

Twin Hills Wind Farm

Bird and Bat Management Plan



DATE: 7/07/2026

Ref: 304501729

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Revision Schedule

Rev. No.	Date	Description	Prepared by	Quality Reviewer	Technical Independent Reviewer	Project Manager Final Approval
rev_a01	1 May 2025	Final draft for client review	SP, JS	PB	PB	PB
rev_b01	24 July 2025	Revised following client review for environmental referral submission	SP, JS	PB	PB	PB
rev_b02	6 August 2025	Further revisions following client review for environmental referral submission	SP, JS	PB	PB	PB
rev_c01	31 October 2025	Review following state regulator feedback	SP, JS	PB	PB	PB
rev_d01	18 November 2025	Revised following client comments	NP	PB	PB	PB
rev_e01	4 February 2026	Change to project design	JS	PB	PB	PB
rev_f01	25 March 2026	Revised following client comments	SW, JS	PB	PB	PB
rev_g01	7 July 2026	Revised minimum rotor tip height to 60m	JS	PB	PB	PB

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Executive Summary

Table ES-0-1: Executive summary of the Bird and Bat Management Plan (BBMP) and Monitoring Program.

Item	Description
Proposal Name	Twin Hills Wind Farm (the Project)
Proponent Name	Twin Hills Wind Farm Pty Ltd
Ministerial Statement number	N/A – Under Assessment
Key Environmental Factors and Objectives	Terrestrial Fauna. The EPA Objective for Terrestrial Fauna is ' <i>to protect terrestrial fauna so that biological diversity and ecological integrity are maintained</i> ' (EPA 2016b).
Purpose of the BBMP	Mitigate the direct and indirect impacts to at-risk terrestrial fauna (bird and bat) species that can potentially result from the Project.
Environmental Outcomes	Environmental Outcome 1: - Maintain long term, viable populations of: - Listed threatened bird and bat species; - Listed migratory bird and bat species; and - Non-listed bird and bat species within the Project Area. Environmental Outcome 2: - Monitor mortality or injury to bird and bat species caused by turbine collision or barotrauma as a result of the Project.
Outcome-based Management Provisions	Management Outcome 1: - No significant adverse Project-related direct impacts to a species listed threatened or migratory under the Commonwealth EPBC Act or WA BC Act as a result of turbine collision or turbine barotrauma. Management Outcome 2: - No significant adverse Project-related direct impacts to a non-listed species as a result of turbine collision or turbine barotrauma.
Objective-based Management Provisions	Management Objective 1: - Identify bird and bat species potentially at risk from the Project. Management Objective 2: - Avoid significant impacts to the Carnaby's Black-Cockatoo as a result of the Project. Management Objective 3: - Allow for continued utilisation of Wedge-tailed Eagle nesting sites within the Project Area (that were identified during baseline Bird and Bat Utilisation Surveys (BBUSs)). Management Objective 4: - Minimise impacts to birds and bats from changes in their behaviour patterns that result from the Project. Management Objective 5: - Minimise degradation to bird and bat habitat within proximity of the Project Area. Management Objective 6: - Implement the BBMP effectively.
Condition Clauses	N/A - Under Assessment



Corporate endorsement

I hereby certify that to the best of my knowledge, the provisions within this **PROPONENT NAME** Bird and Bat Management Plan and bird and bat monitoring program are true and correct.

Name: MANGER NAME Signed: SIGNATURE

Designation: Environment Manager Date: XX XX 2025



Table of Contents

Executive Summary	i
Corporate endorsement	ii
Table of Contents	i
Table of Acronyms	iv
Glossary Table	v
1. Background, Framework, and Policy Alignment	1
1.1 Project Background	1
1.2 Purpose and Framework	5
1.3 EPA Environmental Factors	5
1.4 Compliance with Legislation, Policy, and Guidance	5
2. Environmental Outcomes	13
3. Baseline BBUS Surveys	13
3.1.1 Birds	13
3.1.2 Bats	14
3.1.3 Significant Bird and Bat Species	15
4. Impact Management	20
4.1 Potential Impacts	20
4.2 Impact Management Provisions	21
4.2.1 Mitigation Measures	21
4.2.2 Outcome-Based Management Provisions	22
4.2.3 Objective-Based Management Provisions	23
4.2.4 Justification for Impact Management Provisions	23
5. Bird and Bat Monitoring Program	28
5.1 Operational Bird and Bat Utilisation Surveys	28
5.1.1 Introduction	28
5.1.2 Methods	28
5.2 Mortality Monitoring	32
5.2.1 Introduction	32
5.2.2 Revisions to Turbine Collision Risk	33
5.2.3 Carcass Persistence and Searcher Efficiency Trials	33
5.2.4 Incidental finds	34
5.2.5 Carrion Monitoring	34
5.3 Bird and Bat Monitoring Reporting Requirements	34
6. Reporting Provisions	36
6.1 Annual Reporting	36
6.2 Trigger and Threshold Exceedance Reporting	36
6.3 Incident Reporting	36



6.4	Bird and Bat Monitoring Program Reporting	36
7.	Injured Fauna Management	37
8.	Roles and Responsibilities	37
9.	Adaptive Management	38
9.1	Review of the BBMP	38
9.2	Changes to the BBMP	38
10.	Stakeholder Consultation	40
11.	References	41

List of Tables

Table ES-0-1: Executive summary of the Bird and Bat Management Plan (BBMP) and Monitoring Program.	i
Table 1-1: Assessment of compliance with Draft Onshore Wind Farms Guidance – Section 5 Bird and Bat management Plan (DCCEEW 2024b)	7
Table 1-2: Assessment of compliance with Department of Water and Environmental Regulation (DWER) Green Energy Proponent Guideline	11
Table 3-1: Species recorded within the Rotor Swept Area (40-300 m) during FP counts	13
Table 3-2: Significant fauna species recorded in the Project Area - summary table of key threats, proposal impacts, and key survey findings	16
Table 4-1: Key potential impacts to birds and bats associated with the Project	20
Table 4-2: Outcome-based management provisions	24
Table 4-3: Objective-based management provisions	26
Table 5-1: Weather and flight variables recorded for each bird observation	29
Table 5-2: Carcass Persistence and Searcher Efficiency Trial Methods	33
Table 5-3: Bird and Bat Monitoring Program reporting requirements	34
Table 8-1 Roles and responsibilities for implementation of the BBMP	37
Table 9-1: Changes to the BBMP	39

List of Figures

Figure 1-1: Regional location of the Project Area	2
Figure 1-2: Proposed wind turbine locations for the Project	3
Figure 1-3: Land use in relation to the Project Area	4
Figure 3-1: Foraging habitat scores and CBC records within the Project Area	17
Figure 3-2: Malleefowl mound location within the Survey Area	19
Figure 5-1: Bird and Bat Utilisation Survey (BBUS) monitoring sites	31

List of Plates

Plate 3-1: A flock of CBCs observed foraging on Banksia sp. during the Q2 2024 BBUS, travelling north from nature reserve R 48098 to R 12705 along First North Rd	18
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List of Appendices

Appendix A	Ecological Risk Model
Appendix B	MNES: Carnaby's Black-Cockatoo Risk Assessment
Appendix C	Bird and Bat Utilisation Survey Report
Appendix D	Basic and Targeted Fauna Survey Report
Appendix E	Report: Carnaby's Cockatoo <i>Calyptrorhynchus latirostris</i> in the Eneabba Region



Appendix F Data Monitoring Sheets for Mortality Surveys



Table of Acronyms

Term	Definition
BBMP	Twin Hills Bird and Bat Management Plan
BBUS	Bird and Bat Utilisation Survey
BC Act	Biodiversity Conservation Act 2016
CBC	Carnaby's Black-Cockatoo
CEMP	Construction Environmental Management Plan
CRM	Collision Risk Model
DBCA	Department of Biodiversity, Conservation and Attractions
DCCEEW	Department of Climate Change, Energy, the Environment and Water
DWER	Department of Water and Environmental Regulation
EIA	Environmental impact assessment
EPA	Western Australia Environmental Protection Authority
EPBC Act	Environmental Protection and Biodiversity Conservation Act 1999
ERM	Ecological Risk Model
FP	Fixed point (from which surveys for birds are conducted)
ha	Hectare(s)
km	Kilometre(s)
MNES	Matter of National Environmental Significance
WA	Western Australia



Glossary Table

Term	Definition
Adaptive management	An iterative decision-making process, in which monitoring and data collection are incorporated into the BBMP with the express purpose of improving the understanding of the system so that the decision can be revisited and improved in a structured, systematic way to reduce the uncertainty in the decision-making process over time.
Barotrauma	An injury that is sustained due to a change in barometric pressure.
Basic fauna survey	A low-intensity survey, conducted at the local scale to gather broad fauna and habitat information (EPA 2020).
Carcass persistence	An estimate of the length of time a bird or bat carcass will remain on the landscape before being scavenged by predators or destroyed by the elements.
Carcass persistence trials	An activity to determine how quickly the carcasses will be scavenged by predators or destroyed by the elements by deliberately placing bird or bat carcasses on the landscape.
Commissioning	A process through which equipment is tested after it has been installed to determine whether it is ready to be operated. For wind turbines, the blades rotate during this process.
Direct impact	An impact on an individual species or population through direct interaction of an activity with an environmental component.
Displacement	A scenario in which an individual species or population is unable to use or access otherwise suitable habitat and so is forced to avoid an area they would otherwise utilise or move to a new location.
Fixed Point (FP) count	A bird survey method whereby a stationary observer records birds at the same location over multiple survey events, for the same duration, with a range of flight variables recorded for all birds observed.
Incidental sighting / find	A sighting / find of injured or deceased birds or bats outside of a regularly scheduled search for birds or bats as part of the post-construction monitoring protocol.
Indirect impact	An impact on the environment of an individual species or population that results in a long-term impact to the individual species or population.
Migratory species	A species that moves between habitats based on a seasonal cycle driven by external factors such as food availability and temperature or internal factors such the need to access breeding grounds.
Monitoring Program	Twin Hills Wind Farm bird and bat monitoring program.
Mortality monitoring	An activity that encompasses looking for, identifying, and recording bird and bat carcasses that have resulted from impacts from operating wind turbines.
The Project	The proposed Twin Hills Wind Farm
Project Area	The collection of privately held land parcels and government-owned land upon which infrastructure for the Project is proposed to be situated.
Proponent	Twin Hills Wind Farm Pty Ltd
Rotor swept area	The two-dimensional space enclosed within a circle subtended by the wind turbine's rotor blades.
Searcher efficiency	The percentage of bird or bat carcasses on the landscape that are found by observers looking for evidence of species' collision with wind turbines.
Searcher efficiency trials (or detectability trials)	An activity in which searcher efficiency is assessed through deliberately placing bird or bat carcasses on the landscape without observers' knowledge prior to a regularly scheduled carcass search.
Stantec	Stantec Pty Ltd
Suitably qualified expert	A person that has professional qualifications and at least three years of work experience designing and implementing surveys for a specific MNES and can give an authoritative assessment and advice on the presence of the specific MNES and the impacts of wind farms on these using relevant protocols, standards, methods and/or literature.
Survey Area	The area over which ecological surveys have been conducted.



Term	Definition
Targeted fauna survey	A fauna survey used to gather information on significant fauna and/or habitats, or to collect data where a desktop study or field survey has identified knowledge gaps (EPA 2020).
Wind Prospect	Wind Prospect Pty Ltd



1. Background, Framework, and Policy Alignment

1.1 Project Background

Stantec Australia Pty Ltd (Stantec) was engaged by Twin Hills Wind Farm Pty Ltd (the Proponent), care of Wind Prospect Pty Ltd (Wind Prospect), to undertake technical ecological work to inform the environmental referrals and the development application for the proposed Twin Hills Wind Farm (the Project).

The land parcels involved in the Project and all proposed accessways to these land parcels that are within road reserves (the sum of which is referred to as the Project Area) are contained within the Shire of Three Springs Local Government Area of Western Australia (WA) approximately 260 kilometres (km) north of Perth (**Figure 1-1**). The wind turbines and ancillary infrastructure associated with the wind farm are proposed to be located entirely within the Project Area (**Figure 1-2**). The Project Area is comprised of 11,166 hectares (ha) of land that is primarily cleared for crops and livestock grazing with interspersed patches of remnant native vegetation, generally associated with ridges, hills and slopes. Other major land uses within the Project Area include nature conservation and roadways (**Figure 1-3**) (McKenzie *et al.* 2003). Non-exclusive native title exists over the whole of the Project Area, as determined by the Yamatji Nation tribunal case (National Native Title Tribunal 2022). The Warradarge Wind Farm is the only operational wind farm within 50 km of the Project Area. Tathra Wind Farm and the Arrowsmith Hydrogen Project (for which wind turbines are proposed) are within 50 km of the Project Area.

Key specifications of the Project are listed below.

- The proposed maximum number of wind turbines is 93.
- The proposed total area of the disturbance footprint is 543 ha.
- The proposed maximum rotor swept area (RSA) is 31,416 sqm (based on the maximum blade length of 100m).
- The proposed maximum blade tip height is 300 m (based on the max blade length of 100m and the maximum proposed hub height of 200 m).
- The proposed minimum blade tip height is 60 m above ground level.



