Appendix I Bird and Bat Management Plan

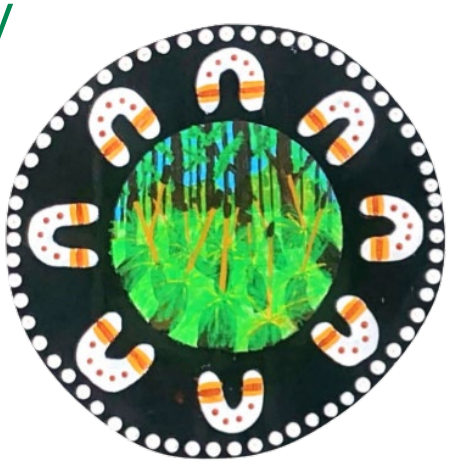
ecosure
improving ecosystems

BIRD AND BAT MANAGEMENT PLAN
TARONG WEST WIND FARM

May 2025

TARONG WEST PROJECT CO PTY LTD

Acknowledgement of Country



Ecosure acknowledge the Traditional Custodians of the lands and waters where we work. We pay deep respect to Elders past and present who hold the Songlines and Dreaming of this Country. We honour and support the continuation of educational, cultural and spiritual customs of First Nations peoples.

Acknowledgements

Ecosure would like to acknowledge the project team that has collaboratively contributed knowledge over the course of the project to produce this Bird and Bat Management Plan, including staff from icubed Consulting Pty Ltd, AECOM Australia Pty Ltd, SLR Consulting and RES Australia Pty Ltd.

Declaration of accuracy

In making this declaration, I am aware that section 491 of the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (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	

Glossary, acronyms and abbreviations

BACI	Before - After - Control - Impact
BBMP	Bird and Bat Management Plan
BBUS	Bird And Bat Utilisation Survey report
BoM	Bureau of Meteorology
DCCEEW	Department of Climate Change, Energy, the Environment and Water (Commonwealth)
DES	Department of Environment and Science (now DETSI) (Queensland)
DETSI	Department of Environment, Tourism, Science and Innovation (Queensland)
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
kV	Kilovolt
LC	Least concern
MNES	Matters of national environmental significance
NC Act	Queensland *Nature Conservation Act 1999*
PER	Public Environmental Report
RE	Regional ecosystem
RSA	Rotor Swept Area
SARA	State Assessment Referral Agency
SDAP	State Development Assessment Provisions
SEVT	Semi-evergreen vine thicket
SLC	Special least concern
SMP	Species Management Program
TNT	Threatened (critically endangered, endangered or vulnerable) and near threatened
VM Act	Queensland *Vegetation Management Act 1999*
WTG	Wind turbine generator

Contents

List of figures

List of tables

1 Introduction

1.1 Background

This Bird and Bat Management Plan (BBMP) has been produced for Tarong West Project Co Pty Ltd (the Proponent) to support a development application for the proposed Tarong West Wind Farm site (herein referred to as the project site). This BBMP addresses the requirements of the State Development Assessment Provisions (SDAP) version 3.0 and Performance Outcome 5 of State Code 23: Wind farm development, as they relate to bird and bat species. The project requires approval under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) for assessment of environmental impacts to matters of national environmental significance (MNES; EPBC 2023/09643). A Public Environment Report (PER) is required to assess impacts. A BBMP is required to accompany the PER and the planning application. The project is also the subject of a Development Approval from the State Assessment and Referral Agency (SARA) dated 25 July.

Some bird and bat species are known to be at risk of impacts from wind farm infrastructure, predominantly collisions with wind turbine generators (WTGs). Factors that influence the risk of collision include the nature of the environment and landscape, the species present and the layout of the proposed infrastructure (Jenkins et al., 2010).

Field surveys have been undertaken to confirm environments and associated habitats on site and to identify those avian and bat species present. These have helped inform the wind farm layout and assessment of potential impacts on fauna. The BBMP seeks to minimise and mitigate potential impacts on bird and bat species at risk of collision due to their flying behaviour, habitat requirements, size or feeding strategy (Langston & Pullan, 2003).

This BBMP focuses on threatened species, although the risk of impact for common and least concern species is also considered. This BBMP aims, through a robust monitoring strategy involving bird utilisation surveys, targeted surveys and carcass monitoring, to identify opportunities to respond to the project's potential impacts.

The BBMP provides an adaptive management and monitoring program to document bird and bat mortalities to allow the effectiveness and implementation of controls to be assessed as required. This will ensure that alternative mitigation strategies can be employed if there is reason to do so. The BBMP has been prepared in accordance with the guidance and requirements of the following documents and other relevant references:

- Wind Farms and Birds: Interim Standards for Risk Assessment (Brett Lane & Associates & Aria Professional Services, 2005)
- EPBC Act Policy Statement 2.3: Wind farm industry (DEWHA, 2009)
- State Development Assessment Provisions v3.0 State code 23: Wind farm development Performance Outcome 5 (PO5) (DSDILGP, 2022b)
- State code 23: Wind farm development – Planning guideline (DSDILGP, 2022a) – Appendix 3 – Ecological assessment methodology.

This BBMP is an adaptive management plan and will be updated as the monitoring data detailed in this BBMP becomes available and as the project design progresses (i.e. WTG design is finalised). The BBMP will also be updated in the future to include a compliance summary in response to conditions of approval on the Project and discussions with the Wind Farm Developer, the Department of Environment, Tourism, Science and Innovation (DETSI), and the Department of Climate Change, Energy, the Environment and Water (DCCEEW).

1.2 Proposed development

The proposed development is the construction and operation of a wind farm located at Ironpot, near Kingaroy in south east Queensland (Figure 1). The wind farm will have up to 97 WTGs connected by access tracks and supported by other infrastructure. The development and construction of the site will involve significant ground disturbing work and will include the construction of the following key components:

- up to 97 WTGs
- wind turbine foundations and hardstand areas
- three permanent and four temporary (during construction period only) meteorological masts
- internal electrical reticulation consisting of overhead lines and underground cabling
- access tracks including widening sections of Ironpot Road
- planning corridor containing a maximum clearing footprint of 871.87ha. The planning corridor allows scope to allow for minor micro-sitting of project infrastructure within the planning corridor
- on-site connection to existing 275 kilovolt (kV) transmission line
- electrical substations to facilitate connection of the project to the grid
- construction compounds and laydown areas
- site compounds
- operations and maintenance facilities
- batching plant
- borrow pits
- washdown areas
- helipad.

A candidate WTG has been selected for the proposed development and is based on the following assumptions:

- up to 90 m turbine blades
- up to 180 m rotor diameter
- up to 190 m hub height
- maximum upper tip height of 280 m above ground level

- minimum lower tip height of 65 m above ground level
- up to 26,015 m^2 rotor swept area (RSA).

For the purposes of this BBMP, the maximum impact scenario (blade reach of 65 m to 280 m above ground level, plus a 25 m buffer) has been considered as such in terms of assessing risk to birds and bats.

Figure 2 shows the proposed planning corridor and clearing footprint to accommodate WTGs, access tracks and other associated infrastructure. The clearing footprint represents the maximum proposed clearing area (as provided by the Proponent in April 2025) and has been reduced by ongoing refinement during the detailed design phase. Potential for micro-siting of infrastructure will provide further opportunity to refine the clearing area. In the planning corridor presented in this plan, no WTGs or hardstands are proposed to be placed in ecologically significant areas (e.g. areas of remnant vegetation).

The project is currently planned to be constructed in a single stage with construction proposed to start in the fourth quarter of 2025 and last approximately 30 months.

Construction

The construction methodology will generally include:

- marking out areas for infrastructure installation
- clearing the areas of vegetation
- scraping off the topsoil and stockpiling for later use in rehabilitation
- construction of access tracks
- widening sections of Ironpot Road to allow transport of turbine components
- creating a level pad for infrastructure construction
- installing the infrastructure
- rehabilitating disturbed surfaces that are not required for operations.

Operation

The project is expected to have an operational life of at least 30 years excluding construction and decommissioning. The operational parameters of the project have not been finalised at this stage. However, it has been assumed that all WTGs will be operating continuously when wind speeds are suitable, apart from occasional shut-down periods for maintenance.

Decommissioning

Decommissioning or repowering of the site is expected to occur at the end of the project's useful life. If decommissioning occurs, the process is expected to take approximately 24 months and be undertaken in accordance with all relevant approval conditions and best practice methods at the time of decommissioning. If repowering occurs it will be undertaken in accordance with all relevant approval conditions and any changes to the Project design or

configuration will be submitted for assessment by all relevant regulatory bodies, as required.

1.3 Aim and Objectives

Impacts to birds and bats from wind farm operation can be classified as direct (collisions with moving turbine blades or other infrastructure) or indirect (creation of a soft barrier or alienation of habitat around operating WTGs) (Langston & Pullan, 2003). Collisions, in the context of this management plan, include birds and bats directly striking the turning blades or other structures (e.g. nacelle, tower) and barotrauma whereby microchiropteran bats (microbats) experience sudden and severe pressure changes from the blade sweep leading to tissue damage within the sensitive air sacs in their lungs (Baerwald et al., 2008). The aim of the BBMP is to identify the direct and indirect impacts associated with the operating project and ensure measures are appropriately monitored and managed to ensure the risk to birds and bats is as low as reasonably practicable.

The objectives of the BBMP to support this aim are to:

- assess potential impacts to bird and bat species associated with the operation of the project, as identified in the Bird and Bat Utilisation Survey (BBUS) report (Ecosure, 2025b)
- identify potential mitigation measures and other strategies to reduce impacts on birds and bats
- develop a monitoring program to:
  - detect changes in utilisation of habitat at the project site by birds
  - detect mortality of birds and bats around the project that can be attributed to direct impacts from the project operation
  - provide a framework for management response to changes in habitat utilisation or mortality of birds and bats beyond a defined trigger level
- detail the reporting requirements to implement this BBMP.

The duration of the monitoring program within the BBMP may be conditioned through the project's development approvals and will be determined through consultation between the Wind Farm Developer, DETSI and consultant ecologist. Other BBMPs for Australian wind farm projects have been conditioned to operate for between two and five years. Smallwood and Thelander (2008) identified that carcass monitoring should be completed over three years in order to detect all species directly impacted by wind farm operation. Monitoring will be conducted for at least two years post-construction (operational period), with the capacity for extension to allow monitoring of the effectiveness of any adaptive management measures which are implemented.

1.4 Document context

The BBMP is supported by, and should be read in conjunction with, the following documents:

- Assessment of Matters of National Environmental Significance for Tarong West Wind Farm, Ironpot, Queensland (Ecosure, 2023a)
- Ecological Assessment Report for Tarong West Wind Farm (Ecosure, 2023b)
- Supplement to the Assessment of Matters of National Environmental Significance for Tarong West Wind Farm (Ecosure, 2025a)
- Bird and Bat Utilisation Survey Report for Tarong West Wind Farm (Ecosure, 2025b)
- Fauna Management Plan for Tarong West Wind Farm (Ecosure, 2025c)
- Vegetation Management Plan for Tarong West Wind Farm (Ecosure, 2025d).

The BBMP is an adaptive management plan and will be updated as the monitoring data detailed in this BBMP becomes available and as the project design progresses (i.e. WTG design is finalised).

1.5 Report conventions

The following conventions are used throughout the report:

- The project site comprises the properties identified in Figure 1.
- The project boundary defines the outer perimeter of the project site.
- The proposed development comprises the spatial data presented in the shapefiles provided by the Proponent in October 2024.
- The planning corridor is the area for all infrastructure and development to occur within the project site and contains the clearing footprint (Figure 2).
- The clearing footprint represents the maximum disturbance footprint of the project, while allowing for minor micro-sitting within the planning corridor.
- The study area used in desktop searches comprises the project site and a buffer around the site. Two buffer distances were used:
  - a 10 km buffer which contains similar vegetation and habitat to the project site
  - a 20 km buffer that includes the Bunya Mountains, which contains high altitude rainforest habitat not occurring within the project site.
- Conservation significant species include flora and fauna species that are listed as:
  - threatened (critically endangered, endangered or vulnerable) and/or migratory under the EPBC Act
  - threatened or near threatened (TNT) or special least concern (SLC) under the Queensland *Nature Conservation Act 1992* (NC Act).
- Common and scientific names of flora and fauna species follow the DETSI WildNet database (DETSI, 2024).

1.6 Legislative context

The legislation outlined in Table 1 is relevant to identifying the bird and bat fauna values likely to be present on the site and provides guidance for the assessment of potential project impacts, and the avoidance and mitigation of those impacts based on the operational project activities.

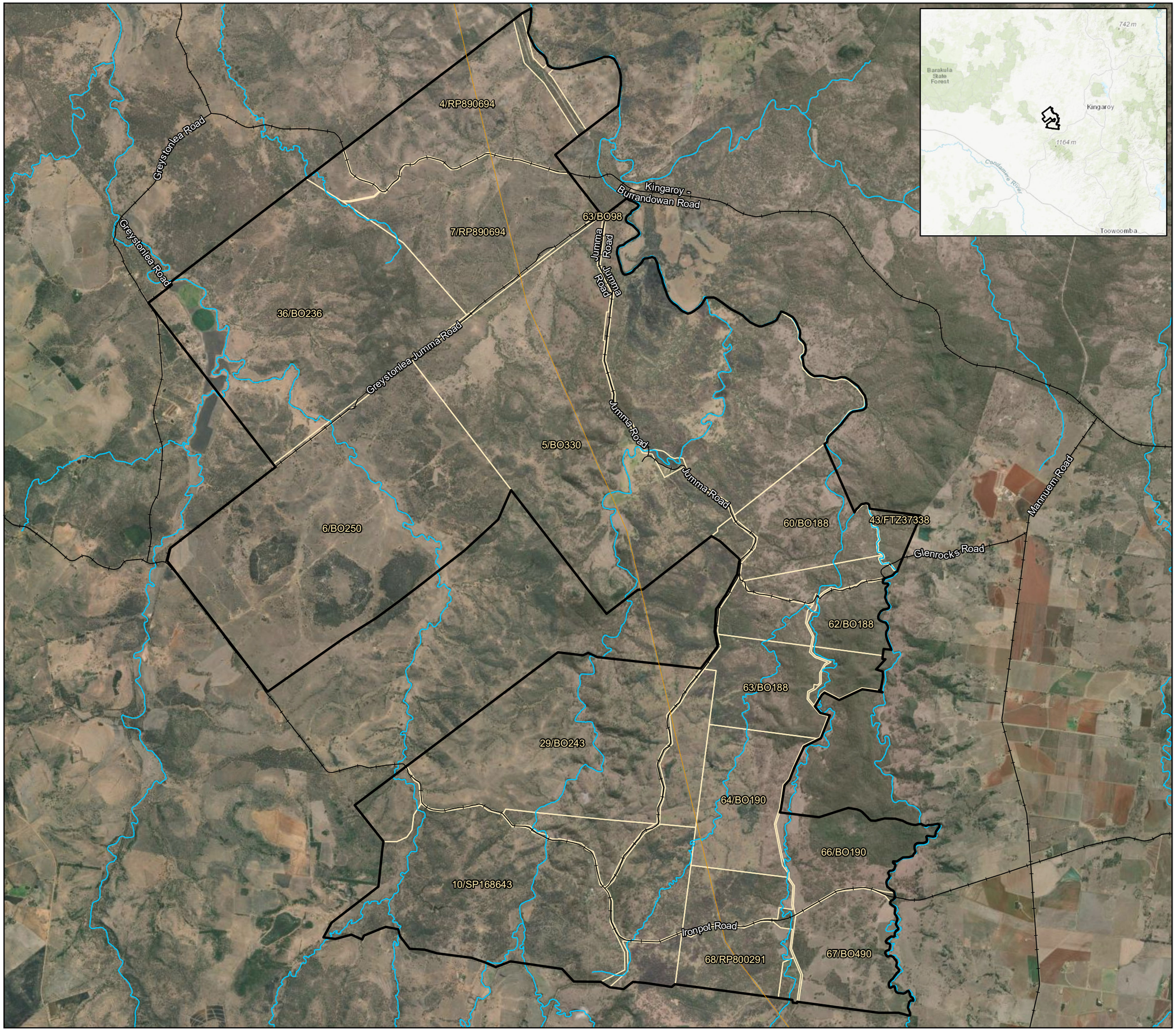
Table 1 Legislation relevant to the proposed development and impacts on birds and bats

