeau, É., Bird, D.M., Elliott, K.H., 2022. Miniaturization eliminates detectable impacts of drones on bat activity. Methods in Ecology and Evolution 13, 842–851. https://doi.org/10.1111/2041-210X.13807.

Lentini, P.E., Lumsden, L.F., van Harten, E.M., 2025. Assessment, mitigation and monitoring of onshore wind turbine collision impacts on wildlife: A systematic review of the international peer-reviewed literature, and its relevance to the Victorian context. Arthur Rylah Institute for Environmental Research Technical Report Series No. 389. Department of Energy, Environment and Climate Action, Heidelberg, Victoria

McIsaac, H.P., 2001, Raptor acuity and wind turbine blade conspicuity. *Proceedings of National Avian-Wind Power Planning Meeting IV*, 59-87.

Marchant S & Higgins PJ (eds) 1993, Handbook of Australian, New Zealand and Antarctic birds, Volume 2: Raptors to Lapwings, Oxford University Press, Melbourne.

May, R., Nygård, T., Falkdalen, U., Åström, J., Hamre, Ø. and Stokke, B.G. 2020, Paint it black: Efficacy of increased wind-turbine rotor blade visibility to reduce avian fatalities. *Ecol Evol*.; 10: 8927–8935.

McClure, C.J.W., Rolek, B.W., Dunn, L., McCabe, J.D., Martinson, L., Katzner, T., 2021. Eagle fatalities are reduced by automated curtailment of wind turbines. Journal of Applied Ecology 58, 446–452. https://doi.org/10.1111/1365-2664.13831.

Menkhorst, P., 1995. 1995, Mammals of Victoria. Oxford University Press, Melbourne, Australia.

Moloney PD, Lumsden LF and Smales I 2019, Investigation of existing post-construction mortality monitoring at Victorian wind farms to assess it utility in estimating mortality rates. Arthur Rylah Institute for Environmental Research, Heidelberg, VIC.

NSW Office of Environment and Heritage, 2021. Threatened Species Profile Database - Yellow-bellied Sheath-tailed Bat Saccolaimus falviventris. NSW Office of Environment and Heritage, Hurstville, NSW.

Parry-Jones, K. and Augee, M. 1992, Movements of Grey-headed Flying-foxes (*Pteropus poliocephalus*) to and from a Colony Site on the Central Coat of New South Wales. *Wildlife Research*, 19: 331-340.

Rabie, P.A., Welch-Acosta, B., Nasman, K., Schumacher, S., Schueller, S., Gruver, J., 2022. Efficacy and cost of acoustic-informed and wind speed-only turbine curtailment to reduce bat fatalities at a wind energy facility in Wisconsin. PLoS ONE 17, e0266500. https://doi.org/10.1371/journal.pone.0266500

DRAFT

Romano, W.B., Skalski, J.R., Townsend, R.L., Kinzie, K.W., Coppinger, K.D., Miller, M.F., 2019. Evaluation of an acoustic deterrent to reduce bat mortalities at an Illinois wind farm. Wildlife Society Bulletin 43, 608–618. https://doi.org/10.1002/wsb.1025.

Rydell J., Bach L., Dubourg-Savage M.-J., Green M., Rodrigues L. & Hedenström A. 2010, Bat mortality at wind turbines in northwestern Europe. *Acta Chiropterologica,* 12, 261–274.

Stratman, B., 2005. Comparison of pine plantations and native remnant vegetation as habitat for insectivorous bats in south-eastern South Australia. Deakin University.

Symbolix 2020, *Post Construction Bird and Bat Monitoring at Wind Farms in Victoria*, Melbourne. Public report, 13th Wind Wildlife Research Meeting 2020.

Threatened Species Scientific Committee, 2021. Conservation Advice - *Miniopterus orianae bassanii* (Southern Bent-wing Bat). Department of Agriculture, Water and the Environment, Canberra, Australian Capital Territory.

Tidemann, C.R., 1999, Biology and management of the grey-headed flying-fox, *Pteropus poliocephalus. Acta Chiropterologica,* 1: 151-164.

Veltheim I, Cook S, Palmer G, Hill R and McCarthy M 2019. Breeding home range movements of pre-fledged brolga chicks, *Antigone rubicunda* (Gruidae) in Victoria, Australia – Implications for wind farm planning and conservation, *Global Ecology and Conservation* (2019), doi: https://doi.org/10.1016/j.gecco.2019.e00703.

Weaver, S.P., Hein, C.D., Simpson, T.R., Evans, J.W., Castro-Arellano, I., 2020. Ultrasonic acoustic deterrents significantly reduce bat fatalities at wind turbines. Global Ecology and Conservation 24, e01099. https://doi.org/10.1016/j.gecco.2020.e01099

Wellig S.D., Nusslé S., Miltner D., Kohle O., Glaizot O., Braunisch V., Obrist M.K. & Arlettaz R. 2018, Mitigating the negative impacts of tall wind turbines on bats: vertical activity profiles and relationships to wind speed. *PLOS ONE,* 13, e0192493.