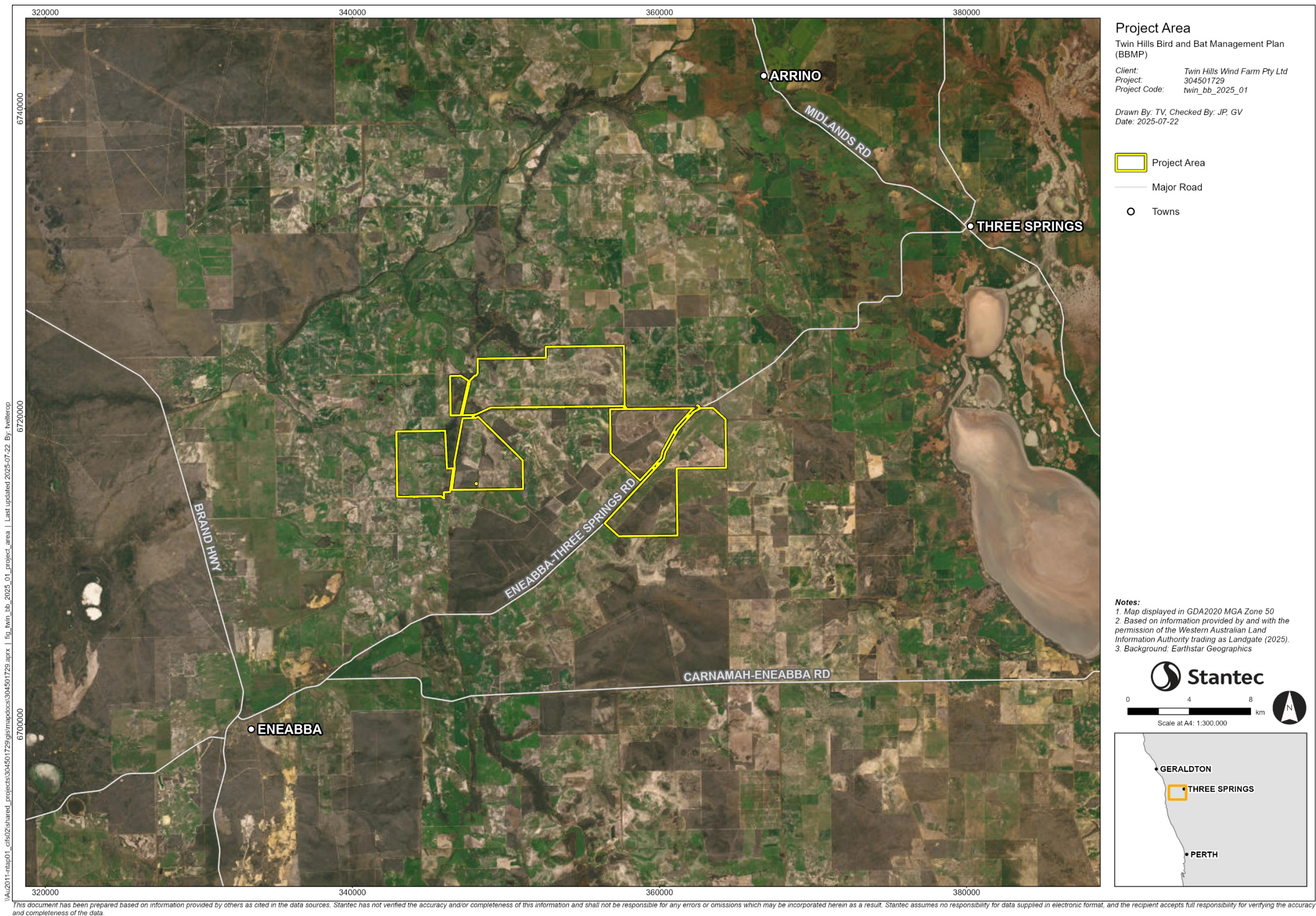


Figure 1-1: Regional location of the Project Area





Figure 1-2: Proposed wind turbine locations for the Project

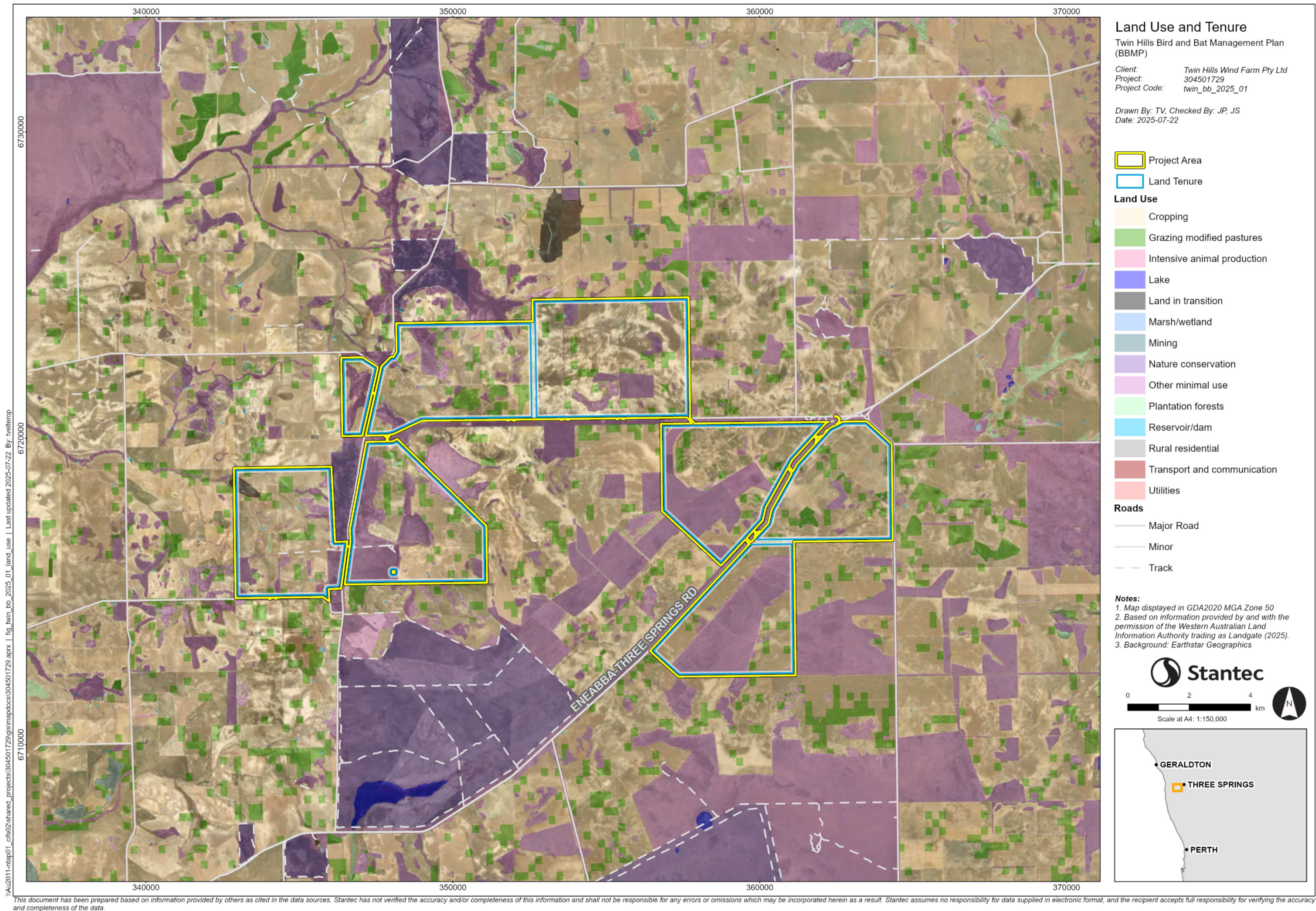


Figure 1-3: Land use in relation to the Project Area



1.2 Purpose and Framework

The purpose of the Bird and Bat Management Plan (BBMP) is to mitigate direct and indirect impacts to at-risk bird and bat species that can potentially result from the Project during its planning, commissioning, and operation phases.

Eight (8) quarters of baseline Bird and Bat Utilisation Surveys (BBUS) have been completed, and the respective results have been incorporated into the BBMP.

The framework applied to develop the BBMP is detailed below:

- Establish overarching environmental outcomes for the BBMP (**Section 2: Environmental Outcomes**).
- Identify potential impacts from the Project on listed threatened and non-listed bird and bat species (**Section 4.1: Potential Impacts**).
- Determine mitigation measures that can reduce impacts to bird and bat species from the Project using the Environmental Protection Authority (EPA) mitigation hierarchy for Environmental Factors (avoid, minimise, rehabilitate, offset) (**Section 4.2.1: Mitigation Measures**).
- Establish management outcomes and associated outcome-based management provisions (**Section 4.2.2: Outcome-Based Management Provisions**), and management objectives and associated objective-based management provisions (**Section 4.2.3: Objective-Based Management Provisions**) to meet the overarching environmental outcomes.
- Establish a Monitoring Program (**Section 5: Bird and Bat Monitoring Program**) and reporting provisions (**Section 6 Reporting Provisions**) to facilitate an adaptive management approach (**Section 9: Adaptive Management**) for the BBMP.

1.3 EPA Environmental Factors

Terrestrial Fauna is the key EPA Environmental Factor that is relevant to this BBMP. The EPA objective for Terrestrial Fauna is *'to protect terrestrial fauna so that biological diversity and ecological integrity are maintained'* (EPA 2016b). Comprehensive surveys and an environmental impact assessment (EIA) identified potential impacts to terrestrial fauna (specifically bird and bat species) from the Project, including the Carnaby's Black-Cockatoo (*Zanda latirostris*) (hereafter "CBC"). The CBC is a Matter of National Environmental Significance (MNES) and is listed as Endangered under both 1) the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) at the federal level, and 2) the *Biodiversity Conservation Act 2016* (BC Act) at the state level.

1.4 Compliance with Legislation, Policy, and Guidance

The BBMP has been developed in accordance with the WA and Commonwealth policies and guidance listed below:

- Environmental Management Plan Guidelines (Commonwealth of Australia 2014).
- Instructions: How to prepare Environmental Protection Act 1986 Part IV Environmental Management Plans (EPA 2024).
- Green-Energy-Proponent Guideline (DWER 2024).
- Onshore Wind Farms – interim guidance on bird and bat management (DAWE 2021).
- Draft Onshore Wind Farms Guidance – Section 5 Bird and Bat management Plan (DCCEEW 2024b).
- EPBC Act Policy Statement 2.3 Wind Farm Industry (DEWHA 2009).
- Best Practice Guidelines for Implementation of Wind Farm Energy Projects in Australia (Auswind 2006).
- Environmental Impact Assessment (Part IV Divisions 1 and 2) Administrative Procedures 2016 (EPA 2016a).
- Environmental Impact Assessment (Divisions 1 and 2) Procedures Manual (EPA 2021).
- EPBC Act 1999 Outcomes-based Conditions Policy (DoE 2016a).
- EPBC Act 1999 Outcomes-based Conditions Guidance (DoE 2016b).
- Environmental Factor Guideline – Terrestrial Fauna (EPA 2016b).
- Biodiversity Conservation Act 2016 (WA) (BC Act).



- Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act).
- Matters of National Environmental Significance. Significant impact guidelines 1.1 - Environment Protection and Biodiversity Conservation Act 1999 (DoE 2013).
- Survey Guidelines for Australia's Threatened Birds (DEWHA 2010).

The WA and Commonwealth plans and management prescriptions listed below are relevant to the BBMP:

- National Malleefowl Monitoring Manual: Standards, Protocols and Monitoring Procedures (National Malleefowl Recovery Team 2020).
- National Recovery Plan for the Malleefowl (*Leipoa ocellata*) (DCCEEW 2024a).
- Referral Guideline for 3 WA Threatened Black-Cockatoo Species (DAWE 2022b).
- Carnaby's Cockatoo (*Calyptorhynchus latirostris*) Recovery Plan (DPaW 2013).
- Draft referral guideline for 14 birds listed as migratory species under the EPBC Act (DoE 2015).

The third-party bird and bat management plans listed below were considered in the preparation of the BBMP:

- Narrogin Wind Farm: Preliminary Bird and Bat Adaptive Management Plan (Umwelt 2024).
- Bird and Bat Management Plan: Dugald River Windfarm (Wulguru Technical Services 2024).
- Biala Wind Farm: Second Annual Report on the Implementation of the Bird and Bat Adaptive Management Program (Nature Advisory 2024).
- MacIntyre Wind Farm: Bird and Bat Adaptive Management Plan (Nature Advisory 2021b).
- Bodangora Wind Farm: Bird and Bat Adaptive Management Plan – Second Annual Report (Nature Advisory 2021a).

Compliance assessments of the BBMP with the Draft Onshore Wind Farms Guidance – Section 5 Bird and Bat Management Plan (DCCEEW 2024b) and the WA EPA Green Energy Proponent Guideline are presented in **Table 1-1** and **Table 1-2**.



Table 1-1: Assessment of compliance with Draft Onshore Wind Farms Guidance – Section 5 Bird and Bat management Plan (DCCEEW 2024b)

Section DCCEEW Interim Guidance and Requirements (DCCEEW 2024b)		Specifications according to Guidance (DCCEEW 2024b)	Addressed in the BBMP	Guidance met? (Y/N)
Section 5.1: Overview of BBMP	Identify potential risks of the Project to birds and bats	Wind farms present three main risks to birds and bats: • Direct habitat loss through construction of wind farm infrastructure • Displacement (also known as indirect habitat loss) when the birds and bats avoid the area due to the wind farm construction and operation. • Strike impact or barotrauma causing death or injury.	• Refer to Table 4-1: Key potential impacts to birds and bats associated with the Project • Potential risks to birds and bats outside of the commissioning and operation phases will be identified in a CEMP.	Y
Section 5.1: Overview of BBMP	BBMP must demonstrate that: a) The Proponent is taking all practicable steps to avoid and mitigate your proposed wind farm's impact on listed threatened and migratory bird and bat species. b) The Proponent ensures that the steps that are proposed will meet department's expectations. c) The proposed impact risk reduction measures will occur over the life of a wind farm project (planning, construction, operation and decommissioning), as each phase has specific requirements that are needed to ensure effective management.	NA	a) Refer to Section 4.2.1: Mitigation Measures, Table 4-2: Outcome-based management provisions, and Table 4-3: Objective-based management provisions b) Refer to Section 4.2.2: Outcome-Based Management Provisions, Section 4.2.3: Objective-Based Management Provisions, and Section 4.2.4: Justification for Impact Management Provisions for alignment of the BBMP with DCCEEW expectations. c) The proposed impact risk reduction measures detailed in the BBMP will be implemented during the planning, commissioning, and operation phases of the Project. Impacts to birds and bats and associated habitats from clearing and construction for the Project will be actively managed through a CEMP.	Y (following implementation of a CEMP)
Section 5.1: Preparation of your BBMP	The BBMP must be prepared by a suitably qualified ecologist and in accordance with the department's Environmental Management Plan Guidelines (DCCEEW 2024c).	A suitably-qualified ecologist means a person who has relevant professional qualifications, as well as: • At least 3 years of work experience designing and implementing surveys for the species in question and in considering the threats posed to these species by wind farms who can give an authoritative assessment and advice on: ○ The potential presence of those species in the vicinity of the wind farm site during its life; and ○ The potential impacts of the wind farm on those species, using relevant protocols, standards, methods and/or literature.	The BBMP was compiled by: • Principal Zoologist Sonja Puglisi (15 years experience in zoology with extensive experience in bat surveys and environmental management plans); and • Senior Zoologist Joe Sollis (8 years experience in environmental consulting with experience in BBUSs and CRM).	Y
Section 5.1: Environmental Outcomes	The BBMP must define the specific environmental outcomes it intends to achieve, which will enable a long-term approach to mitigating and managing potential impacts on relevant species and potential changes to species' utilisation of the Project site and its surrounds.	a) These outcomes must be reflected in the BBMP adaptive management framework. b) Outcomes may include but are not limited to: - An improved understanding of the risk of turbine collision and barotrauma impacts on listed bird and bat species. - An improved understanding of whether and how project site usage changes as a result of wind farm construction and operation. - An improved monitoring approach for the timely identification of turbine collisions and collection and analysis of data - An improved approach to the timely and regular validation and update to the mathematical collision risk modelling (CRM) (discussed further below) using monitoring data, and a robust adaptive management approach. - The development and implementation of tangible, on-ground management measures (for example, using artificial intelligence devices) and corrective actions to promote a long-term reduction in the risk of turbine collision and barotrauma impacts on listed bird and bat species.	a) Refer to Section 9: Adaptive Management. b) Refer to Section 2: Environmental Outcomes.	Y
Section 5.2: BBMP Survey requirements	The BBMP must include the process and outcomes of a preliminary site characterisation (via a desktop analysis and/or initial site visit) for each species that potentially occurs on site, to identify all drivers of presence on the Project site and utilisation of the Project site.	This characterisation must include, but not be limited by, the consideration of: a) Site characteristics: focal habitat features, topography, prevailing wind and weather patterns, wetlands (including in the vicinity of 10 kms radius of the wind farm site), distance to potential nesting, roosting and foraging areas, and proximity to water bodies b) Species characteristics: behaviour, species presence [ongoing, transitory/migratory/diurnal species absence (peer reviewed), site use (e.g. transit, roosting, breeding and/or foraging), flight paths in relation to the site (including migratory flight paths), flight or demographic factors (flight heights, soaring, flocking, and population numbers, including nationally and internationally important populations of migratory shorebirds).	a) Refer to Appendix C: Bird and Bat Utilisation Survey Report and Appendix D: Basic and Targeted Fauna Survey Report for site characteristics. b) Refer to Appendix C: Bird and Bat Utilisation Survey Report, Appendix D: Basic and Targeted Fauna Survey Report, and Appendix E Report: Carnaby's Cockatoo <i>Calyptrorhynchus latirostris</i> in the Eneabba Region for species characteristics.	Y
Section 5.2: BBMP Survey requirements	Site-specific assessment: site utilisation surveys	a) the BBMP must include a detailed discussion of how at-risk listed threatened and migratory bird and bat species are using the wind farm site and proposed disturbance footprint.	a) Refer to Appendix C: Bird and Bat Utilisation Survey Report and Appendix D: Basic and Targeted Fauna Survey Report.	Y (following incorporation of all



Section DCCEEW Interim Guidance and Requirements (DCCEEW 2024b)		Specifications according to Guidance (DCCEEW 2024b)	Addressed in the BBMP	Guidance met? (Y/N)
		b) Each site utilisation survey must be of a duration and spatial coverage that ensures a statistically sufficient sample size (including taking into consideration intended turbine layout) to adequately evaluate site utilisation. c) The site utilisation survey methodology and effort details for each relevant species must be included as an attachment to the BBMP. d) To provide sufficient baseline data about a relevant species' potential to utilise the Project site and its surrounds, the department considers it best practice to provide at least 24 months of site utilisation surveys before assessment of your proposed wind farm can be completed and an approval decision made.	b) Utilisation surveys (as detailed in Appendix C: Bird and Bat Utilisation Survey Report) were of an adequate duration (5-9 days per quarter, surveying each fixed point (FP) once in the morning, midday and afternoon) and spatial coverage (10-16 FPs across the Survey Area, dependent upon landholding accessibility) to achieve a statistically sufficient sample size. c) Refer to Appendix C: Bird and Bat Utilisation Survey Report. d) Eight (8) quarters of baseline Bird and Bat Utilisation Surveys (BBUS) have been completed, and the respective results have been incorporated into the BBMP.	baseline BBUSs into final BBMP)
Section 5.2: Impact risk assessment	Provide sufficient detail in relation to potential impacts of your wind farm, such as mortality from turbine collision and barotrauma, or potential changes to species' utilisation of the Project site and its surrounds on relevant species to allow for a robust assessment.	The BBMP must include relevant features and components of the proposed wind farm: a) The size of the proposed windfarm and the total disturbance size in hectares, including the disturbance footprint and size for any alternative options b) Swept rotor area and tip heights/rotation speed for each proposed turbine c) Distance and spacing between the pads and tips of turbines d) Details on operating and proposed windfarms within 50 km of the proposed wind farm site.	a) Refer to Section 1.1 Project Background. b) Refer to Section 1.1 Project Background. c) Refer to Section 1.1 Project Background. d) Refer to Section 1.1 Project Background.	Y
		An assessment of the potential impact pathways on each relevant species (based on the desktop assessment and site utilisation surveys) including, but not limited to: a) Direct mortality from turbine collision and barotrauma • Potential tower collision and changes to site utilisation during construction and operation of the proposed action.	a) Refer to Table 4-1: Key potential impacts to birds and bats associated with the Project b) Refer to Section 4.2.3: Objective-Based Management Provisions for changes to site utilisation for CBC during the operation phase of the Project. Impacts to birds, bats and, associated habitats from during the construction phase of the Project will be actively managed through a CEMP.	Y (following implementation of a CEMP)
		Identification of potential impacts to each relevant species from direct mortality, including but not limited to: a) analysis and mapping of suitable habitat, territories and activity/utilisation patterns/rates ('heat maps') in the Project site and its surrounds, including nearby wetlands b) population numbers and flight path analysis of birds and bats including heights and speeds.	a) Refer to Appendix C: Bird and Bat Utilisation Survey Report and Appendix D Basic and Targeted Fauna Survey Report. b) Refer to Appendix C: Bird and Bat Utilisation Survey Report and Appendix E Report: Carnaby's Cockatoo <i>Calyptrorhynchus latirostris</i> in the Eneabba Region.	Y
		Where risks to listed threatened species are identified, mathematical CRM must be undertaken, incorporating: a) a wind farm site-wide assessment to identify high risk turbines b) baseline data collected during site utilisation surveys (see section 5.2 of guidance) c) the recommendations of an independent peer review of the CRM (the peer review must be included as part of every BBMP). d) a literature review e) justification of the choice of the model used f) a statement of all assumptions and uncertainties.	• CRM will be conducted and the respective results will be incorporated into this BBMP prior to entering the construction phase for the Project.	Y (following completion of CRM)
		The BBMP must include a map for each relevant species which identifies areas in the wind farm site and its surrounds which have been determined as 'high risk' based on the outputs of the CRM.	• The BBMP will be updated to include a map for each relevant species which identifies areas in the wind farm site and its surrounds which have been determined as 'high risk' following the completion of CRM.	Y (following completion of CRM)
		The BBMP must also clearly demonstrate how the species profile and threats database, and relevant departmental policies and guidelines (including statutory documents such as recovery plans) have been used to assess: • the potential impacts of direct mortality from turbine collision and barotrauma • potential changes to site utilisation by relevant listed threatened and migratory bird and bat species during construction and operation of the proposed action.	• Refer to Section 4.1: Potential Impacts and Appendix A: Ecological Risk Model for how the species profile and threats database has been used to assess these potential impacts and changes. Refer to Section 1.4: Compliance with Legislation, Policy, and Guidance and Section 4.2.4: Justification for Impact Management Provisions for how relevant departmental policies and guidelines been used to assess these potential impacts and changes. Potential changes to site utilisation by relevant listed threatened and migratory bird and bat species during the construction phase of the Project will be assessed and managed through a CEMP.	Y (following implementation of a CEMP)
Section 5.3: BBMP impact thresholds and adaptive management	To ensure the environmental outcomes will be achieved for relevant species, the BBMP must include an adaptive management framework.	The adaptive management framework must, at a minimum be designed to clearly demonstrate the linkages between: • Environmental outcomes	Addressed in Section 9: Adaptive Management .	Y