Jurisdiction	Legislation / Guideline	Brief description
Commonwealth	*Environment Protection and Biodiversity Conservation Act 1999* Significant Impact Guidelines 1.1 - Matters of National Environmental Significance	The EPBC Act provides the legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities, and heritage places identified as MNES. MNES are defined in the EPBC Act and include: · Ramsar wetlands of international importance · World Heritage properties · National Heritage places · Commonwealth Marine areas · the Great Barrier Reef Marine Park · nationally listed threatened species and ecological communities · nationally listed migratory species · nuclear actions (including uranium mining) · water resources in relation to coal seam gas and large coal mining development. A project or action which is likely to have a significant impact on a MNES is a 'controlled action' and must be submitted to the Commonwealth DCCEEW for assessment and determination by the Minister. The EPBC Act processes allow voluntary referral of a project to seek confirmation as to whether a significant impact on MNES is likely and to confirm any approval pathway. The Significant Impact Guidelines 1.1 - Matters of National Environmental Significance were released to assist proponents with the assessment of the significance of impacts on MNES and are relevant to fauna and this site. This project was determined to be a controlled action to be assessed using a PER based on impacts to threatened bird and bat species present in the project area.
State	*Planning Act 2016*	The *Planning Act 2016* establishes the framework for the Queensland planning system. The purpose of the legislation is to establish an efficient and accountable system of land-use planning and development assessment that will lead to ecological sustainability. The *Planning Act* defines ecological sustainability as a balance between:

Jurisdiction	Legislation / Guideline	Brief description
		· the protection of ecological processes and natural systems at local, regional, state and national levels · economic development · the cultural, economic, physical and social wellbeing of Queenslanders. The Planning Regulation (2017) and the State Planning Policy (2017) are to guide local and state government in land use planning and development by defining the Queensland Government policies relating to matters of State interest. Development Application 2402-39136 SDA for a Material change of use for a wind farm (97 wind turbine generators and ancillary infrastructure) and Operational work for clearing native vegetation was approved by SARA on 25 July 2024. A Preliminary BBMP (Ecosure, 2023c) and accompanying Ecological Assessment (Ecosure, 2023b), supported the assessment process for the development application. Condition 15 of the approval requires finalisation of the BBMP prior to the commencement of operation of the wind farm and implementation of the BBMP during operation.
State	SDAP State code 23: Wind farm development State code 23: Wind farm development – Planning guideline	Development Application 2402-39136 SDA for a Material change of use for a wind farm (97 wind turbine generators and ancillary infrastructure) and Operational work for clearing native vegetation was approved by SARA on 25 July 2024. The SDAP provide assessment benchmarks and consistency in assessment and contain state codes which are specific to particular development proposals or impacts. Each code includes a purpose and performance outcomes. Some include acceptable outcomes which identify one way to achieve the relevant performance outcome. State code 23: Wind farm development. Performance was addressed as part of the development application, including outcome PO5 of the code which requires that "*wind farm development is designed, sited and operated to ensure that flora, fauna and associated ecological processes are protected from adverse impacts*". The following information was provided with the development application, as specified in the Guidelines accompanying the state code, to demonstrate that a proposal is consistent with Performance Outcome 5: · an Ecological Assessment (Ecosure, 2023b) · a Preliminary Fauna Management Plan (Ecosure, 2023d) · a Preliminary Vegetation Management Plan (Ecosure, 2023e) · a Preliminary BBMP (Ecosure, 2023c). No further assessment against the State Code is required and a final BBMP is to be provided for approval in accordance with the development permit.

Jurisdiction	Legislation / Guideline	Brief description
State	*Nature Conservation Act 1999* Nature Conservation (Animal) Regulation 2020	The NC Act aims to conserve nature through strategies such as dedicating and declaring protected areas for those parts of Queensland with outstanding biological diversity, natural features and wilderness values. The NC Act provides for the conservation of native fauna through restriction of activities such as taking, keeping or interfering with animals or their breeding places. The act also contains provisions relating to the management of non-native wildlife. Unless authorised, it is an offence under the NC Act to take, keep, use, or move protected animals for commercial, recreational or other purposes. Protected animal is defined as an animal that is prescribed under this Act as threatened, near threatened or least concern wildlife. Where a proposed development will result in such impacts to fauna protected under the NC Act, authorisation from DETSI will be required. **Nature Conservation (Animal) Regulation 2020** In support of the purpose and the provisions of the NC Act, this regulation identifies all native fauna species as either 'extinct in the wild', 'endangered', 'vulnerable, 'near threatened' and 'least concern (LC)' which includes SLC wildlife. Wildlife listed as SLC includes echidna (*Tachyglossus aculeatus*), platypus (*Ornithorhynchus anatin*us) and migratory birds listed under international conservation agreements with Japan, Korea or China or the Bonn Convention. Under *s335* Tampering with animal breeding place, a person must not, without a reasonable excuse, tamper with an animal breeding place that is being used by a protected animal to incubate or rear the animal's offspring. A high-risk Species Management Program (SMP) is required for near threatened, vulnerable, endangered, critically endangered, SLC species and colonial breeders (bats, some wetland bird species). A low-risk SMP is required for other LC species. Note that due to the mobility of koala (with young in the pouch), this species is excluded from this requirement (DES, 2020). The Ecological Assessment (Ecosure, 2023b) details the threatened fauna species listed under the NC Act confirmed or likely to occur within the project site.
State	*Vegetation Management Act 1999*	The *Vegetation Management Act 1999* (VM Act) is the planning initiative underlying regional management of vegetation in Queensland. The VM Act aims to conserve remnant endangered and of concern REs, prevent land degradation and further loss of biodiversity, manage the environmental impacts of clearing vegetation and reduce greenhouse emissions. In addition to provisions related to the protection and management of native vegetation and regrowth, the VM Act contains provisions for the regulation of essential habitat for species of state significance. Essential habitat (mapped by DES) is vegetation in which a species listed as endangered or vulnerable under the NC Act has been known to occur. Clearing or disturbance to areas of essential habitat will require compensatory habitat measures to be developed. The Ecological Assessment (Ecosure, 2023b) details the regulated vegetation and regional ecosystems ground-truthed across the project site to provide habitat for the bird and bat species detailed in the BBMP.

Figure 1: Project site location



Legend

- Existing 275kV transmission line
- Road
- Watercourse
- Project boundary
- Land parcel

RES Australia

Bird and Bat Management Plan for Tarong West Wind Farm, Ironpot, Queensland

0 1 2 4
Kilometers

Job number: PR6944
Revision: 0
Author: KF
Date: 11/27/2024

GDA 1994 MGA Zone 56
Projection: Transverse Mercator
Datum: GDA 1994
Units: Meter

ecosure
improving ecosystems

Figure 1a: Proposed development layout

Legend

- WTG
- Mast (permanent)
- Mast (temporary)
- Turbine hardstand
- Cables - overhead 275kV
- Cables - overhead 33kV
- Cables - underground
- Access track
- Existing 275kV transmission line
- Watercourse
- Road
- Batch plant
- Borrow pit
- Helipad
- Laydown
- Operations and maintenance building
- Site compound
- Substation
- Switching station
- Planning corridor
- Project boundary
- Land parcel

Tarong West Project Co Pty Ltd

Bird and Bat Management Plan for Tarong West Wind Farm, Ironpot, Queensland

0 1 2 4
Kilometers

Job number: PR6944
Revision: 0
Author: KF
Date: 15-May-2025

GDA 1994 MGA Zone 56
Projection: Transverse Mercator
Datum: GDA 1994
Units: Meter

ecosure
improving ecosystems

Figure 1b: Proposed clearing footprint

Legend

- WTG
- Mast (permanent)
- Mast (temporary)
- Existing 275kV transmission line
- Watercourse
- Road
- Clearing footprint
- Planning corridor
- Project boundary
- Land parcel

Tarong West Project Co Pty Ltd

Bird and Bat Management Plan for Tarong West Wind Farm, Ironpot, Queensland

0 1 2 4
Kilometers

Job number: PR6944
Revision: 0
Author: KF
Date: 13-May-2025

GDA 1994 MGA Zone 56
Projection: Transverse Mercator
Datum: GDA 1994
Units: Meter

ecosure
improving ecosystems

2 Site characterisation- existing environment

2.1 Landscape values and climate

The project site covers an area of approximately 17,500 ha within the South Burnett Regional Council area and lies approximately 30 km west of Kingaroy and approximately 85 km east of Chinchilla. It is currently used for cattle grazing with areas of cleared paddocks and standing vegetation. Access to the site is via Ironpot Road (Figure 1).

The site is located approximately 20 km to the north of the Bunya Mountains National Park, 7 km to the east of Diamondy State Forest and 7 km to the south of Dangore State Forest. It lies to the north, but outside, of a mapped state significant biodiversity corridor (DES, 2018) and regionally significant corridors are mapped along the Boyne River and Jumma Creek.

The site is located on the southern border of the Brigalow Belt (South) bioregion in the Banana-Auburn Ranges subregion. Landforms present are primarily undulating plains and hillslopes. Large patches of vegetation occur along the ranges on the eastern boundary of the site, which extends to vegetation north-east of the site and eventually connects to Dangore State Forest to the north. A large patch of vegetation in the western portion connects to vegetation near Kingaroy-Burrandowan Road connecting to Diamondy State Forest to the west. Linear strips of vegetation provide some connectivity along Kingaroy-Burrandowan Road along the northern boundary of the project site. Riparian vegetation along larger watercourses (e.g. Boyne River, Jumma Creek) provide connectivity along the lower portions of the project site.

The site predominantly occurs on the Chahpingah Meta-igneous Complex, which is a granite dominated geology. The Evergreen Formation (comprising sandstone, mudstone and siltstone) dominates the southern portion of the site around the upper reaches of the Boyne River along with a small intrusion in the north-western portion. Quaternary alluvium occurs around the Boyne River and other larger watercourses in the northern portion of the site.

Eight flyway sites, part of the East Asian-Australasian Flyway, are registered in Queensland (DES, 2022a). Of these, five are Ramsar listed wetlands and/or protected areas. The three remaining sites are located in the Gulf of Carpentaria. There are no known flyways, migratory routes or significant bird habitats within or adjacent to the site.

Natural wetlands do not occur within the site and there are no significant wetlands in close proximity to the site (Ecosure, 2023b). There are, however, temporary wetlands to the north and north-west of site, including one palustrine wetland (Ecosure, 2023b). Landholders have also constructed numerous farm dams throughout the site. These dams may provide habitat for wetland birds and waterfowl and a water source for other birds and bats. It is expected that wetland birds have the potential to traverse between farm dams and these temporary wetlands and ponded pastures after rainfall.

The project site occurs within the Boyne-Auburn Rivers drainage sub-basin in the Burnett

drainage basin, which drains to the Great Barrier Reef lagoon. One major mapped watercourse flows generally south to north within the site. The Boyne River begins as a second order stream in the south of the site, increasing in size before exiting the site along the north-western boundary. The Boyne River feeds into Boondooma Lake and the Burnett River before discharging at Bargara near Bundaberg. Other large streams that flow into Boyne River, either within or north of the site, include Mannuem Creek on the eastern boundary, Middle Creek in the south-eastern portion, Jumma Creek in the central portion, Boughyard Creek in the western portion and Ironpot Creek in the north-western portion of the site.

The Brigalow Belt South bioregion features a predominantly subtropical climate with hot summers and mild winters. Rainfall is summer-dominant but varies significantly across the region, ranging from approximately 590 mm annually in the north to 400 mm in the southwest, and increasing to about 1,200 mm near the coast (QPWS, 2013). Climate change poses several threats to this bioregion's ecosystems. Increased temperatures and altered rainfall patterns could exacerbate land degradation, reduce water availability, and stress native vegetation and wildlife. While historical averages for temperature and rainfall have been used for this assessment, it is recognized that climate change creates uncertainties in how local ecosystems (including bird populations and their habitats) will adapt over time.

The climate is defined as sub-tropical with warm, humid summers and cool and dry winters. Average maximum temperatures range from 19.6°C in July to 30.9°C in January (Bureau of Meteorology [BoM], Kingaroy Airport Station 040922, approximately 30 km east of the site). The average annual rainfall is 663.3 mm (BoM, 2023).

Landforms and features of the site influence interactions between birds and bats and WTGs in the following ways:

- movement along vegetated corridors and movement between habitat areas (eg Boyne River)
- movement between wetland areas and farm dams
- movement along ridgelines
- creation of updrafts which are used for soaring
- caves and overhangs may provide roost areas for microbats and influence the direction and height of flyouts.

2.2 Vegetation and habitats

The vegetation within the site is relatively homogenous comprising narrow bands of riparian vegetation along larger watercourses and dry sclerophyll forests and woodlands dominated by lemon-scented gum (*Corymbia citriodora*) and narrow-leaved ironbark (*Eucalyptus crebra*) on ridges and slopes. One small patch of semi-evergreen vine thicket (SEVT) occurs in the south-western corner.

Non-remnant vegetation covers most of the site (15,843.79 ha or 90.56% of the site). The ground layer is sparse to dense and is dominated by grasses, including native and exotic

species. A variety of native and exotic forbs are common in non-remnant areas. Tree cover is variable.

Field-verified remnant vegetation occurs within 1,331.08 ha (7.61%) of the site and HVR within 321.35 ha (1.84%). Field surveys confirmed seven (11.3.25, 11.5.20, 11.7.6, 11.8.3, 11.11.15, 11.12.3, 11.12.6) mapped regional ecosystems (REs) within the project site and one other RE (11.11.4) that was not mapped within the site by the Queensland Herbarium. One other RE (11.3.4) may possibly occur on the project site outside of the planning corridor but was not detected during ground-truthing surveys.

The fauna habitats and component REs identified during field survey are outlined in Table 2.

Table 2 Fauna habitats recorded within site

Habitat type	Component REs	Habitat description	Area (ha)
Pasture / exotic grassland	Non-remnant	Isolated trees and shrubs. Ground layer sparse to dense and dominated by grasses and forbs. Rare hollows in large remnant paddock trees.	15,843.79 (90.56%)
Eucalypt woodland/forest	11.5.20, 11.7.6, 11.11.4, 11.11.15, 11.12.3, 11.12.6	Sparse to mid-dense canopy of trees. Shrub layer absent to mid-dense. Ground layer sparse to mid-dense and dominated by grasses and forbs. Numerous small hollows and occasional large hollows.	1,628.56 (9.3%)
Riparian forest	11.3.25 and non-remnant wooded	Sparse to mid-dense canopy of trees. Shrub layer absent to mid-dense. Ground layer sparse to dense with diverse range of grasses, forbs, sedges and rushes. Numerous small hollows and occasional large hollows.	23.30 (0.13%)
Vine thicket	11.8.3, patches of RE 11.12.6 with developing vine thicket mid storey	Scattered emergent trees over sparse to dense canopy containing a diverse variety of vine thicket tree species. Shrub layer absent to mid-dense. Ground layer very sparse to sparse (may be denser in patches with reduced tree cover), numerous vines. Numerous small hollows and occasional large hollows in emergent eucalypts.	0.63 (0.004%)
Farm dam	Non-remnant	Banks have scattered trees and shrubs. Ground layer varies from bare dirt to dense layer of grasses, forbs and sedges. Shallow water may support sparse to dense aquatic plants including forbs, sedges and rushes. Deeper water generally open with scattered lilies or floating aquatic plants. Occasional hollows in large remnant paddock trees.	Scattered throughout site

Cleared grassland is the main habitat type, by area, across the project site. Isolated trees provide limited food, roosting and nesting/denning resources. The sparse to dense grassy ground layer provides shelter and food resources for suitable species.

Remnant eucalypt woodland/forest is the main remnant fauna habitat within the site. It is generally dominated by *Eucalyptus crebra* or *Corymbia citriodora*. Mature individuals of these species typically contain numerous small hollows suitable for nesting or denning by small arboreal fauna, including microbats and occasional large hollows suitable for larger arboreal mammals and large birds. These species also provide important seasonal nectar resources for birds and bats. Some small areas have rock outcrops (e.g. granite, metamorphic, conglomerate and laterite outcrops) that provide shelter and habitat for fauna such as reptiles and small mammals.

Riparian forest occurs on riparian soils along major watercourses. These areas provide a sparse to mid-dense canopy of trees usually containing scattered large and numerous small hollows, providing nesting and denning habitat for arboreal fauna, including greater gliders. Trees also provide important seasonal nectar resources. Scattered pools provide drinking and bathing water for numerous species and riparian areas can be valuable refuges during droughts and provide important corridors for wildlife travelling between remnant habitat blocks.

