



Yathroo Wind Farm

Year One Bird and Bat Utilisation Summary Report

Final

December 2025

NEOEN

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Final

Prepared by
Umwelt (Australia) Pty Limited

On behalf of
Neoen Australia Pty Ltd

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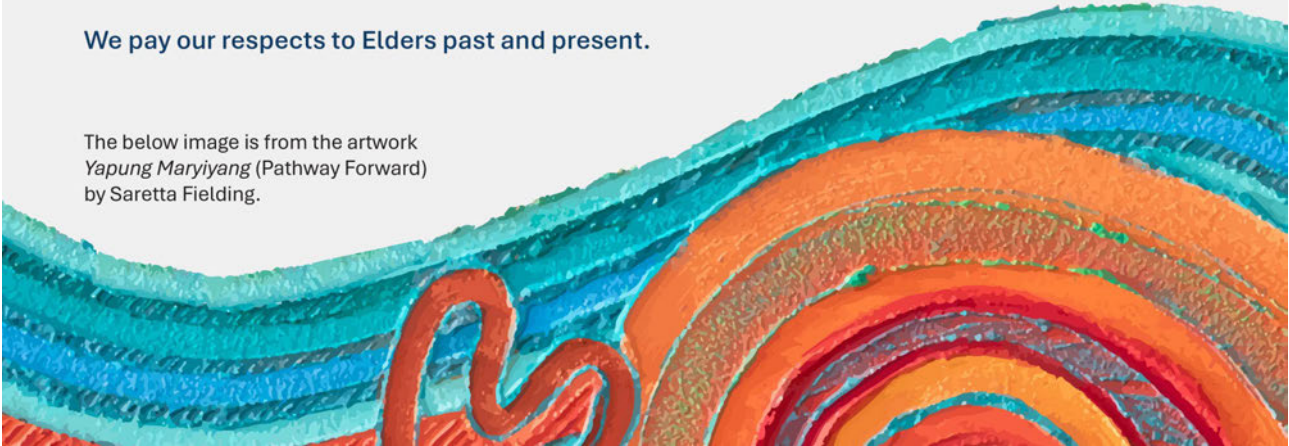
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Umwelt acknowledges the Traditional Owners of Country throughout Australia and their continuing values, culture and connection to the land, waters and sky.

We pay our respects to Elders past and present.

The below image is from the artwork *Yapung Maryiyang* (Pathway Forward) by Saretta Fielding.



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Executive Summary

Neoen Australia Pty Ltd (Neoen) proposes the development of the Yathroo Wind Farm (the Project) in the Shire of Dandaragan, Western Australia. The Project includes up to 65 wind turbines, a Battery Energy Storage System (BESS), and associated infrastructure. To support environmental approvals and design feasibility, Umwelt conducted a Bird and Bat Utilisation Survey (BBUS) program in each of the four seasons from September 2024 to July 2025. This report provides a summary of the methods and associated results as well as discussing any pertinent limitations of the surveys.

Objectives

The objectives of this BBUS program were to:

- Collect an inventory of and report on bird and bat species with a potential to utilise the Survey Area.
- Collect and report information on known or potential flight behaviours of bird and bat species using the Survey Area.
- Collect and report information on how the Survey Area is used by birds and bats (e.g. roosting, breeding, foraging, dispersal), specifically those listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), *Biodiversity Conservation 2016 Act* (BC Act), or as Priority species by the Department of Biodiversity, Conservation and Attractions (DBCA).
- Collect information on how utilisation of the Survey Area may change over varying seasons, specifically by those species listed under the EPBC Act, BC Act, or as Priority species by DBCA.

Key Findings

Birds

- 127 unique species recorded, including 9 conservation significant bird species.
- The most frequently observed bird species across the BBUS program were Australian Ringneck (*Barnardius zonarius*), Galah (*Eolophus roseicapilla*), and Australian Raven (*Corvus coronoides*), none of which are recognised as conservation significant species.
- Carnaby's Black-cockatoo (*Zanda latirostris* – Endangered under the EPBC Act and BC Act) was the most frequently recorded conservation significant species (56 records) with flocks of up to 200 individuals recorded.
- Other conservation significant bird species recorded included the:
 - Blue-billed Duck (*Oxyura australis*) – Priority 4 listed by DBCA.
 - Peregrine Falcon (*Falco peregrinus*) – Other Specially Protected under the BC Act.
 - Forest Red-tailed Black-cockatoo (*Calyptorhynchus banksii naso*) – Vulnerable under the EPBC Act and BC Act.

and a number of migratory shorebirds, including:

- Black-tailed Godwit (*Limosa limosa*) – Endangered and migratory under the EPBC Act and BC Act.
- Ruff (*Calidris pugnax*) – Migratory under the EPBC Act and BC Act.
- Sharp-tailed Sandpiper (*Calidris acuminata*) – Vulnerable and migratory under the EPBC Act and BC Act.
- Red-necked Stint (*Calidris rufficollis*) – Migratory under the EPBC Act and BC Act.
- Common Greenshank (*Tringa nebularia*) – Endangered and migratory under the EPBC Act and BC Act.
- An additional six conservation significant bird species were determined to have a ‘Moderate’ to ‘High’ likelihood of occurrence within the Survey Area but were not recorded:
 - Common Sandpiper (*Actitis hypoleucos*) – Migratory under the EPBC and BC Act.
 - Curlew Sandpiper (*Calidris ferruginea*) – Critically Endangered under the EPBC and BC Act; Migratory under the BC Act.
 - Fork-tailed Swift (*Apus pacificus*) – Migratory under the EPBC and BC Act.
 - Glossy Ibis (*Plegadis falcinellus*) – Migratory under the EPBC and BC Act.
 - Long-toed Stint (*Calidris subminuta*) – Migratory under the EPBC and BC Act.
 - Pacific Golden Plover (*Pluvialis fulva*) – Migratory under the EPBC and BC Act.

Bats

- Seven (7) species were detected via passive ultrasonic recorders. No conservation significant bat species were recorded or determined likely to occur within the Survey Area.
- Southern Forest Bat (*Vespadelus regulus*) and Gould’s Wattled Bat (*Chalinolobus gouldii*) had the highest call detections, neither of which are recognised as conservation significant species.
- Three bat species, which are the White-striped Free-tailed Bat (*Austronomus australis*), Gould’s Wattled Bat, and Western Free-tailed Bat (*Ozimops kitcheneri*), are considered highly susceptible to injury or mortality as a result of turbine collision based on their known foraging strategies.

Abbreviations

Abbreviation	Definition
AGL	Above Ground Level
BACI	Before–after–control–impact
BBUS	Bird and Bat Utilisation Survey
BBUS01	2024 Spring Bird and Bat Utilisation Survey
BBUS02	2025 Summer Bird and Bat Utilisation Survey
BBUS03	2025 Autumn Bird and Bat Utilisation Survey
BBUS04	2025 Winter Bird and Bat Utilisation Survey
BC Act	<i>Biodiversity Conservation Act 2016 (WA)</i>
BESS	Battery Energy Storage System
BOM	Bureau of Meteorology
CR	Critically Endangered
DBCA	Department of Biodiversity, Conservation and Attractions
DCCEEW	Department of Climate Change, Energy, the Environment and Water
DPIRD	Department of Primary Industries and Development
DWER	Department of Water and Environmental Regulation
EN	Endangered
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999 (Cth)</i>
IBRA	Interim Biogeographic Regionalisation for Australia
IBSA	Index of Biodiversity Surveys for Assessment
MNES	Matters of National Environmental Significance
DSA	Desktop Study Area
ERM	Exposure Risk Model
OS	Other Specially Protected
P1–P4	Priority 1 – Priority 4 listed species by DBCA
RSA	Rotor Swept Area
VU	Vulnerable

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1.0 Introduction

Neoen is proposing the development of the Yathroo Wind Farm Project (the Project) located approximately 120 kilometres (km) north of Perth in the Shire of Dandaragan, Western Australia. The Project is expected to comprise of up to 65 wind turbines, a BESS, and associated ancillary infrastructure. Umwelt were commissioned by Neoen in 2024 to undertake BBUS to guide design feasibility and support environmental approvals for the Project. This report outlines the findings of all BBUS undertaken to date. An additional 12-months of BBUS are currently being undertaken for the Project and results will be presented in a future report following the completion of surveys.

1.1 Project Description

The Project is situated across several freehold properties around Brand Highway and Dandaragan Road, between Dandaragan, Cataby and Regan's Ford. The Project will connect into existing 132 / 330 kilovolts (kV) double circuit transmission infrastructure, which is scheduled to be upgraded to dual circuit 330 kV. This will provide network access and intersects the western portion of the Project.

1.1.1 Project Area Definitions

Two areas of study were defined for the Project:

- The **Survey Area**, provided by Neoen on the 1st November 2024 (YTO-PRJ-PA-008), covers 17,213 ha and formed the basis of BBUS (**Figure 1.1**).
- The **Desktop Study Area** included the Survey Area plus a 20 km buffer and was used to assess the broader environmental context of the Project.

1.2 Scope of Works

This report presents all findings from BBUS undertaken to date (four survey programs total) to provide an overview of bird and bat utilisation of the Survey Area.