Section DCCEEW Interim Guidance and Requirements (DCCEEW 2024b)	Specifications according to Guidance (DCCEEW 2024b)	Addressed in the BBMP	Guidance met? (Y/N)
Actions.	- Implementation of mitigation and management measures - Monitoring, reporting and investigations - Implementation of corrective actions to ensure environmental outcomes will be achieved. - Be designed to incorporate site-specific data collected through ongoing monitoring activities, and take into account changes to turbine risk ratings based on the CRM outputs.		
	Adaptive management generally requires an impact threshold (also referred to as a 'trigger') to be met for adaptive management actions to be initiated. For example, if an impact threshold is reached (e.g. through number of individuals impacted by turbine collision/ barotrauma) then the adaptive management actions could include: a) Adjusting the activity causing the impact, implementing a mitigation measure and/or offsetting the impact. b) Monitoring enables the proponent to determine when an impact threshold has been met or exceeded.	Impact triggers and thresholds to be met for adaptive management actions to be initiated are outlined in the following sections: a) Refer to Table 4-2: Outcome-based management provisions for trigger and threshold response actions that serve to adjust the activity causing the impact and / or implement a mitigation measure. b) Refer to Table 4-2: Outcome-based management provisions for timeframes associated with threshold criteria. Refer to Section 5 Bird and Bat Monitoring Program for monitoring scope and methodology.	Y
	Develop impact thresholds for the BBMP that are: - Species specific - Quantitative with transparent, measurable outcomes and capable of accurate measurement - Ecologically justified - Based on SMART principles (i.e. specific, measurable, achievable, realistic and timebound). Include species-specific impact thresholds and targeted adaptive management actions for at-risk target species considered to be at high or very high risk of strike.	- The ecological risk model (ERM) (within Appendix C Bird and Bat Utilisation Survey Report) has not identified any at-risk target species considered to be at high or very high risk of strike within the Project Area. - Specific impact thresholds that are quantitative, ecologically justified, and based on the SMART principles are detailed in Table 4-2: Outcome-based management provisions.	Y
	Any identified avoidance and mitigation measures must also be documented in the BBMP, including a description of the relevant measures and associated timing.	Refer to Section 4.2.1 Mitigation Measures for avoidance and mitigation measures that will be implemented during the planning, commissioning, and operation phases. Avoidance and mitigation measures that will be implemented during the construction phases will be documented in a CEMP.	Y (following implementation of a CEMP)
Section 5.3: Long-term mortality monitoring	To manage potential long-term mortality impacts on relevant species as a result of turbine collision and barotrauma, the BBMP must include a long-term monitoring and CRM update approach. The approach must, at a minimum: a) include details of the nature, timing and frequency of monitoring to inform progress against achieving the environmental outcomes, and be sufficient to determine whether the BBMP is likely to achieve those environmental outcomes in adequate time to implement all necessary corrective actions b) demonstrate how site-specific and species-specific risks and uncertainties have informed the design of the monitoring program (for example, scavenger activity, searcher efficiency), including engagement with relevant research bodies (for example, Universities) c) include a proposed timeframe for the regular validation and update of the CRM using site - specific data collected through ongoing monitoring activities d) include a commitment to DNA test carcasses that cannot be otherwise identified by suitably qualified bird or bat expert e) include a commitment for carcass persistence trials to maximise turbine collision detection in a timely manner f) include a commitment for searcher efficiency trials to maximise carcass detection in a timely manner.	- Refer to Section 5: Bird and Bat Monitoring Program for details of the nature, timing and frequency of monitoring to inform progress against achieving the environmental outcomes, and be sufficient to determine whether the BBMP is likely to achieve those environmental outcomes in adequate time to implement all necessary corrective actions - Refer to Section 5.1.1: Introduction, Section 5.2.1: Introduction and Section 5.2.2: Revisions to Turbine Collision Risk for demonstration of how site-specific and species-specific risks and uncertainties have informed the design of the monitoring program. - Refer to Section 5.2.2: Revisions to Turbine Collision Risk for a proposed timeframe for the regular validation and update of the CRM using site - specific data collected through ongoing monitoring activities. - Refer to Section 5.2.1.4: Data Collection for a commitment to DNA test carcasses that cannot be otherwise identified by suitably qualified bird or bat expert - Refer to Section 5.2.3: Carcass Persistence and Searcher Efficiency Trials for a commitment for carcass persistence trials to maximise turbine collision detection in a timely manner. - Refer to Section 5.2.3: Carcass Persistence and Searcher Efficiency Trials for a commitment for searcher efficiency trials to maximise carcass detection in a timely manner. CRM will be conducted and the respective results will be incorporated into this BBMP, as detailed in Section 9.1 of the BBMP.	Y
	Data Template for Mortality Surveys, included at Appendix B of guidance, to document results of long-term mortality monitoring	Refer to Appendix F: Data Monitoring Sheets for Mortality Surveys.	Y

Section DCCEEW Interim Guidance and Requirements (DCCEEW 2024b)		Specifications according to Guidance (DCCEEW 2024b)	Addressed in the BBMP	Guidance met? (Y/N)
Section 5.4: BBMP Reporting requirements	You must review the implementation of the approved BBMP at least once every 12 months to inform preparation of an annual compliance report submitted to the department.	This report should: • update target species risk assessment based on actual turbine collision impacts to date, including monitoring data and incidental species sightings • re-analyse flight path and habitat predictions and turbine collision impact predictions as required, compared against actual turbine collision impacts to date (including monitoring data and incidental species sightings) • re-analyse individual turbine collision risk based on monitoring data and incidental species sightings, including justification for any proposed changes to risk ratings based on ongoing monitoring and survey efforts • reference improvements and updates to the monitoring program, including the methodology applied • incorporate adjustments to impact thresholds and provide details of associated adaptive management actions taken, including a review of the effectiveness of any implemented BBMP mitigation measures • reference ongoing process improvement and incorporation of new information and technology; for example improved turbine collision mitigation measures and strike detection technology • outline unforeseen limitations or issues identified during wind farm operation, and any other matters requested by the decision-maker. Consideration of the above matters should be informed by current information and data including actual turbine collision impacts to date, target species data, published turbine collision data and peerreviewed literature. Additionally, details of your compliance with conditions of approval and summaries of monitoring results need to be published on your public website.	• Refer to Section 6: Reporting Provisions and Section 9: Adaptive Management and Section 5: Bird and Bat Monitoring Program	Y



Table 1-2: Assessment of compliance with Department of Water and Environmental Regulation (DWER) Green Energy Proponent Guideline

Section DWER Green Energy Proponent Guideline (DWER 2024)		Specifications according to Guidance (DWER 2024)	Addressed in the BBMP	Guidance met? (Y/N)
The mitigation hierarchy	Proponents will be expected to demonstrate how they have considered and applied this hierarchy to reduce the potential impacts on the environment.	Each step in the mitigation hierarchy should be applied to the greatest extent practicable before determining the residual impact and consideration of the next step. The process of mitigation is iterative, and the hierarchy should be considered and applied continually throughout all stages of the Project. Planning and early actions to avoid and minimise environmental impacts (over and above rehabilitation and offsets) should be prioritised. Avoidance and minimisation actions, particularly when identified early in the Project planning phase, can: • increase the certainty that environmental impacts can be mitigated • provide cost-effective mitigation options and flexibility of mitigation methods • attract greater stakeholder acceptance and support for the Project • reduce the complexity and/or number of environmental approvals required Where it is likely a significant residual impact may remain after all steps in the mitigation hierarchy have been applied, offsets should be considered as early as possible.	• Refer to Section 4.2.1: Mitigation Measures.	Y
The mitigation hierarchy, environmental outcomes and monitoring	For each relevant environmental factor (i.e. terrestrial fauna or flora and vegetation) the EPA expects proponents to propose environmental outcomes for each relevant environmental value (e.g. a specific Priority Ecological Community) impacted by their proposal as part of their EIA. In this context, an environmental outcome is the state or condition of the environmental value during or after implementation. In essence, it is the state of the environment after the mitigation hierarchy has been applied.	While the EPA has objectives for each environmental factor, an environmental outcome should be more specific and relate to each value that will be impacted.	• Refer to Section 2: Environmental Outcomes.	Y
Steps for mitigating environmental impacts	Step 1: Understand the environmental values	Proponents are encouraged to initially undertake a detailed desktop assessment to understand the potential for their project to impact these values. Where desktop analysis indicates that there may be relevant environmental values, undertaking on-ground surveys is typically required as part of the assessment process.	• Refer to Appendix C: Bird and Bat Utilisation Survey Report.	Y
Steps for mitigating environmental impacts	Step 2: Investigate and apply avoidance options	Avoidance through project siting. The principles below should be considered for green energy projects (birds and bats) to avoid environmental impacts and reduce assessment requirements: • Use disturbed land • Co-locate and use shared infrastructure • Locate near existing infrastructure • Avoid environmentally significant areas • Avoid threatened fauna • Consider site topography • Consider cumulative impacts Avoidance through project design. The following project design strategies should be considered to avoid environmental impacts: • Adjust project layout • Select suitable technologies and materials • Use sufficient buffers and separation	• Refer to Section 4.2.1: Mitigation Measures and Section 4.2.3: Objective-Based Management Provisions for avoidance options through project siting and project design.	Y
Steps for mitigating environmental impacts	Step 3: Investigate and apply minimisation options	Fauna (including marine and subterranean fauna) can be displaced by green energy projects. Many factors contribute to fauna displacement, including the removal and fragmentation of habitat, light pollution, noise emissions, invasive species introduction, and collisions. The following strategies should be considered to minimise potential impacts on fauna: • Maintain fauna movement corridors. • Minimise road traffic. • Implement speed limits. • Narrow roads and verges to allow wildlife to cross the road quickly. • Engage a fauna spotter for pre-clearing surveys and during clearing and site disturbance. • Use high-frequency noise, outside the range of human hearing, to repel animals. • Manage waste to prevent the attraction of wildlife. • Implement fencing and barriers to minimise fauna interactions with the Project site or infrastructure. • Provide shading or carefully direct light sources to reduce disruption to nocturnal fauna. • Manage feral animals.	• Refer to Section 4.2.1: Mitigation Measures and Section 4.2.3: Objective-Based Management Provisions for minimisation options. • Impacts to birds and bats and associated habitats from clearing and construction for the Project will be actively managed through a Construction Environmental Management Plan (CEMP).	Y (following implementation of a CEMP)

Section DWER Green Energy Proponent Guideline (DWER 2024)		Specifications according to Guidance (DWER 2024)	Addressed in the BBMP	Guidance met? (Y/N)
Mitigating impacts of green energy proposals	Review the avoidance and minimization examples and assess whether each can be applied. These lists are not exhaustive, and impacts can vary considerably by Project. Proponents should engage relevant consultants and consult with stakeholders to ensure all the potential impacts of their specific projects are identified, adequately understood, and mitigated.	A range of avoidance and minimization options are presented for consideration. Those related to bird and bat injury and/or mortality via collision with wind turbines or traffic are: - Avoidance option: Explore options for below-ground transmission lines to avoid bird or bat collisions. - Avoidance option: Consider smart curtailment protocols, such as turning off wind turbines at certain speeds to reduce the chance of collision. Wind turbines could also be shut off when birds are detected in the vicinity. - Minimisation option: Explore tower designs that minimise attraction as perches. - Minimisation option: Explore blade design features and patterning known to reduce collision risk. Consider turbine features, blade height, visibility, lighting, configuration, row spacing, and column number.	Refer to Section 4.2.1: Mitigation Measures and Section 4.2.3: Objective-Based Management Provisions for avoidance and minimisation options.	Y



2. Environmental Outcomes

The BBMP aims to achieve the overarching environmental outcomes listed below:

- Maintain long term, viable populations of:
 - Listed threatened bird and bat species;
 - Listed migratory bird and bat species; and
 - Non-listed bird and bat species
 within the Project Area.
- Monitor mortality or injury to bird and bat species caused by turbine collision or barotrauma as a result of the Project.

3. Baseline BBUS Surveys

Eight baseline BBUSs were conducted between Quarter 4 2023 and Quarter 3 2025 to ensure all FPs were assessed during each season over a two-year period. Detailed results are provided in **Appendix C**.

3.1.1 Birds

During the FP counts, each bird/flock was recorded every 30 seconds. A total of 18,507 observations with associated flight heights were recorded within and surrounding the Survey Area. This included a total of 92 species within the Survey Area, including eight raptors, seven aerial foragers, 11 waterbirds, two shorebird, 12 other species of potential risk (parrots, corvids, magpie, cuckoo-shrike and triller) and 51 bush birds. The remaining 22 species recorded in the surveys were either recorded outside the Survey Area, heard only (no flight height data available) or recorded opportunistically during the baseline BBUSs or basic and targeted fauna survey (Stantec 2025b) (not during FP counts). As the turbine model to be installed had not been finalised at the time of the baseline BBUS assessment, an RSA height of between 40 and 300m above ground level was used for the baseline assessment.

Of the of 18,507 observations, 1,968 (10.63%) were within the initially proposed RSA (40-300 m). A total of 27 species were at potential risk (recorded flying within RSA) (**Table 3-1**). The Little Corella accounted for 44.00% of all observations within RSA height, and the Tree Martin accounted for 19.00% of all observations within RSA height. Of the 27 species recorded flying within the RSA height, seven were raptors, five were aerial foragers, one was a shorebird, six were waterbirds, six were other species of potential risk and two were bush birds. All observations of the Endangered Carnaby's Black-Cockatoo were below RSA (0-40 m).

Table 3-1: Species recorded within the Rotor Swept Area (40-300 m) during FP counts

Species	Classification	Number of observations within RSA	Total number of observations	Proportion of observations of that species within RSA (%)
Australian Hobby <i>Falco longipennis</i>	Raptor	1	1	100.00
Wedge-tailed Eagle <i>Aquila audax</i>	Raptor	121	152	79.61
Banded Lapwing <i>Vanellus tricolor</i>	Shorebird	0	2	0
Tree Martin <i>Petrochelidon nigricans</i>	Aerial Forager	150	415	36.14
Rainbow bee-eater <i>Merops superciliosus</i>	Aerial Forager	0	1	0
Spotted Harrier <i>Circus assimilis</i>	Raptor	2	6	33.33
Little Corella <i>Cacatua sanguinea</i>	Other Species of Potential Risk	410	2,443	16.78



Species	Classification	Number of observations within RSA	Total number of observations	Proportion of observations of that species within RSA (%)
Western Corella <i>Cacua pastinator</i>	Other Species of Potential Risk	200	200	100.00
Little Crow <i>Corvus bennetti</i>	Other Species of Potential Risk	0	5	0
Welcome Swallow <i>Hirundo neoxena</i>	Aerial Forager	8	147	5.44
White-backed Swallow <i>Cheramoeca leucosterna</i>	Aerial Forager	12	65	18.46
White-faced Heron <i>Egretta novaehollandiae</i>	Waterbird	1	4	25.00
Magpie Lark <i>Grallina cyanoleuca</i>	Bush Bird	0	47	0
Australian Kestrel <i>Falco cenchroides</i>	Raptor	13	62	20.97
Australian Raven <i>Corvus coronoides</i>	Other Species of Potential Risk	12	294	4.08
Fairy Martin <i>Petrochelidon ariel</i>	Aerial Forager	0	2	0
Brown Falcon <i>Falco berigora</i>	Raptor	0	3	0
Australian Magpie <i>Gymnorhina tibicen</i>	Other Species of Potential Risk	0	30	0
Grey Teal <i>Anas gracilis</i>	Waterbird	2	8	25.00
Pacific Black Duck <i>Anas superciliosa</i>	Waterbird	0	0	0
Australian Shelduck <i>Tadorna tadornoides</i>	Waterbird	4	22	18.18
Australian Pipit <i>Anthus australis</i>	Bush Bird	1	180	0.56
Galah <i>Eolophus roseicapilla</i>	Other Species of Potential Risk	1	1,417	0.07

A Peregrine Falcon (*Falco peregrinus*) (OS) was observed opportunistically once within the Survey Area foraging within RSA height. Additionally, the following species were observed within RSA height in the vicinity of the Survey Area and may therefore be at risk if flying at RSA height within the Survey Area:

- Little Eagle (*Hieraaetus morphnoides*)
- Brown Goshawk (*Accipiter fasciatus*)
- Little Pied Cormorant (*Microcarbo melanoleucos*)
- Little Black Cormorant (*Phalacrocorax sulcirostris*)
- Pacific Black Duck (*Anas superciliosa*)

3.1.2 Bats

A total of seven insectivorous bat species were recorded on bat echolocation units during the survey, none of which were significant. Exact call numbers were not always analysed, due to some species calling continuously throughout the night. However, this analysis indicates that the most frequently recorded species were the White-striped Free-tailed Bat (*Austronomus australis*) and Gould's Wattled Bat (*Chalinolobus gouldii*). These species, and the Southern Forest Bat



(*Vespadelus regulus*) were the only species recorded in all habitat types and during all quarterly surveys. 83.33% of all bat species identified during the desktop assessment were recorded during the baseline BBUSs: not including the Little Red Flying-fox (*Pteropus scapulatus*). Two species were recorded that had not been previously identified during the desktop assessment: the Northern Free-tailed Bat (*Ozimops lumsdenae*) and Inland Broad-nosed Bat (*Scotorepens balstoni*).