Vine thicket has a sparse to dense canopy of trees and shrubs that provide shelter as well as important seasonal fruit and nectar resources. The shrub layer is often mid-dense to dense, providing cover for reptiles and ground dwelling mammals and birds. Leaf litter, logs and rocks provide shelter and foraging habitat for small fauna such as reptiles and small mammals.

Most of the site has been previously cleared (only 9.4% of the site retains remnant vegetation) and supports non-remnant woodland and grassland. Non-remnant woodland includes varying regrowth stages of the original eucalypt woodland communities within the site. Tree cover is variable in density and age and similar to the remnant habitat patches is generally dominated by *Eucalyptus crebra* or *Corymbia citriodora*. Some areas of regrowth contain remnant mature individual trees that contain numerous small hollows suitable for nesting or denning by small arboreal fauna and occasionally large hollows that may be suitable for larger arboreal mammals (e.g. greater gliders) and large birds (e.g. glossy black-cockatoo). These mature trees may also provide important seasonal nectar resources. Most non-remnant woodland communities were in poor to average condition, caused by:

- clearing leading to habitat fragmentation and the loss of large hollow-bearing trees and mature trees
- weed invasion, especially *Eragrostis curvula** and *Glandularia aristigera**
- some areas of intense fires resulting in tree death and increased weed invasion and erosion
- heavy grazing, especially close to farm dams and other sources of water.

Farm dams are scattered throughout the site and provide drinking and bathing water and dense fringing vegetation on some dams provide shelter and food resources for small animals such as wetland birds.

A small area of weathered outcropping occurs between Jumma Road and Middle Creek within the central eastern portion of the project site. The outcrops provide a variety of overhangs and recessed areas that were found to have been used by microbats (dropping piles). No microbats were observed during inspection of the outcrops, however several species detected during surveys are known to use overhangs and crevices as roosts, including little pied bat (*Chalinolobus picatus*), eastern cave bat (*Vespadelus troughtoni*), and little bentwing bat (*Miniopterus australis*). The little bentwing bat in particular uses such roosts as over-wintering sites and some species are known to frequent several roosts over time (Churchill, 2008).

3 Risk assessment process

Figure 3 provides a conceptual overview of the risk assessment process and methods that will be employed for managing risks to birds and bats over the operational life of the wind farm. The pre-construction or pre-approval phase allows for the collection of baseline data on bird utilisation and the distribution of microbat species across the project site and determines at risk species. This phase also allows for the detection of threatened bird and bat species.

The operational phase provides for continuation of the bird utilisation surveys and combined with carcass monitoring, enables detection of impacts on bird and bat species (such as avoidance behaviour and collisions). Targeted species surveys are continued in this phase for threatened species known or likely to occur within the site.

Where an impact has occurred or is suspected to have occurred, a process is provided to determine the nature of the impact, the significance of the impact and whether corrective actions are required.

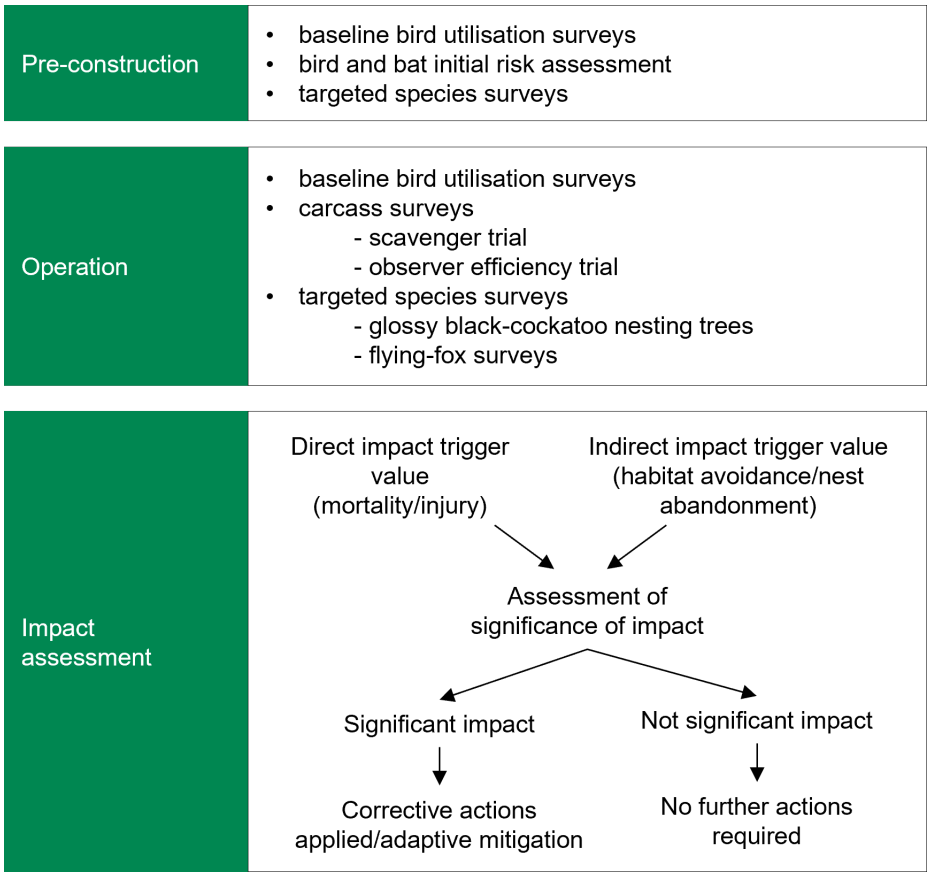


Figure 3 Conceptual risk assessment process

Consistent with this model, a Level One assessment to obtain baseline bird and bat data was undertaken as part of the Bird and Bat Utilisation Survey report (BBUS, (Ecosure, 2025b) which included:

- compilation of bird and bat data for the project site including:
  - species diversity
  - occurrence of conservation significant species
  - critical fauna resource habitats within turbine footprints and adjacent areas
- assessment of risk to birds and bats including:
  - species susceptible to collision impacts
  - qualitative and semi-quantitative estimate of risk
  - collision risk modelling
- recommended risk mitigation measures
- recommended further investigations and monitoring.

The outcomes of that investigation are presented in this BBMP.

4 Baseline data

Previous assessments to inform this BBMP involve desktop analysis, targeted and roaming bird surveys, and seasonal field surveys. Desktop analysis provided data on known bird and bat species presence, threatened or listed species that may be affected by the development and known significant bird and bat aggregations and habitats within the area. Each significant species identified in database searches was assessed for its likelihood of occurrence based on:

- records in the local area (ALA, 2022; DES, 2022b), survey results)
- presence of suitable habitat (determined using both desktop and field-verified data)
- presence of essential habitat (DoR, 2022)
- species abundance, distribution and behaviour (sourced from published field guides, DCCEEW species profiles and threats database and scientific journal articles).

The final assessment of the likelihood of species occurring was refined by field surveys that included targeted searches for possible and likely species and ground-truthing of suitable habitat for these species. Marine species were excluded from the table (as not a relevant MNES on this site), but migratory species were included where habitat or species records were present in the area. Likelihood of occurrence was classified into four categories:

- confirmed – the species or signs of their presence were observed during the field survey
- likely – the site contains habitat that is suitable for the species and Wildnet has recent records of the species (i.e. since 1980) within 10 km of the site
- possible – the site contains habitat that is suitable for the species but Wildnet has no recent records of the species within 10 km of the site; or the site contains marginal / low quality habitat for the species and Wildnet has recent records of the species within 10 km of the site
- unlikely – the site does not contain habitat for the species and Wildnet has no recent records of the species within 10 km of the site.

4.1 Bird and bat survey methods

The pre-construction bird utilisation survey was based on the Standard Bird Management Guideline for the Australian Wind Energy Association for initial site risk assessment, Level One Investigation (Brett Lane & Associates & Aria Professional Services, 2005). These guidelines outline a ‘Before – After – Control – Impact’ (‘BACI’) experimental design as the best method to assess bird impacts at windfarms.

Full details of surveys and results are presented in the BBUS (Ecosure, 2025b), though in summary a number of field survey methods were employed to characterise bird and bat use of the site, both at the project site (impact site) and at reference sites (control sites) in the

surrounding areas. A summary of surveys conducted is presented in Table 3.

Table 3 Summary of survey

Survey period	Dates	Survey types
Spring 2018	29 October – 9 November	Habitat assessments, roaming bird surveys, fixed point count surveys, microbat harp trapping, microbat call recording, targeted surveys for glossy black-cockatoo, and powerful owl.
Autumn 2019	25 March – 5 April	Habitat assessments, fixed point count surveys, nocturnal spotlighting, microbat harp trapping, microbat call recording, dam searches for waterbirds, targeted surveys for black-breasted button-quail, glossy black-cockatoo, and powerful owl.
Spring 2020	23 – 28 November	Fixed point count surveys, nocturnal spotlighting, microbat harp trapping, microbat call recording, dam searches for waterbirds, targeted surveys for black-breasted button-quail and glossy black-cockatoo.
Spring 2021	25 October – 7 November	Fixed point count surveys, nocturnal spotlighting, microbat harp trapping, microbat call recording, dam searches for waterbirds, targeted surveys for black-breasted button-quail and glossy black-cockatoo.
Summer 2022	21 – 26 February, 15 – 17 March	Fixed point count surveys, nocturnal spotlighting, dam searches for waterbirds, targeted surveys for black-breasted button-quail and glossy black-cockatoo.
Autumn 2022	22 – 27 June	Fixed point count surveys
Winter 2022	16 – 21 August	Fixed point count surveys
Spring 2022	6 – 11 November	Fixed point count surveys
Summer 2023	30 January – 4 February	Fixed point count surveys
Autumn 2023	2 – 7 May	Fixed point count surveys
Winter 2023	10 – 15 August	Fixed point count surveys
Spring 2023	30 October – 4 November	Fixed point count surveys

A modified seasonal survey design was employed whereby roaming surveys were undertaken during the 2018 spring survey, and the 2019 autumn, 2020 spring, and 2021 spring surveys targeted TNT species and migratory birds, using fixed point counts, feeding searches, dam and nocturnal surveys instead of seasonal roaming surveys. Microbat surveys focused on acoustic recording and harp trapping, while flying-fox surveys included nocturnal surveys for foraging and flyouts, and habitat searches for signs of roosts.

Ongoing surveys in 2022 and 2023 focused on establishing a robust seasonal dataset of fixed point count surveys for further assessment of bird utilisation and collision risk.

4.2 Bird survey results

All field surveys (including targeted species surveys, roaming surveys, spotlighting, incidental sightings, and fixed point count surveys) from 2018 – 2023 detected 191 identified native bird species, three introduced bird species and an additional 14 unidentified bird species (by sighting or call). Targeted surveys were undertaken for glossy black-cockatoo (*Calyptorhynchus lathami lathami*), powerful owl (*Ninox strenua*) and black-breasted button-quail (*Turnix melanogaster*).

During fixed point count surveys a total of 24,526 individual birds comprising 186 species were detected. The majority of these sightings (80%) were comprised of 28 out of the observed 186 species. The most common species observed were noisy miners (n = 2830), Torresian crows (n = 2309), little corellas (n = 1775), galahs (n = 1472) and pied currawongs (n = 929). These five most commonly sighted species are common in agricultural landscapes and account for approximately 38% of all birds observed in fixed point count surveys.

Field surveys detected three conservation significant bird species, white-throated needletail (*Hirundapus caudacutus*), glossy black-cockatoo, and fork-tailed swift (Table 4). The glossy black-cockatoo was further detected via chewed cones (orts) underneath their preferred *Allocasuarina* feed trees during targeted feeding and habitat searches across the site.

No powerful owl were detected during targeted or other surveys, however this species is considered to possibly occur on site. No black-breasted button-quail were recorded and only a small area of vine thicket habitat is present on site which is outside of the planning corridor. This habitat will not be impacted by the project.

Table 4 Conservation significant birds detected during site surveys

Species name	Common name	EPBC Act	NC Act	Number of detections
Hirundapus caudacutus	white-throated needletail	V, Mi	V	364 individual detections during spring 2018, spring 2021, summer 2022, spring 2022, summer 2023 and spring 2023 surveys.
Calyptorhynchus lathami lathami	glossy black-cockatoo	V	V	7 individual detections and feeding signs (orts) found in 21 locations during autumn 2019, spring 2020, spring 2021, spring 2022, and spring 2023 surveys.
Apus pacificus	fork-tailed swift	Mi	SLC	3 individual detections during summer 2023 and spring 2023 surveys.

Conservation status: NC Act: V – Vulnerable, SLC – Special Least Concern;
EPBC Act status: V – Vulnerable, Mi – Migratory Species.

4.3 Bat survey results

Field surveys (including acoustic recording and harp trapping) detected 16 confirmed microbat species and an additional six possible microbat species. Nocturnal and opportunistic surveys recorded three flying-fox species, black flying-fox (*Pteropus alecto*), little red flying-fox (*P. scapularis*) and the EPBC Act-listed vulnerable grey-headed flying-fox (*P. poliocephalus*). No bat species listed as conservation significant under the NC Act were positively confirmed during surveys.

The survey program targeted grey-headed flying-fox and the EPBC listed vulnerable Corben's long-eared bat (*Nyctophilus corbeni*). Corben's long-eared bats are uncommon and sparsely distributed throughout their range and as positive species identification can only be made through capture there are limited records for this species in Queensland. Corben's long-eared bat was identified as potentially occurring in the project area through the DCCEEW Protected Matters Search Tool search. Although species of the genus *Nyctophilus* were acoustically detected during surveys, individual species within this genus cannot be distinguished by call. Harp trapping in 2021 captured several lesser long-eared bats (*Nyctophilus geoffroyi*), a species which is not listed under the EPBC Act or NC Act. Although it cannot be confirmed whether calls detected in acoustic surveys are from the threatened Corben's long eared bat or another unlisted *Nyctophilus* species, it is most likely to be the least concern *N. geoffroyi*, which is confirmed to occur on the project site.

Table 5 Conservation significant bats detected during site surveys

Species name	Common name	EPBC Act	NC Act	Number of detections
Pteropus poliocephalus	grey-headed flying-fox	V	LC	12 detections during spring 2021 surveys, observed foraging within the project area.

Conservation status: NC Act: LC – Least Concern;
EPBC Act status: V – Vulnerable.

4.4 Use of baseline data

The bird utilisation surveys completed to date have complied with a BACI survey design. This decision was taken early in the project development to ensure that baseline data could be used for operational monitoring of impacts to birds and a BACI designed survey is also required by the Wind Farm State Code (DSDILGP, 2022b) and the PER Guidelines. Survey sites were randomly selected from within a grid based system to ensure a stratified survey design with appropriate WTG coverage. Due to the large size and accessibility of the project site, some survey sites were selected as they provided improved vantage points across the landscape. However, it is recognised that due to minor changes in the detailed design phase of the project some amendments to the operational phase monitoring design (e.g. addition of survey locations for new areas of concern as determined by the operational monitoring results, or a slight shift of survey site locations to gain an improved vantage point following construction) may be required. Any proposed changes must ensure adequate review of pre-construction survey data and methods and be reviewed by a suitably qualified ecologist and statistician to ensure any changes can be statistically incorporated into the BACI design. As with all experimental designs, the larger the changes made to an experiment, the larger the

reduction in statistical power of the results. Therefore, any changes to the survey design proposed must be considerate of the analysis to be completed and confidence in the results. At a minimum, a replication of the pre-construction BUS effort must be completed during the operational monitoring phase.

5 Level One Investigation

The Interim standards for assessing the risks to birds from wind farms in Australia (Brett Lane & Associates & Aria Professional Services, 2005) recommends a hierarchical approach with three levels of investigation, where the outcome of each level determines if the assessment is required to move to the next level of investigation.

The Level One Investigation aims to:

1. provide a preliminary risk assessment of significant impacts to birds and bats
2. determine if proposed mitigation measures are likely to minimise risk of all bird and bats to “low risk”
3. determine if further Level Two Investigations are required
4. identify target bird and bat groups or species to be considered during any subsequent site surveys or monitoring.