Werber, Y., Hareli, G., Yinon, O., Sapir, N., Yovel, Y., 2023. Drone-mounted audio-visual deterrence of bats: implications for reducing aerial wildlife mortality by wind turbines. Remote Sensing in Ecology and Conservation 9, 404–419. https://doi.org/10.1002/rse2.316.

Whitby, M.D., O'Mara, T, Hein, C., Huso, M. & Frick, W. 2024 A decade of curtailment studies demonstrates a consistent and effective strategy to reduce bat fatalities at wind turbines in North America. Ecological Solutions and Evidence, 5(3), e12371.

Young D.P.Jr., Nomani S., Tidhar W.L. & Bay K. 2011 NedPower Mount Storm Wind Energy Facility post-construction avian and bat monitoring: July–October 2010. Western EcoSystems Technology, Inc. (WEST) report.

Zeale, M.R.K., Bennitt, E., Newson, S.E., Packman, C., Browne, W.J., Harris, S., Jones, G., Stone, E., 2016. Mitigating the Impact of Bats in Historic Churches: The Response of Natterer's Bats *Myotis nattereri* to Artificial Roosts and Deterrence. PLoS ONE 11. https://doi.org/10.1371/journal.pone.0146782.

Zeng, Z., and Sharma, A., 2023. Novel ultrasonic bat deterrents based on aerodynamic whistles. arXiv 2302, 08037. https://doi.org/10.48550/arxiv.2302.08037

DRAFT

Appendices

DRAFT

Appendix 1: Carcass search protocol

A qualified ecologist, or personnel trained in carcass searches, will undertake the searches. A supervising ecologist will oversee the searches, and a scent dog may be employed where appropriate.

Based on applying the Hull and Muir model (2010) to the HWF turbine model, 95% of bat carcasses are expected to be found within 74m of the turbine, and carcasses of medium to large birds are expected to be reasonably evenly distributed out to 122m. Carcasses of very large birds (e.g., Wedge-tailed Eagle) may be found a little further out, but 95% are expected to be within 130m of the turbine. This has been used to determine the inner and outer circular search zones, as follows:

- The **inner zone** targets the detection of carcasses of bats and small to large-sized birds. The zone is a circle with a 70m radius from the turbine and transects are spaced every 6m (Figure 3).
- The **outer zone** targets the detection of carcasses of medium to large-sized birds. The zone is a circle between 70m and 130m radius circles from the turbine. Search transects are spaced at 12m and carried out from the edge of the inner zone to the edge of the outer zone (Figure 3).

All turbines once operational will be searched once per month. Each search and carcasses found will be documented in the form provided in Appendix 2.

Scent dogs

Trained scent dogs will be the recommended option for carcass searches, depending on their availability and handlers familiarity with the appropriate skills and familiarity with the local fauna to undertake the searches. The searching protocol will be based on a minimum detection ability where dogs must maintain at a searcher efficiency of 50% or greater during efficiency trials. If both humans and dogs are used, this factor will be corrected in the searcher efficiency trials as outlined below.

The method used when using dogs will generally involve:

1. The dogs will work on a reference transect line from downwind to upwind.
2. The handler will start downwind of the turbine and walk across the direction of the wind allowing the dog to freely zigzag across the searcher's transects, using whistle commands to control how far the dog moves to each side of the transect (i.e., 30 m). This will ensure all scent cone areas will be encountered (Figure 4).
3. The dog does not 'look' for carcasses but finds them via scent. Therefore, it does not need to cover as much ground as if it were looking with its eyes. It only needs to cover enough ground to encounter all possible 'scent cones' within the search radius.
4. Carcasses found outside the defined search area will be recorded and collected as an incidental find.
5. The scent cone is the area downwind of the target, in this case, a carcass, in which the scent will drift with the wind. So, if the wind is strong; the scent will drift further but in a narrower scent cone, and if the wind is light, the scent cone will be wider but will not drift as far. In the case of strong wind, then transects will need to be narrow to ensure scent cone areas are encountered. Whereas transects of approximately 30 m wide will be adequate to cover an area in moderate wind conditions, this will be reduced to 10 or 20 m in conditions with no wind or strong wind.
6. A GPS collar will be fitted to the dog which will allow the handler to track movements in real-time and allow the handler to ensure the entire search area has been effectively covered by the dog.
7. Search areas will be loaded onto GPS prior to commencing searches to allow the handler to see the exact borders of the area and the dog's movements within it.
8. GPS data will be made available to regulators on request.

DRAFT

Dog handler(s) will have demonstrated capacity to identify bird and bat species of south-east Australia.

Search regime

All turbines will be searched out to 130 m once per month. The order of turbines searched will be randomised between searches.