3.1.3 Significant Bird and Bat Species

No significant bat species were recorded during the baseline BBUSs or basic and targeted fauna survey (Stantec 2024b) or baseline BBUS.

No migratory bird species were confirmed in the Survey area.

Two significant bird species was recorded during the baseline BBUSs and basic and targeted fauna survey (Stantec 2024b) and BBUSs: the CBC and Peregrin Falcon. A summary of key threats, proposal impacts, and key survey findings for the CBC and Peregrine Falcon are presented in **Table 3-2** below.

During habitat assessments, suitability of foraging habitat for black cockatoos was assessed in accordance with the foraging habitat scoring tool in the Referral Guideline for 3 WA Threatened Black-Cockatoo Species (DAWE 2022b) (**Appendix D**). Four of the eight habitats are high quality, with a foraging score of 10 (**Figure 3-1**): Diverse Shrubland and Heath; Low Eucalypt Woodland; Shrubland on Lateritic Ridge/Outcrop; and Wetland. The remaining four habitats receive a foraging score of zero (0).

Additionally, one long unused Malleefowl (*Leipoa ocellata*; Vu, Vu) mound was recorded within the Survey Area, in Low Eucalypt Woodland (**Figure 3-2**). The mound was approximately 2.5m x 1m, with a low, flat profile and no evidence of recent use. Small pieces of eggshell and a thin layer of incubating material were observed but do not appear recent. Based on the age of the mound, the lack of other mounds/activity within the Survey Area, and the age/prevalence of records of Malleefowl in the vicinity of the Survey Area from the Desktop assessment, this species was assessed as possible to occur within the Survey Area. If the species is present within the Survey Area, it will be at very low risk of interaction with wind turbines as it flies only short distances. All Malleefowl habitat coincides with high quality foraging habitat the CBC, therefore management and mitigation measures to minimise potential impacts to CBC habitat within the BBMP will also mitigate potential direct or indirect impacts from the proposal to potential Malleefowl habitat.



Table 3-2: Significant fauna species recorded in the Project Area - summary table of key threats, proposal impacts, and key survey findings

Species habitat requirements and representation of habitat within the Project Area	Ecology and Distribution	Key Threats	Potential Proposal Related Impacts	Key Findings
Carnaby's Black-Cockatoo (CBC) (<i>Zanda latirostris</i>) (En; En)				
Critical Habitat: The Survey Area contains: - Low Eucalypt Woodland; Shrubland on Lateritic Ridge/Outcrop and Melaleuca Wetland habitats contain high-quality CBC foraging habitat. 899 potential breeding trees, 328 suitable breeding trees, and zero confirmed breeding trees; - No CBC roosts were identified within the Survey Area. One roost was confirmed during the Survey, located within nature reserve R 12705 approximately 2 km north of the Survey Area. Habitat within the Project Area: - The extent of CBC habitat in the Project Area is described in Appendix D. - Representative photographs of CBC habitat are provided in Appendix D.	Description CBC is a large, gregarious cockatoo species (DCCEEW 2024d). It is one of two white-tailed black-cockatoo species and can be differentiated from Baudin's Black-Cockatoo (<i>Zanda baudinii</i>) (En; En) by its shorter upper bill and by subtle differences in its call (Menkhorst <i>et al.</i> 2019). Distribution CBC is endemic to the south-west of WA, where it is widespread across the Wheatbelt, Swan Coastal Plain and Southern Coast (DCCEEW 2024d). Although most CBCs are nomadic after breeding, the Eneabba flock of 300-400 individuals is resident throughout the year (Johnstone and Johnstone 2024). Ecology CBC forages in native vegetation, close to breeding trees during the breeding season and close to roost sites during the non-breeding season. It generally favours proteaceous species in shrubland and heath habitat, and forages on the seeds of these species, but also larvae and insects. (DCCEEW 2024d; Johnstone and Johnstone 2024).	Threatening processes: The main threats to the species include: - Extensive clearing of breeding habitat and a lack of regeneration of potential nest trees due to grazing by sheep and rabbits; - Competition for nest hollows with other birds and the feral European honeybee; - Death and injury resulting from vehicle strike; - Illegal shooting by orchardists and pine plantation owners; - Reduced food and water availability due to climate change; and - Death and injury resulting from extreme weather events exacerbated by climate change (DCCEEW 2023).	Potential Proposal Related Impacts: - Project- related clearing of native vegetation resulting in loss of critical CBC habitat. - Occurrence of Project-related fire as a result of Project-related activities resulting in the degradation, loss of habitat and loss of individuals of CBC. - Potential decline or change in the health/composition of CBC habitat arising from dust generated as part of construction and operation activities and the potential spread of weed species, has the potential to degrade CBC habitat and potentially limit availability of food resources. - Artificial light can potentially disturb species natural foraging and roosting behaviour.	Records in Project Area: CBC have been recorded within the Survey Area on the following occasions (Figure 3-1): 150 individuals utilising the roost near FP6R on multiple evenings during the Q3 2025 BBUS; - Two individuals observed from FP15 during the Q2 2025 BBUS; 80 individuals observed from FP16R during the Q2 2025 BBUS; - Two individuals observed flying over the Additional Area during the Q4 2024 BBUS; - An estimated total 105 individuals were observed within the Survey Area during the Q3 2024 BBUS; - An estimated total 400 individuals were observed during the Q2 2024 BBUS. The largest flock observed during this period was of 380 individuals, and due to the flock being observed in similar locations close to dawn and dusk it is assumed that the majority of observations were of individuals from this group, with approximately 400 Carnaby's Black-Cockatoos utilising the Survey Area and surrounds during the Q2 2024 BBUS. Some of the more common flight paths observed for this flock were south to north close to First North Road, and east to west at the northern nature reserve R 12705; and 22 individuals observed flying over the Survey Area during the Q1 2024 BBUS.
Peregrine Falcon (<i>Falco peregrinus</i>) (OS)				
Suitable Habitat: Suitable foraging and breeding habitat in the Survey Area may include: - Open Woodland on Farmland - Shrubland on Lateritic Ridge/Outcrop - Minor Drainage Line	Description: The Peregrine Falcon is a powerful aerial hunter that inhabits most environments with suitable nest sites across Australia, with a preference for cliff faces (Menkhorst <i>et al.</i> 2019). Distribution: The species is found in most habitats from rainforests to arid zones, from the coast to alpine areas. The species prefer coastal and inland cliffs or open woodlands near water (BirdLife Australia 2023). Ecology: The species occurs in habitats supporting nest sites, preferentially cliff-faces however also uses raptor stick nests (Menkhorst <i>et al.</i> 2019).	Threatening processes: The major threat to the species is habitat loss, particularly wooded areas which serve as nesting sites to the species in the absence of cliffs (DAWE 2020).	Potential Proposal Related Impacts: - Rotor strike. - Project- related clearing of native vegetation resulting in loss of habitat.	Records in Project Area: One Peregrine Falcon was observed within the Survey Area during the Q4 2024 BBUS, foraging within RSA height. The species was observed opportunistically near the north-eastern boundary of the Survey Area.



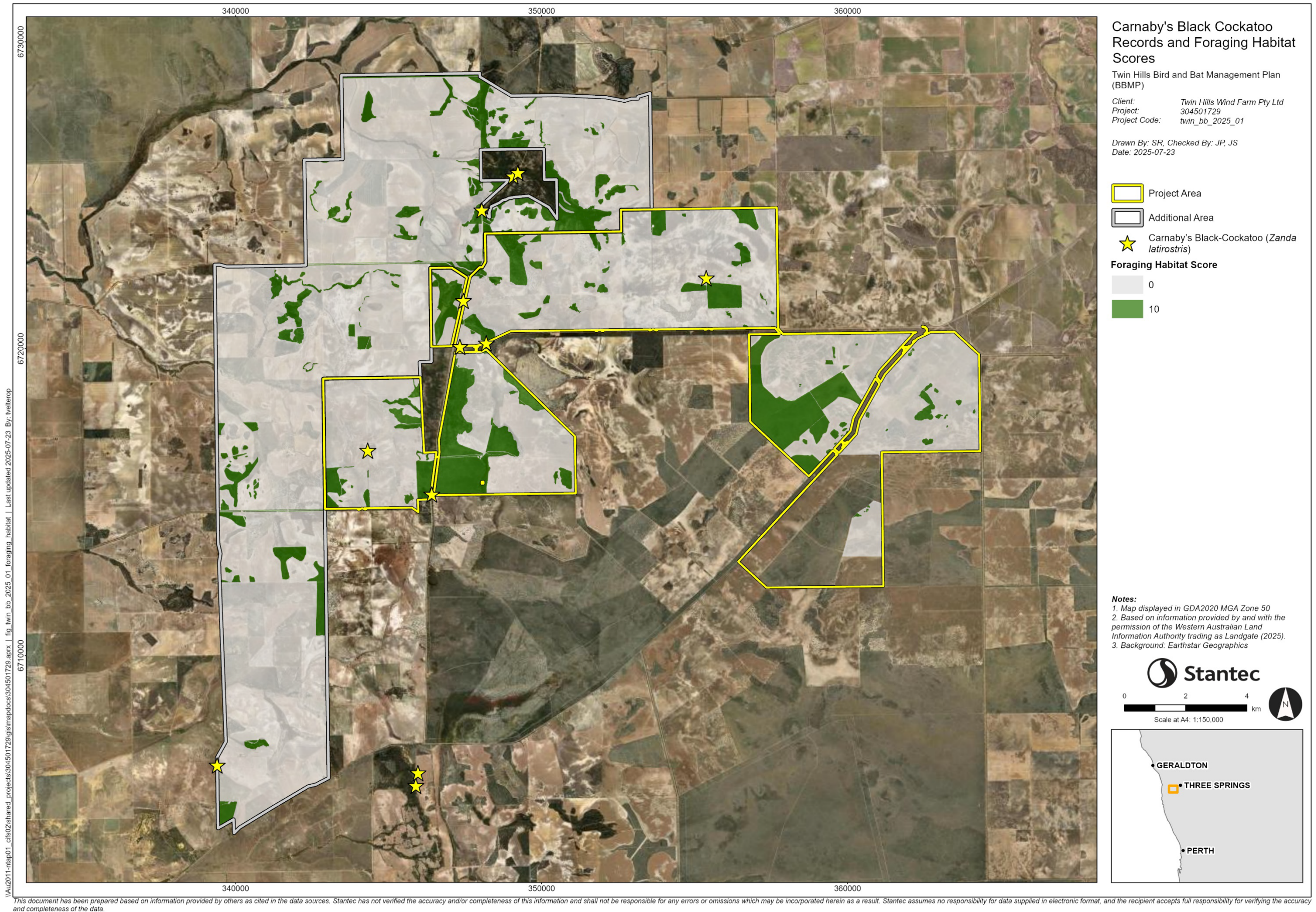


Figure 3-1: Foraging habitat scores and CBC records within the Project Area





Plate 3-1: A flock of CBCs observed foraging on Banksia sp. during the Q2 2024 BBUS, travelling north from nature reserve R 48098 to R 12705 along First North Rd

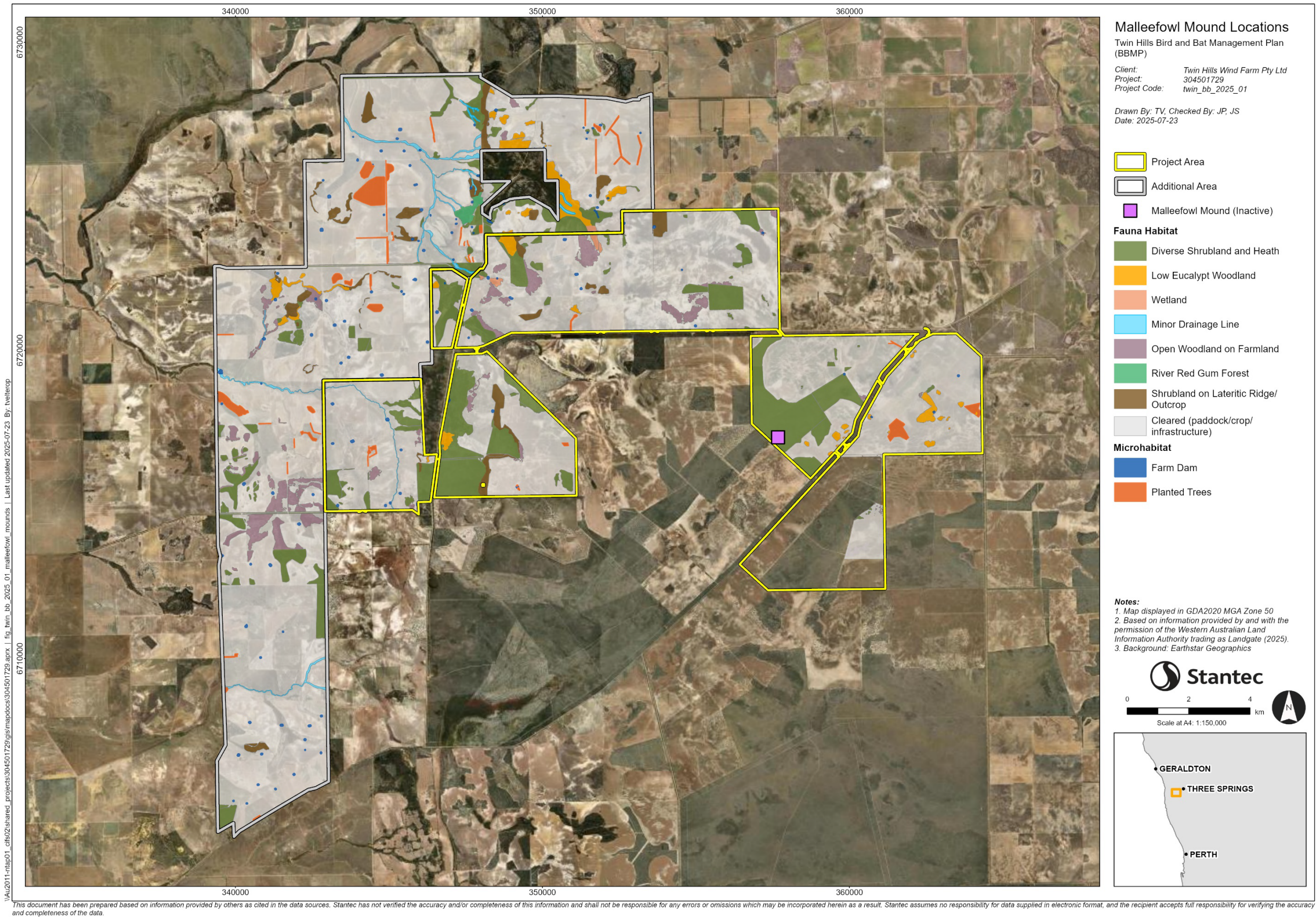


Figure 3-2: Malleefowl mound location within the Survey Area

4. Impact Management

4.1 Potential Impacts

The key potential impacts to birds and bats from the Project during the commissioning and operation phases are summarised below.

Table 4-1: Key potential impacts to birds and bats associated with the Project

Potential Impacts	Bats	Birds
Mortality or injury due to wind turbine collision	The bat species most at risk of collision tend to have long narrow wings, forage in open air, and be migratory (Cryan and Barclay 2009). Research suggests that tree roosting species and those that disperse over greater distances are more prone to collision than other groups (Cryan and Barclay 2009; Thaxter <i>et al.</i> 2017). Tree roosting or migratory bats with high wing aspect ratios that forage in the open air at high altitude have been found to be more prone to fatalities at Wind Farms (Hull and Cawthen 2013). These risk factors are evident in the taxa, including the family Molossidae, which has been found to be especially vulnerable to wind farm collisions in studies from North America and Latin America (Agudelo <i>et al.</i> 2021; Thaxter <i>et al.</i> 2017). Additionally, a range of landscape factors, habitat factors, and wind farm design (particularly turbine placement), affects risks relating to rotor strike (Marques <i>et al.</i> 2014).	Species-specific risk factors associated with rotor strike include flight height, manoeuvrability, sensorial perception, conservation status, population size, generation time, and habitat use (Marques <i>et al.</i> 2014; Reid <i>et al.</i> 2022). Groups at high risk of impacts from wind farms therefore include raptors (Beston <i>et al.</i> 2016; Hull <i>et al.</i> 2013; Watson <i>et al.</i> 2018), aerial foragers (Hull <i>et al.</i> 2013), waterbirds (Halse <i>et al.</i> 2006), shorebirds (Halse <i>et al.</i> 2006), and other groups that are known to fly within RSA ranges. Within the Survey Area, these other at-risk groups may include parrots, corvids, cuckoo-shrikes, magpies, and trillers. Additionally, a range of landscape factors, habitat factors, and wind farm design (particularly turbine placement), affects risks relating to rotor strike (Marques <i>et al.</i> 2014). Overall, the CBC flight paths observed in the Survey Area varied in their starting points, direction of travel, and end points; with no clear pattern being observed (Stantec 2025a). As such, micro-siting wind turbines or other infrastructure around observed flight paths is not considered to be a reliable measure to mitigate against CBC collisions with Project infrastructure.
Mortality or injury due to barotrauma	There is a rapid air pressure reduction near moving turbine blades which has been shown to cause barotrauma resulting in injury or death in bats (Baerwald <i>et al.</i> 2008).	N/A
Displacement of fauna	N/A	Bird species have been documented to learn to avoid turbines (Cook <i>et al.</i> 2018). However, if avoidance of turbines results in an inability to access habitat, this may result in the species being displaced from important food sources, breeding habitat and refuge habitat (Ellerbrok <i>et al.</i> 2022; Marques <i>et al.</i> 2014).
Clearing critical habitat for significant species	Clearing has the potential to directly impact significant bat species through the removal of critical breeding and or foraging habitat.	Clearing has the potential to directly impact significant bird species through the removal of critical breeding and or foraging habitat. Foraging resources for Black-Cockatoos are scarce due to habitat modification, climate change, and bushfire events (DAWE 2022b).