A Level One Investigation was undertaken by Ecosure as part of the BBUS (Ecosure, 2025b). The assessment prioritises occurrence and susceptibility of species of national and state conservation significance. The level one risk assessment is a qualitative assessment based on the following elements:

- regional overview - identify species presence in the area and any threatened or listed species that may be affected; significant bird and bat aggregations; and habitats known to occur in the area
- roaming surveys and fixed-point counts
- targeted surveys.

The probability (likelihood) of an impact for a species was based on the likelihood of occurrence at the site and the height at which a species is known to fly. Table 6 provides a probability scoring matrix (high, medium, low) based on species occurrence and flight height criteria.

Table 6 Probability matrix for risk of collision

Probability	Occurrence	Flight height
High	Reside / regularly traverse site	Regularly fly at RSA height
Medium	Reside / regularly traverse site	Occasionally fly at RSA height
	Rarely traverse site	Regularly fly at RSA height
Low	Reside / regularly traverse site	Rarely to never fly at RSA height
	Unlikely to occur	Not applicable

A semi-quantitative risk assessment was completed for species that were recorded most commonly during surveys. The assessment at this level also considered the number of individuals of the species recorded flying between 40 m and 305 m above ground level (incorporating the RSA and a conservative risk assessment area). The consequence of WTG collision to an individual bird or bat is considered equal, resulting in death. However, the consequence to the species is dependent on population size. For example, the loss of one individual would be greater for a TNT species or species where the local population is low in numbers.

5.1 At risk species

Some bird and bat species and groups are more at risk of direct and indirect impacts than other species or groups (Smales, 2015). Species identified as high risk of direct impacts by Smales (2015) and confirmed present at the Tarong West Wind Farm project site include a number of least concern species listed under the NC Act and species listed as vulnerable and migratory under the EPBC Act. These species are identified as likely to utilise the RSA across the project area and were confirmed during surveys (white-throated needletail, fork-tailed swift). It is important to note that many of the studies on bird and bat collision with WTGs involve older, operating wind farms with much smaller turbines installed than proposed for the project. Consequentially, the RSA of older turbines is much closer to the ground level than the WTGs proposed for the Project and changes the risk profile for birds and bats flying above the canopy. The existing detailed investigations into wind farm mortality are also not based in Queensland (Moloney et al., 2019; Smales, 2015), and so not all species present at Tarong West Wind Farm are represented in existing studies.

At risk species are characterised by morphological, ecological (feeding strategies, habitat preference, airspace usage) and behavioural traits that mean that they regularly fly significantly above the canopy and are likely to occur within the RSA. These species can be described as:

- aerial hunters – raptors and predominantly aerial species that search and/or hunt for prey at RSA height
- forest / woodland occupiers – generally medium to large species traversing between habitat areas
- wetland species – species traversing between habitat areas and congregating at wetland habitats
- shorebirds / pelagics – species soaring around coastal areas or coming into land after hunting in the open ocean
- high-flying / open air hunting microbats.

Smales (2015) notes that not all species that are present at wind farm sites are involved with collisions with WTGs. There is a poor correlation between a species frequency and abundance at a site and number of collisions, which means that even though a species may be abundant at a site, that abundance does not translate into a high risk of collision.

As part of the qualitative assessment, probability of collision for bird and bat groups based on species' known flight behaviour (e.g. flight height, flight distance, vigilance) and preferred habitat was completed for species known or considered likely to use the project site, including microbats and flying-foxes (Ecosure, 2025b). An extract from section 4.1 of this report is provided in Table 7, which identifies species of Commonwealth and state conservation significance recorded or with the potential to occur on site and provides a qualitative assessment of collision for these species. Each group has been assigned a qualitative risk category of high, medium, or low probability of collision with project infrastructure, including WTG blades.

Table 7 Probability of collision for conservation significant bird and bat groups

Species group	Conservation significant species	Behaviour	RSA probability
Raptors	Least concern (LC) only recorded	· soaring above canopy level to hundreds of metres above ground level · searching for carrion · actively hunting prey above canopy level · includes territorial and nomadic species · occur within forests/woodlands and open plains · low vigilance	**High probability** · species may fly at RSA height · territorial species at greater risk of blade strike · occur above ridgelines where air currents are favourable for soaring · species may be attracted to carcasses at base of WTGs
Aerial foragers	· white-throated needletail (V under EPBC Act and NC Act, and migratory under EPBC Act) · fork-tailed swift (migratory under EPBC Act and SLC under NC Act)	· soaring above canopy level to hundreds of metres above ground level · includes territorial and migratory species · low vigilance	**High probability** · species may fly at RSA height
Cockatoos (excluding glossy black-cockatoo)	LC only recorded	· fly from hub height to ground level, within forests/woodlands and open plains · do not soar as raptors or aerial foragers do, tend to travel from one point to another · locally nomadic · low vigilance	**High probability** · do not soar at height · may fly at RSA height when moving between roosts and food sources
Wetland birds	LC only recorded	· soaring above canopy level to hundreds of metres above ground level while moving between wetland areas · may fly between temporary ponded pastures and wetlands after rainfall events · generally nomadic · low vigilance	**High probability** · species may fly at hub height and within the RSA

Species group	Conservation significant species	Behaviour	RSA probability
Microbats (above canopy foragers)	LC only recorded	· fly from above canopy level to many tens of metres above canopy height · fast-flying, with limited manoeuvrability · moderate vigilance	**High probability** · do not soar, fly between roosts or actively hunting flying insect prey · if operational lighting is considered, then higher risk of barotrauma when microbats are hunting insects
Flying-fox species	· grey-headed flying-fox (V under EPBC Act)	· fly from hub height to below canopy level, within forests/woodlands and open plains · flying-foxes follow food sources and may congregate if major flowering event occurs · moderate vigilance	**High probability** · do not soar, species may fly at RSA height between camps and food sources · many flying-foxes could be attracted to site if major flowering event occurs
Other cockatoos and owls	· glossy black-cockatoo (V under EPBC Act and NC Act)	· fly from hub height to ground level, within forests/woodlands and open plains · occasionally fly at hub height · includes territorial and locally nomadic species · moderate vigilance	**Medium probability** · do not soar, generally fly between roosts and food sources · moderate vigilance · territorial species at greater risk of blade strike
Microbats (below canopy foragers)	LC only recorded	· generally occur below canopy · moderate vigilance	**Low probability** · generally fly below hub height · generally fly between vegetated patches
Migratory / forest/ woodland/ grassland birds	· oriental cuckoo (migratory under EPBC Act and SLC under NC Act) · glossy ibis (migratory under EPBC Act and SLC under NC Act) · regent honeyeater (CR under EPBC Act and NC Act) · squatter pigeon (V under EPBC Act and NC Act) · diamond firetail (V under EPBC and NC Act) · black-breasted button-quail (V under EPBC and NC Act) · Australasian bittern (E under	· includes territorial and migratory species · generally occur below canopy · moderate vigilance · ground dwelling species (black-breasted button-quail and squatter pigeon)	**Low probability** · generally fly below hub height · generally fly between vegetated patches

Species group	Conservation significant species	Behaviour	RSA probability
	EPBC Act and NC Act)		

CR = Critically Endangered under the EPBC and NC Act; **E** = Endangered under the EPBC Act and NC Act; **V** = Vulnerable under the EPBC Act and NC Act; **LC** = least concern under the NC Act; **SLC** = special least concern under NC Act.

5.2 Project specific risk assessment

5.2.1 Turbine layout

WTGs have been placed to avoid impacts to remnant and high value regrowth vegetation. However, some WTGs are located adjacent to habitat patches and/or are located between large patches of vegetation, which places them within potential flight paths for forest and woodland birds traversing between habitat patches. Turbines in proximity to remnant vegetation offering potential habitat may also present a risk to bird and bat movements. The majority of WTGs are located on ridges and hills where they may present a risk to soaring birds utilising updrafts and thermals consistent with these features.

5.2.2 Threatened birds and habitats

The Project site supports known populations of two threatened bird species, namely:

- white-throated needletail (*Hirundapus caudacutus*), listed as vulnerable under the NC Act and the EPBC Act
- glossy black-cockatoo (*Calyptorhynchus lathami lathami*), listed as vulnerable under the NC Act and the EPBC Act.

Profiles of these species are provided in Appendix 1.

Five other threatened bird species were identified as possibly occurring within the Project site. These species were not detected during surveys, but there is some potential habitat present on or adjacent to the project site. These possible species are determined to be a low risk of WTG collision and include:

- regent honeyeater (*Anthochaera Phrygia*) listed as critically endangered under the NC Act and the EPBC Act
- Australasian bittern (*Botaurus poiciloptilus*), listed as endangered under the NC Act and the EPBC Act
- diamond firetail (*Stagonopleura guttata*), listed as Vulnerable under the NC Act and the EPBC Act
- squatter pigeon (*Geophaps scripta scripta*), listed as Vulnerable under the NC Act and the EPBC Act

- black-breasted button-quail (*Turnix melanogaster*), listed as Vulnerable under the NC Act and the EPBC Act.

5.2.2.1 White-throated needletail

White-throated needletails were recorded flying above the project site during the spring 2018 (n = 2), spring 2021 (n = 1), summer 2022 (n = 12), spring 2022 (n = 26), summer 2023 (n = 191), and spring 2023 (n = 132) surveys. Migration into Australia generally occurs in spring, and migration to breeding grounds in the northern hemisphere occurs in early/mid autumn (Threatened Species Scientific Committee, 2019). In Australia, white-throated needletails are mostly aerial, reaching heights of up to 1,000 m, and may occur singly or in large flocks. They fly above most habitats, although they are most common above wooded areas. They were previously believed to never land while in Australia, however have now been recorded roosting in dense foliage or tree hollows (Tarburton, 1993; Threatened Species Scientific Committee, 2019). However, across all surveys none have been observed roosting on the Tarong West project site.

White-throated needletails have been identified as previously colliding with operating wind farms (Hull et al., 2013; Smales, 2015) and are likely to spend some time within the RSA while foraging for insects. Although they range over a wide area, they have the potential to remain within the project site for extended periods if foraging conditions are suitable. Most white-throated needletails observed on the Tarong West Wind Farm were sighted in association with storms, foraging aerially ahead of the storm front. Group sizes observed ranged from one individual to a flock of approximately 100 individuals. Qualitative assessment of white-throated needletail determined the species to be at high risk of collision with WTGs as they were observed to utilise airspace from above canopy level to many hundreds of metres above ground level.

5.2.2.2 Glossy black-cockatoo

Surveys confirmed seven sightings of glossy black-cockatoo and signs of glossy black-cockatoo feeding at 22 locations within the project area. Two individuals were observed circling a dam and perching in the canopy in the spring 2021 surveys, and two further group sightings were made in 2022 (n = 2) and 2023 (n = 3) during fixed point count surveys (control site NT6). During 2022 two individuals were heard flying above the canopy and during 2023 three individuals were observed flying just above the canopy at approximately 20 m height. Suitable foraging habitat exists in small patches of *Allocasuarina torulosa*, *A. littoralis*, *A. luehmannii* and *Casuarina cunninghamiana* amongst forest and woodland communities across the site.

Large hollow-bearing trees in remnant REs may provide nesting resources. Glossy black-cockatoo require large old tree hollows, positioned 10 to 20 m above the ground in eucalypt species, in branches/stems 30 cm in diameter, at a branch/stem angle of vertical or no more than 45 degrees from vertical and with a minimum entrance diameter of 15 cm (Cameron, 2006). Potential nesting trees may occur in large hollow bearing trees, generally in the remnant vegetation and may be in proximity to WTGs. There may be a risk of behavioural disturbance

from WTGs, which may lead to abandonment of nesting hollows, however, mitigating measures (e.g. pre-clearing surveys, and breeding and nesting monitoring) outlined in this BBMP and the Fauna Management Plan (Ecosure, 2025c) will aid in mitigating this risk.

The glossy black-cockatoo was assessed to be at medium risk of collision in the qualitative assessment. The species is present on the project site, is likely to traverse the site and while they have only been observed flying at canopy height, may occasionally fly at RSA height. Due to their low reproductive success (one chick every two years) and vulnerable status, the consequence of occasional loss of an individual is also a factor in determining the level of risk. A precautionary approach has been applied with a minimum risk rating of 'moderate' for the glossy black-cockatoo. However, mitigating measures as outlined in this BBMP have been designed to reduce the likelihood of collision. Provided that ongoing monitoring confirms impact mitigation for this species, the risk rating may be changed to 'low' for the glossy black-cockatoo.

No other threatened bird species are considered likely to be present on site based on the likelihood of occurrence assessment conducted in the BBUS (Ecosure, 2025b).

5.2.3 Threatened bats and habitats

5.2.3.1 Grey-headed flying-fox

Grey-headed flying-foxes were observed foraging within the site during the spring 2021 surveys when food species were in flower. While the site does contain eucalypt species suitable for feeding, no habitats within the project area are considered to be critical food sources for this species. The nearest known grey-headed flying-fox camp is near Cooyar (38 km south-east of site) and is a nationally important camp. Most recently, the camp was estimated to contain 500 – 2,500 grey-headed flying-foxes in 2022 (DCCEEW, 2024). Grey-headed flying-foxes are reported to fly long distances (up to 50 km per night) from camps to food sources (Tidemann, 1998) and traverse open country. It is possible that grey-headed flying-foxes will occupy the project area during times of food availability generally between July and December (Ecosure, 2023a, 2025b). Ongoing bird utilisation surveys conducted from 2022-2023 did not capture mass flowering events, and so were unlikely to detect the species utilising the area. Further surveys will be conducted during the adaptive management period of wind farm operations if mass flowering or fruiting events are identified.

The grey-headed flying-fox was determined through the qualitative assessment to be at high risk of collision with WTGs owing to their tendency to congregate around feeding sources and their ability to fly at RSA height. No other threatened bat species are considered likely to be present on site given the location and habitats present based on the likelihood of occurrence assessment conducted in the BBUS and the field surveys completed (Ecosure, 2025b).

Profile of this species is provided in Appendix 1.

5.2.4 Migratory birds and habitats

The project site supports known populations of migratory bird species, namely:

- white-throated needletail (*Hirundapus caudacutus*), listed as migratory and vulnerable under the EPBC Act
- fork-tailed swift (*Apus pacificus*), listed as migratory under the EPBC Act.

Profiles of these species are provided in Appendix 1.

Migratory species not detected during surveys, but with some potential habitat present on or adjacent to the project site and considered to possibly occur within the Project site include:

- glossy ibis (*Plegadis falcinellus*), listed as migratory under the EPBC Act
- oriental cuckoo (*Cuculus optatus*), listed as migratory under the EPBC Act.

These possible species are determined to be a low risk of WTG collision.

5.2.4.1 Fork-tailed swift

Two fork-tailed swifts were recorded flying above the project area during summer 2023 surveys, and one was recorded flying above the project area in spring 2023. On both occasions, they were sighted foraging aerially in association with larger flocks of white-throated needletails. The sightings occurred over two open woodland and grassland fixed point count sites, one in the east and one in the west of the project site.

Survey results indicate that the project site does not support an ecologically significant proportion of the fork-tailed swift population. In Australia, fork-tailed swifts are believed to be exclusively aerial, flying at heights up to 1,000 m above the ground (DoE, 2015). The species migrates to Australia in October and November and departs in April to breed in east Asia (DoE, 2015). Fork-tailed swifts occur mostly over inland plains, but are also seen above vegetated areas, coastal habitats and urban environments, where they forage ahead of storm fronts to feed on aerial insects (DCCEEW, 2023). The project site is highly unlikely to provide roosting habitat for fork-tailed swifts, however, they may forage aerially and roost on the wing over the entire site.

Fork-tailed swift was determined through qualitative assessment to be at medium risk of collision with WTGs as they have been observed in low numbers across the site and are considered high risk of occurring within the RSA.

5.2.5 Least concern birds and bats

Of all bird species observed during the fixed-point count surveys from 2018 - 2023, 63% were observed to only fly outside of the RSA risk assessment area (40 – 305 m above ground level). The data used to inform the semi-quantitative risk assessment is presented in Appendix 2. The least concern species considered most likely to collide with WTG (based on qualitative risk assessment determining them as high probability of collision, number of individuals and

frequency observed in the RSA risk assessment area) included wood swallows, cockatoos (galahs, little corella, sulphur-crested cockatoo), and raptors (wedge-tailed eagle, Australian hobby, nankeen kestrel).