Specific objectives of this scope of work include:

- Collect an inventory of and report on bird and bat species with a potential to utilise the Survey Area.
- Collect and report information on known or potential flight behaviours of bird and bat species using the Survey Area.
- Collect and report information on how the Survey Area is used by birds and bats (e.g. roosting, breeding, foraging, dispersal), specifically those listed under the EPBC Act, BC Act, or as Priority species by the Department of Biodiversity, Conservation and Attractions (DBCA).
- Collect information on how utilisation of the Survey Area may change over varying seasons, specifically by those listed under the EPBC Act, BC Act, or as Priority species by DBCA.

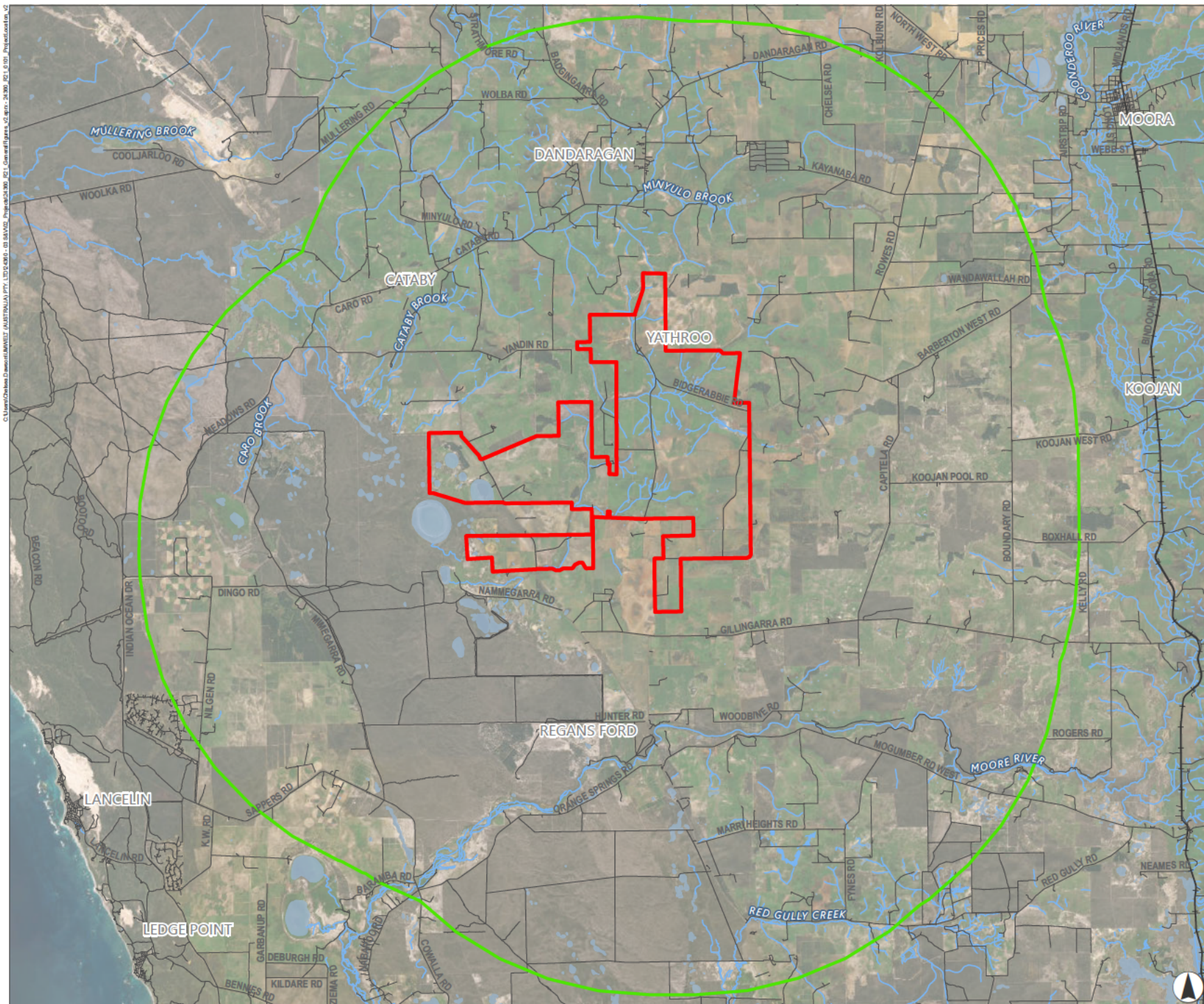
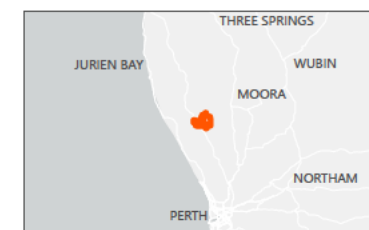


FIGURE 1.1

Survey Area and Desktop Study Area

Legend

- Survey Area
- Desktop Study Area
- Railway
- Road
- Watercourse
- Waterbody



0 2 4

Kilometres

Scale 1:320,000 at A4
GDA2020 MGA Zone 50



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2.0 Methods

2.1 Desktop Assessment

Prior to the commencement of the BBUS program, a review of desktop data sources was undertaken to characterise potential site and species characteristics of the Survey Area. The following sections provide an overview of the data sources and method used during the desktop assessment.

2.1.1 Site Characterisation

A review of data sources to identify key site characteristics that may influence the occurrence of bird and bat species and their utilisation of the Survey Area was undertaken prior to field surveys to inform survey design and preparation. Data sources used to inform the site characterisation component of the desktop assessment are presented in **Table 2.1**.

Table 2.1 Desktop Assessment Data Sources – Site Characterisation

Aspect	Data Source
Biogeography	Interim Biogeographic Regionalisation for Australia (IBRA) Version 7 (Subregions) (DCCEEW, 2023b)
Climate	Climate Data Online (BOM, 2025)
Soil Landscape Mapping	Soil Landscape Mapping – Best Available (DRIRP-027) (DPIRD, 2025)
Hydrology	Hydrographic Catchments – Basins (DWER-027) (DWER, 2018) Hydrographic Catchments – Catchments (DWER-028) (DWER, 2018) Ramsar Sites (DBCA-010) (DBCA, 2017) Directory of Important Wetlands in Australia – Western Australia (DBCA-045) (DBCA, 2018b)
Vegetation	Pre-European Vegetation (DPIRD-006) (DPIRD, 2019) Native Vegetation Extent (DPIRD-005) (DPIRD, 2023)

2.1.2 Species Characterisation

A review of databases for bird and bat species previously recorded within the Desktop Study Area was conducted as part of the desktop assessment. This involved obtaining and reviewing reports from previous biodiversity surveys undertaken in the vicinity of the Project using the Index of Biodiversity Surveys for Assessments (IBSA) database (DWER, 2024a). Data sources used to inform the species characterisation component of the desktop assessment are presented in **Table 2.2**.

Table 2.2 Desktop Assessment Data Sources – Species Characterisation

Aspect	Data Source
Conservation Significant Fauna	DBCA NatureMap database (DBCA, 2024c) DBCA Threatened and Priority Fauna Database (DBCA, 2024b) Black-cockatoo Roosting Dataset (DBCA, 2024a) Black-cockatoo Dataset (DBCA, 2024a) Black-cockatoo Breeding Dataset (DBCA, 2025) BirdLife DataZone (BirdLife Australia, 2025) Atlas of Living Australia (Atlas of Living Australia, 2025) eBird Database (Cornell Lab of Ornithology, 2025) BatMap (Australasian Bat Society, 2025)
Matters of National Environmental Significance (MNES)	EPBC Protected Matters Search Tool (DCCEE, 2024a)

A likelihood of occurrence assessment was then conducted for conservation significant birds and bats identified during the desktop assessment. This assessment considered species biology, distribution, habitat preferences, the availability and quality of suitable habitat, and existing records within or near the Survey Area. Each species was assigned a likelihood ranking (**Table 2.3**) based on these factors, ranging from ‘Known’ to ‘Very Low’, reflecting the probability of the species occurring within the Survey Area. The assessment was then updated following the completion of the BBUS program to reflect results obtained during surveys with the results presented in **Section 3.0**.

Table 2.3 Categories for Likelihood of Occurrence

Likelihood Category	Description
Known	The species has been recorded during the field survey or from recent, reliable records within the Survey Area.
High	The Survey Area contains suitable habitat and there are recent records of the species occurring in close proximity to the Survey Area. OR Species known distribution overlaps the Survey Area which contains suitable habitat.
Moderate	The species is known from the Desktop Study Area and some preferred habitat is present within the Survey Area. Aerial foragers and other migratory birds that may overfly the Survey Area are also included in this category.
Low	The species has been recorded within the Desktop Study Area however, there is limited habitat (i.e. quantity, type and quality) within the Survey Area. This may include marginal and isolated habitat with limited ability for the species to access. The species may disperse through the Survey Area infrequently and is unlikely to depend on the habitat for survival.
Very Low	The Survey Area offers limited to no potential habitat for the species, is outside its known range, and/or is lacking broader habitat requirements.