Potential Impacts	Bats	Birds
		Loss of 1 ha or more of high-quality Black-Cockatoo foraging habitat (score of 5-10) is considered a potential significant impact to the CBC triggering the threshold for referral to DCCEEW (DAWE 2022b).
Degradation of significant fauna critical foraging habitat as a result of unplanned project-related fire, fugitive dust emissions, or spread of weeds and plant pathogens from operation of the Project.	Unplanned fire regimes may threaten birds and bats by reducing their survival and/or reproduction during the fire event and degrading or altering habitats (DAWE 2022a). Fire regimes that threaten biodiversity may also degrade ecosystem functions, reducing the capacity of ecosystems to sustain native flora and fauna and result in the amplification of, or change the responses to, other environmental stressors (for example increased competitive abilities of weeds relative to native plant species, increased hunting efficiency of introduced predators, reduced evasion or defence by native prey species). Bird and bat habitat may be affected by dust deposition (Farmer 1993), altering the community structure of the habitat. Weed invasion has the potential to transform the landscape, changing soil conditions and fire regimes, resulting in long term changes in the environment (Webber 2021).	
Disruption to fauna behaviour due to an increase in artificial light emissions.	Bats may be attracted to turbines based on artificial lights emissions from turbines and nearby project infrastructure (Guest <i>et al.</i> 2022). Bats may also be attracted to the increased numbers of insects that may congregate near bright light sources.	Artificial lighting may affect the collision rates of birds, particularly around tall structures which migratory birds may be drawn to. Species that use natural light sources to assist with migration may also be at risk of disorientation by artificial light sources (Longcore and Rich 2004).
Disruption to fauna behaviour due to turbine-generated noise	Potential disturbance to bats caused by turbine-generated noise is poorly understood (Ellerbrok <i>et al.</i> 2022). Some evidence from Europe suggests that forest specialist bats may avoid turbines, but it is unclear whether this is caused by noise, habitat loss in proximity to turbines, or other factors (Ellerbrok <i>et al.</i> 2022). This potential impact is not assessed within this report.	Impacts of wind turbine noise are poorly understood, but frequencies of turbine-generated noise are known to be within hearing range of most bird species, suggesting that site utilisation and call behaviour may be impacted (Teff-Seker <i>et al.</i> 2022). Whilst noise impacts at operational turbines are not well studied, an experiment using playback of wind turbine noise demonstrated a reduction in bird presence (Lehnardt <i>et al.</i> 2024).
Increase in the presence of carrion resulting in increase in likelihood of raptor strike with turbines	N/A	Presence of carrion may attract raptor species that scavenge on carrion, resulting in a potential increase in likelihood of raptor strike with turbines.

4.2 Impact Management Provisions

4.2.1 Mitigation Measures

Mitigation measures that can reduce impacts to bird and bat species from the Project have been established using the EPA mitigation hierarchy for Environmental Factors (avoid, minimise, rehabilitate, offset, monitor).

The Proponent will seek to reduce impacts to bird and bat species through implementing the **avoidance** measures listed below:

- Locate wind turbines on cleared land (i.e. land free of native vegetation or any planted trees) only.
- Implement a minimum turbine blade tip height of 60 m. (CBCs were not observed flying above 40 m within the Project Area. According to Johnstone and Johnstone (2024), who have collected records of CBCs in the Eneabba region over the past 70 years and conducted surveys of wind farms in the region, CBCs rarely fly above 40 m and are at low risk of rotor strike).
- Ensure no wind turbine towers are installed within 500 m of Wedge-tailed Eagle nests identified during baseline BBUSs.



- Ensure no wind turbines are installed within 2 km of the CBC roost identified during the baseline BBUSs that is located north of the Project Area.

The Proponent will seek to reduce impacts to bird and bat species through implementing the **minimisation** measures listed below:

- Site and design non-wind turbine infrastructure to minimise clearing requirements.
- Implement lighting options that minimise potential impacts to bird and bat species where practicable. These may include:
 - Implementing directive lighting that minimises high intensity light spill beyond fenced areas (e.g., substations and maintenance yards, etc).
 - Installing light hoods.
 - Using low-pressure sodium or mercury lamps with UV filters to reduce brightness.
 - Using blue, green or red lights rather than white or yellow lights.
- Implement site vehicle and machinery hygiene procedures to minimise the spread of weeds and plant pathogens.
- Implement appropriate speed limits on unsealed access tracks to control dust generation.
- Develop and implement fire prevention and management procedures (e.g. hot works procedures, fuel storage procedures).
- Develop and implement awareness, induction, and training packages to effectively implement the BBMP.
- Undertake monitoring (including carcass searches) in accordance with the Monitoring Program (**Section 5: Bird and Bat Monitoring Program**).
- Review the ERM (**Appendix A: Ecological Risk Model**) following the completion of 2 years of baseline BBUS to identify species most at risk of collision within the Project Area.
- Re-evaluate the risk rating of at-risk bird and bat species following the annual review of qualitative risk assessment based on the results from the operational BBUS compared to those from the baseline BBUS data collected during the Bird and Bat Monitoring Program (**Section 5: Bird and Bat Monitoring Program**).
- Undertake carrion removal in accordance with the Bird and Bat Monitoring Program (**Section 5: Bird and Bat Monitoring Program**).
- Actively manage impacts to birds, bats, and associated habitats during the construction phase of the Project through implementing a CEMP.

The Proponent will seek to reduce impacts to bird and bat species through implementing the **rehabilitation** measures listed below:

- Restore land used for temporary infrastructure during the construction phase to its pre-construction-state during the operations phase.

4.2.2 Outcome-Based Management Provisions

The Proponent has established management outcomes and associated outcome-based management provisions to achieve the desired environmental outcomes (**Section 2: Environmental Outcomes**). Outcome-based management provisions specify triggers and thresholds (environmental criteria) for direct impacts to birds and bats that are quantitative and can be accurately measured. Trigger criteria represent notable levels of direct impact that initiate the implementation of appropriate response actions well in advance of the respective management outcome being compromised. Threshold criteria represent the limit of acceptable impact beyond which the respective management outcome is likely to be compromised.

The management outcomes established for the BBMP are listed below.

- **Management Outcome 1:** No significant adverse Project-related direct impacts to a species listed threatened or migratory under the Commonwealth EPBC Act or WA BC Act as a result of turbine collision or turbine barotrauma.



- **Management Outcome 2:** No significant adverse Project-related direct impacts to a non-listed species as a result of turbine collision or turbine barotrauma.

The associated outcome-based management provisions for these management outcomes are detailed in **Table 4-2: Outcome-based management provisions**. These outcome-based management provisions will be revised as further data is collected from the Monitoring Program.

4.2.3 Objective-Based Management Provisions

The Proponent has also established management objectives and associated objective-based management provisions to achieve the desired environmental outcomes (**Section 2: Environmental Outcomes**). Objective-based management provisions specify management targets for both direct and indirect impacts to birds and bats that are qualitative and not able to be accurately measured. Management targets have associated management actions that serve to prevent the respective management objective from being compromised.

The management objectives established for the BBMP are listed below:

- **Management Objective 1:** Identify bird and bat species potentially at risk from the Project.
- **Management Objective 2:** Avoid significant impacts as a result of the Project to the CBC.
- **Management Objective 3:** Allow for continued utilisation of Wedge-tailed Eagle nesting sites within the Project Area (that were identified during baseline BBUSs).
- **Management Objective 4:** Minimise impacts to birds and bats from changes in their behaviour patterns that result from the Project.
- **Management Objective 5:** Minimise degradation to bird and bat habitat within proximity of the Project Area.
- **Management Objective 6:** Implement the BBMP effectively.

The associated objective-based management provisions for these management objectives are detailed in **Table 4-3: Objective-based management provisions**. These objective-based management provisions will be revised as further data is collected from the Monitoring Program.

4.2.4 Justification for Impact Management Provisions

Source information used to inform the management provisions are detailed below:

- EPBC Act Referral guideline for three WA threatened black cockatoo species: Carnaby's Cockatoo (*Zanda latirostris*), Baudin's Cockatoo (*Zanda baudinii*) and the Forest Red-tailed Black-cockatoo (*Calyptorhynchus banksii naso*) (DAWE 2022b) informed the trigger and threshold criteria for potential impacts to CBCs from rotor strike.
- Department of the Environment (DoE 2015) Referral guideline for 14 birds listed as migratory species under the EPBC Act informed the trigger and threshold criteria for potential impacts to migratory bird species from rotor strike with consideration of the following:
 - DoE (2015) states that an important population of a migratory species constitutes 0.1% of the national population.
 - No migratory species have been recorded in the pre-construction (baseline) BBUS with the Fork-tailed Swift (*Apus pacificus*; Mi, Mi) being the only migratory species assessed as likely to occur in the Project Area
- Currently available survey data (Stantec 2024a; b) was also used to inform the trigger and threshold criteria.
- The ERM developed in the **Bird and Bat Utilisation Survey Report (Appendix C)** and the CBC Risk Assessment (**Appendix B**) were used to inform all management provisions within the BBMP.



Table 4-2: Outcome-based management provisions

EPA Factor and Objective		Terrestrial Fauna (TF): 'To protect terrestrial fauna so that biological diversity and ecological integrity are maintained' (EPA 2016b).						
BBMP Purpose		Mitigate the direct and indirect impacts to at-risk bird and bat species that can potentially result from the Project during its planning, commissioning, and operation phases.						
Key Impacts and Risks		Potential for loss of fauna listed as threatened or migratory under the Commonwealth EPBC Act or WA BC Act and non-listed bird and bat species identified as potentially "at risk" from implementation of the Project.						
Indicators		Loss or injury of bird and bat species from wind turbine collision and / or barotrauma.						
Outcome-based Management Provisions		Trigger and Threshold Criteria		Trigger and Threshold Response Actions		Monitoring	Timing / Frequency of Monitoring	Reporting
		Trigger Criteria	Threshold Criteria	Trigger Level Actions	Threshold Level Actions			
Management Outcome 1	No significant adverse Project-related direct impacts to a species listed threatened or migratory under the Commonwealth EPBC Act or WA BC Act as a result of turbine collision or turbine barotrauma.	One individual of a species listed as threatened under the Commonwealth EPBC Act or WA BC Act is found deceased or injured within 300 m of a turbine.	Multiple individuals of a species listed as threatened under the Commonwealth EPBC Act or WA BC Act are found deceased or injured within 300 m of any turbine over a 12-month period.	- Report the trigger event internally as an incident. - Record the trigger event in accordance with a Fauna Injury and Mortality Register/ Injured Fauna Management Procedure. - Notify Department of Water and Environmental Regulation (DWER)/ DCCEE within seven (7) days of the trigger event (if identification such as DNA testing is required to determine the species of a carcass, then the reporting timeframe will commence from the date the species of the carcass is confirmed). - Determine whether the trigger event should be attributed to turbine collision. - If the trigger event is attributed to turbine collision, determine whether additional mitigation measures should be implemented to lower the likelihood of future trigger events based on the frequency of prior trigger events. - If it is determined that additional mitigation measures should be implemented to lower the likelihood of future trigger events, implement these additional measures and update the BBMP accordingly.	- Report the threshold event internally as an incident. - Record the threshold event in accordance with a Fauna Injury and Mortality Register/ Injured Fauna Management Procedure. - Notify DWER/ DCCEE within seven (7) days of the threshold event (if identification such as DNA testing is required to determine the species of a carcass, then the reporting timeframe will commence from the date the species of the carcass is confirmed). - Determine whether the threshold event should be attributed to turbine collision. - If the threshold event is attributed to turbine collision, prepare and submit a report to DWER within 28 days of the exceedance being reported and, for matters relating to MNES, also submit a report to DCCEE within 28 days of the exceedance being reported. The report(s) shall include: - The threshold level that was reached. - The species and number of individuals involved in the threshold event. - The date(s) and location(s) of recovered carcasses. - Potential ecological factors that may have contributed to the threshold event. (A suitably qualified ecologist shall be engaged to determine these factors, and the Proponent will endeavour to have this determination completed within 10 business days of the exceedance being reported.) - An assessment as to whether future threshold events are likely to be rare or regular. - Following their review of the report after it has been submitted, consult with DWER (and with	- Fauna Injury and Mortality Register. - Carcass Searching in accordance with the Monitoring Program (Section 5). - Monitor any adaptive management responses for effectiveness in accordance with Section 9.1.	Operation: In accordance with the Monitoring Program (Section 5).	- Induction records - Reporting requirements outlined in Section 6 apply: - Annual Environmental Reporting in accordance with Section 6.1. - Threshold exceedance reporting in accordance with Section 6.2. - Incident reporting in accordance with Section 6.3. - Bird and Bat Reporting requirements as outlined in Section 5.3.
		Or Four individuals of the same species listed as migratory are found deceased or injured within 300 m of the same turbine within a 3-month period.	Or 0.05% of the total national population of the same species listed as migratory are found deceased or injured within 300 m of any turbine in a 12-month period.					

EPA Factor and Objective		Terrestrial Fauna (TF): ‘To protect terrestrial fauna so that biological diversity and ecological integrity are maintained’ (EPA 2016b).						
BBMP Purpose		Mitigate the direct and indirect impacts to at-risk bird and bat species that can potentially result from the Project during its planning, commissioning, and operation phases.						
Key Impacts and Risks		Potential for loss of fauna listed as threatened or migratory under the Commonwealth EPBC Act or WA BC Act and non-listed bird and bat species identified as potentially “at risk” from implementation of the Project.						
Indicators		Loss or injury of bird and bat species from wind turbine collision and / or barotrauma.						
Outcome-based Management Provisions		Trigger and Threshold Criteria		Trigger and Threshold Response Actions		Monitoring	Timing / Frequency of Monitoring	Reporting
		Trigger Criteria	Threshold Criteria	Trigger Level Actions	Threshold Level Actions			
					DCCEEW on matters relating to MNES) on whether additional mitigation measures should be implemented to lower the likelihood of future threshold events. If it is determined that additional mitigations measures should be implemented to lower the likelihood of future threshold events, implement these additional measures and update the BBMP accordingly.			
Management Outcome 2	No significant adverse Project-related direct impacts to a non-listed species as a result of turbine collision or turbine barotrauma.	One individual of a non-listed raptor species is found deceased or injured within 300 m of the same or adjacent turbines 1) during each of two successive Carcass Searches, or 2) over a 6-month period. Or Four or more individuals of the same non-listed bird or bat species (excluding raptors and those listed below) are found deceased or injured within 300m of the same or adjacent turbines either 1) during each of two successive Carcass Searches, or 2) over a 6-month period. Deceased or injured individuals of the species listed below will be reported but do not result in the Trigger Criteria being reached. - Little Corella. - Galah. - Little Crow. - Australian Raven. - Australian Magpie. - Australasian Pipit. - Any introduced species.	Three individuals of a non-listed raptor species are found deceased or injured within 300 m of the same or adjacent turbines 1) during each of two successive Carcass Searches, or 2) over a 6-month period. Or 10 or more individuals of the same non-listed bird or bat species (excluding raptors and those listed below) are found deceased or injured within 300m of the same or adjacent turbines either 1) during each of two successive Carcass Searches, or 2) over a 6-month period. Deceased or injured individuals of the species listed below will be reported but do not result in the Trigger Criteria being reached. - Little Corella. - Galah. - Little Crow. - Australian Raven. - Australian Magpie. - Australasian Pipit. - Any introduced species.	- Report the trigger event internally as an incident. - Record the trigger event in accordance with a Fauna Injury and Mortality Register/ Injured Fauna Mangement Procedure. - Determine whether the trigger event should be attributed to turbine collision. - If the trigger event is attributed to turbine collision, determine whether additional mitigation measures should be implemented to lower the likelihood of future trigger events based on the frequency of prior trigger events. - If it is determined that additional mitigation measures should be implemented to lower the likelihood of future trigger events, implement these additional measures and update the BBMP accordingly.	- Report the threshold event internally as an incident. - Record the threshold event in accordance with a Fauna Injury and Mortality Register/ Injured Fauna Mangement Procedure. - Notify DWER within seven (7) days of the threshold event. (If identification such as DNA testing is required to determine the species of a carcass, then the reporting timeframe will commence from the date the species of the carcass is confirmed). - Determine whether the threshold event should be attributed to turbine collision. - If the threshold event is attributed to turbine collision, prepare and submit a report to DWER within 28 days of the exceedance being reported. The report(s) shall include: - The threshold level that was reached. - The species and number of individuals involved in the threshold event. - The date(s) and location(s) of recovered carcasses. - Potential ecological factors that may have contributed to the threshold event. (A suitably qualified ecologist shall be engaged to determine these factors, and the Proponent will endeavour to have this determination completed within 10 business days	- Fauna Injury and Mortality Register. - Carcass monitoring in accordance with the Monitoring Program (Section 5). Monitor any adaptive management responses for effectiveness in accordance with Section 9.1.	- Operations - In accordance with the Monitoring Program (Section 5).	- Reporting requirements outlined in Section 6 apply: - Annual Environmental Reporting in accordance with Section 6.1. - Threshold exceedance reporting in accordance with Section 6.2. - Incident reporting in accordance with Section 6.3. - Bird and Bat Reporting requirements as outlined in Section 5.3.