5.2.5.1 Raptors

Several raptor species were observed within the RSA during field surveys. From 2018-2023, during fixed point count surveys the wedge-tailed eagle was the most common raptor species observed (n = 95), with an average flight height of 141 m. (Moloney et al., 2019) identified wedge-tailed eagles as the second most commonly recorded of all species found dead during wind farm mortality surveys. Nankeen kestrels (n = 17) and brown falcons (n = 21) were also commonly recorded flying within the RSA, and are known to collide with wind turbines in Australia (Moloney et al., 2019; Smales, 2015). Other least concern and non-EPBC listed species such as sulphur-crested cockatoo and wood swallows have been previously recorded as colliding with turbines at operating wind farms in Australia (Smales, 2015).

5.2.5.2 Microbats and flying-foxes

Microbats, where foraging above the canopy, were determined through qualitative assessment to be at high risk of collision with WTGs. Those foraging below the canopy were determined to be at low risk. Bats are also prone to barotrauma injuries from flying in close proximity to turbine blades (Baerwald et al., 2008). Impacts associated with barotrauma are only likely to occur in the immediate area around the turbine blade.

No threatened bat species other than grey-headed flying-fox are considered likely to be present on site given the location and habitats present, however a number of species which are not considered conservation significant may be at high risk of mortality from WTG collision. (Moloney et al., 2019) identified the white-striped freetail bat (*Austronomus australis*) at particular risk of mortality.

Three species of microbats (eastern bent-wing bat, white-striped freetail bat and yellow-belled sheathtail bat) and two species of least concern flying-fox species (black flying-fox and little red flying-fox) are known to exhibit behaviour that places them at risk of collisions with WTGs. Although these species are known to be present at the project site, comprehensive utilisation data is not available for these species and so it has been assumed that the species regularly or seasonally utilise the project site. All of these species are listed as least concern under the NC Act, with broad geographical distributions (Churchill, 2008) and therefore any potential loss of a number of individuals from the wind farm operation in isolation is unlikely to affect their local or regional populations. Therefore, the collision risk has been assessed as low (likelihood of impact is likely, and the consequence is low).

5.3 Impact management measures

Impacts will be managed in accordance with the impact minimisation hierarchy to firstly avoid, then minimise, then mitigate any potential impacts on ecological values. A number of impact management measures have already been committed to reduce the broader ecological

impacts of the Tarong West Wind Farm (Ecosure, 2023a, 2023b, 2025a). Those which are designed to reduce the impact to birds and bats during the operational period of the project are:

- WTGs and tracks have been situated away from regulated vegetation and watercourses as far as practicable to reduce the risk of placing wind turbines in high thoroughfare areas
- siting of infrastructure in areas that have already been cleared or on the edge of vegetation patches to reduce fragmentation and reduce the risk of placing wind turbines in high thoroughfare areas
- the RSA will be maintained at a height no less than 65 m above the ground, to reduce the risk of WTG collision for species which usually fly at canopy height
- transmission lines will be kept to below 34 m in height, providing clear and a collision risk free airspace between 34 - 65 m (lower WTG blade tip height)
- minor micro-siting of the clearing footprint within the planning corridor will be implemented where construction and engineering solutions allow to avoid important habitat features such as hollow-bearing and food trees
- low wind speed curtailment when wind speeds are between 0-3 ms-1.

5.4 Bird and bat risk assessment summary

A summary of the risk of wind turbine collision to conservation significant bird and bat species is presented in Table 8. Ongoing post-construction (operational period) monitoring is designed to capture mortality rates of all species (including least concern species and species not listed under the EPBC Act), as well as targeting species at medium and high risk of WTG collision.

Table 8 Collision risk summary for conservation significant birds and bats

Species	EPBC Act	NC Act	Occurrence in project site	Occurrence in RSA	Collision risk
white-throated needletail *Hirundapus caudacutus*	V, Mi	V	Regularly traverses site, 364 sightings over six survey periods	Regularly flies at RSA height, with an average flight height of 115 m (Table 13)	High
glossy black-cockatoo *Calyptorhynchus lathami lathami*	V	V	Resides on site, signs of feeding found on site and seven individual sightings	May occasionally fly at RSA height, only observed to fly at canopy height on the project site but known to fly within RSA	Medium
fork-tailed swift *Apus pacificus*	Mi	SLC	Rarely traverses site, three individuals observed during two survey periods	Regularly flies at RSA height, with an average flight height of 80 m (Table 13)	Medium
grey-headed flying-fox *Pteropus*	V	LC	Likely to traverse site during periods of high food availability,	Regularly flies at RSA height, not observed flying at project site but	High

Species	EPBC Act	NC Act	Occurrence in project site	Occurrence in RSA	Collision risk
poliocephalus			observed on site during mass flowering	known to fly at RSA height	
powerful owl	-	V	No individuals detected during surveys.	May occasionally fly at RSA height, none observed flying at project site.	Low
black-breasted button quail	V	V	No individuals detected during surveys.	Rarely or never flies at RSA height, none observed flying at project site.	Low
oriental cuckoo	Mi	SLC	No individuals detected during surveys.	Rarely or never flies at RSA height, none observed flying at project site.	Low
regent honeyeater	CR	CR	No individuals detected during surveys.	Rarely or never flies at RSA height, none observed flying at project site.	Low
glossy ibis	Mi	SLC	No individuals detected during surveys.	Rarely or never flies at RSA height, none observed flying at project site.	Low
Australasian bittern	E	E	No individuals detected during surveys.	Rarely or never flies at RSA height, none observed flying at project site.	Low
diamond firetail	V	V	No individuals detected during surveys.	Rarely or never flies at RSA height, none observed flying at project site.	Low
Squatter pigeon	V	V	No individuals detected during surveys.	Rarely or never flies at RSA height, none observed flying at project site	Low

Conservation status: CR – Critically endangered, E – Endangered, V – Vulnerable, SLC – Special Least Concern, LC – Least Concern.

6 Monitoring and reporting

6.1 Introduction

Monitoring data must be collected in a robust and statistically meaningful way to ensure that the results gained are able to be translated into effective management measures. The monitoring program must be designed for the site with a clear idea of the statistical analysis to be used (Brett Lane & Associates & Aria Professional Services, 2005). This BBMP presents a monitoring program designed to be adaptive to changes in monitoring data or finalisation of detailed project design. If required, any supplemental data analysis will be conducted by a suitably qualified ecologist with data analysis experience for incorporation into this BBMP.

The monitoring methods presented in this BBMP are informed by scientific literature, governmental guidance such as approved species conservation plans, and in particular the following two investigations into bird and bat use at Australian wind farms:

- *Wind Farms and Birds: Interim Standards For Risk Assessment* (Brett Lane & Associates & Aria Professional Services, 2005)
- *Investigation of existing post-construction mortality monitoring at Victorian wind farms to assess its utility in estimating mortality rates* (Moloney et al., 2019).

As is provided in Section 1.3, the objectives of the BBMP and monitoring program are to:

- detect changes in utilisation of habitat at the project site by birds
- detect mortality of birds and bats around the project that can be attributed to direct impacts from the project operation
- provide a framework for response to unacceptable changes in habitat utilisation or mortality of birds and bats.

In order to determine the potential direct and indirect impacts on birds and bats from the operating wind farm, the post-construction (operational period) monitoring surveys will be conducted for at least the first two years of wind farm operation to confirm the adequacy of the monitoring techniques and establish a baseline for the impact of wind farm operation. Should impacts exceeding prescribed trigger values be identified, the monitoring period will be extended to allow the effectiveness of adaptive management measures to be assessed. Post-construction monitoring surveys will include the following:

1. quarterly seasonal bird utilisation surveys for two years at the commencement of operation of Tarong West Wind Farm to fulfill the “after” component of the BACI design and to detect any changes in the number and distribution of species and/or individuals utilising the site
2. surveys within the glossy black-cockatoo breeding season during the adaptive management period of wind farm operations

3. flying-fox surveys during the adaptive management period of wind farm operations if mass flowering and fruiting events (as confirmed by a suitably qualified ecologist) occur across the project site, providing foraging resources for flying-foxes
4. microbat surveys using microbat call recording devices to detect any changes of number of species and/or distribution across the site
5. carcass surveys at the base of WTGs to determine direct impacts (collisions with WTGs), and searcher efficiency trials to inform the confidence of mortality estimates
6. carcass persistence monitoring to determine the potential under estimation of impacts from collisions due to removal of carcasses by scavengers or decomposition.

Incidental observations of conservation significant bird or bat species will be recorded during all monitoring events by suitably qualified ecologists on site. Key species will include:

- glossy black-cockatoo
- grey-headed flying-fox
- white-throated needle-tail
- migratory species.

Sightings will be documented with each record including the following information:

- date and time of sighting
- location of sighting
- species
- number of individuals (approximate)
- proximity to turbines.

6.2 Bird utilisation surveys

Quarterly bird utilisation surveys have occurred seasonally for over two years pre-construction and will continue to occur seasonally each quarter for two years post-construction at the pre-defined 15 fixed-point count survey locations to fulfill the ‘before’ and ‘after’ component of the BACI design and determine if bird utilisation in the area significantly differs with the construction of the wind farm. The preconstruction surveys have been completed at these sites, with surveys in 2020, 2021, 2022, and 2023 (Ecosure, 2025b). All sites will be surveyed using the same fixed point count methodology as detailed in the BBUS report (Ecosure, 2025b) to ensure data is comparable and without bias.

6.3 Targeted glossy black-cockatoo surveys

Targeted bird surveys during the adaptive management period will be used to monitor wind farm operation to glossy black-cockatoo behaviour, including avoidance of feeding habitat and avoidance of roosting and nesting trees. As glossy black-cockatoos are unlikely to be detected

during standard bird utilisation surveys (only five individuals were sighted during 12 seasons of fixed point count surveys), targeted surveys for their feeding activity will be completed at known feeding sites, particularly those in close proximity to WTGs. Glossy black-cockatoos exhibit fidelity to feed trees and patches and so these will be monitored to detect changes in use of the area. Glossy black-cockatoos also require large, deep hollows in which to nest. Prior to (during pre-clear surveys), during and post-construction (operation), searches will be completed within 500 m of each WTG for potential nesting hollow resources (where pre-clear surveys have previously identified suitable nesting hollows) and if any are identified surveys will be completed to determine nesting activity for further monitoring during breeding season or signs of abandonment.

Monitoring for glossy black-cockatoo will be conducted for a minimum of two years or two breeding seasons, whichever is longer, during the adaptive management period. As this species may only breed every second year, due to the significant investment made by the parents in successfully raising a chick, continuation of the monitoring program must occur over two breeding seasons to determine whether a chick has been successfully raised.

6.4 Targeted flying-fox surveys

Evening flyout and nocturnal surveys will be conducted during the adaptive management period when high food availability (flowering and fruiting) occurs across the project site to (generally during spring) to gather data on the use of the project area and flight behaviours of the grey-headed flying-fox. Periods of high food availability (i.e. mass flowering and fruiting events), to be identified by a suitably qualified ecologist, are critical for survey timing regardless of the project phase (pre-construction, construction, or operation). Incidental observations of any roost sites on or adjacent to the project site during the operational phase of the project will be recorded and investigated by a suitability qualified ecologist for species identification and flyout direction.

6.5 Carcass survey methods

6.5.1 Carcass monitoring

The key focus of monitoring will be carcass surveys to detect mortality from collisions with WTGs. It is noted that some of the carcasses found within the vicinity of WTGs may not be as a result of collision with project infrastructure, however it will be assumed for the purposes of monitoring that carcasses are the result of WTG collision. Feather-spots will also be recorded during carcass surveys.

Carcass surveys will be designed in consultation with the Proponent, the regulator, and a suitably qualified ecologist to ensure a robust, statistically powerful method of data collection. The following points are considered:

- Carcass surveys will be conducted monthly during the first two years of operation, in association with the bird utilisation surveys (section 6.2).

- An area of a circle with radius equal to the hub height of the turbine will be searched. The search area will be determined once final selection of the WTG model has been completed. The search area will include an inner circle, where smaller birds and bats are typically found, and an outer circle, where carcasses of larger species typically fall (Hull & Muir, 2010).
- A representative sample of WTGs will be searched during each monitoring period. This will include WTG site specific factors such as terrain, ground cover, seasonality, and obstructions. In addition, WTGs considered high risk to birds and bats (for example, those located within 500 m of suitable habitat areas for birds and bats) will also be searched during each monitoring period.
- It is recognised that carcasses will be lost due to scavenger activity and natural decomposition. This can impact the number of mortalities recorded. To ensure the results of carcass surveys are representative of impacts, carcass persistence trials will be completed. Carcass persistence trials are important to complete, as overseas scavenger surveys have shown that 50-75% of carcasses can be removed after 4 weeks (Morrison, 2002) and wild dogs are prevalent within the locality (Ecosure, 2023a, 2023b, 2025a).
- Any carcasses which cannot be definitively identified and which may belong to a conservation significant species will be DNA tested to confirm species identity.
- It is critical to record all turbines which are searched and the survey effort employed (time searched, distance and area covered), even when no carcasses are found. This allows accurate determination of survey effort required to assess mortality for birds and bats.

It is recognised that observers may not find all carcasses within a search area as quickly or at all compared with other observers. To obtain estimates of the efficiency of carcass monitoring, both carcass persistence and observer efficiency trials will be conducted. Observer efficiency trials will be completed to determine the proportion of carcasses that observers find within a set amount of effort expended, and carcass persistence trials will provide estimates of carcass longevity (and therefore detection probability) in the landscape. The results of observer efficiency and carcass persistence trials will be used on an ongoing basis to inform carcass survey methods. For example, if observer efficiency is low or carcasses are found to be scavenged quickly after placement, the frequency of carcass searches will increase to account for a lower likelihood of carcass detection from WTG collision.

Any find of glossy black-cockatoo or other TNT species carcass outside of the search area will be investigated to determine the possible cause for mortality and be recorded as such. If WTG collision cannot be reasonably excluded as a cause of mortality, the carcass will be included in calculations of impact triggers and mortalities.

6.5.2 Carcass persistence trials

Carcass persistence trials will be developed following the protocols within (Brett Lane & Associates & Aria Professional Services, 2005). These trials are important to determine the rate of carcasses loss within the site due to scavengers and to attempt to correct for the rate

of carcasses detected. Carcass persistence trials will be completed within the first two years of the monitoring program at a frequency to be determined through consultation with the regulator and a suitably qualified ecologist. The following methods will be used to conduct the carcass persistence trials:

- A representative subset of turbines will be chosen to place carcasses underneath in a range of micro-habitats.
- Trials will be conducted twice during the first year of monitoring in addition to other monitoring, during the wet and dry seasons, to capture seasonal differences in carcass decay, scavenger populations, and scavenging rates.
- Available carcasses which are of comparable size and colour to birds and bats which are at risk of WTG strike (small, medium and large-bodied species) will be placed in varying proximity to WTGs and their locations marked.
- Carcasses will be checked visually on a regular basis (e.g. once every three days), and camera traps may be deployed and collected after a suitable amount of time (e.g. 2 months) to assess the length of time before the carcass decomposes or is scavenged. If carcasses decompose or are scavenged quickly, this will inform the frequency of carcass monitoring (lower carcass persistence in landscape will necessitate more frequent carcass monitoring).

Data collected as part of the carcass persistence trials will be collected in accordance with Appendix 2 of (Moloney et al., 2019) and include:

- size, weight, and species of carcass
- date the carcass was deployed
- nearest turbine
- environment and micro-environment of the carcass, e.g. within a sparsely forested area, placed amongst dry leaf litter
- details of any pest control which may affect scavenger activity on the site
- for days when the carcass is checked, the weather conditions since the previous check and the condition of the carcass will be recorded.

6.5.3 Observer efficiency trials

The number of carcasses found by an observer over a set length of search effort is termed observer efficiency. Observer efficiency differs according to the observer and the characteristics of the site and therefore, trials at Tarong West Wind Farm will be required. The observer efficiency trial will be completed within the first year of carcass monitoring and include two trials over different seasons (wet season and dry season, to capture the effect of weather conditions on observer efficiency). Effort will be made to conduct the trials as blindly as possible, to reduce the effect of prior knowledge on survey effort and results. To accomplish this, observers will not be informed that a trial is being conducted and will not be informed of the number of carcasses present, or which turbines have been selected.