2.2 Field Survey

The following sections provide an overview of the survey methodology employed during the BBUS program.

2.2.1 Survey Timing and Personnel

A total of four seasonal BBUS have been undertaken to date during the BBUS program. Climatic conditions for the region were reviewed prior to scheduling the BBUS events to identify suitable periods for sampling that would capture seasonal variations in site utilisation by bird and bat species across a 12-month period.

The timings and personnel of each BBUS undertaken are presented in **Table 2.4**.

Table 2.4 Bird and Bat Utilisation Survey Effort Timing and Personnel

Survey	Season	Personnel	Start	End	Number of Survey Person Days
BBUS01	Spring	Belinda Howe – Senior Ecologist Tevita Koloamatangi – Environmental Consultant	09/09/2024	15/09/2024	14
BBUS02	Summer	Jeremy Ringma – Principal Ecologist Tevita Koloamatangi – Environmental Consultant Indigo Sibanda - Ecologist	13/02/2025	17/02/2025	15
BBUS03	Autumn	Wes Bancroft – Principal Ecologist Brittany Osborn – Senior Zoologist Liam Chirio – Senior Zoologist Grace Ball – Ecologist Frederik Niclauss - Ecologist	04/05/2025	08/05/2025	25
BBUS04	Winter	Madison Roberts – Senior Zoologist Loren Appleby – Principal Ecologist Ray Turnbull – Ecologist Mark Hutchinson – Ecologist	21/07/2025	25/07/2025	20

2.2.2 Weather Conditions

Weather conditions experienced across the BBUS program were considered typical of the season in which the survey events were completed. The nearest Bureau of Meteorology (BOM) monitoring station to the Survey Area is Badgingarra Station (Station No. 009037) which is located approximately 50 km north of the Survey Area. Climatic data from the nearest during each BBUS event are presented in **Table 2.5**.

Table 2.5 Weather Conditions from Badgingarra Station (Station No. 009037) (BOM, 2025)

Survey	Max Daily Temp	Min Daily Temp	Max Daily Wind Gusts	Total Rainfall
BBUS01 (Spring)	19.1–27.3 °C	9.5–13.3 °C	50 km/h	0.4 mm
BBUS02 (Summer)	31.3–36.7 °C	14.4–20.7 °C	54 km/h	0 mm
BBUS03 (Autumn)	22.6–31.8 °C	8.3–14.4 °C	44 km/h	1.0 mm
BBUS04 (Winter)	11.3–15.6 °C	2.9–8.5 °C	54 km/h	69.8 mm

2.2.3 Site Selection

During BBUS01, a total of 15 sample sites (vantage points) for bird utilisation surveys were originally established at high points and clearings across and in proximity to the Survey Area with best attempts made to position them near proposed wind turbine locations. Sites were configured such that total spatial coverage of the Survey Area and visibility of the surrounding landscape at each sample site was maximised.

Following BBUS01, a review of survey sites and the survey method employed was undertaken, and modifications were made to improve the survey design. Given that the Survey Area comprises a matrix of variable habitat types interspersed amongst cleared agricultural land, sampling was stratified across each major fauna habitat type with increased sampling in more prevalent agricultural areas. This modification improved the coverage of habitat types that were not cleared agricultural land and allowed a more representative sample of species' presence and utilisation across the Survey Area. As a result, a total of 6 sites were removed and an additional 18 sites were added prior to BBUS02, bringing the total number of sample sites to 27 during BBUS02.

As the indicative Project Area evolved over the life of the BBUS program, sites were removed and replaced with others to ensure sufficient sample effort across the future Project Area while maintaining additional sites outside of this area for control sites. An additional 2 sites were added during BBUS03 bringing the total to 29, and another 3 sites were removed during BBUS04 bringing the total to 26. The details of survey sites utilised across the BBUS program are provided in **Table 2.6** and their locations depicted on **Figure 2.1**. Representative photos and descriptions for each of the habitat types associated with survey sites are provided in **Table 3.1**.

Passive ultrasonic recorders (Mini Bat Detector and Titley Scientific Rangers) were deployed to detect the presence of bat species at a subset of survey sites during all BBUS. The locations of these recorders are detailed in **Table 2.7** and depicted on **Figure 2.1**. Recorders were also deployed at different heights (5 m, 50 m, and 100 m above ground level [AGL]) on a meteorological mast within the Survey Area during BBUS04; however, this data is yet to be analysed and associated results are not presented in this report.

Table 2.6 Bird Utilisation Sample Sites

Habitat Type*	Site ID	Original Site ID	Easting	Northing	BBUS01 (Spring)	BBUS02 (Summer)	BBUS03 (Autumn)	BBUS04 (Winter)
Agriculture	AG01	VP03	372526.6	6586032.57	✓	✓	✓	✓
	AG02	VP04	370263.19	6588093.62	✓		✓	✓
	AG03	VP05	369068.44	6587998.02	✓			
	AG04	VP07	375147.54	6595760.24	✓			
	AG05	VP08	376994.87	6580070.51	✓	✓	✓	✓
	AG06	VP10	377882.09	6586191.74	✓	✓	✓	✓
	AG07	VP02	369738.39	6582020.53	✓	✓	✓	✓
	AG08	VP11	377001.85	6596507.85	✓	✓	✓	
	AG09	-	375629.4	6588883.3		✓	✓	✓
	VP01	VP01	365969.16	6582315.61	✓			
	VP12	VP12	377395.64	6588869.43	✓			
	VP15	VP15	374769.78	6593042.17	✓			
	BW01	-	367116.68	6585907.34		✓	✓	✓
	BW02	-	368167.7	6587225.05		✓	✓	✓
	BW03	-	371067.56	6591537.51		✓	✓	✓
Banksia Woodland	BW04	-	368890.31	6583617.84		✓	✓	✓
	BWC	-	363317.36	6589275.55		✓	✓	✓
Flooded Gum Floodplain	FG01	VP13	375119.45	6586018.89	✓	✓	✓	✓
	FG02	-	375293.17	6592012.77		✓	✓	✓
	FG03	-	378505.64	6592437.93		✓	✓	✓
	FG04	-	371102.08	6582945.66		✓	✓	✓
	FGC	-	369318.23	6581475.60		✓	✓	✓

Jarrah Marri Forest	JM01	VP14	380073.23	6587668.47	✓	✓	✓	✓
	JM02	VP09	380506.16	6582817.72	✓	✓	✓	✓
	JM03	-	374331.42	6594757.69		✓	✓	
	JM04	-	380770.61	6585712.38		✓	✓	✓
Pine Plantation	PP01	-	371920.46	6588339.17		✓	✓	✓
	PP03	-	371213.63	6590766.79		✓	✓	✓
	PPC	-	363609.28	6589033.22			✓	
Wetland	WE01	-	371690.05	6595201.16		✓	✓	✓
	WE02	-	380462.54	6590447.15		✓	✓	✓
	WE03	-	380246.1	6594667.78		✓	✓	✓
	WEC1	VP06	364697.86	6587494.47	✓	✓	✓	✓
	WEC2	-	366454.53	6586613.48		✓	✓	✓
Total					15	27	29	26

Note. All coordinates are in Datum GDA2020 and Zone 50. *Habitat type descriptions and representative photos provided in **Table 3.1**.

Table 2.7 Bat Utilisation Sample Sites

Habitat Type*	Site ID	Original Site ID (BBUS01)	Easting	Northing	(BBUS01) Spring	(BBUS02) Summer	(BBUS03) Autumn	(BBUS04) Winter
Agriculture	AG01	VP03	372526.6	6586032.57	✓			
	AG02	VP04	370263.19	6588093.61	✓			
	AG03	VP05	369068.44	6587998.02	✓			
	AG04	VP07	375147.54	6595760.24	✓			
	AG05	VP08	376994.87	6580070.51	✓			
	AG06	VP10	377882.09	6586191.74	✓	✓	✓	
	AG07	VP02	369738.39	6582020.53	✓		✓	
	AG08	VP11	377001.85	6596507.85	✓	✓	✓	
	AG09	-	375629.4	6588883.3		✓	✓	
	VP01	VP01	365969.16	6582315.61	✓			
	VP12	VP12	377395.64	6588869.43	✓			
	Met Mast**		376926	6581551				✓
Banksia Woodland	BW01	-	367116.68	6585907.34		✓	✓	✓
	BW02	-	368167.7	6587225.05		✓	✓	✓
	BW04	-	368890.31	6583617.84		✓	✓	✓
Flooded Gum Floodplain	FG01	VP13	375119.45	6586018.89	✓	✓	✓	
	FG04		371102.08	6582945.66				✓
	FGC	-	369318.23	6581475.60		✓	✓	✓
Jarrah Marri Forest	JM01	VP15	380073.23	6587668.47	✓			✓
	JM02	VP09	380506.16	6582817.72	✓	✓	✓	
	JM03	-	374331.42	6594757.69		✓		
	JM04		380770.61	6585712.38				✓

Wetland	WE01	-	371690.05	6595201.16		✓	✓	
	WE02	-	380462.54	6590447.15			✓	✓
	WE03	-	380246.1	6594667.78		✓		
	WEC1	VP06	364697.86	6587494.47	✓			
Total					14	12	12	9

Notes. All coordinates are in Datum GDA2020 and Zone 50. *Habitat type descriptions and representative photos provided in Table 3.1.