EPA Factor and Objective		Terrestrial Fauna (TF): ‘ <i>To protect terrestrial fauna so that biological diversity and ecological integrity are maintained</i> ’ (EPA 2016b).						
BBMP Purpose		Mitigate the direct and indirect impacts to at-risk bird and bat species that can potentially result from the Project during its planning, commissioning, and operation phases.						
Key Impacts and Risks		Potential for loss of fauna listed as threatened or migratory under the Commonwealth EPBC Act or WA BC Act and non-listed bird and bat species identified as potentially “at risk” from implementation of the Project.						
Indicators		Loss or injury of bird and bat species from wind turbine collision and / or barotrauma.						
Outcome-based Management Provisions		Trigger and Threshold Criteria		Trigger and Threshold Response Actions		Monitoring	Timing / Frequency of Monitoring	Reporting
		Trigger Criteria	Threshold Criteria	Trigger Level Actions	Threshold Level Actions			
					of the exceedance being reported.) – An assessment as to whether future threshold events are likely to be rare or regular. • Following their review of the report after it has been submitted, consult with DWER on whether additional mitigation measures should be implemented to lower the likelihood of future threshold events. • If it is determined that additional mitigations measures should be implemented to lower the likelihood of future threshold events, implement these additional measures and update the BBMP accordingly.			

Table 4-3: Objective-based management provisions

EPA Factor and Objective	Terrestrial Fauna (TF): ‘To protect terrestrial fauna so that biological diversity and ecological integrity are maintained’ (EPA 2016b).				
BBMP Purpose	Mitigate the direct and indirect impacts to at-risk bird and bat species that can potentially result from the Project during its planning, commissioning, and operation phases.				
Key Impacts and Risks	Potential for loss of fauna listed as threatened or migratory under the Commonwealth EPBC Act or WA BC Act and non-listed bird and bat species identified as “at risk” from implementation of the Project.				
Indicators	Loss or injury from wind turbine collision and / or barotrauma, decrease in utilisation of the Project Area.				
Management Targets	Management Actions	Monitoring	Timing	Responsible	Reporting
Management Objective 1: Identify bird and bat species potentially at risk from the Project.					
- Complete sufficient baseline BBUSs. - Complete a sufficient ERM. - Complete a sufficient CRM.	MA1. Complete baseline BBUSs and data analysis by suitably qualified ecologist in accordance with DCCEEW guidance (DCCEEW 2024b); 24 months in total comprising eight (8) survey events, quarterly. MA2. Complete an ERM for species identified during the baseline BBUSs to determine those that are most at risk of turbine collision within the Project Area (Appendix A). MA3. Conduct CRM prior to entering the construction phase for the Project. MA4. Update the BBMP to include a map for each relevant species which identifies areas in the wind farm site and its surrounds which have been determined as ‘high risk’ following the completion of the CRM.	NA - data used to inform baseline for the Monitoring Program (Section 5).	Planning (MA1, MA2, MA3, MA4).	Environment Manager.	- Baseline BBUS reports (Appendix C). - ERM. - CRM. - Updated BBMP.
Management Objective 2: Avoid significant impacts to the CBC as a result of the Project.					
- Implement sufficient avoidance and minimisation mitigation measures. - Effectively monitor CBC roost utilisation.	MA1. Locate wind turbines on cleared land only. MA2. Keep the minimum turbine blade tip height at 60 m, above the typical flight height of CBC. MA3. Ensure no wind turbines are installed within 2 km of the CBC roost identified during the baseline BBUSs that is located north of the Project Area. MA4. Monitor CBC roost utilisation identified in the baseline BBUS in accordance with the Monitoring Program (Section 5).	In accordance with the Monitoring Program (Section 5).	- Planning (MA1, MA2, MA3). - Operations (MA4).	Environment Manager	- Annual Environmental Reporting (Section 6.1). - Baseline BBUS reports (Appendix C).
Management Objective 3: Allow for continued utilisation of Wedge-tailed Eagle nesting sites within the Project Area (that were identified during baseline BBUSs).					



- Effectively avoid and monitor the utilisation of existing Wedge-tailed Eagle nesting sites within the Project Area. - Reduce likelihood of significant impacts to Wedge-tailed Eagles in the Project Area.	MA1. Ensure no wind turbine towers are installed within 500m of Wedge-tailed Eagle nests identified during baseline BBUSs. MA2. Monitor Wedge-tailed Eagle nest utilisation identified in the baseline BBUS in accordance with the Monitoring Program. MA3. Undertake carrion removal in accordance with the Monitoring Program.	In accordance with the Monitoring Program (Section 5).	- Planning (MA1). - Operations (MA2, MA3).	- Environment Manager. - Engineers responsible for wind farm design.	- Annual Environmental Reporting (Section 6.1). - Bird and Bat Reporting requirements (Section 5.3).
Management Objective 4: Minimise impacts to birds and bats from changes in their behaviour patterns that result from the Project.					
Consider lighting options that minimise potential impacts to bird and bat species within the Project Area.	MA1. Consider implementing directive lighting that minimises high intensity light spill beyond fenced areas (e.g., substations and maintenance yards, etc). MA2. Consider installing light hoods. MA3. Consider using low-pressure sodium or mercury lamps with UV filters to reduce brightness. MA4. Consider using blue, green or red lights rather than white or yellow lights.	NA.	Operations (MA1, MA2, MA3, MA4).	Environment Manager.	Annual Environmental Reporting (Section 6.1).
Management Objective 5: Minimise degradation to bird and bat habitat within proximity of the Project Area.					
- Reduce the likelihood of weeds spreading. - Control dust generation. - Reduce the likelihood of bushfires.	MA1. Implement site vehicle and machinery hygiene procedures to minimise the spread of weeds and plant pathogens. MA2. Implement appropriate speed limits on unsealed access tracks to control dust generation. MA3. Develop and implement fire prevention and management procedures (e.g. hot works procedures, fuel storage procedures).	NA.	Operations (MA1, MA2, MA3).	Environmental Manager.	Annual Environmental Reporting (Section 6.1).
Management Objective 6: Implement the BBMP effectively.					
Train personnel to effectively discharge their responsibilities that pertain to the BBMP.	MA1. Include a summary of key environmental values, MNES, and other significant environmental matters in induction and training packages. MA2. Detail BBMP requirements and the trainee's/inductee's role in the implementation of the BBMP in induction and training packages. MA3. Outline the potential consequences of not meeting environmental responsibilities under the BBMP in induction and training packages.	Online records of all training conducted shall be maintained and used to facilitate site access.	- Commissioning (MA1, MA2, MA3). - Operations (MA1, MA2, MA3).	- Environment Manager. - All individuals that access the site during the commissioning and operations phases.	Training and induction records.

5. Bird and Bat Monitoring Program

5.1 Operational Bird and Bat Utilisation Surveys

5.1.1 Introduction

The operational BBUS approach was developed based on the Onshore Wind Farms interim guidance on bird and bat management (DAWE 2021; DCCEE 2024b), a review of best-practice approaches (Jenkins *et al.* 2015; Scottish Natural Heritage 2017) and assessment of surveys undertaken for previous wind turbine assessments. The methods adopted for the operational BBUSs were also aligned with the following survey guidelines for significant species with the potential to occur:

- EPBC Act Policy Statement 3.21 – Industry guidelines for avoiding, assessing mitigating impacts on EPBC Act listed migratory shorebird species (DEE 2017);
- EPBC Act Policy Statement 3.21 – Industry guidelines for avoiding, assessing mitigating impacts on EPBC Act listed migratory shorebird species (DEE 2017);
- Environmental Factor Guideline: Terrestrial Fauna (EPA 2016b); and
- Technical Guidance: Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment (EPA 2020).

Details of survey methods are described in **Section 5.1.2**, consisting of FP counts, deployment of bird and bat acoustic and echolocation recording units. Based on best-practice approaches (Jenkins *et al.* 2015; Scottish Natural Heritage 2017), Stantec adapted an approach to use a method that focuses on the number of bird observations and species flying at different heights (e.g. above, below and within the RSA), whilst also recording robust data on species utilisation. As the turbine model to be installed had not been finalised at the time of the baseline BBUS assessment, an RSA height of between 40 and 300m above ground level was used for the baseline assessment. The operational BBUS will take into consideration the revised RSA height of between 60 and 300m above ground level.

5.1.2 Methods

5.1.2.1 Survey Timing

Operational BBUSs will be undertaken quarterly over a consecutive 24 month period in accordance with relevant regulator guidance (DAWE 2021; DCCEE 2024b) and to mirror the duration of the baseline BBUSs. Each operational BBUSs will include:

- Bird utilisation surveys (FP counts);
- Bat utilisation surveys (echolocation units);
- CBC utilisation roost utilisation monitoring; and
- Wedge-tailed Eagle nest monitoring.

Approximately five (5) days will be allocated for each operational BBUS to facilitate completion of all scopes listed above. The same FPs from which the baseline bird utilisation surveys were conducted will be used for operational bird utilisation surveys.

5.1.2.2 Bird Utilisation Surveys

The Bird Utilisation Survey follows a before-after-control-impact design. Surveys will be undertaken at six (6) impact FPs and four (4) reference FPs (**Figure 5-1**).

To align with the methods used for baseline BBUSs, FP counts should be undertaken by two observers, with each observer watching a 180-degree field of view at each FP, recording all birds heard and observed in flight for a minimum of 2 hours 15 minutes over the duration of each quarterly Survey. FP counts should be conducted across hours in which target bird species (particularly raptors, aerial foragers and other species of potential risk) are likely to be active, subject to safety constraints (i.e. avoidance of dawn and dusk driving). Each FP should be visited three times for 45 minutes per instance: once in the morning (between sunrise and 10:00); once in the middle of the day (between 10:00 and 14:00); and once in the afternoon/evening (14:00 to sunset). This will result in each FP sites receiving a total of nine hours of survey effort during the year.

For each bird observed in flight, weather and flight variables listed in **Table 5-1** should be recorded. Flight variables (sighting distance and bearing; flight mode and behaviour; flight direction; flight height) should be recorded every 30



seconds that a bird or flock was observed. Changes in flight behaviour is a new variable included in the operational BBUSs that not previously recorded during baseline BBUSs. Changes in flight behaviour are categorised as follows:

- Avoidance: involves birds remaining on a wind farm site but flying around, over or under operating wind turbines and it is a commonly observed behaviour at wind farms.
- Diversion: involves birds remaining within the area around a wind farm but avoiding the wind farm site entirely.
- Displacement: involves birds being displaced through disturbance from the area around the wind farm.

Opportunistic observations to be recorded may include:

- Visual observations of species encountered whilst transversing the Survey Area at any time; and
- Observations of secondary evidence such as tracks, diggings, scats, bones and nests.

Table 5-1: Weather and flight variables recorded for each bird observation

Weather Variables	Flight Variables
Visibility	Species
Cloud cover	Number of adults and sub-adults
Temperature	Initial sighting distance and bearing
Wind strength and direction	Flight direction
	Flight height in 20 m intervals
	Flight mode and behaviour, including avoidance behaviour

5.1.2.3 Bat Utilisation Surveys

To align with the baseline BBUSs, bat echolocation recording units (bat units) should be deployed at each FP for two nights during each quarterly survey to determine:

- Bat diversity observed at monitoring points over the duration of the monitoring program;
- Total counts of bat calls recorded at monitoring points over the duration of the monitoring program; and
- Total calls recorded for each bat species comparative to baseline.

The Bat Utilisation Survey follows a before-after-control-impact design whereby, impact and reference FP sites will align with those used for Bird Utilisation Surveys (**Figure 5-1**).

5.1.2.4 Carnaby's Black-Cockatoo Roost Utilisation Monitoring

There is potential for impacts to regional movement of black-cockatoos due to the presence of wind turbines. During each quarterly operational BBUS, the CBC roost located approximately 2 km north of the Survey Area (**Figure 5-1**) will be visited at sunrise on at least two days and at sunset on at least two days during BBUS surveys. The following data will be recorded on each visit:

- Presence or absence of CBCs utilising the roost;
- Number of individuals;
- Date and time;
- Flight behaviour variables as per FP counts; and
- Any foraging or breeding behaviour observed.

Results will be analysed and reported on within annual operational BBUS survey reports to monitor roosting success.

5.1.2.5 Wedge-Tailed Eagle Nest Monitoring

During each quarterly operational BBUS, the two impact Wedge-tailed Eagle nests identified within the Project Area and one reference nest identified approximately 10 km north of the Survey Area (**Figure 5-1**) should be visited once. The following data should be recorded on each visit:

- Presence or absence of Wedge-tailed Eagles utilising the nest;



- Number of adult, juvenile and nestling individuals;
- Date and time; and
- Flight behaviour variables as per FP counts; and
- Any foraging or breeding behaviour.

Following the breeding season (likely to be during the Q1 BBUS only but may depend on evidence of nestling and fledgling activity), nests should be examined using a camera mounted on a telescopic pole by a suitably qualified expert. nest activity to be characterised as:

- Active, if lined with fresh leaves, contains eggs, or observed to be occupied by an adult incubating (Cherriman 2013);
- Abandoned, if partial or total collapse is evident (Cherriman 2013); or
- Occupied, if a flat top with visible compaction is evident, the best characteristic for predicting occupation (Wiersma and Koch 2012).

Objectives of the Wedge-tailed Eagle monitoring are to develop an understanding of the local population of Wedge-tailed Eagles by estimating the local population's likely reproductive and dispersal capacity and identifying impacts to breeding success caused by the Project. Estimating the reproductive success of Wedge-tailed Eagles is variable and can be measured in different ways (Olsen 2005). Failure can occur at any stage but is generally considered where pairs fail to lay or chicks are lost as soon as after hatching (Olsen 2005). For the purposes of estimating reproductive success and dispersal capacity, consideration is given to the number of nests that are found to be lined with fresh leaves and those in which eggs were laid to measure the success of young that fledged (Cherriman 2013).



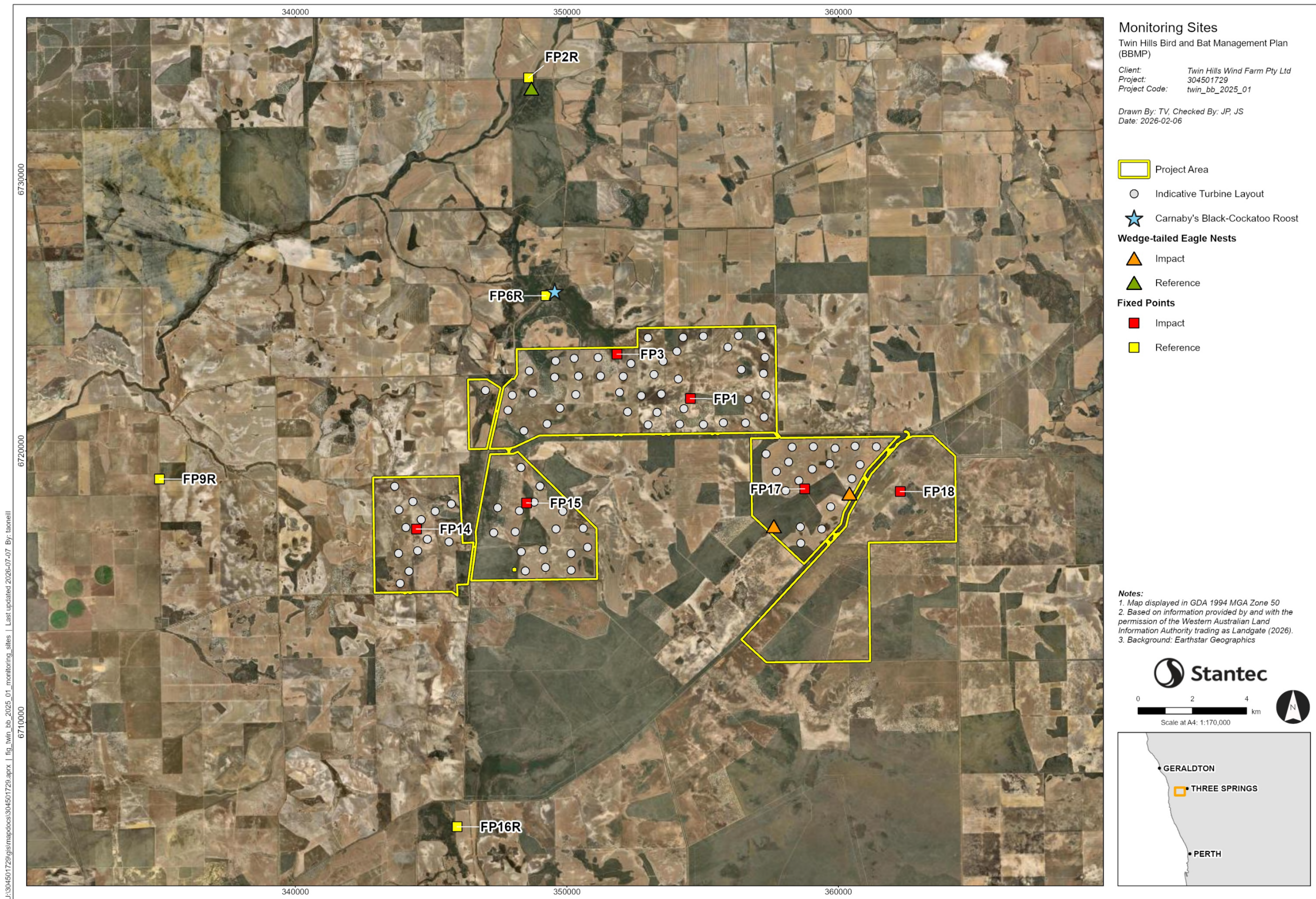


Figure 5-1: Bird and Bat Utilisation Survey (BBUS) monitoring sites



5.2 Mortality Monitoring

5.2.1 Introduction

The Mortality Monitoring (Carcass Searches) approach was developed based on the Onshore Wind Farms interim guidance on bird and bat management (DAWE 2021; DCCEEW 2024b), a review of best-practice approaches (IFC 2023) and assessment of surveys undertaken for previous wind turbine assessments. The primary purpose Mortality Monitoring is to estimate the frequency of bird and bat mortalities caused by interaction with wind turbines (collision or barotrauma).

5.2.1.1 Carcass Search Methods

Carcass Searches may be carried out using a trained carcass detection dog (trained by a suitably qualified handler), or by suitably experienced ecologists. Whichever option is used, it should be used consistently for the duration of the three-year monitoring period as changes in method will result in changes in detection rate.