The following methods will be used to conduct the observer efficiency trials:

- Someone who is not the observer will place a number of carcasses of varying type and size (small [≤20 cm body length, medium [21 – 60 cm body length], and large-bodied [≥61 cm body length] species) under a number of turbines which the observer is scheduled to survey that day.
- Where possible, the frozen carcasses of native birds or bats collected during previous surveys will be used, but in order to ensure sufficient data is collected, easily obtainable carcasses may be used. The number and GPS location of carcasses will be recorded, as will be the micro-habitat in which the carcass was placed (e.g. in long or short grass). The carcass will be inconspicuously marked to ensure it is not confused with a WTG collision carcass.
- The observer will conduct the carcass survey as prescribed, and will record any of the planted carcasses in addition to any others observed.

Data collected as part of the observer efficiency trials will be collected in accordance with Appendix 2 of (Moloney et al., 2019):

- date and weather conditions
- name of the searcher, and if a dog was used, name of the dog
- search transect details for each turbine, including total area searched, distance walked, and time spent searching
- for each carcass identified, record the size and species of carcass, the micro-habitat in which the carcass was found (e.g. long grass).

Upon completion of the carcass survey, the results obtained by the searcher can be compared to the known number of carcasses placed within the survey area to determine observer efficiency. This data can also be used to determine the effects of micro-habitat on carcass detection, and over time, the effects of weather conditions on observer efficiency.

6.6 Incidental finds

In the course of normal works (pre-, during or post-construction), should any site personnel identify a dead or injured bird or bat (particularly at the base of a turbine) within or adjacent to the project area, the project ecologist will be notified. In the case of injured birds a wildlife carer or veterinarian will be contacted and if safe to do so, the bird will be taken to the carer or veterinarian. Only experienced and appropriately vaccinated professionals should handle bats due to the risk of disease transmission, so in the case of injured bats, the bat will be monitored visually and an appropriately qualified individual will be contacted to collect and assess the bat. The find shall be recorded as follows:

- species, size, and condition of the carcass or injured fauna (e.g. heavily decomposed)
- date and prevailing weather conditions

- GPS location and distance from nearest turbine.

6.7 Post-construction monitoring schedule

The objectives of the BBMP and monitoring program, outlined in Section 1.3, include assessment of potential impacts to bird and bat species associated with the operation of the project and the detection of changes in utilisation of habitat at the project site by birds. Direct impacts on bird and bat species can be measured by monitoring of mortality. Changes in site utilisation are more complex but can for example, be reflected by a reduction in the number of species and/or the number of individuals of a species at fixed point locations. It may also be indicated by reduced use of foraging resources or changes in nesting behaviours of species such as glossy black-cockatoo. Decreases in utilisation of the Project site could lead to pressure on other foraging resources, increased competition for nesting sites outside the impact area or reduced breeding success, reduced extent of occupation by a species or a population of a species, restriction of genetic diversity and overall decline in a species.

Bird utilisation data was collected over a two year period and for glossy black-cockatoo will be continued during the pre-clear and construction phases. The intent of this continued survey for glossy black-cockatoo is to capture as much data as possible in relation to foraging areas and nesting sites for this species. Additional surveys for grey-headed flying-fox will be completed during mass flowering events to inform the extent of use across the site.

Collection of bird utilisation data, and monitoring of glossy black-cockatoo nests identified during previous surveys, will continue for at least two years after the commencement of operations for comparison against baseline data. This will allow completion of the ‘after’ step in the BACI design. Changes identified in the number and distribution of species and/or individuals utilising the site may trigger the need for implementation of adaptive management measures in this plan and for continued monitoring to assess the effectiveness of those measures. Triggers for the implementation of adaptive measures relate to reduced bird observations and changes in the use of the site by glossy black-cockatoo. These are outlined in Section 7.2.

The commencement date of the post-construction monitoring program will be at the start of the operation period. The monitoring program may commence at any time of the year. The BBMP will be updated to include the commencement date, monitoring duration and monitoring schedule for the monitoring period.

As has been implemented for other wind farm projects in Victoria and New South Wales, monitoring programs typically occur over the first two years of operation and for up to five years of operation. Monitoring will be conducted for at least two years post-construction (operational period), with the capacity for extension to allow monitoring of the effectiveness of any adaptive management measures which are implemented. The final monitoring program is highly dependent upon a range of factors such as:

- monitoring effort and duration is appropriate to the final project design and the associated risk to conservation significant birds and bats, to be determined through statistical design

- monitoring is related to the timing and specifications of the operational phase of the project, such as whether a staged start-up approach is selected or soft starts employed
- monitoring is adaptive to the findings of the surveys and can be adjusted as needed, and will be extended where required to validate that corrective actions have had the intended effect of mitigating risk to birds and bats.

A summary of the proposed post-construction (operational) monitoring schedule for birds and bats is provided in Table 9. Changes to management practices may be made at any point in time in response to the data obtained during monitoring surveys, and the collision risk analysis will be updated within the annual turbine strike risk report and final monitoring report. Monitoring is the responsibility of the Proponent to ensure monitoring is conducted, monitoring data reviewed, adaptive management is implemented and additional monitoring conducted where required.

Table 9 Proposed post-construction (operational) monitoring schedule

Monitoring method	Schedule	Objective	Project phase
Bird utilisation surveys	Quarterly for the first two years of the operational monitoring period according to the survey methods for fixed point count surveys from 2020 – 2023 as detailed in Ecosure (2025b).	Determine whether bird use alters within the project area during operation of the wind farm, as compared to baseline data collected from 2018 – 2023.	Operation
Glossy black-cockatoo surveys · feeding areas · nest trees	Twice yearly during operational monitoring period, involving: · monitoring known and potential feeding locations for evidence of continued use during operation · searches for nesting hollows during the breeding season and continued monitoring of known nesting trees during operation for signs of abandonment.	Determine whether site utilisation by glossy black-cockatoo is altered by wind turbine operation.	Operation
Grey-headed flying-fox surveys	Annual flyout and nocturnal surveys during adaptive management period, during spring when food tree species are flowering and or fruiting in mass.	Obtain more data on site use patterns during periods of high food availability (mass flowering and fruiting) to further refine risk assessment.	Operation
Microbat surveys	Anabat and harp trapping surveys at select locations previously surveyed in accordance with the BBUS survey methods (Ecosure, 2025b).	Assess whether site utilisation is altered by wind turbine operation	Operation
Carcass surveys	Monthly per year for the first two years of operational monitoring.	Determine mortality risk to birds and bats from wind turbine strike and barotrauma.	Operation
Observer efficiency trials	Twice during first year of carcass monitoring (assuming the same	Determine observer efficiency to inform confidence with which	Operation

Monitoring method	Schedule	Objective	Project phase
	observers are used throughout all carcass surveys).	mortality rates can be estimated.	
Carcass persistence trials	Twice per year for the first two years of monitoring.	Determine carcass persistence in the landscape to refine carcass monitoring surveys and inform confidence with which mortality rates can be estimated.	Operation
Incidental detections of injured or dead birds and bats	Conducted by all site personnel on a continuous basis in the course of normal works.	Supplement standardised monitoring methods with any incidental finds.	Operation

6.8 Reporting of mortality and survey results

Accurate records must be gained from the monitoring program to ensure that statistically powerful analyses can be undertaken. Data must be recorded using standardised forms that are consistent between observers and reduce potential for errors. Electronic data capture systems are preferred to reduce transcription errors from paper forms and can be configured from the outset to ensure data is recorded to allow efficient analysis.

The monitoring program must include regular reporting of results. The following reports will be completed:

- Threatened species report – detection of injured or killed threatened bird or bat. This involves preparation of a formal report and generally follows initial notification (within 24 hours of the incident occurring) to the regulator as detailed in the Fauna Management Plan (Ecosure, 2025c).
- Post-survey report – provided to the Proponent at the end of a survey. May be formal or informal.
- Annual turbine strike risk report – provided to the regulator at the end of the survey year (generally upon the anniversary of the commencement of the monitoring program). This will involve preparation of a formal report and include estimates of bird and bat mortality as a result of WTG collision, updating the collision risk model, identify high-risk turbines and potential changes to risk ratings, and in particular address high risk species
- Final monitoring report – provided at the end of the formal monitoring program containing detailed analysis of all mortality data.
- Informal correspondence – by email.

Estimations for annual mortality rate will be completed as part of the Annual turbine strike risk report and the Final monitoring report. These estimations will utilise the following:

- supporting evidence from case studies of listed species carcass size classes

- results of persistence trials and searcher efficiency trials
- annual probability of detection and monthly strike monitoring
- collision monitoring protocol and survey effort.

Regular reports will be updated at the end of each monitoring survey to ensure that management strategies can adapt to changed circumstances. All reports will be the responsibility of the Proponent to commission and a suitability qualified person to deliver. The Proponent will provide all reports to the relevant regulators, as required by any future approval/s.

Table 10 Content and frequency of monitoring reports for Tarong West Wind Farm

Report	Schedule	Details required
Threatened species report	Following initial notification to the regulator	· Species impacted. · Method of detection (i.e. opportunistic observation or standard carcass survey). · Distance from nearest wind turbine. · Details of any visible impact damage (particularly for microbats where barotrauma may be the cause of mortality).
Post-survey report	Following completion of survey period	· Raw data of mortality or bird and bat utilisation. · Methods and results of surveys completed. · Confidence intervals for mortality estimates (informed by observer efficiency and carcass persistence trials)
Annual turbine strike risk report	Once per year on anniversary of initiation of monitoring period.	· Raw mortality data. · Methods and results of ongoing monitoring surveys conducted throughout the year (e.g. fixed point count surveys, nocturnal spotlighting for flying-foxes). · Methods and results of carcass persistence trials and observer efficiency trials. · Environmental/meteorological conditions associated statistical analysis · Update the collision risk model. · Estimates of annual mortality rate for all species. · Confidence intervals for mortality estimates (informed by observer efficiency and carcass persistence trials). · Review turbine risk rating, where appropriate. · Recommendations for improvements or changes to monitoring methods, in particular to improve the confidence of mortality estimates.
Final monitoring report	At conclusion of post-construction (operational) monitoring period.	· Raw mortality data for all surveys conducted during the monitoring period. · Methods and results of ongoing monitoring surveys conducted throughout the post-construction (operational) monitoring period. · Methods and results of carcass persistence trials and observer efficiency trials. · Estimates of annual mortality rate for all species. · Recommendations for adaptive management measures to be implemented and monitoring methods to be continued to assess the effectiveness of measures implemented.

Report	Schedule	Details required
Informal correspondence	As required.	· Relevant information as required.

6.9 Additional MSES or MNES species

Should any observations or carcass of an EPBC Act or NC Act listed threatened bird or bat not specified in this plan be detected, these species must be included in the relevant reports (Table 10). Additional monitoring may be required and an appropriate data collection procedure will be designed as required for these species and the BBMP updated to include these monitoring requirements.

7 Adaptive management

7.1 Risk assessment tool

In order to implement an effective management plan, there must be a clear connection between an impact that has occurred and a management response. The risk assessment tool, as outlined in Section 5, is recommended by Brett Lane & Associates and Aria Professional Services (2005) as the way to ensure appropriate decision making is made in response to a potential impact on birds or bats as a result of collision with turbines or barotrauma. Given that birds and bats exist in a natural state and are subject to impacts outside of the Proponent's control, the risk assessment tool will be viewed as a guide to decision making and responses to medium and high risks will be made on a case-by-case basis.

The risk assessment tool provided in this BBMP has the following purposes:

1. to assist with determining the significance of an impact (i.e. collision, carcass) detected by the monitoring program
2. to assist with developing an appropriate management response to a breach of a trigger level (see below).

The probability of impacts upon any individual bird or bat was determined using the likely occurrence of each species on site and the relative flight height of each (Table 6). Based on the known flight behaviours of different groups of birds and bats (e.g. soaring, foraging below canopy, etc), a qualitative risk category of high, medium, or low probability of collision with project infrastructure was determined for each (Table 7). Species specific risks were determined using the attributes of each (Table 8). This was used to establish priorities and timeframes for monitoring and management actions.

Measuring the extent of indirect impacts on individual species as a result of disturbance or loss of foraging or breeding habitats is more complex. Long-term monitoring and assessment over the operational phase of the project is required to determine changes to species' utilisation of the Project site. Comparison of bird utilisation surveys completed prior to and after operation may identify changes in the distribution or number of species which will prompt further investigation and survey to provide context and identify potential causes, project related or otherwise.

Where possible, short term indicators of potential changes in behaviour and site utilisation are also included in this BBMP where impacts on utilisation may occur within a more immediate timeframe.

7.2 Triggers for corrective action

The trigger levels for situations requiring corrective action are discussed in this section. Triggers signify that a threshold condition or impact has been reached and that the threshold is of a level requiring a management response. Generally, an impact trigger is where a

monitoring survey identifies mortality or injury of conservation significant species or a number of at-risk species. Consequently, triggers may be reviewed regularly depending upon the significance ascribed to various situations and the adaptive management approach employed throughout this management plan.

Triggers for corrective action will be reviewed prior to the final BBMP and the list of triggers agreed between the Proponent, the regulator, and a suitably qualified ecologist. Draft triggers are provided in Table 11.

Table 11 Draft triggers for corrective action implementation

Category	Trigger	Trigger value
Death, or injury of, or site alienation of a species listed as threatened (critically endangered, endangered, vulnerable) under the NC Act and/or EPBC Act	Dead or injured fauna within a radius equal to the hub height of the turbine from the base of a WTG	Mortality or injury of 1 individual.
	Point count survey location showing reduced species presence	Resident species not detected over two years of bird utilisation surveys
	Point count survey location showing altered species presence	Species detected in areas where not previously recorded in bird utilisation surveys
	Glossy black-cockatoo – reduced use of feeding trees	Evidence of feeding (chewed cones of *Allocasuarina* / *Casuarina* species) not detected in known feeding areas during the adaptive management period
	Glossy black-cockatoo – reduced use of nesting tree(s)#	Abandonment of any confirmed nesting trees during operation (no evidence of nesting after confirmed nesting event during the adaptive management period)
Death or injury of species listed as near threatened, SLC under the NC Act or migratory under the EPBC Act	Dead or injured fauna within a radius equal to the hub height of the turbine from the base of a WTG	Mortality or injury of 10^ or as per the species specific trigger level identified in Table 12, whichever is lower
*Death or injury of LC raptors or owls	Dead or injured fauna within a radius equal to the hub height of the turbine from the base of a WTG	Mortality or injury of 3
Death or injury of bats (LC flying-foxes or microbats)	Dead or injured fauna within a radius equal to the hub height of the turbine from the base of a WTG	Mortality or injury of 10
Unusually high mortality rates associated with one particular turbine.	Dead or injured fauna within a radius equal to the hub height of the turbine from the base of a WTG	Mortality or injury demonstrated to be significantly higher than other turbines.

^ 10 individuals represent a small percentage of the migratory species population in Australia for the species known or likely to occur within the site.

* Where there is a conflict between a species conservation status and its functional group, the lower trigger value shall prevail. For example, the trigger value for a grey-headed flying-fox will be as for threatened species and not bats, similarly for white-throated needletail.

Contingent upon locating known nesting tree(s) during baseline surveys.

Species specific significant impact trigger thresholds have been set based on the concept that an annual fatality rate of >0.1% of the population would be significant due to serious disruption to an ecologically significant proportion of that population. This is consistent with the approach adopted at other wind farms. Table 12 outlines the species specific guidelines for threatened and migratory species which may occur within the RSA (excludes ground dwelling species squatter pigeon and black-breasted button-quail) and where population numbers are reliably known.

Table 12 Species specific significant impact trigger thresholds

Species	Risk level	Estimated population	Annual trigger threshold based on 0.1% of population
White-throated needletail	High	41,000 (Tarburton & Garnett 2021), with a nationally important proportion of the population is 10 and an internationally important proportion of the population is 100 individuals (DoE 2015)	41
Grey-headed flying-fox	High	680,000 (±158,500) individuals based on the National Flying-Fox Monitoring Program (DCCEEW, 2025)	680
Fork-tailed swift	Medium	100,000 with a nationally important proportion of the population is 100 individuals (DoE 2015)	100
Glossy-black cockatoo	Medium	7,000 – 14,000 (Birdlife International 2025)	7
Glossy Ibis	Low	Resident in most of Australia, estimated population globally is between 230,000 – 2,220,000 individuals (Birdlife International 2025).	230
Oriental cuckoo	Low	Birdlife International (2025) estimates 500,000 – 5,000,000 mature individuals. 1,000 is listed as an ecologically significant proportion of the population of a migratory species (DoE 2015)	1,000
Australasian bittern	Low	estimates 2,500 mature individuals (DETSI 2025)	2.5
Diamond firetail	Low	136,000 mature individuals (DCCEEW 2023)	136
Regent honeyeater	Low	Estimated at 340 – 400 mature individuals in 2010 (Birdlife International 2025)	1

The following procedure will be enacted once a trigger value has been reached in Table 11 or Table 12:

1. The suitably qualified ecologist will report the result to the Proponent and commence an investigation.
2. The suitably qualified ecologist and Proponent will complete a risk assessment to determine the significance of the event.
3. If the event is determined to be a significant impact, then this will either:

a. require corrective action within approved timeframes to implement one or more of the mitigation measures outlined in Section 7.3 to attempt to reduce further impacts; or

b. require further investigation/survey to determine level of impact.