**Three rangers were deployed at the Met Mast at 5 m, 50 m, and 100 m.

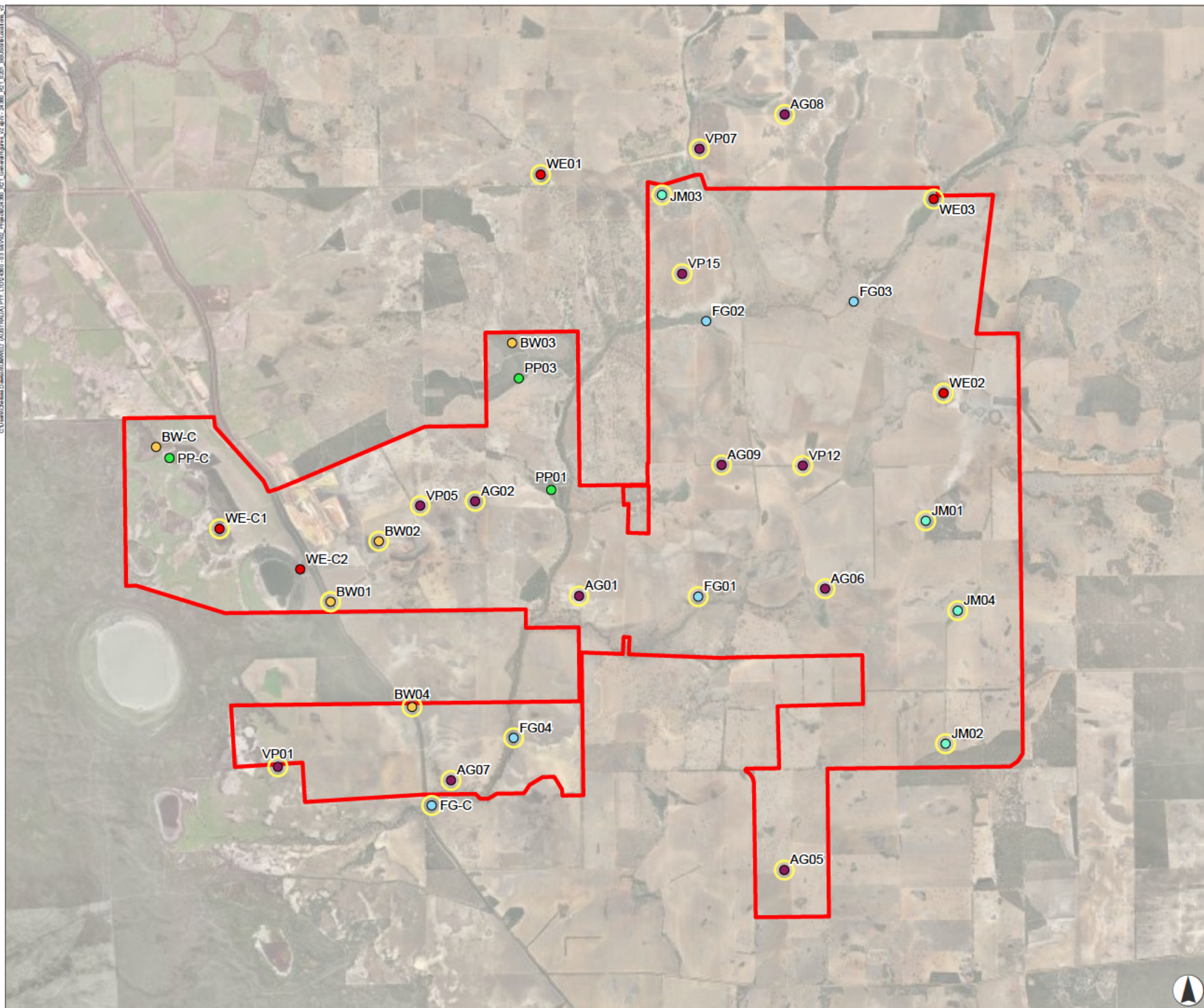
Bird and Bat Utilisation Survey Sample Sites

 Project Area

 Ultrasonic Recording Sites

Bird and Bat Utilisation Survey Locations

- Agriculture
- Flooded Gum Floodplain
- Jarrah Marri Forest
- Pine Plantation
- Banksia Woodland
- Wetland



Scale 1:115,000 at A4
GDA2020 MGA Zone 50



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2.2.4 Bird Utilisation Surveys

Bird utilisation surveys were undertaken using two different approaches across the BBUS program. A new method was adopted following a review of the previous method employed during BBUS01 and commenced from BBUS02 onwards.

The first BBUS event (BBUS01) employed only fixed-point counts and incidental observations, while all remaining BBUS incorporated survey transects into the survey design and recorded additional flight information for species observed. Along with the modifications to the number of sample sites surveyed (**Section 2.2.3**), this was intended to provide:

- More robust population density estimates for bird species at a sample site and within habitats.
- Greater representative coverage of habitat types within the Survey Area.
- More targeted sampling of flight height data for species of interest which are at lower density in agricultural landscapes.
- Improved compatibility for a before–after–control–impact (BACI) assessment in the post-commissioning phase of the project (e.g. testing for changes to habitat utilisation as a result of turbine operations).

An overview of the methods employed across the BBUS program to date is provided in **Table 2.8**.

Table 2.8 Survey Methods Employed During the BBUS Program

Survey Method	BBUS01	BBUS02	BBUS03	BBUS04
Fixed Vantage Point Counts (Section 2.2.4.1)	✓	✓	✓	✓
Survey Transects (Section 2.2.4.2)		✓	✓	✓
Opportunistic Observations (Section 2.2.4.3)	✓	✓	✓	✓

2.2.4.1 Fixed-point Count (Vantage Point Survey)

Fixed-point counts were conducted to assess site utilisation and flight behaviours of bird species in the Survey Area. The fixed-point count method involved an observer positioned at each sample site for 30-minutes.

Sample sites were visited at different times of day and across different days to allow for time-of-day differences in bird movements and activity to be recorded. Sampling periods selected were:

- Morning (between 6.00 am and 10.00 am).
- Midday (between 10.00 am and 2.00 pm).
- Afternoon (between 2.00 pm and 6.00 pm).

Surveys were undertaken twice across each of the sampling periods during BBUS01. The removal of the second replicate for each sampling period during remaining BBUS allowed for the incorporation of survey transects in place of the second replicate (see **Section 2.2.4.2**).

During each fixed-point count, a single observer recorded the following information for each observation:

- species
- abundance

- observation type (visual or aural)
- minimum, maximum, and modal flight height AGL of the observed bird/s (to the nearest metre beneath 100 m and in 10 m increments thereafter)
- flight duration (not recorded during BBUS01).

For conservation significant species and raptors, the following information was also recorded:

- distance and direction from the observer (to the nearest 10 m and 10°, respectively)
- direction of flight (to the nearest 10°)
- flight pattern (i.e. not flying, local movement, directional flight, circling, swooping, varied, or other)
- behaviour (i.e. flight, foraging, perching, mating, aggressive interactions, hollow inspection, nesting, or on station).

2.2.4.2 Survey Transects

Survey transects were paired with each fixed-point count across the morning, midday, and afternoon sampling periods for all BBUS events except BBUS01. Survey transects involved an observer walking a 400 m transect and recording all birds observed visually or aurally within a specified distance for 20 minutes. Distances were dependent on the habitat within which the transect was undertaken, being:

- treeless habitats (e.g. agriculture) transects widths were either 50 m, 100 m, or 200 m,
- dense habitats with closed vegetation (e.g. Jarrah-Marri woodland) a transect width of 50 m was used.

No other transect widths were used and widths were specified and recorded for each sampling event to allow standardisation of results for future population density estimates and BACI analysis.

For all at-risk or conservation significant species (including those observed outside of the transect), all information recorded during fixed point counts was also noted (e.g. flight behaviours, height, bearing, duration; see **Section 2.2.4.1**).

2.2.4.3 Opportunistic Observations

General

In addition to the structured surveys described above, opportunistic bird observations were recorded at various locations throughout the Survey Area. Emphasis was placed on observations of species of interest (i.e. conservation significant birds and raptors), as well as birds moving through the Survey Area at rotor swept area (RSA) height or new species not previously recorded. For each observation, the following was recorded:

- species
- location of the observation
- observation type (visual or aural)
- abundance
- flight behaviour

- minimum, maximum, and modal flight height AGL of the observed bird(s) (to the nearest metre beneath 100 m and in 10 m increments thereafter)
- flight duration (not recorded during BBUS01).

For conservation significant species and raptors additional information was recorded in accordance with **Section 2.2.4.1**.

Wetland Census

Given the presence of significant surface water features such as lakes and large farm dams across the Survey Area, opportunistic wetland censuses were undertaken at specific wetland sites during each BBUS. These sites are presented in **Table 2.6**. Wetland censuses involved one or more observers utilising a combination of binoculars and a telescope to identify and count all bird species present, while another personnel recorded the information. Wetland censuses were not timed to allow for identification and counts of all species visible. These surveys were treated as opportunistic as in some instances, visibility was limited by accessibility to the wetland or surface water body and therefore not all individuals present may have been detectable using binoculars or a telescope.