5.2.1.2 Survey Timing and duration

Carcass Searches will be conducted quarterly for three years. The three year duration is recommended by the International Finance Corporation's (IFC 2023) Good Practice Handbook and Decision Support Tool for Post-construction bird and bat fatality monitoring for onshore wind energy facilities in emerging market countries.

5.2.1.3 Site and Plot Selection

Carcass Searches will be carried out at a randomly selected subsection (25% of the total number turbines) where all turbines have an equal chance of being selected. The number of turbines searched should be the same throughout each monitoring quarter. A circular plot with a radius of 300 m around each wind turbine, equal to the hub height plus rotor radius as recommended by IFC (2023), will be searched. As vegetation within 300 m of turbines will generally be sparse, with most turbines located in paddocks, a transect width of 20 m for Carcass Searches is recommended (IFC 2023). Searches of nominated turbines to be undertaken by the detection dog team or ecologists walking transects spaced 20 m apart within the 300 m radius. All observers should carry GPS devices to record tracks.

5.2.1.4 Data Collection

During all searches, all species of birds and bats detected as carcasses or as bird feather spots, are to be recorded on the data monitoring sheet (**Appendix F.4**). If a carcass is detected, the following information will be recorded as shown in the carcass data monitoring sheet (**Appendix F.4**):

- GPS position, distance in metres and compass bearing of the carcass from the base of the wind turbine tower.
- Substrate and vegetation.
- Species (should a carcass not be otherwise able to be identified by a suitably qualified bird or bat expert then a DNA test will be completed).
- Age, number, sex (if possible) signs of injury and estimated date of strike.
- Weather
- Visibility (measured as how difficult it is to search separately for each visibility class present in the search plots) ranging from:
 - Very Difficult: Little or no bare ground; more than 25% of ground cover over 30 cm in height.
 - Difficult: Bare ground 25% or less; 25% or less of ground cover over 30 cm in height.
 - Moderate: Bare ground 25% or greater; all ground cover 15 cm or less in height and mostly sparse.
 - Easy: Bare ground 90% or greater; all ground cover sparse and 15 cm or less.
- If the species is not able to be immediately identified by site personnel, then photographs will be provided to the qualified ecologist for identification.

5.2.1.5 Carcass Handling Protocol

A carcass collected during carcass trials will be handled according to the following protocols:



- The carcass will be removed from the site.
- The carcass will be handled by personnel wearing rubber gloves, packed into a plastic bag, then wrapped in a sheet of newspaper then in a second plastic bag.
- A completed carcass search data sheet (**Appendix F.4; F.5**) will be stored in the outer plastic bag to ensure that its origin can be traced at a later date, if required;
- The wrapped carcass will be stored in a freezer at the site office for storage, if appropriate it may be used in later scavenger and detectability trials.
- The location and date of discovery and date of removal of all nonbird or bat carcasses will be recorded and maintained in a Fauna Injury and Mortality Register.

5.2.2 Revisions to Turbine Collision Risk

Collision risk assessments from the baseline BBUS are to be revised to consider data from the operational BBUS at the completion of year 1 and year 2 of operational BBUS surveys. CRM will be updated through the adaptive management process in the event of a threshold exceedance, as required.

5.2.3 Carcass Persistence and Searcher Efficiency Trials

Carcasses of deceased birds and bats may not persist or may be non-detectable due to a range of factors including scavenging, natural degradation and efficacy of the searcher. Therefore, Carcass Persistence and Search Efficiency Trials will be conducted to establish a baseline for these factors. Carcass Persistence Trials will be conducted following commencement of the Carcass Search Program, with carcasses being placed without the knowledge of the searcher – to reduce bias when comparing Carcass Persistence Trials to Carcass Searches. Searcher Efficiency relates to the probability that a searcher will detect a carcass that is present within the search plot during the search. Estimates of mortality rates (from Carcass Searches) will be adjusted accordingly, following completion of the Carcass Persistence and Searcher Efficiency Trials. Methods for Carcass Persistence and Searcher Efficiency Trials are described in **Table 5-2**.

Table 5-2: Carcass Persistence and Searcher Efficiency Trial Methods

Component	Carcass Persistence Trials	Searcher Efficiency Trials
Timing	During four of twelve quarterly Carcass Searches. Once in each quarter during the three-year period.	During four of twelve quarterly Carcass Searches. Once in each quarter during the three-year period.
Site selection	At least one turbine randomly selected per quarterly Carcass Search period.	One turbine randomly selected per quarterly Carcass Search period.
Approach	• Five carcasses of different sizes and species (both bird and bat if possible*) should be obtained as fresh roadkill or from previous Carcass Searches. • The carcasses will be placed around a selected turbine, over the entire spatial extent of the wind farm including in different types of ground cover (paddock, crop, native vegetation) and their locations recorded. • As Carcass Searches are conducted quarterly, carcasses should be placed at different time intervals ahead of the Carcass Search period (e.g. one week, two weeks, one month, two months, three months) to allow for estimates of persistence over time. • Carcass placement should be limited to a maximum of two trial carcasses at any one turbine at any one time to avoid undue attraction of scavengers <i>*Surrogate carcasses that may be acceptable for searcher efficiency and carcass persistence trials include farm-</i>	• The search team should not be advised of the timing or site, to avoid biasing estimates of searcher efficiency. • Five carcasses of different sizes and species (both bird and bat if possible **) should be obtained as fresh roadkill or from previous Carcass Searches. • The carcasses will be placed around a selected turbine, over the entire spatial extent of the wind farm, including in different types of ground cover (paddock, crop, native vegetation) and their locations recorded. • Carcass placement should be limited to a maximum of two trial carcasses at any one turbine at any one time to avoid undue attraction of scavengers. <i>** When insufficient fatalities or suitable surrogates are available, alternate approaches for implementing trials may be needed. Examples include the following: These include hunting bird decoys and toy bats. It is generally acceptable to re-use artificial decoys in multiple searcher</i>



	<i>raised ducks and pigeons as surrogates for non-raptor bird fatalities, dark-colored adult mice as surrogates for bats and fresh road-killed birds and bats</i>	<i>efficiency trials if they remain reasonably intact.</i>
Adjustment to Carcass Search estimates of mortality rates	- The results of the Carcass Search Program will be corrected using a calibration factor, derived from the number of placed carcasses found, divided by the number of carcasses placed. - As the four trails are completed, the level of certainty in the calibration of estimated mortality rates will increase.	

5.2.4 Incidental finds

Search teams and other personnel (e.g., operations, maintenance personnel, contractors) may discover bird and bat fatalities that are not part of the systematic searches. These should be recorded on the Incidental Carcass Discovery Form (**Appendix F.5**).

5.2.5 Carrion Monitoring

Carrion monitoring will be undertaken quarterly for a duration of two years during the operation phase. Carrion inspections will be completed by vehicle and/or on foot in accessible areas within a 300 m radius of a representative number of turbines (25 % selected at random) or incidental finds. Carrion removal will apply to any carcass (other than bird or bat species) found within 300 m of turbines in accessible areas. A carrion removal procedure will be developed, which will include the following provisions:

- A scavenged carcass may increase the variability in mortality rate estimates and thus carcasses will be assessed for possible scavenging.
- The following information will be collected for carrion: GPS location, species, date and time.
- The location and date of discovery and date of removal of all non- bird or bat carcasses will be recorded and maintained in a carrion removal register.

The need for continuation of the carrion removal program will be assessed after two years of operation. The Environmental Manager is responsible for the implementation of the carrion monitoring program and carrion removal procedures.

5.3 Bird and Bat Monitoring Reporting Requirements

Table 5-3: Bird and Bat Monitoring Program reporting requirements

Report	Phase	Reporting Requirements	Reporting Timing and Duration
Baseline BBUS	- Pre-construction: - Bird utilisation survey - Bat utilisation survey	Baseline BBUS report.	Quarterly and annual reporting for two years prior to construction.
Operational BBUS	- Commissioning - Operation	Operational BBUS report.	Quarterly and annual reporting for two years during commissioning and operation.
- CBC Roost Utilisation Survey - Wedge-tailed Eagle Nest Utilisation Survey	- Commissioning - Operation	Reporting to be included in operational BBUS report.	Quarterly and annual reporting in Operational BBUS report for two years during commissioning and operation.
Mortality Monitoring (carcass searches) Reporting	- Commissioning - Operation	Following each year of the carcass search program, the program findings will be compiled and recorded. The report should detail the species impacted including:	Annual reporting for two years during commissioning and operation.



		○ Total carcasses/feather spots detected of each species. ○ Locations of carcasses/feather spots detected. ○ Dates carcasses/feather spots were detected. ○ Details of any carcass/feather spots detections that triggered impact levels. ○ The number of carcasses of each species identified during the carcass search. ○ Search program which are utilised in the detectability trials will also be reported. ● Evaluation regarding the effectiveness of measures implement to avoid and mitigate mortality and or injury to threatened and migratory species.	
● Fauna Injury and Mortality Register Reporting	● Commissioning ● Operation	● Provision for recording information regarding all turbine collisions and incidents of barotrauma, including method of detection, species, conservation status, probable cause of injury or fauna mortality. ● Estimations of annual mortality and injury for each relevant threatened and/ or migratory species.	● Annual reporting for two years during commissioning and operation.
● Carrion Removal Program	● Commissioning ● Operation	● To be included in Mortality Monitoring Report	● Annual reporting for two years during commissioning and operation. (The need for continuation of the carrion removal program will be assessed after two years of operation.)

6. Reporting Provisions

6.1 Annual Reporting

Twin Hills Wind Farm Pty Ltd will prepare an Annual Environmental Report (AER) for submission to the DWER and Department of Biodiversity, Conservation and Attractions (DBCA) (where applicable). An Annual Compliance Assessment Report (ACAR) will be prepared for submission to:

- DWER/ EPA; and
- DCCEEW annually for MNES related values (ACAR: Annual Compliance Assessment Report).

The format and contents of these reports will align with the conditions and requirements stipulated by the individual authorities and demonstrate compliance. In accordance with current Draft Onshore Wind Farms Guidance (DCCEEW 2024b) annual reporting for the BBMP will include the following information, where applicable:

- Updated target species risk assessments based on actual turbine collision impacts to date, including monitoring data and incidental species sightings.
- Re-analyses of flight paths, habitat predictions, and turbine collision impact predictions compared against actual turbine collision impacts to date.
- Re-analyse individual turbine collision risk based on monitoring data and incidental species sightings, including justification for any proposed changes to risk ratings based on ongoing monitoring and survey efforts.
- Reference improvements and updates to the Monitoring Program, including the methodology applied.
- Incorporate adjustments to impact thresholds and provide details of associated adaptive management actions taken, including a review of the effectiveness of any implemented BBMP mitigation measures.
- Reference ongoing process improvement and incorporation of new information and technology; for example, improved turbine collision mitigation measures and strike detection technology.
- Outline unforeseen limitations or issues identified during wind farm operation, and any other matters requested by the decision-maker.

Reporting specific to the management of terrestrial fauna (bird and bat populations) in relation to the BBMP will be summarised in the AER and ACAR to address the relevant conditions, with technical reports appended. Details of compliance with conditions of approval and summaries of monitoring results will be published on the Proponents' public website.

6.2 Trigger and Threshold Exceedance Reporting

DWER, EPA and DBCA will be notified of trigger and threshold events as described in **Table 4-2: Outcome-based management provisions**

6.3 Incident Reporting

An internal incident reporting procedure will be developed, and environmental incidents will be reported in accordance with this procedure to the Environment Manager as soon as practicable.

6.4 Bird and Bat Monitoring Program Reporting

The reporting requirements for the Monitoring Program are summarised in **Section 5.3: Bird and Bat Monitoring Reporting Requirements**.



7. Injured Fauna Management

An Injured Fauna Management Procedure will be incorporated into the BBMP prior to entering the construction phase for the Project. The management actions listed below will be included in the Injured Fauna Management Procedure.

- Record injured fauna as an incident in accordance with reporting requirements in **Section 6.3**.
- Maintain and record details (e.g. species, nature of injury, time date location, photo, corrective actions) in the Fauna Injury and Mortality Register.
- Assess whether it is safe to approach the animal and whether capture is necessary. Capture of the injured animal will be undertaken by a suitably qualified fauna handler.
- Ensure potential risks to personnel from handling animals are considered (e.g. proper handling techniques and gloves for animals with sharp claws, teeth and beaks. Contractors undertaking carcass searches may require Australian bat lyssavirus (ABLV) vaccination in the event that an injured or deceased bat needs to be handled.).
- If handling is the preferred method, safely confine the animal (generally by wrapping in a towel and placing in a cardboard box), ensuring the animal can breathe.
- Keep animal confinement containers closed but not sealed to allow for ventilation and place box in a dry, warm, dark and quiet place.
- Adhere to the DBCA (2017b) SOP: Transport and Temporary Holding of Wildlife procedure if the injured animal is to be transported.

First response wound management will be undertaken in accordance with DBCA (2017a) SOP: This includes the measures listed below.

- Assess any medical attention required to be administered to animals on a case-by-case basis in consultation with a veterinarian and the Environment Manager.
- If an animal is injured or dependent young and is not able to be re-released based on veterinarian advice, consult with the DBCA on rehabilitation options.
- Do not relocate nests or rehabilitated fauna individuals unless in extenuating circumstances where prior consultation has occurred with EPA, DCCEEW and DBCA and approval and a permit to handle and move significant fauna has been granted.
- At the instruction of a veterinarian or under the conditions specified in DBCA (2018) SOP: Humane Killing of Animals Under Field Conditions, undertake euthanasia of native fauna, where appropriate and in accordance with DBCA (2018) SOP: Humane Killing of Animals Under Field Conditions,

8. Roles and Responsibilities

Table 8-1 Roles and responsibilities for implementation of the BBMP

Role	Responsibility
Proponent	• Overall responsibility for implementation of the BBMP. • Engagement with Key Stakeholders.
Environment Manager	• Obtain relevant approvals from regulatory agencies for disturbance as required. • Undertake the Monitoring Program in accordance with Section 5. • Audit and compliance. • Monitor and report incidents. • Implement and maintain the BBMP. • Undertake training and inductions of personnel in accordance with the BBMP. • Liaise with stakeholders and technical experts for advice and resolution of management aspects/objectives as required. • Report as required to regulating authorities. • Organise carrion inspections and removal of carrion (non bird and bat species) in accordance with the Carrion Removal Procedure.
All personnel (including contractors)	• Complete inductions, toolbox talks, and training as required.



9. Adaptive Management

The BBMP has been designed to be adaptive and should be updated over the life of the Project. It is expected that additional information from the Bird and Bat Monitoring Program (**Section 5: Bird and Bat Monitoring Program**) will be used to revise environmental criteria and response actions in the BBMP, as required. Other changes that may prompt the revision of the BBMP include:

- Addressing items identified during incident investigations,
- Audits or inspections; and
- Additional information or data becomes available.

Suitable adaptive management actions may include:

- Adjusting the activity causing the impact (e.g. altering how the wind turbines are operated), and/or
- Implementing additional mitigation measures (e.g. novel bird/bat detection technologies).

The monitoring and review process for adaptive management responses will include:

- Monitor any adaptive management responses every 3 months and report to DCCEE and DWER if changes are made to the adaptive management approach (unless a higher frequency reporting schedule is required). This report will follow the format of the annual compliance report, but with a focus on the implemented adaptive management response(s).
- Periodic review and evaluation of monitoring data or methodology as required; and
- As additional information is received, which may be used to better inform environmental criteria, management or response actions.

9.1 Review of the BBMP

This BBMP will be reviewed to determine if it is effective in achieving the environmental outcomes and remains adaptive in nature. The BBMP will be reviewed and revised accordingly to the following:

- Annual (12 monthly) reporting throughout the life of the Project to inform preparation of an annual compliance report.
- Amendments to the Project or operations.
- The review the implementation of the approved BBMP will include the following:
 - Collision risk assessments from the baseline BBUS are to be revised to consider data from the operational BBUS at the completion of year 1 and year 2 of operational BBUS surveys Include improvements or updates to the Bird and Bat Monitoring Program (**Section 5: Bird and Bat Monitoring Program**), including the methodology applied.
 - Incorporate adjustments to trigger and or thresholds and provide details of associated adaptive management actions taken, including a review of the effectiveness of any implemented BBMP mitigation measures.
 - Reference ongoing process improvement and incorporation of new information and technology; for example, improved turbine collision mitigation measures and strike detection technology; and
 - Outline unforeseen limitations or issues identified during wind farm operation, and any other matters requested by the decision-maker.

9.2 Changes to the BBMP

This BBMP (v1) is the original version submitted to the EPA and DCCEE for review prior to assessment. All changes to the BBMP post-assessment must be provided separate to compliance reports and submitted to DWER and DCCEE (for matters relating to MNES) for approval with changes summarised in **Table 9-1**.



Table 9-1: Changes to the BBMP

Complexity of Changes		Minor Revisions ☐	Moderate Revisions ☐	Major Revisions ☐
Number of Environmental Factors		One ☐	Two – Three ☐	> Three ☐
Date Revision submitted to DWER: DD/MM/YYYY				
Proponent's Operational Requirement Timeframe for approval of revision				
for Timeframe:		< One Month ☐	< Six Months ☐	> Six Months ☐
		No ☐	Reason	
Item No.	EMP Section No.	EMP Page No.	Summary of Change	Reason for Change



10. Stakeholder Consultation

Key stakeholders associated with the BBMP are listed below.

- Host landowners.
- Neighbouring landowners.
- Traditional custodians.
- Decision making authorities: DCCEEW, DBCA, EPA, DWER, and DPLH.
- The Shire of Three Springs.

The Proponent has consulted with these stakeholders throughout the early development of the Project and will continue to do so as the Project is progressed through the planning phase. Learnings and feedback through engaging with these key stakeholders have been and will continue to be incorporated into the BBMP as required.