4. Depending upon the project's approval conditions, a report to the regulator may be required.

7.3 Adaptive management and mitigation framework

Additional mitigation measures will be implemented when trigger values are breached (Table 13). These measures would be in addition to the impact management measures committed to in Section 5.3 of this BBMP. It is recognised that the wind farm will be developed within a functioning and dynamic ecological community and that alternative mitigation measures may be required to adequately address risk to birds and bats. Should a risk assessment process identify a significant impact, there are a number of additional mitigation measures that can be implemented as part of the adaptive management response.

Table 13 Corrective actions and mitigation measures

Mitigation measure	Management details	Timing for implementation
Increase survey effort	Increased survey effort will provide additional data that supports a trigger level breach. The frequency of point count surveys and/or targeted surveys will be increased depending on the species targeted, the behaviour and ecology of the species and the location of the trigger.	Next seasonal survey opportunity.
Investigate activities or events	Investigation will provide contextual data that may have contributed to a species mortality or absence from the site. This may include such events as bushfires, mass flowering events, severe storms, drought or heat waves that will influence species utilisation of the site. In the case of glossy black-cockatoo factors such as extended breeding period, use of alternative nest site, or changes in food source availability should also be investigated as well as extended monitoring where use of a breeding site has been interrupted (e.g. to capture the next season which could be two years from the trigger event.	Immediate or as soon as practically possible and in consultation with a suitably qualified ecologist.
Continue BUS	Where wider impacts on species utilisation across the project site are suspected utilisation surveys are to continue in conjunction with wider assessments of biological and anthropogenic influences impacting the region and consideration of project impacts (habitat clearance, regeneration of disturbed areas, fire management).	Next seasonal survey opportunity, must be reviewed by a suitably qualified ecologist and statistician to ensure any changes can be statistically incorporated into the monitoring program.
Investigate anthropogenic activities	Anthropogenic activities not related to this project may also require investigation to determine whether those activities have contributed to species mortality or absence (e.g., baiting for wild dogs causing attraction of carrion-foraging wedge-tailed eagles, new stock watering point constructed attracting birds, planting of crops that provide foraging resources).	At appropriate times, following strikes to a threatened species and in consultation with regulators (refer to triggers in Section 7.2).
Investigate attractants	Investigate attractants such as artificial lighting, which attracts both birds and bats and their food sources such as insects (Longcore et al., 2008). Artificial	At appropriate times, following strikes to a threatened species and in consultation with

Mitigation measure	Management details	Timing for implementation
	lighting may also temporarily blind birds, particularly nocturnal species such as owls or other species used to flying at night or in low light conditions. Birds may then fly towards the lights and / or collide with physical structures such as WTGs or other infrastructure such as buildings and powerlines (Gauthreaux Jr & Belser, 2006).	regulators (refer to triggers in Section 7.2).
Investigate deterrents	Where it has been shown that a species mortality has been caused by collision with a WTG and the risk assessment has determined a significant impact has occurred, a variety of deterrents may be investigated to attempt to direct birds away from WTGs. Deterrents may involve physical objects or aural cues that attempt to scare birds away.	At appropriate times, following strikes to a threatened species and in consultation with regulators (refer to triggers in Section 7.2).
Carrion management	Removal of carrion from the area around WTGs to reduce the potential incidence of raptor collision where these are attracted to an additional food resource on site.	During WTG routine maintenance and operations – ongoing.
Onsite habitat creation / improvement / protection / modification	To provide alternative habitat away from WTGs should avoidance of habitats be identified (in particular for glossy black-cockatoos).	Survey results identify glossy black-cockatoo avoidance of WTG areas – prior to the following nesting season.
	Should habitat be attracting species to a particular turbine where it becomes a high risk of meeting a trigger threshold, complete vegetation management and creation of additional habitat away from WTGs. This mitigation does not imply that additional habitats will be cleared over and above the approved clearing for the project.	Increase in species-specific utilisation observations at a WTG –to be agreed with a suitably qualified species expert and regulators to avoid impacts to other threatened species and to ensure habitat management is justified and addressed.
Implement radar detection systems and temporary turbine slowdown	Several radar systems are available that are designed to detect birds and slow WTGs when birds approach the blades. Currently, these systems are most commonly implemented to detect large birds, in particular birds of prey. However, a recent study on the effectiveness of one radar detection system at a wind farm in Australia (Goldwind, 2022) determined that smaller species, such as white-throated needletails, were able to be identified.	At appropriate times, following strikes to a threatened species and in consultation with regulators (refer to triggers in Section 7.2).
Modify turbine activity - glossy black-cockatoo nesting season	Modification of wind farm and turbine activity during glossy black-cockatoo nesting season where individuals are found to be nesting in a previous nest site at a location known to have been abandoned.	Survey results identify glossy black-cockatoo at a previously abandoned nest site.
Modify turbine activity – changes in site utilisation	Modification of turbine activity in areas where changes in site utilisation by conservation significant species can be directly attributed to the operation of turbines. This could include options for seasonal modification to avoid migratory occupation of the site or changes in response to conditions that favour particular species (e.g. turbines adjacent thoroughfares that are used during identified weather events or those near intermittent food resources such as mass flowering events).	Survey results in an annual report identify changes in site utilisation. Implement as appropriate and in consultation with regulators.
Biodiversity offsets determined in consultation with regulators	If significant impact thresholds have been exceeded (Table 12) or identified as a recurring risk.	Timing for delivery of offsets to be determined in consultation with appropriate authorities.

The risk assessment (Section 5.2) will be used to determine the significance of the observed impact and the appropriateness of the mitigation response(s). Multiple measures may be required in order to minimise further risk to as low as reasonably practicable.

7.4 Recurring risk investigation framework

In the event that an impact trigger occurs and the incident is potentially a recurring risk, a significant impact assessment (in accordance with the EPBC Act Significant Impact Guidelines 1.1 or the relevant Queensland Government Significant Residual Impact Guideline) will be completed with updated data from utilisation surveys, carcass monitoring and a revised collision risk model.

In the event that the incident is potentially a recurring risk, the following activities will be undertaken:

- species-specific monitoring and mitigation program, with periodic reports provided to regulators;
- if, once all other additional mitigation measures are implemented and the impact trigger is recurring, operational curtailment may be considered in consultation with relevant regulators.

In consultation with the relevant regulators, if a fatality or injury is determined to be an isolated event, or there is no significant impact to the species, no further action will be required. All documentation of any investigations, along with recommended mitigation measures will be summarised in the annual reports and provided to the regulators.

8 Roles and responsibilities

8.1 Roles

Key roles and responsibilities relevant to the implementation of the BBMP are identified in Table 14.

Table 14 Key roles and responsibilities

Role	Responsibility	Frequency
Proponent		
The Proponent's role is to ensure that the BBMP is implemented in accordance with relevant approvals.	Submit monitoring results to the regulator in accordance with the reporting schedule	As per reporting schedule
	Submit non-conformances to the regulator in accordance with the compliance requirements	As required when triggers are breached
	Ensure that the BBMP is being implemented in accordance with the BBMP and relevant approvals	Ongoing
	Contribute to monitoring for bird and bat mortalities in consultation with the ecologist	Ongoing
Project Ecologist		
The ecologist's role is to undertake monitoring as per the BBMP and inform the Proponent of non-conformances or improvements.	Undertake bird utilisation surveys and carcass surveys in accordance with the BBMP	As per the monitoring schedule
	Ensure timely and accurate reporting of survey results to the operator	As per the reporting schedule
	Ensure timely and accurate reporting of non-conformances to the operator	As required when triggers are breached
	Assess the performance of the BBMP and recommend adaptations for improvement to the operator	Ongoing
	Provide technical advice / notes / reports to the operator	As required

8.2 Qualifications and experience

A suitably qualified ecologist will implement and oversee the monitoring program, including carcass searches, searcher efficiency trials and scavenger trials. Searches will be conducted by trained personnel or dogs trained by suitably qualified ecologists experienced in these methods.

All site personnel will be inducted and informed of the conservation significant fauna on the project site and the requirement to report the deaths of any bird or bat species observed, but in particular the conservation significant species and high risk species identified in this BBMP.

Bird utilisation surveys and carcass surveys are specialised tasks that require a reasonable level of experience to be held by the project's suitably qualified ecologist. The project ecologist will hold the following:

- a degree in science, environmental science or ecology
- a minimum of 5 years' experience in completing bird surveys within south east Queensland and/or the Brigalow Belt bioregions
- experience in working on large-scale wind energy projects in Australia.

It is known that there is considerable observer bias in conducting bird surveys and results can varying between observers. To minimise observer bias, it is preferable that personnel remain consistent over the BBMP monitoring period, as far as practicable.

8.3 Record keeping

Records of the qualifications and experience of the project ecologist and other ecologists contributing to the monitoring program must be kept by the Proponent for a minimum of five years following the end of the monitoring program.

8.4 Audit and review

The BBMP will be reviewed to align with the monitoring reporting, or when triggered by an incident (Table 11). A review will assess whether the plan is achieving its objectives and the requirements of any relevant approval conditions. A review will take into account environmental monitoring records, corrective actions and the results of any audits. During the review process, any reasons for varying the management plan will be documented.

The BBMP will be reviewed by the Proponent, a suitability qualified ecologist and a qualified external auditor (i.e. technical area expert in bird and bat strike). Updated management plans will be provided to the regulator as required.

Review of a management plan would typically be undertaken:

- following significant environmental incidents
- when there is a need to improve performance in an area of environmental impact
- periodically for actions undertaken over long timeframes such as one, two or five years.

References

ALA. (2022). *Spatial Data Portal*. Atlas of Living Australia, Canberra. http://spatial.ala.org.au/webportal/

Baerwald, E., D'Amours, G., Klug, B., & Barclay, R. (2008). Barotrauma is a significant cause of bat fatalities at wind turbines. *Current Biology*, *18*, 695–696.

BirdLife International (2025) IUCN Red List for birds. Downloaded from https://datazone.birdlife.org accessed on 22/05/2025

BoM. (2023). *Climate data online*. Bureau of Meteorology. www.bom.gov.au/climate/data

Brett Lane & Associates, & Aria Professional Services. (2005). *Wind Farms and Birds: Interim Standards For Risk Assessment* (No. A report prepared for the Australian Wind Energy Association, 2003.35(2.2); A Report Prepared for the Australian Wind Energy Association).

Cameron, M. (2006). Nesting habitat of the glossy black-cockatoo in central New South Wales. *Biological Conservation*, *127*, 402–410.

Churchill, S. (2008). *Australian bats* (2nd ed.). Allen & Unwin.

DCCEEW. (2023). Apus pacificus—*Fork-tailed Swift*. jurisdiction=Commonwealth of Australia; corporateName=Department of the Environment. https://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=678

DCCEEW. (2023). Conservation Advice for *Stagonopleura guttata* (diamond firetail), Canberra.

DCCEEW. (2024). *National Flying-fox monitoring viewer*. https://www.environment.gov.au/webgis-framework/apps/ffc-wide/ffc-wide.jsf

DES. (2018). *Biodiversity Planning Assessment for Brigalow Belt Bioregion, v 2.1*. Department of Environment and Science, Brisbane. https://www.qld.gov.au/__data/assets/pdf_file/0029/68186/bb-bpa-summary-report.pdf

DES. (2020). *Information sheet—Species management program*. Department of Environment and Science, Brisbane. https://environment.des.qld.gov.au/__data/assets/pdf_file/0031/88717/is-wl-smp.pdf

DES. (2022a). *East Asian–Australasian Flyway Partnership*. Wetland*Info*.

DES. (2022b). *Species profile search*. Department of Environment and Science, Brisbane. https://apps.des.qld.gov.au/species-search/

DETSI. (2024). *Request a species list*. Department of Environment, Tourism, Science and Innovation. https://apps.des.qld.gov.au/report-request/species-list/

DETSI. (2025). WildNet Taxon Records, available at https://wildnet.science-data.qld.gov.au/, accessed on 22/05/2025

DEWHA. (2009). *EPBC Act Policy Statement 2.3 – Wind Farm Industry*. Department of the Environment, Water, Heritage and the Arts, Canberra. https://www.dcceew.gov.au/environment/epbc/publications/epbc-act-policy-statement-23-wind-farm-industry

DoE. (2015). *Referral guideline for 14 birds listed as migratory species under the EPBC Act*. Department of Environment, Canberra. https://www.dcceew.gov.au/sites/default/files/documents/migratory-birds-draft-referral-guideline.pdf

DoR. (2022). *Vegetation management mapping*. Department of Resources, Brisbane. https://www.qld.gov.au/environment/land/vegetation/map-request

DSDILGP. (2022a). *Planning guidance state code 23: Wind farm development*. Department of State Development, Infrastructure, Local Government and Planning, State of Queensland, Brisbane. https://dsdmipprd.blob.core.windows.net/general/state-code-23-wind%20farm%20development-planning-guidance.pdf

DSDILGP. (2022b). *State development assessment provisions—Version 3.0*. Department of State Development, Infrastructure, Local Government and Planning, State of Queensland, Brisbane.

Ecosure. (2023a). *Assessment of Matters of National Environmental Significance for Tarong West Wind Farm, Ironpot, Queensland*. Report to RES Australia Pty Ltd, Brisbane.

Ecosure. (2023b). *Ecological assessment for Tarong West Wind Farm*. Report to RES Australia Pty Ltd, Brisbane.

Ecosure. (2023c). *Preliminary Bird and Bat Management Plan for Tarong West Wind Farm*. Report to RES Australia Pty Ltd, Brisbane.

Ecosure. (2023d). *Preliminary Fauna Management Plan for Tarong West Wind Farm*. Report to RES Australia Pty Ltd, Brisbane.

Ecosure. (2023e). *Preliminary Vegetation Management Plan for Tarong West Wind Farm*. Report to RES Australia Pty Ltd, Brisbane.

Ecosure. (2025a). *Supplement to the Assessment of Matters of National Environmental Significance for Tarong West Wind Farm*. Report to Tarong West Project Co Pty Ltd, Brisbane.

Ecosure. (2025b). *Bird and Bat Utilisation Survey Report for Tarong West Wind Farm*. Report to Tarong West Project Co Pty Ltd, Brisbane.

Ecosure. (2025c). *Fauna Management Plan for Tarong West Wind Farm*. Report to Tarong West Project Co Pty Ltd, Brisbane.

Ecosure. (2025d). *Vegetation Management Plan for Tarong West Wind Farm*. Report to Tarong West Project Co Pty Ltd, Brisbane.

Gauthreaux Jr, S., & Belser, C. (2006). Effects of artificial night lighting on migrating birds. In C. Rich & T. Longcore (Eds.), *Ecological Consequences of Artificial Night Lighting*. Island Press.

Glossy Black Conservancy. (2010). *Glossy black-cockatoo Conservation Guidelines for South-Eastern Queensland and far North-Eastern New South Wales*. Glossy Black Conservancy.

Goldwind. (2022). *Assessment of effectiveness of the IdentiFlight avian detection system*. https://cattlehillwindfarm.com/wp-content/uploads/2022/03/Assessment-of-IDF-Avian-Detection-System-FINAL_updated.pdf

Hull, C., & Muir, S. (2010). Search areas for monitoring bird and bat carcasses at wind farms using a Monte-Carlo model. *Australasian Journal of Environmental Management*, *17*(2), 77–87.

Hull, C., Stark, E., Peruzzo, S., & Sims, C. (2013). Avian collisions at two wind farms in Tasmania, Australia: Taxonomic and ecological characteristics of colliders versus noncolliders. *New Zealand Journal of Zoology*, *40*, 47–62.