Wetland census sites are illustrated on **Figure 3.1**.

2.2.4.4 Bird Flight Height Analysis – Exposure Risk Models (ERMs)

Umwelt has created a decision support tool referred to as an Exposure Risk Model (ERM) to (i) assess the relative risk of rotor strike at different heights and (ii) determine whether data collected for a given species adequately captures the variation and general patterns of flight behaviour. These models are built from flight data collected during *Fixed Point Counts* and *Survey Transects*. These data include:

- The heights for each flight record consisting of the minimum, modal and maximum value. The minimum and maximum value serve to capture the variance in height (e.g. a bird recorded taking off from the ground, flying across a field at four metres and landing in the top of a tree that is 7 metres tall would have a flight height of min=0, mode =4, max =7) while also serving as a mechanism for quantifying 90% confidence bounds of observer error. An illustration of flight height values is provided in **Figure 2.2**.
- Number of individuals in the observation.
- Flight duration in seconds within the confines of the vantage point or transect focal area. The measure is used as a multiplier.
- Survey area in hectares.

The ERMs take the minimum, maximum and most frequent (modal) heights recorded for each flight observation and use these as inputs into a beta-PERT (Pouillot et al., 2024) distribution. Each pert hull is then multiplied by the number of individual birds in the flight record and the duration of flight. The record is then scaled by the area in hectares. The resultant hulls for all records are combined and divided by total survey effort to provide the combined flight height distribution hull.

For each species, ERMs were tested for completeness using a bootstrapping process where flight records were systematically removed and tested for their contribution to the complete model. This was in turn repeated for all flights recorded to attain an average contribution value and variance. Species were considered to be adequately surveyed when on average the omission of a single data point captured at least 95% of the complete dataset.

The ERM's were prepared for all species of interest with flight observations recorded during the BBUS program including:

- conservation significant bird species
- raptor species
- non-listed and non-raptor bird species recorded flying within RSA.

As data on duration of flight observations and standardised search areas for each sampling event were not initially collected during BBUS01, the ERM's prepared in this report are reflective of flight data gathering during BBUS02-BBUS04 only.



Figure 2.2 Minimum, Modal, and Maximum Flight Height Scenarios

2.2.5 Bat Utilisation Surveys

Microchiropteran (microbat) echolocation calls were sampled using passive ultrasonic recorders at a subset of sample sites during each survey event. Devices were placed approximately 2 m AGL facing a cleared area or flyway (flight route used by bats) for a total of two to three nights per sample site. Call data was sent to Balance Environmental for analysis and species identification. To date, only BBUS01 (Spring) and BBUS02 (Summer) data has been analysed and is presented in this report. BBUS03 (Autumn) and BBUS04 (Winter) bat call data will be incorporated into the year two BBUS summary report along with the call data gathered from the meteorological mast.

As bat call data presented here was only gathered from units deployed at 2 m AGL, information such as flight height is not yet available. The likelihood that bat species detected in the Survey Area fly at RSA height has instead been inferred based on literature relevant to the flight behaviour of recorded species. As such, a preliminary precautionary approach has been applied in some instances where there is a paucity of available literature.

2.2.6 Survey Limitations

Bird flight data is limited to what is visually observable and therefore were restricted to diurnal surveys and tended towards more open sample sites with increased visibility. Similarly, the survey methodology is limited by human visual acuity and ability to estimate distances. Vertical estimates are subject to a degree of uncertainty, and detection probability of small birds (honeyeaters, silvereyes etc.) relative to larger birds (corvids, raptors, waterfowl, etc.) likely declines markedly as distance from observer increases. To reduce the impact of these limitations, the average and maximum canopy height and survey radius was measured at each site using a range finder. This allowed for flight height and distance estimates to be made based on known measurements.

Bat surveys were limited to the use of stationary bat-detector devices for recording calls of bat species. No active trapping was undertaken. Bat species' density is impossible to estimate from echolocation records, similarly, bat-detectors placed at ground level provide no resolution to bat abundance in vertical space. Bat presence at a series of sites is therefore substituted as an approximate guide to the relative numbers of each species using the Survey Area.

No other survey limitations were considered to be present.

3.0 Results

3.1 Desktop Assessment

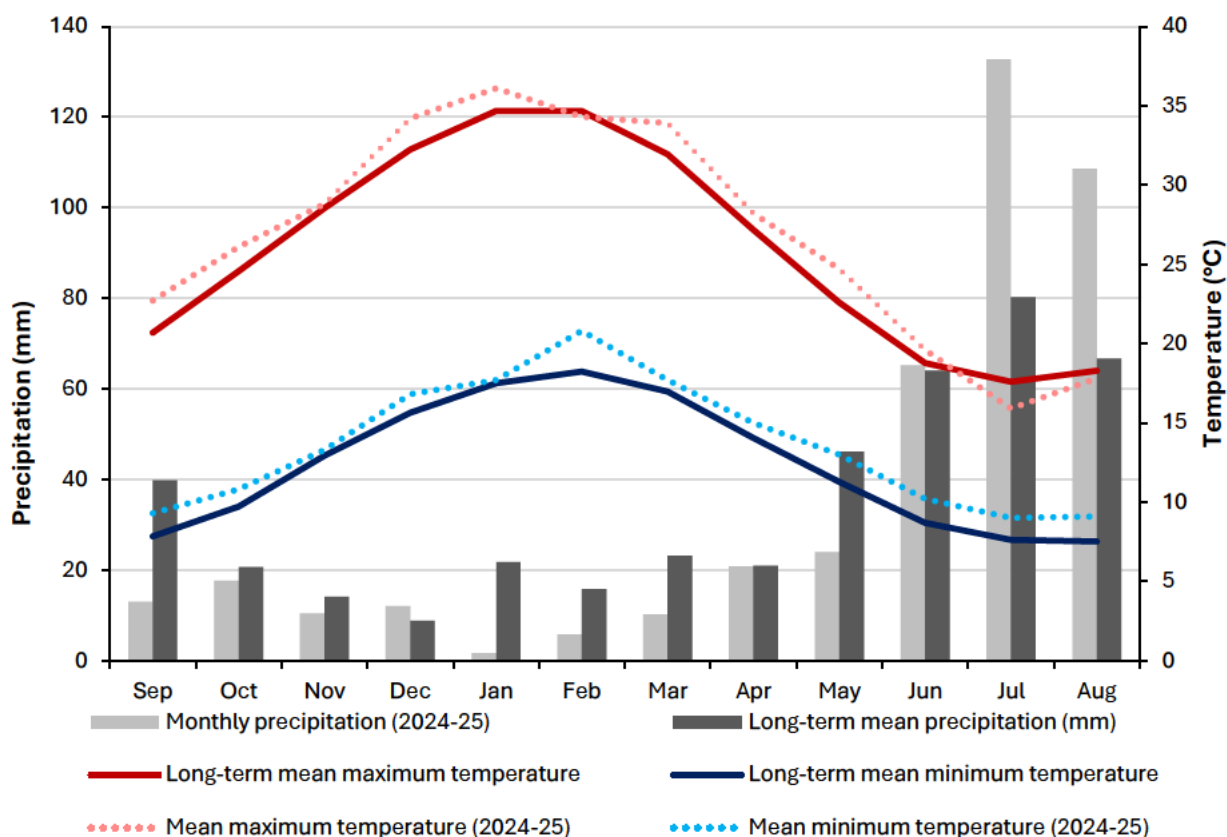
The following sections present the outcomes of the preliminary site characterisation undertaken for the Survey Area to identify those conservation significant bird and bat species with a potential to occur and possible environmental drivers of their presence.

3.1.1 Site Characteristics

Climate

The closest meteorological stations with long-term climate data are Badgingarra Station (Station No. 9037) situated approximately 70 km northwest of the Survey Area and Barberton Station (Station No. 8005), situated approximately 30 km northeast of the Survey Area (BOM, 2025).

During the survey period, maximum temperatures and rainfall were generally consistent with the long-term monthly averages (1994-2024) (**Graph 3.1**). While total rainfall from September 2024 to August 2025 (421.9 mm) was slightly below the long-term average (443.2 mm), rainfall during July and August 2025 was significantly higher the average (BOM, 2025).



Graph 3.1 Long-term and Survey Period Climatic Conditions

Biogeography

The Survey Area lies across three IBRA subregions: Lesueur Sandplain (GS2), Dandaragan Plateau (SWA01) and Perth (SWA02), although the majority is located within SWA01 and SWA02.