To maximise detectability, particularly for species prone to quicker scavenging than larger ones such as small birds and bats, a secondary 'pulse' search will be undertaken every month during the monitoring program. Pulse searches entail searching in the same way the 'inner zone' (out to 70 m) again two to three days after the initial search. This will maximise the detectability of most species of concern.

After the initial 12-month pulse search period, the requirement for another 12 months of pulse searches will be reviewed in the first annual report depending on the species and number of carcasses found.

Carcass detection protocol

This carcass detection protocol applies to both incidental carcass finds and the formal carcass search program. If a carcass is detected (a 'find') the following variables will be recorded in the Carcass Search Data Sheet (Appendix 2):

- Position of the carcass relative to the turbine (i.e., distance in metres and compass bearing of the carcass from the base of the turbine);
- Substrate and vegetation;
- Species, age, number, sex (if possible), signs of injury and estimated date of collision;
- Weather (including recent extreme weather events, if any), visibility, maintenance of the turbine and any other factors that may affect carcass discovery; and
- If the species is not able to be immediately identified (e.g., an incidental find, and there is not an ecologist on site), photographs must be provided to the qualified ecologist immediately for identification purposes. The ecologist must reply within two business days, for the possible reporting of an impact trigger. If carcass identification is not possible and there is a suspicion it may be a listed species or species of concern, samples will be sent to the Australian Museum (Australian Centre for Wildlife Genomics) for DNA analysis.

The carcass will be handled according to the following standard protocol:

1. The carcass will be removed from the turbine site;
2. Personnel will wear appropriate PPE (e.g. rubber gloves) *Note – the carcass handler will adhere to all health and safety protocols detailed by their respective organisations*;
3. Personnel will place the carcass into a plastic bag, then into a second plastic bag;
4. A copy of the completed Carcass Search Data Sheet will be placed in the second plastic bag;
5. The double-bagged carcass will be transferred to a designated carcass freezer (at the Project Site office) for storage. This freezer will not be used for anything other than animal carcass storage.
6. The carcass will be stored for a second opinion on the species identity, if necessary.

The wind farm operator is required to have a permit under the Victorian *Wildlife Act 1975* to handle and keep native wildlife (even dead wildlife) as part of the monitoring program. An application for this permit will be submitted in a timely manner to ensure approval has been obtained prior to turbine commissioning.

DRAFT

Any carcasses will be retained for 12 months before disposal.

Bird and bat handling protocol

All on-site staff and monitoring personnel will be advised of the correct procedure for assisting injured wildlife. Construction and operations personnel who find injured wildlife will report the find to the Project's site manager, who will organise recovery of, and treatment for the animal. If safe to do so, place the animal immediately into a dark place (e.g., box or cloth bag) for transfer to the nearest wildlife carer or veterinarian (Table A1-1). For injured native animal collection, contact Wildlife Victoria.

All persons who handle injured or dead animals must wear gloves and adhere to health and safety protocols detailed by their respective organisations. Particular care[8] will be taken to avoid bat-borne viruses (i.e., Australian Bat Lyssavirus and Hendra Virus), and only people with appropriate vaccinations will handle bats (living or deceased).

Table A1-1: Vet and wildlife carer details for the local region

Name	Phone	Location/Address	Bats?

This protocol is valid for two years after commissioning and will be reviewed after this time. Any changes will be incorporated into future BAM Plan reviews and updates.

DRAFT

[8] Bats and human health (https://www.qld.gov.au/health/condition/infections-and-parasites/viral-infections/bats-human-health accessed October 2024).

Appendix 2: Carcass datasheet; to be used for any carcass finds (formal or incidental)

Hexham Wind Farm – MORTALITY MONITORING PROGRAM: CARCASS DATA-SHEET				
Fill out all details above the heavy line for each site searched. All details below the line are required if a carcass is found.				
Collector:	Date:	Start time:	Finish time:	
Turbine identifier:				
Temperature:	Wind direction/speed:	Humidity:		
Search purpose (e.g. monitoring):	If scheduled search; search completed: Yes / No			
On-site works in the last 5 days:				
Weather conditions in the last 5 days:				
Comments:				
Carcass details Time:	Coordinates:	Substrate:		
Distance from tower(m):	Bearing from tower (deg):			
Species common name: Scientific name:	Sex/age? :			
Photo taken*	Yes / No			
Carcass condition: Intact, Scavenged, Feather spot:	Describe:			
Signs of injury:				
Estimated age of the carcass (✓):	<24 hrs	1-3 days	> 3 days	Other
Other notes: (incl. presence of stock)				
Post carcass find actions: 1. Place carcass in sealable plastic bag then place in a second sealable bag and take to freezer at the site office. 2. Send a copy of this completed form to the site manager within seven days of the date of the carcass find. 3. Complete one form per carcass found. 4. *Attach photo to this form				

DRAFT