Jenkins, A., Smallie, J., & Diamond, M. (2010). Avian collisions with power lines: A global review of causes and mitigation with a South African perspective. *Bird Conservation International*, *20*, 263–278.

Langston, R., & Pullan, J. (2003). *Windfarms and Birds: An analysis of the effects of windfarms on birds, and guidance on environmental assessment criteria and site selection issues*. Strasbourg: Report T-PVS/Inf (2003) 12, by BirdLife International to the Council of Europe, Bern Convention on the Conservation of European Wildlife and Natural Habitat.

Longcore, T., Rich, C., & Gauthreaux Jr, S. (2008). Height, guy wires, and steady-burning lights increase hazard of communication towers to nocturnal migrants: A review and meta-analysis. *The Auk*, *125*(2), 485–492.

Moloney, P., Lumsden, L., & Smales, I. (2019). *Investigation of existing post-construction mortality monitoring at Victorian wind farms to assess its utility in estimating mortality rates*. Arthur Rylah Institute for Environmental Research Technical Report Series No. 302. https://www.ari.vic.gov.au/__data/assets/pdf_file/0024/435309/ARI-Technical-Report-302-Investigation-of-existing-post-construction-monitoring-at-Victorian-wind-farms.pdf

Morrison, M. (2002). *Searcher bias and scavenging rates in bird/wind energy studies*. Golden, Colorado: National Renewable Energy Laboratory. https://www.nrel.gov/docs/fy02osti/30876.pdf

Smales, I. (2015). Fauna collisions with wind turbines: Effects and impacts, individuals and populations. What are we trying to assess? In C. Hull, E. Bennett, E. Stark, I. Smales, J. Lau,

& M. Venosta (Eds.), *Wind and Wildlife: Proceedings from the Conference on Wind Energy and Wildlife Impacts*. Springer.

Smallwood, K., & Thelander, C. (2008). Bird mortality in the Altamont Pass Wind Resource Area, California. *The Journal of Wildlife Management*, *71*(1), 215–223.

Tarburton, M. (1993). Radiotracking a White-throated Needletail to roost. *Emu*, *93*, 121–124.

Tarburton, M., & Garnett, S. (2021). Eastern white-throated needletail Hirundapus caudacutus. In S. Garnett & G. Baker (Eds.), *The Action Plan for Australian Birds 2020* (pp. 58–60). CSIRO Publishing.

Threatened Species Scientific Committee. (2019). *Conservation Advice* Hirundapus caudacutus *White-throated Needletail*. Department of the Environment and Energy, Canberra. https://www.environment.gov.au/biodiversity/threatened/species/pubs/682-conservation-advice-04072019.pdf

Tidemann, C. (1998). Grey-headed Flying-fox, *Pteropus poliocephalus*. In R. Strahan (Ed.), *The Mammals of Australia*. New Holland Publishers.

Appendix 1 Species profiles

Glossy black-cockatoo *Calyptorhynchus lathami lathami*

EPBC Act status	Vulnerable
NC Act status	Vulnerable
Likelihood of occurrence	Known
Species description	· 460 – 510 mm body length · 422 – 480 g (males), 430 – 500 g (females) · Smallest of the black-cockatoos. They are generally black to sooty brown with bright red undertail coverts. The female has yellow feathers scattered through the head and neck. The beak is large and rounded. The crest is subdued (Glossy Black Conservancy 2010)
Habitat withing the site	Seven individual glossy black-cockatoos were detected and evidence of their feeding was detected throughout the site. Habitat preference was shown to be within coastal she-oak *Allocasuarina littoralis* patches within larger patches of vegetation. No evidence of feeding was detected within patches of belah or river oak *Casuarina cunninghamiana*.
Relevant biology / ecology	The glossy black-cockatoo is a habitat specialist that preferentially feeds on the seeds of oaks (Casuarina) and she-oaks (*Allocasuarina*) trees. They are essentially a temperate zone species and inhabits higher altitude sites in the north of their range. They prefer a range of woodland habitats where preferred food sources occur including *Eucalyptus, Corymbia* and Angophora woodlands or in patches dominated by oaks and she-oaks or brigalow *Acacia harpophylla*. Food trees can be identified by the presence of discarded seed cones (termed orts) at the base of trees. They breed within remnant woodland patches and require a hollow stump or limb (living or dead). Roosts are usually less than 1 km from reliable water (eg. dam). Glossy black-cockatoos lay a single egg from March to June and if a young is successfully raised, the parents will forgo the subsequent breeding season. Incubation of the egg lasts for 30 days and the chick fledges after 84-96 days. The chick is fed by both parents for 12 months following hatching and will roost with its parents (Glossy Black Conservancy, 2010).


Photo (left): Glossy black-cockatoo (female), (right) chewed cones or orts. *Source: D. Fleming*

White-throated needletail *Hirundapus caudacutus*

EPBC Act status	Vulnerable and migratory
NC Act status	Vulnerable
Likelihood of occurrence	Known
Species description	· 19-21 cm body length · 93 grams · largest swift species. Heavy looking body tapering to a broad, short, square-cut tail · white forehead and throat, glossy dark green above, brown below
Habitat withing the site	White-throated needletails are almost entirely aerial, occurring within high, open airspaces above almost all habitats including oceans. They will roost occasionally in trees within any habitats.
Relevant biology / ecology	The species does not breed in Australia, migrating to their breeding grounds in northern Asia in May and returning in October. Like other swifts, the needletail at times gathers over ranges, headlands preceding thunderstorms when aerial insect activity is high.

Photo: White-throated needletail. *Source: Steve Burrows, via Atlas of Living Australia*

Grey-headed flying-fox *Pteropus poliocephalus*

EPBC Act status	Vulnerable
NC Act status	Least concern
Likelihood of occurrence	Potentially present
Species description	· 244 mm body length · 410 – 1270 (average 780) g · Large bat, has a mantle of rusty coloured fur completely encircling the neck. Fur on the back is dark grey, often with silver frosting. Fur extends down the legs to the toes.
Habitat withing the site	Habitat preferences include all remnant and HVR vegetation within the site as well as non-remnant vegetation where food trees are present.
Relevant biology / ecology	Feeds on a variety of nectar and blossom producing species as well as fruiting species. Their major food source is *Eucalyptus* blossom and are likely to feed within the site during infrequent large blossom events. Grey-headed flying-fox are seasonally nomadic and follow food resources throughout their range (central Qld to Victoria and South Australia). Camps occur in dense vegetation usually near water within paperbark *Melaleuca*, river oak *Casuarina cunninghamiana* or exotic trees. Individual bats can forage up to 50 km from camps (Churchill 2008). Male fertility peaks in March and females gestate for 6 months. Females congregate in maternity camps where a single young is born. The young is carried with the mother during early foraging trips and then is increasingly left in the maternity camp. The young bats leave the camp to forage with the females in January and February and are weaned by March.

Photo: Grey-headed flying-fox. *Source: National Park NSW* https://www.nationalparks.nsw.gov.au/plants-and-animals/grey- headed-flying-fox

Fork-tailed swift *Apus pacificus*

EPBC Act status	Migratory
NC Act status	Special least concern.
Likelihood of occurrence	Known
Species description	· 18-21 cm body length · 30 - 40 grams · medium sized swift species, with slim body · long scythe-shaped wings that taper to fine pointed tips · long deeply forked tail · mainly blackish with a white band across the rump.
Habitat withing the site	In Australia, fork-tailed swifts are believed to be exclusively aerial, flying at heights up to 1,000 m above the ground. Fork-tailed swifts occur mostly over inland plains, but are also seen above vegetated areas, coastal habitats and urban environments, where they forage ahead of storm fronts to feed on aerial insects.
Relevant biology / ecology	The species does not breed in Australia, and migrates to Australia in October and November and departs in April to breed in east Asia migrating. Like other swifts, the fork-tailed swift at times gathers over ranges, headlands preceding thunderstorms when aerial insect activity is high.

Photo: Fork-tailed swift. *Source: Sandy Horne, via Atlas of Living Australia*

Appendix 2 Data informing semi-quantitative assessment of collision risk

Table 15 Flight behaviour summary for species recorded flying within the RSA and 25 m buffer (40 – 305 m) during fixed point count surveys from 2018 - 2023

Species	EPBC Act	NC Act	Average flight height of all individuals observed in flight (m)	Maximum observed flight height (m)	Number of individuals observed within RSA	Total number of individuals observed	Number of group occurrences in RSA	Total number of group occurrences	Percentage of group occurrence in RSA	Qualitative RSA probability
†falcon species	-	LC	150	150	1	1	1	1	100%	High
†martin species	-	LC	73	100	15	21	2	4	50%	High
†passerine species	-	LC	25	100	17	58	2	14	14%	-
†raptor species	-	LC	70	70	1	1	1	1	100%	High
†unknown species	-	-	35	90	1	4	1	4	25%	-
†wood swallow species	-	LC	150	150	86	86	1	21*	5%	High
apostlebird	-	LC	10	50	20	594	2	104	2%	Low
Australasian figbird	-	LC	21	40	3	23	2	12	17%	Low
Australian bustard	-	LC	21	40	1	15	1	9	11%	Low
Australian hobby	-	LC	78	80	3	3	2	2	100%	High
Australian magpie	-	LC	17	360	38	875	25	614	4%	Low
Australian pelican	-	LC	145	200	6	6	2	2	100%	High
Australian raven	-	LC	42	300	220	694	92	393	23%	Low
black-faced cuckoo-shrike	-	LC	17	60	6	209	5	167	3%	Low
black-fronted dotterel	-	LC	40	40	2	3	1	2	50%	Medium
blue-faced honeyeater	-	LC	12	50	3	218	2	112	2%	Low
brolga	-	LC	150	150	1	1	1	1	100%	High

Species	EPBC Act	NC Act	Average flight height of all individuals observed in flight (m)	Maximum observed flight height (m)	Number of individuals observed within RSA	Total number of individuals observed	Number of group occurrences in RSA	Total number of group occurrences	Percentage of group occurrence in RSA	Qualitative RSA probability
brown falcon	-	LC	55	100	8	21	8	18	44%	High
brown goshawk	-	LC	53	100	5	6	3	4	75%	High
channel-billed cuckoo	-	LC	30	100	4	35	2	28	7%	Low
cockatiel	-	LC	26	100	27	90	5	29	17%	Low
common myna	-	LC	21	50	14	79	3	37	8%	Low
dollarbird	-	LC	26	60	6	36	5	33	15%	Low
dusky woodswallow	-	LC	35	80	4	8	2	4	50%	High
eastern great egret	-	LC	65	100	1	2	1	2	50%	High
fairy martin	-	LC	66	120	12	14	7	9	78%	High
fork-tailed swift	Mi	SLC	80	100	3	3	2	2	100%	High
galah	-	LC	29	200	396	1472	133	535	25%	High
great cormorant	-	LC	120	200	6	6	2	2	100%	High
grey butcherbird	-	LC	19	200	3	310	3	269	1%	Low
grey-crowned babbler	-	LC	13	50	5	120	1	48	2%	Low
laughing kookaburra	-	LC	11	50	5	410	3	272	1%	Low
little black cormorant	-	LC	28	40	57	58	2	3	67%	Medium
little corella	-	LC	38	200	285	1775	43	161	27%	High
little friarbird	-	LC	12	100	2	441	1	312	0%	Low
little lorikeet	-	LC	63	200	3	11	1	7	14%	Low
little pied cormorant	-	LC	55	60	2	2	2	2	100%	Medium
magpie-lark	-	LC	12	50	1	261	1	172	1%	Low
musk lorikeet	-	LC	70	70	4	4	1	1	100%	Low
nankeen kestrel	-	LC	78	150	12	17	11	16	69%	High

Species	EPBC Act	NC Act	Average flight height of all individuals observed in flight (m)	Maximum observed flight height (m)	Number of individuals observed within RSA	Total number of individuals observed	Number of group occurrences in RSA	Total number of group occurrences	Percentage of group occurrence in RSA	Qualitative RSA probability
noisy friarbird	-	LC	13	70	19	682	9	426	2%	Low
noisy miner	-	LC	11	50	7	2830	5	1247	0%	Low
Pacific black duck	-	LC	21	60	2	30	2	14	14%	High
pale-headed rosella	-	LC	12	100	4	360	2	204	1%	Low
pied butcherbird	-	LC	12	70	5	486	3	367	1%	Low
pied cormorant	-	LC	70	120	1	3	1	3	33%	Medium
pied currawong	-	LC	22	120	109	929	47	653	7%	Low
rainbow bee-eater	-	LC	25	100	9	160	4	86	5%	Low
rainbow lorikeet	-	LC	30	200	185	909	71	370	19%	Low
red-rumped parrot	-	LC	27	50	5	49	3	18	17%	Low
red-winged parrot	-	LC	20	100	21	173	9	98	9%	Low
rufous whistler	-	LC	12	200	2	315	2	281	1%	Low
scaly-breasted lorikeet	-	LC	29	100	60	275	22	115	19%	Low
straw-necked ibis	-	LC	54	150	12	43	3	9	33%	Medium
sulphur-crested cockatoo	-	LC	36	200	328	884	107	408	26%	High
Torresian crow	-	LC	35	300	556	2309	238	1056	23%	Low
Torresian crow/Australian raven	-	LC	40	400	182	353	84	194	43%	Low
tree martin	-	LC	52	200	3	41	3	9	33%	High
wedge-tailed eagle	-	LC	141	300	71	95	54	71	76%	High
weebill	-	LC	11	50	4	469	2	340	1%	Low
welcome swallow	-	LC	16	50	1	10	1	6	17%	High
whistling kite	-	LC	150	150	1	1	1	1	100%	High
white-browed woodswallow	-	LC	40	40	1	1	1	1	100%	High

Species	EPBC Act	NC Act	Average flight height of all individuals observed in flight (m)	Maximum observed flight height (m)	Number of individuals observed within RSA	Total number of individuals observed	Number of group occurrences in RSA	Total number of group occurrences	Percentage of group occurrence in RSA	Qualitative RSA probability
white-faced heron	-	LC	27	50	2	17	2	14	14%	High
white-necked heron	-	LC	55	100	1	2	1	2	50%	Medium
white-plumed honeyeater	-	LC	9	40	1	75	1	52	2%	Low
white-throated gerygone	-	LC	14	40	1	135	1	124	1%	Low
white-throated needletail	V, Mi	V	115	200	363	363	24	24	100%	High
white-winged chough	-	LC	13	60	1	279	1	64	2%	Low

†birds which could not be identified to species level

*total number of group occurrences calculated from all woodswallow species observed

Conservation status: NC Act: V – Vulnerable, SLC – Special Least Concern;

EPBC Act status: V – Vulnerable, Mi – Migratory Species.

Revision History

Revision No.	Revision date	Details	Prepared by	Reviewed by	Approved by
00	10/12/2024	Bird and Bat Management Plan for Tarong West Wind Farm	Meghan Castelli, Ecologist	Leigh Knight, Principal Environmental Planner	Dr Natalie Toon, Principal Ecologist
01	26/05/2025	Bird and Bat Management Plan for Tarong West Wind Farm	Kalita Free, Senior Ecologist Leigh Knight, Principal Environmental Planner	Dr Natalie Toon, Principal Ecologist	Diane Lanyon, Director of Strategic Partnerships

Distribution List

Copy #	Date	Type	Issued to	Name
1	26/05/2025	Electronic	Tarong West Project Co Pty Ltd	Toby Coates

Citation: Ecosure, 2025, *Bird and Bat Management Plan for Tarong West Wind Farm*, Report to Tarong West Project Co Pty Ltd. Publication location – Brisbane.

Report compiled by Ecosure Pty Ltd

ABN: 63 106 067 976 admin@ecosure.com.au www.ecosure.com.au

Brisbane
PO Box 675
Fortitude Valley QLD 4006
P 07 3606 1030

Coffs Harbour
PO Box 4370
Coffs Harbour Jetty NSW 2450
P 02 5621 8103

Gladstone
PO Box 5420
Gladstone QLD 4720
P 07 4994 1000

Gold Coast
PO Box 2034
Burleigh Waters QLD 4220
P 07 5508 2046

Rockhampton
PO Box 235
Rockhampton QLD 4700
P 07 4994 1000

Sunshine Coast
PO Box 1457
Noosaville QLD 4566
P 07 5357 6019

Sydney
PO Box 880
Surry Hills NSW 2010
P 1300 112 021

Townsville
PO Box 2335
Townsville QLD 4810
P 1300 112 021