The Lesueur Sandplain subregion is described by Desmond & Chant (2002) as follows:

“The Geraldton Sandplains bioregion is composed mainly of proteaceous scrub-heaths, rich in endemics, on the sandy earths of an extensive, undulating, lateritic sandplain mantling Permian to Cretaceous strata. Extensive York Gum and Jam woodlands occur on outwash plains associated drainage. The Lesueur Sandplain (GS3) comprises coastal Aeolian and limestones, Jurassic siltstones and sandstones (often heavily lateritised) of central Perth Basin. Alluvials are associated with drainage systems. There are extensive yellow sandplains in south-eastern parts, especially where the subregions overlaps the western edge of the Pilbara Craton. Shrub-heaths rich in endemics occur on a mosaic of lateritic mesas, sandplains, coastal sands and limestones. Heath on lateritised sandplains along the subregions north-eastern margins. The climate is Mediterranean and the subregional area is 1,358,915 ha.”

The SWA01 subregion is described by Desmond (2001) as follows:

“The plateau is bordered by Derby and Dandaragan Faults. Cretaceous marine sediments are mantled by sands and laterites. Characterised by Banksia low woodland, Jarrah - Marri woodland, Marri woodland, and by scrub-heaths on laterite pavement and on gravelly sandplains. The climate is Warm Mediterranean and annual rainfall is 700 mm and the subregional area is 447,862 ha.”

The SWA02 subregion is described by Mitchell et al. (2002) as follows:

“The Swan Coastal Plain is a low lying coastal plain, mainly covered with woodlands. It is dominated by Banksia or Tuart on sandy soils, Casuarina obesa on outwash plains, and paperbark in swampy areas. In the east, the plain rises to duricrusted Mesozoic sediments dominated by Jarrah woodland. The climate is Warm Mediterranean. Three phases of marine sand dune development provide relief. The outwash plains, once dominated by C. obesa-marri woodlands and Melaleuca shrublands, are extensive only in the south. The Perth subregion is composed of colluvial and aeolian sands, alluvial river flats, coastal limestone. Heath and/or Tuart woodlands on limestone, Banksia and Jarrah Banksia woodlands on Quaternary marine dunes of various ages, Marri on colluvial and alluvials. Includes a complex series of seasonal wetlands and also includes Rottnest, Carnac and Garden Islands etc. Rainfall ranges between 600 mm and 1,000 mm annually and the climate is Mediterranean. The subregional area is 1,333,901 ha.”

Fauna Habitats

Preliminary fauna habitats were initially reviewed prior to BBUS01 (Spring) using satellite imagery to delineate their approximate boundaries and broad habitat types. A formal fauna habitat assessment was then completed prior to BBUS02 (Summer) and used to inform the modification of sample sites to obtain representative samples of volant fauna assemblage and utilisation across the Survey Area. A summary of results from the fauna habitat assessment is presented below.

Twelve (12) fauna habitat types were identified within the Survey Area which are listed and described in **Table 3.1** and illustrated on **Figure 3.1**. The largest habitat type is the Cleared habitat type (12,007 ha, 69.8%), mainly consisting of paddocks and areas of infrastructure. The second largest habitat type is Scattered Trees (2,508 ha, 14.6%).

Key habitats for use by conservation significant fauna were considered to be:

- Wetlands and Waterbodies.
- Marri-Jarrah Forest.
- Flooded Gum Forest.
- Banksia Woodland.

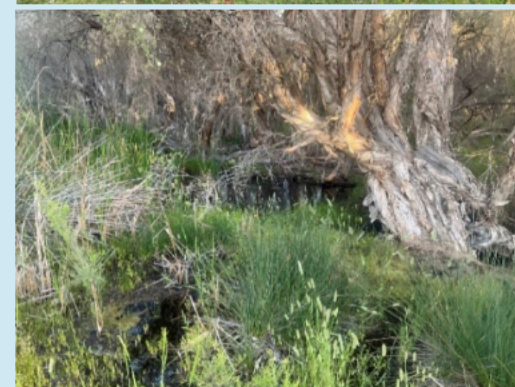
Table 3.1 Fauna Habitats of the Survey Area

Habitat Type	Habitat Description	Representative Photograph
Wetlands (WET)	Wetlands, damplands and farm dams. Often integrated with other habitat types such as <i>Waterbodies</i>, <i>Paperbark Dampland</i> and <i>Flooded Gum</i>. May be ephemeral in nature, often degraded, weedy and heavily browsed by cattle. Natural, remnant wetlands contain native sedges, rushes and grasses while degraded wetlands predominantly contain weedy <i>Juncus acutus</i>. • Area mapped: 457 ha (2.7%). • Suitable habitat for migratory shorebirds and waterbirds. • May provide suitable roosting habitat for black-cockatoo species if present.	
Water Bodies (WB)	Large, permanent/semi-permanent water bodies. • Area mapped: 99 ha (0.6%). • Suitable habitat for migratory shorebirds and waterbirds.	N/A

Paperbark Dampland (MEL)

Dense stands of tall *Melaleuca* spp. associated with drainages and damplands. Understory of grass sedges and non-native *Juncus acutus*. Often adjacent to Flooded Gum (*Eucalyptus rudis*) forest. Fallen timber. Small, ephemeral pools creating habitat for native frogs and fish.

- Area mapped: 47 ha (0.3%).



Flooded Gum Forest (FG)

Stands of Flooded Gum (*Eucalyptus rudis*). Grassy and weedy understory with grazing from cattle. Old, mature forest contains hollows suitable for nesting birds. Associated with drainages and low-lying plains. Small, ephemeral pools creating habitat for native frogs and fish. Logs and coarse woody debris.

- Area mapped: 383 ha (2.2%).
- May provide suitable nesting and roosting habitat for black-cockatoo species if present.
- May provide suitable nesting habitat for the Peregrine Falcon (*Falco peregrinus*) in tall trees.



Marri Jarrah Forest (MJ)

Marri (*Corymbia calophylla*), Jarrah (*Eucalyptus marginata*) forest. Mature forest with hollows. Largely intact understorey providing dense cover. Proteaceae species in understorey provides high value foraging habitat for Carnaby's Black-cockatoo. Logs and coarse woody debris.

- Area mapped: 124 ha (0.7%).
- Foraging and breeding habitat for black-cockatoo species if present.
- May provide suitable nesting habitat for the Peregrine Falcon in tall trees.



Disturbed Woodland (DW)

Eucalyptus woodland with high grazing pressure resulting in little to no understorey species. Includes planted avenue trees and wind breaks. Grassy understory containing few native species of shrubs. Fallen logs and coarse woody debris. Lower quality foraging habitat due to lack of Proteaceae species in understorey.

- Area mapped: 985 ha (5.7%).
- May provide suitable nesting habitat for the Peregrine Falcon in tall trees.



Scattered Trees (ST) Cleared pasture and crop with scattered paddock trees. Paddock trees mostly Flooded Gum (*E. rudis*) and Marri (*C. calophylla*) provide low level foraging value to Carnaby's Black-cockatoo and potential nest hollows. Lacks logs and coarse woody debris.

- Area mapped: 2508 ha (14.6%).
- May provide suitable foraging and breeding habitat for black-cockatoo species if present.
- May provide suitable nesting habitat for the Peregrine Falcon in tall trees.



Banksia Woodland (BW) Open woodland dominated by Proteaceae species with shrubby understorey. High species diversity of *Banksia* spp., *Hakea* spp., *Grevillea* spp. and other native shrubs. Sandy soils.

- Area mapped: 166 ha (1.0%).
- May provide suitable foraging habitat for black-cockatoo species if present.



Low Shrubland (LS)

Dense Proteaceae shrubland with high species diversity of *Banksia* spp., *Hakea* spp., *Grevillea* spp. and other native shrubs. Occurs on sandy soils and laterite jump ups.

- Area mapped: 201 ha (1.2%).
- May provide suitable foraging habitat for black-cockatoo species if present.



Pine Plantation (PP)

Pine plantation. Understorey consisting of grass and pine needles.

- Area mapped: 169 ha (1.0%).
- May provide suitable foraging and/or roosting (where near a water source) habitat for Carnaby's Black-cockatoo if present.
- May provide suitable nesting habitat for the Peregrine Falcon in tall trees.



**Other
(OTHER)**

Highly disturbed, weedy regrowth and cultivated shrubs.

- Area mapped: 67 ha (0.4%).