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◀ Appendices



Appendix A Ecological Risk Model

The tables below summarise the results of the ERM (for bird species) and qualitative risk assessment (for bat species) identifying species potentially at risk from the Project. Refer to the Bird and Bat Utilisation Survey Report in **Appendix C** for additional details.

Table A-1: Impact assessment of the 14 bird species with highest modelled risk index scores, and additional at-risk species/groups.

Common name (<i>Scientific name</i>)	Group	Reason for inclusion	Status		Productivity Score	Susceptibility Score	Overall Risk Index	Discussion
			EPBC Act	BC Act				
Carnaby's Black-Cockatoo (<i>Zanda latirostris</i>)	Other species of potential risk	High relative productivity risk score.	En	En	4.50	1.50	3.32	This species was the most frequently observed species during the Survey, with 5,661 observations, due to a large flock of up to 400 individuals being observed on multiple occasions during the Q2 2024 Survey. Despite being the species with the highest total observations, it was not observed flying at RSA height. The species' high relative productivity score is due to its endangered conservation status and its long average generation time of 11.28 years (Bird <i>et al.</i> 2020). According to Johnstone and Johnstone (2024) (Appendix F), Carnaby's Cockatoos generally fly at 5-15 m above the ground and there is a very low risk of rotor strike due to their preference for flying over uncleared bushland, their competent flight behaviour, and no known evidence of rotor strike on the species at operating wind farms. Johnstone and Johnstone (2024) have identified the local population as one that remains resident in the Eneabba region throughout the year. Clearing of breeding, roosting and foraging sites are likely to have the greatest impact to this population. The majority of observations were within nature reserve R 12705, which is bounded by but not included in the Survey Area, and where a roost site was also recorded. Buffers of at least 500m around known roost sites are recommended (Johnstone and Johnstone 2024).
Australian Pelican (<i>Pelecanus conspicillatus</i>)	Waterbird	High relative susceptibility and productivity risk scores.			2.75	3.00	2.64	One individual of this species was observed opportunistically on one occasion during Q4 2024 within the Additional Area. The species was observed flying within RSA height. Although the species is unlikely to regularly utilise the Survey Area, it is likely to transit through the area occasionally, and may be at risk of rotor strike on the occasions.
Wedge-tailed Eagle (<i>Aquila audax</i>)	Raptor	High relative productivity and			2.75	2.50	2.24	80.53% (182) of the 226 observations of this species were within RSA height. The species is known to be at risk from rotor strike (Hull <i>et al.</i> 2013). Although it is not a listed species of significance, it is long-lived with a low fecundity, and an average



Common name (Scientific name)	Group	Reason for inclusion	Status		Productivity Score	Susceptibility Score	Overall Risk Index	Discussion
			EPBC Act	BC Act				
		susceptibility risk scores.						generation time of 15.5 years (Bird <i>et al.</i> 2020). Therefore, impacts to a small number of individuals may have relatively high impacts on the local population. The soaring flight pattern and heavy body may make the species more susceptible to rotor strike (Tobias <i>et al.</i> 2022). The species perches on huge stick nests (Menkhorst <i>et al.</i> 2019), which have been identified within the Survey Area. Buffers around nests may reduce the risk of collision.
Peregrine Falcon (<i>Falco peregrinus</i>)	Raptor	High relative productivity risk score.		OS	3.25	1.50	2.11	The species was recorded opportunistically on one occasion within the Survey Area during the Q4 2024 BBUS. The species was observed foraging within RSA height. Nesting pairs and resident populations are likely to be at greater risk of rotor strike than nomadic individuals. Buffers around potential nesting habitats with tall trees may reduce the risk of collision.
Little Pied Cormorant (<i>Microcarbo melanoleucos</i>)	Waterbird	High relative susceptibility risk score.			1.75	2.67	1.90	27.27% (nine) of the 33 observations of this species were within RSA height. The high relative susceptibility is due to the species' poor aerial maneuverability (Tobias <i>et al.</i> 2022). Additionally, it has relatively long generation time of 6.84 years (Bird <i>et al.</i> 2020).
Straw-necked Ibis (<i>Threskiornis spinicollis</i>)	Waterbird	High relative susceptibility risk score.			1.75	2.67	1.90	This species was observed opportunistically on two occasions (122 observations) within the Survey Area. The flight height was only recorded on one occasion with 32 observations of this species within the RSA height. The high relative susceptibility is due to the species' poor aerial maneuverability (Tobias <i>et al.</i> 2022). Additionally, it has relatively long generation time of 8.82 years (Bird <i>et al.</i> 2020).
Banded Lapwing (<i>Vanellus tricolor</i>)	Shorebird	High relative susceptibility risk score.			1.25	2.67	1.83	68.86% (115) of the 167 observations of this species were within RSA height. The high relative susceptibility of the species is due to its habitat specialisation: relying on grasslands, chenopod shrublands and agricultural habitats for foraging and breeding (Garnett <i>et al.</i> 2015). Additionally, shorebirds are likely to move nocturnally and diurnally, and in mass in response to infrequent rainfall events across Western Australia (Halse <i>et al.</i> 2006). This may put these species at intermittent but high risk of rotor strike.
Little Eagle	Raptor	High relative productivity and			1.75	2.50	1.74	100% of the seven observations of this species were within RSA height. The species has a relatively long generation time of 8.04 years (Bird <i>et al.</i> 2020), making local



Common name (Scientific name)	Group	Reason for inclusion	Status		Productivity Score	Susceptibility Score	Overall Risk Index	Discussion
			EPBC Act	BC Act				
(<i>Hieraaetus morphnoides</i>)		susceptibility risk scores.						populations susceptible to the loss of individuals. All four observations of the species were within the Additional Area, and its distribution within the Survey Area and therefore location- or habitat-specific risks are unclear.
Little Black Cormorant (<i>Phalacrocorax sulcirostris</i>)	Water Bird	High relative susceptibility risk score.			1.75	2.33	1.58	11.11% (one) of the nine observations of this species were within RSA height. The high relative susceptibility is due to the species' poor aerial maneuverability (Tobias <i>et al.</i> 2022). Additionally, it has a relatively long generation time of 5.48 years (Bird <i>et al.</i> 2020).
Red-tailed Black-Cockatoo (<i>Calyptorhynchus banksii escondidus</i>)	Other species of potential risk	High relative productivity risk score.			2.75	1.33	1.58	This species was not observed flying at RSA height. The species' high relative productivity score is due to its very long average generation time of 16.11 years (Bird <i>et al.</i> 2020). Clearing of breeding, roosting and foraging sites are likely to have the greatest impact to this species.
Western Corella (<i>Cacatua pastinator</i>)	Other species of potential risk	High relative productivity and susceptibility risk scores.			2.25	2.00	1.54	100% of the 200 observations of this species recorded within RSA height. The species' high relative productivity score is due to its very long generation time of 14.07 years (Bird <i>et al.</i> 2020). The majority of observations at RSA height were above small patches of River Red Gum Forest within the Additional Area, where there are many large tree hollows used by the species. Buffers around this habitat type may reduce risk of rotor strike.
Australasian Grebe (<i>Tachybaptus novaehollandiae</i>)	Water Bird	High relative susceptibility risk score.			1.25	2.33	1.50	This species was not observed flying at RSA height. The species' high relative susceptibility score is due to its poor aerial maneuverability (Tobias <i>et al.</i> 2022). Additionally, waterbirds are likely to move nocturnally and diurnally, and in mass in response to infrequent rainfall events across Western Australia. This may put these species at intermittent but high risk of rotor strike (Halse <i>et al.</i> 2006).
Eurasian Coot (<i>Fulica atra</i>)	Water Bird	High relative susceptibility risk score.			1.25	2.33	1.50	This species was not observed flying at RSA height. The species' high relative susceptibility score is due to its poor aerial maneuverability (Tobias <i>et al.</i> 2022). Additionally, waterbirds are likely to move nocturnally and diurnally, and in mass in response to infrequent rainfall events across Western Australia. This may put these species at intermittent but high risk of rotor strike (Halse <i>et al.</i> 2006).
Pacific Black Duck (<i>Anas superciliosa</i>)	Water Bird				1.25	2.33	1.50	7.41% (two) of the 27 observations of this species were within RSA height. The species' high relative susceptibility score is due to its poor aerial maneuverability (Tobias <i>et al.</i> 2022). Additionally, waterbirds are likely to move nocturnally and diurnally, and in mass in response to infrequent rainfall events across Western Australia. This may put these species at intermittent but high risk of rotor strike (Halse <i>et al.</i> 2006).



Common name (<i>Scientific name</i>)	Group	Reason for inclusion	Status		Productivity Score	Susceptibility Score	Overall Risk Index	Discussion
			EPBC Act	BC Act				
Grey Falcon (<i>Falco hypoleucos</i>)	Raptor	Not recorded during BBUSs, but a raptor of significance that may possibly.	VU	Vu				The species has not been recorded within the Survey Area, Additional Area or reference sites but is considered possible to occur. The species is threatened by land clearing and grazing which reduce the number and regeneration of trees used for nesting habitat (Garrett <i>et al.</i> 2011). The species is nomadic and it is unclear whether it is likely to be present or resident within the Survey Area. The sparse distribution of this species means management actions targeting potential habitat are unlikely to be effective.
Fork-tailed Swift (<i>Apus pacificus</i>)	Aerial Forager	Not recorded during BUSs, but an aerial forager of significance that is likely to occur	IA	Mi				The species forages high above the canopy (Johnstone and Storr 1998) and is likely to fly within and above RSA height. It has not been recorded within the Survey Area, Additional Area or reference sites but as non-breeding visitor to Australia (Menkhurst <i>et al.</i> 2019) it is likely to occur intermittently. The species had been identified as having high likelihood of collision, but a low overall impact to the Australian population (Biosis Research 2006).
Other birds likely to fly at night	Multiple groups including waterbird, shorebird and nocturnal predator species	Not recorded during BBUSs, but may be at risk.						Although not likely to be observed during BUSs, many species, particularly waterbirds, shorebirds and nocturnal predators such as owls, are more active at night. These species may be recorded on acoustic recording units, although this is reliant on the species calling. The Barn Owl (<i>Tyto alba</i>) and Boobook (<i>Ninox boobook</i>) were observed multiple times when checking hollows for Black Cockatoos during the targeted fauna survey (Stantec 2025).



Table A-2: Qualitative impact assessment of all seven bat species recorded within the Survey Area.

Common name (Scientific name)	Status		Ecology and habitat	Flight behaviour	Foraging guild	Likelihood	Consequence	Inherent risk of rotor strike (before management)	Discussion
	EPBC Act	BC Act							
White-striped Free-tailed Bat (<i>Austronomus australis</i>)			The species occupies a wide range of habitat types, including urban areas, forests, woodland, shrubland, grasslands and deserts. The species migrates southward in October, then returns north in March (Baker and Gynther 2023). In WA, individuals will migrate up to 1200 km between winter and summer (Bullen and McKenzie 2005). Within the Survey Area, the species was recorded in all habitats in all seasons.	The species possesses long, narrow wings adapted for high-altitude feeding. It flies in a fast, direct path, foraging for high flying insects. Can commute up to 50 km between roost and foraging areas (Baker and Gynther 2023). The species is fast-flying, capable of speeds of up to 61 km/h to intercept their prey 50 m or more above the ground. This foraging strategy is not suited to maneuverability (Churchill 2008).	Open space, aerial forager	Almost certain	Moderate	High	The species been regularly reported as the most frequent species impacted at windfarms in southeast Australia (Australian Ecological Research Services 2015; Bennett <i>et al.</i> 2022; Moloney <i>et al.</i> 2019; Smales 2015). Cape Nelson Wind farm in Victoria recorded the highest fatality rates with 90% of the carcasses belonging to the White-striped Free-tailed Bat. After the implementation of curtailment, the fatality rate decreased to one-third (Bennett <i>et al.</i> 2022). Cape Nelson Wind Farm has 11 turbines with an RSA height from 33.5 m to 126.5 m (Bennett <i>et al.</i> 2022).
Northern Free-tailed Bat (<i>Ozimops lumsdenae</i>)			The species occupies a range of mesic and semi-arid habitats across southern WA (Baker and Gynther 2023). In generally roosts in tree hollows but may also use roofs in urban areas. Within the Survey Area, the species was recorded in five of the eight habitats, in all seasons except summer.	The species has swift direct flight patterns and is not maneuverable (Baker and Gynther 2023). Its body is aerodynamic and ideal for open space flying.	Open space, aerial forager	Likely	Moderate	High	The species belongs to the same family and foraging guild as the White-striped Free-tailed Bat, but as its range is limited to southern WA where there are few existing wind farms, there is little research on impacts. In the absence of such evidence and given its flight behaviour, it is assumed to be likely to be struck by rotors with a moderate consequence.
Gould's Wattled Bat (<i>Chalinolobus gouldii</i>)			This ubiquitous bat is found in virtually all habitats throughout Australia from Alpine regions to tropical rainforests, eucalypt forests and woodlands, deserts, grasslands, agricultural land and urban areas (Churchill 2008). The species typically roosts in tree hollows and is found in most habitats except for treeless deserts (Menkhorst and Knight 2014). Within the Survey Area, the species was recorded in all habitats and in all seasons.	The species forages beside stands of vegetation in the open (McKenzie and Bullen 2009). It is known to travel up to 11 km from the roost to forage (Hull and Cawthen 2013) Flight pattern is direct and rapid but with limited maneuverability (Baker and Gynther 2023).	Open space, aerial forager	Almost certain	Moderate	High	The species has known recorded fatalities at Wind Farms in Australia. Bluff Point and Studland Bay Wind Farms in Tasmania recorded high fatality rates with 38 out of 54 (70%) recorded carcasses identified as Gould's Wattled Bats (Hull and Cawthen 2012). The species had the second highest number of recorded bat mortalities (10%) in Moloney <i>et al.</i> (2019). The high fatality rates for this species may be due to its abundance, but it is nevertheless considered to be at high risk in the Survey Area, where it is widespread.
Chocolate Wattled Bat (<i>Chalinolobus morio</i>)			This species is common across southern Australian and inhabits a wide range of mesic habitats including forests, woodlands, shrublands and plains, and water courses in more arid regions (Churchill 2008). The species tends to be the last bat to enter winter hibernation and the first to emerge in spring (Churchill 2008).	The species forages in well-vegetated areas, generally below the canopy (Menkhorst and Knight 2014) but is also known to fly above the canopy (Baker and Gynther 2023).	Closed canopy forager; open space, aerial forager	Likely	Moderate	Medium	The species has known recorded wind farms in Australia. At Biala Wind Farm in New South Wales, the species was the second most frequently killed bat species, following the White-striped Free-tailed Bat but more frequently killed than Gould's Wattled Bat (Nature Advisory 2024). At some other wind farms, the species has been struck by rotors but at low frequency (Nature Advisory 2021a).



Common name (<i>Scientific name</i>)	Status		Ecology and habitat	Flight behaviour	Foraging guild	Likelihood	Consequence	Inherent risk of rotor strike (before management)	Discussion
	EPBC Act	BC Act							
			Within the Survey Area, the species was recorded in five of the eight habitats and in all seasons.						
Inland Broad-nosed Bat (<i>Scotorepens balstoni</i>)			The species is common and broadly distributed throughout arid and semi-arid Australia, where it tends to forage over waterways, woodlands, shrublands and grasslands (Churchill 2008).	This species forages below the canopy but also at the edges of vegetation and into open space (Churchill 2008). It flies with moderate speeds of 12-21 km/h but with rapid, sudden movements (Churchill 2008).	Closed canopy forager; open space, aerial forager	Likely	Moderate	Medium	A review of existing literature has found no examples of wind farms where this species was recorded as a mortality. This may be due to the species being predominantly found in inland Australia where there are fewer existing wind developments. Based on its flight behaviour, the species is considered likely to fly at RSA height, with occasional loss of individuals expected.
Southern Forest Bat (<i>Vespadelus regulus</i>)			The species is distributed across forest and woodland in southern Australia (Churchill 2008). It tends to avoid fragmented or disturbed habitats (Churchill 2008). Within the Survey Area, the species was recorded in all habitats and is all seasons.	The species is highly maneuverable and with moderate speeds of 5-25 km/h (Churchill 2008). The species generally forages below canopy height, with acrobatic, agile movements (Churchill 2008).	Closed canopy forager	Possible	Moderate	Medium	Despite its flight behaviour, the species has been recorded with moderate numbers of fatalities (relative to other bat species) at wind farms in south-eastern Australia (Nature Advisory 2021a; 2024). Given the low apparent risk due to its flight behaviour, but records of rotor strike, the species is considered at medium risk.
Lesser Long-eared Bat (<i>Nyctophilus geoffroyi</i>)			The species usually occurs around water and riparian vegetation, particularly <i>Melaleuca</i> and <i>Pandanus</i> (Menkhorst and Knight 2014). It frequently roosts under exfoliating bark or in tree hollows. It has short broad wings and forages with a slow, manoeuvrable undulating flight. Prey is caught both aerial and gleaned from vegetation. Often flies close to the ground (Baker and Gynther 2023). Within the Survey Area, the species was recorded in six of the eight habitats (not in Minor Drainage Line or River Red Gum Forest) and in all seasons.	The species has short broad wings and forages with a slow, manoeuvrable undulating flight. Prey is caught both aerial and gleaned from vegetation. Often flies close to the ground (Baker and Gynther 2023). Flight is slow and highly manoeuvrable, flying close to the vegetation and into the understorey. In vegetation, they forage 6-10 m above the ground. In open areas they fly lower around shrubs and bushes. Flight speeds when foraging 4 km/h (slowest of all species examined). Communicating flight is 20 km/h (Churchill 2008).	Closed canopy forager	Unlikely	Moderate	Low	This species is considered at low risk due its foraging behaviour. Closed canopy foragers tend to glean food from the surface of vegetation (Churchill 2008) and are not expected to forage far from the canopy, which is significantly lower than the RSA height proposed for the Project.