**Cleared
(CL)**

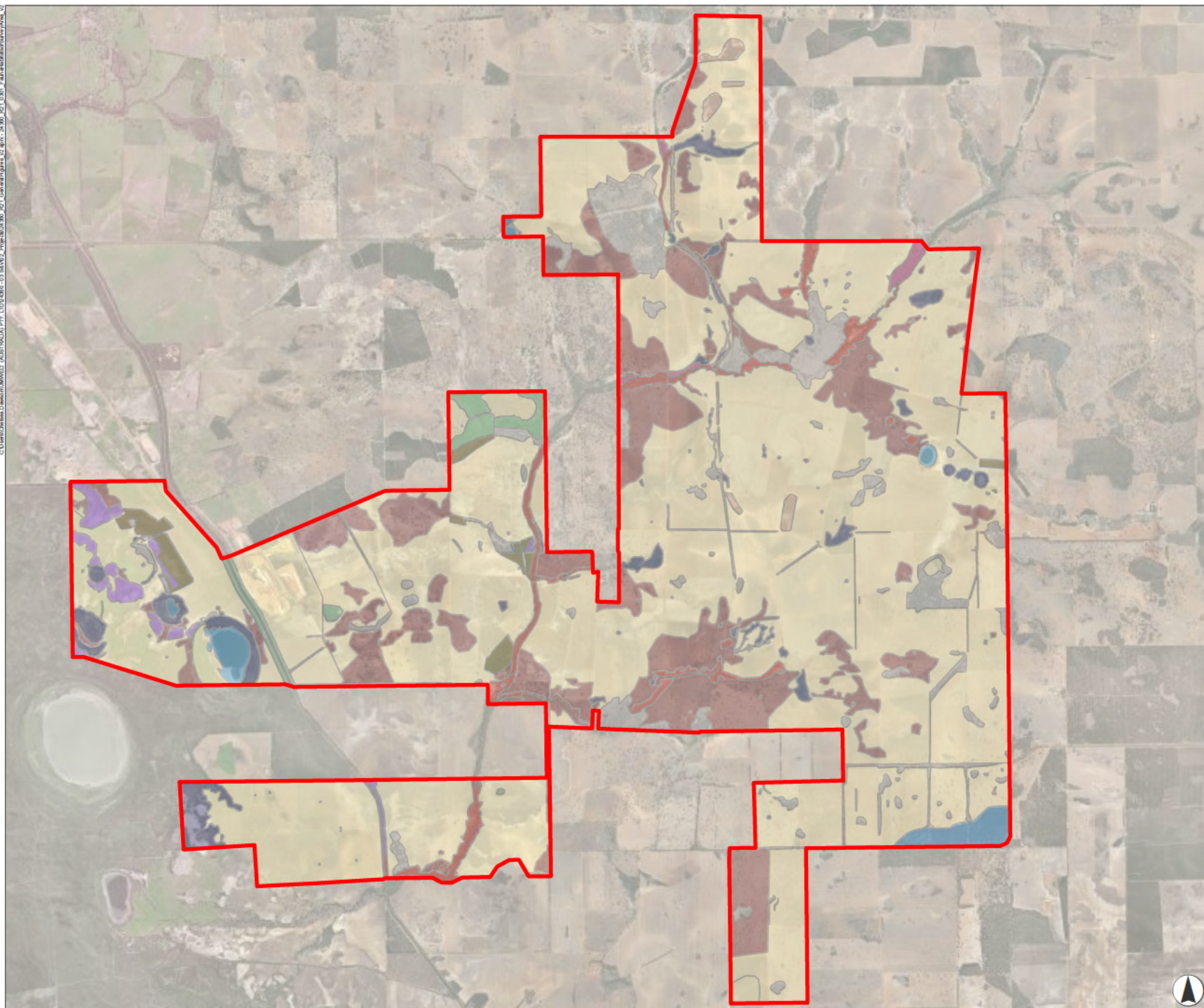
Cleared, open paddocks with very few remaining paddock trees. Highly disturbed. Combination of grain and canola crops. Open pasture for sheep and cattle grazing.

- Area mapped: 12,007 ha (69.8%).

N/A

Legend

-  Survey Area
- Fauna Habitat**
 -  Banksia Woodland
 -  Flooded Gum Forest
 -  Low Shrubland
 -  Paperbark Dampland
 -  Marri Jarrah Forest
 -  Disturbed Woodland
 -  Scattered Trees
 -  Other
 -  Pine Plantation
 -  Cleared
-  Water Bodies
-  Wetlands



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Legend

- | | | | |
|--|--|--|--|
| <p> Survey Area</p> | <p> Paperbark Dampland:
Dense stands of tall <i>Melaleuca</i> associated with drainages and damplands. Understory of grass sedges and non-native <i>Juncus acutus</i>. Often adjacent to <i>Eucalyptus rudis</i> forest , Fallen timber, Small, ephemeral pools creating h</p> | <p> Disturbed Woodland:
Eucalyptus woodland with high grazing pressure resulting in little to no understorey species. Includes planted avenue trees and wind breaks.Grassy understory containing few native species of shrubs, Fallen logs and coarse woody debris, Lower quality fora</p> | <p> Pine plantation: Understorey consisting of grass and pine needles.</p> |
| <p> Banksia Woodland: Open Proteaceae woodland with shrubby understorey. High species diversity of Banksia, Hakea, Grevillea and other native shrubs, Sandy soils.</p> | <p> Marri Jarrah Forest: Marri (<i>Corymbia calophylla</i>) Jarrah (<i>Eucalyptus marginata</i>) forest.Mature forest with hollows, Largely intact understorey providing dense cover, Proteaceae species in understorey provides high value foraging habitat for Carnaby's BI</p> | <p> Scattered Trees: Cleared pasture and crop with scattered paddock trees. Paddock trees mostly <i>E. rudis</i> and <i>C. calophylla</i> provide low level foraging value to Carnaby's Black-Cockatoo and potential nest hollows, Lacks logs and coarse woody debris.</p> | <p> Cleared: Cleared, open paddocks with very few remaining paddock trees. Highly disturbed, Combination of grain and canola crops, Open pasture for sheep and cattle grazing.</p> |
| <p> Flooded Gum Forest:
Stands of <i>Eucalyptus rudis</i>. Grassy and weedy understory with grazing from cattle. Old, mature forest contains hollows suitable for nesting birds, Associated with drainages and low-lying plains, Small, ephemeral pools creating habitat for native frogs and</p> | | <p> Other: Highly disturbed, weedy regrowth and cultivated shrubs.</p> | <p> Waterbodies: Large, permanent/semi-permanent water bodies.</p> |
| <p> Low Shrubland : Dense Proteaceae shrubland with high species diversity of Banksia, Hakea, Grevillea and other native shrubs. Occurs on sandy soils and laterite jump ups.</p> | | | <p> Wetlands, damplands and farm dams. Often integrated with other habitat types such as Waterbodies, Paperbark Dampland and Flooded Gum. May be ephemeral in nature, often degraded, weedy and heavily browsed by cattle. Natural, remnant wetlands contain nativ</p> |

FIGURE 3.1

Fauna Habitats of the Survey Area

Surface Water Features

The Survey Area spans three groundwater catchments within the Moore–Hill Rivers Basin. A small portion of the Nambung River catchment intersects the northern extent of the Survey Area, while a small portion of the Moore River catchment intersects the southern extent. The majority of the Survey Area lies within the Minyulo–Caren Caren catchment. A number of large lakes, farm dams, and surface water drainage lines occur throughout and in vicinity of the Survey Area, with the largest lakes primarily concentrated in the western extent of the Survey Area.

Guraga Lake, a large saline/brackish lake located approximately 1 km west of the Survey Area, and Namming Lake, a saline lake located 3 km south of Guraga Lake, are within the Minyulo-Caren Caren catchment. Water recharge of these lakes occurs through direct precipitation and ongoing waterflow from the Caren Caren Brook system and connecting streams passing through Crackers Swamp (Moore River Catchment Council, 2020). The Caren Caren Brook is a non-perennial drainage line (minor river) that originates 25 km north-east of Guraga Lake and traverses the central portion of the Survey Area in a north–south direction. Guraga Lake and Namming Lake comprise part of a mosaic of surface water features along with a number of smaller lakes within the western extent of the Survey Area.

No Ramsar-listed wetlands occur within the Desktop Study Area. Guraga Lake is listed within the Directory of Important Wetland (DBCA-045), and may provide suitable habitat for migratory shorebirds and other waterbirds that occur within the region along with the numerous other wetlands present. Surface water drainage lines may provide suitable roosting and watering habitat for black-cockatoo species, while farm dams and small lakes elsewhere in the Survey Area may occasionally host migratory shorebirds but primarily provide suitable habitat for other waterbirds.

Surface water features relevant to the Survey Area are illustrated in **Figure 1.1**.

3.1.2 Species Characteristics

Anticipated Bird Species Assemblage

A total of 192 bird species were identified within the Desktop Study Area based on database searches (**Appendix A**). Of these species, 29 are considered conservation significant.

The most speciose avian families detected from database searches were Meliphagidae (honeyeaters – 14), Anatidae (ducks, geese, and swans – 13), Scolopacidae (Snipe, Sandpipers, Godwits, Curlew, Stints and Phalaropes – 13), and Accipitridae (hawks, eagles, and kites – 12).

Five species were excluded from this total and from further consideration based on their ranges being outside of Western Australia, and in some cases outside of Australia. These records were therefore considered erroneous and were reviewed to ensure they had not undergone taxonomic change that was not reflected in the database search results.

Anticipated Bat Species Assemblage

A total of seven bat species were identified within the Desktop Study Area based on database searches (**Appendix A**). This included two species in the family Molossidae (free-tailed bats) and five species in the family Vespertilionidae (evening bats).

One conservation significant species (Ghost Bat [*Macroderma gigas*]) has been excluded from this total and from further consideration. Records of this species identified by the desktop assessment are vouchered specimens recorded in 2007 by the Western Australian Museum. The Desktop Study Area is outside of the Ghost Bat's known range by approximately 800 km (Australasian Bat Society, 2025), and these records have likely been projected in error.

No other conservation significant bat species were identified from the desktop assessment.

3.2 Bird Utilisation Survey

3.2.1 Species Assemblage

A total of 125 unique bird species across 43 families have been recorded during the BBUS program. The most speciose families recorded were Anatidae (ducks, geese, and swans – 11), Meliphagidae (honeyeaters – 11), and Accipitridae (hawks, eagles, and kites – 8). Of these species, 122 were identified during the desktop assessment.

The top 10 most commonly observed species are presented in **Table 3.2** and a complete list of all bird species recorded is presented in **Appendix B**. No conservation significant birds are within the top 10 most common observed species. It should be noted that records represent each observation of a species and does not represent the number of individuals present.

Table 3.2 Most Commonly Observed Species According to BBUS

Common Name	Taxon	Spring Records	Summer Records	Autumn Records	Winter Records	Total
Australian Ringneck	<i>Barnardius zonarius</i>	78	80	114	143	415
Galah	<i>Eolophus roseicapilla</i>	103	44	59	84	290
Australian Raven	<i>Corvus coronoides</i>	70	49	93	58	270
Australian Magpie	<i>Gymnorhina tibicen</i>	44	27	60	55	186
Grey Fantail	<i>Rhipidura albiscapa</i>	2	22	77	60	161
Western Gerygone	<i>Gerygone fusca</i>	25	22	48	34	129
Western Corella	<i>Cacatua pastinator</i>	18	19	46	35	118
Yellow-rumped Thornbill	<i>Acanthiza chrysorrhoa</i>	7	35	38	31	111
Tree Martin	<i>Petrochelidon nigricans</i>	4	41	34	32	111
Rufous Whistler	<i>Pachycephala rufiventris</i>	20	12	42	19	93

3.2.2 Species of Interest

Species of interest are all species that may require further consideration during impact assessment and management of the Project. This includes conservation significant species (i.e. listed under the BC Act, EPBC Act, or as Priority species by DBCA), raptor species, and species recorded flying within the proposed turbine rotor swept area (RSA) during the BBUS program, thus placing them at risk of blade strike. Species of interest are discussed further in the following sections.

3.2.2.1 Conservation Significant Species

A total of nine conservation significant species were recorded during the BBUS program, all of which are listed under the BC Act and seven of which are listed under the EPBC Act (**Table 3.3**). The locations of conservation species' records are presented on **Figure 3.2**.

The Carnaby's Black-cockatoo (*Zanda latirostris*) was the most commonly observed conservation significant species with 56 observations in the Survey Area followed by the Peregrine Falcon (*Falco peregrinus*) with 9 observations. Both the Carnaby's Black-cockatoo and Peregrine Falcon were also recorded across every BBUS event.

Table 3.3 Conservation Significant Species Records within the Survey Area

Common Name	Taxon	Cth Status	WA Status	BBUS01	BBUS02	BBUS03	BBUS04	Total
Blue-billed Duck	<i>Oxyura australis</i>	-	P4	-	1	1	-	2
Black-tailed Godwit	<i>Limosa limosa</i>	EN, MI	MI	-	1	-	-	1
Ruff	<i>Calidris pugnax</i>	MI	MI	-	1	-	-	1
Sharp-tailed Sandpiper	<i>Calidris acuminata</i>	VU, MI	MI	-	1	-	-	1
Red-necked Stint	<i>Calidris ruficollis</i>	MI	MI	-	1	-	-	1
Common Greenshank	<i>Tringa nebularia</i>	EN, MI	MI	-	1	-	-	1
Peregrine Falcon	<i>Falco peregrinus</i>	-	OS	1	1	1	6	9
Forest Red-tailed Black-cockatoo	<i>Calyptorhynchus banksii naso</i>	VU	VU	-	-	-	4	4
Carnaby's Black-cockatoo	<i>Zanda latirostris</i>	EN	EN	32	9	6	9	56

Site utilisation recorded for conservation significant species within the Survey Area is discussed further below. Known habitat preferences and site utilisation summaries are provided in **Table 3.4**.

Blue-billed Duck

The Blue-billed Duck (*Oxyura australis*) was recorded on two occasions during the Summer 2025 and Autumn 2025 BBUS comprising one and six individuals, respectively. [REDACTED]

The species prefers deep freshwater lakes but will also utilise salt lakes, particularly when salinity is reduced following heavy rainfall or run-off. Breeding generally occurs on lakes that are densely vegetated with rushes or sedges providing nesting-material. Breeding sites may also support flocks over winter where suitable. The species may utilise the Wetlands habitat type within the Survey Area during both the breeding and non-breeding seasons.

Carnaby's Black-cockatoo

The Carnaby's Black-cockatoo was recorded during every BBUS event with flocks of up to 200 individuals. The species has been recorded across the Survey Area in the following habitat types:

- Agriculture.
- Pine Plantation.
- Wetlands.
- Flooded Gum Forest.
- Jarrah-Marri Forest.
- Banksia Woodland.

The Carnaby's Black-cockatoo occurs in uncleared or remnant native eucalypt woodlands and remnant patches of native vegetation on land otherwise cleared for agriculture where it forages on eucalypt species and proteaceous shrubs. The species also forages seasonally in non-native pine plantations (*Pinus radiata* and *Pinus pinaster*) which provide a supplementary food source in areas where native vegetation has undergone extensive clearing.

Suitable roosting habitat for the species includes tall trees in proximity to water sources within the Survey area. This includes Flooded Gum Forest, Jarrah-Marri Forest and Pine Plantation Fauna habitat types. Incidental roosting observations have been recorded in Pine Plantation and Flooded Gum.

Breeding habitat can comprise any eucalypt species (dead or alive) supporting suitable hollows and is most often Wandoo (*Eucalyptus wandoo*), Salmon Gum (*Eucalyptus salmonophila*), and Marri (*Corymbia calophylla*); however, breeding has been recorded in a range of other species. The Survey Area intersects the buffers for confirmed breeding areas as mapped by DBCA (2018a) as illustrated in **Figure 3.3**. The nearest mapped breeding sites by DBCA are located approximately six kilometres north in Cataby and six kilometres southeast of the Survey Area. Within the Survey Area, potential breeding habitat occurs within older stands of *Eucalyptus rudis* in Flooded Gum Forest and mature *C. calophylla* in woodland habitats and as isolated paddock trees.

Forest Red-tailed Black-cockatoo

The Forest Red-tailed Black-cockatoo (*Calyptorhynchus banksii naso*) was recorded during the Winter BBUS and also during the targeted fauna habitat assessment undertaken in June 2025 (Umwelt, 2025b). The Survey Area falls outside of the currently modelled distributions for both this and the next closest subspecies (Western Red-tailed Black-cockatoo [*C. banksii escondidus*]); however, the Forest Red-tailed Black-cockatoo formerly had a distribution extending to Dandaragan (Johnstone & Storr, 1998). After a review of secondary evidence (foraging material), these observations were determined to most likely be the Forest Red-tailed Black-cockatoo (Vulnerable under the EPBC Act and BC Act). The species was recorded incidentally along Rowe's Road in June of 2025 and at sample sites AG07 and FG-C in July of 2025. Flock sizes ranged from two to eight individuals.

The Forest Red-tailed Black-cockatoo largely occupies eucalypt forests where they are attracted to seeding Marri and Jarrah in humid and sub-humid regions of the southwest (Johnstone & Storr, 1998). The species primarily feeds on Marri seeds followed by Jarrah (*E. marginata*) and less commonly Snottygobble (*Persoonia longifolia*), Common Sheoak (*Allocasuarina fraseriana*) and proteaceous shrubs. More recently, the species has also been recorded feeding on non-endemic taxa such as introduced eucalypts and Cape Lilac (*Melia azedarach*) (Johnstone et al., 2017).

The species is likely to utilise similar habitats to the Carnaby's Black-cockatoo with foraging in all habitat types except for the Paperbark Dampland, Other, and Cleared habitats, and roosting in habitat types containing tall trees near a water source such as the Flooded Gum Forest, Marri Jarrah Forest, and Pine Plantation habitats. The Forest Red-tailed Black-cockatoo is known to breed year-round and may do so within the Survey Area in habitats containing suitable hollows when present. This includes Flooded Gum Forest, Marri Jarrah Forest, Disturbed Woodland, and Scattered Trees habitats.

Migratory Shorebirds

The following migratory shorebirds [REDACTED]

- Black-tailed Godwit (*Limosa limosa*).
- Ruff (*Calidris pugnax*).
- Sharp-tailed Sandpiper (*Calidris acuminata*).
- Red-necked Stint (*Calidris ruficollis*).
- Common Greenshank (*Tringa nebularia*).

All migratory shorebirds recorded during the BBUS program were only detected during BBUS02 (Summer). The Wood Sandpiper was also recorded opportunistically during the Basic and Targeted Fauna Survey in Spring of 2024 [REDACTED]

All migratory shorebirds listed here are non-breeding visitors to Australia. These species are only likely to occur within the Survey Area from early spring to late summer with presence heavily influenced by the availability of suitable habitat. Their preferred foraging habitat in freshwater systems is large ephemeral or permanent water bodies which retract during summer, leaving an exposed, muddy bank. In the Study Area these species are likely to utilise the Wetlands and Water Bodies fauna habitat types for foraging and roosting when present during the Austral summer. Wetlands and Water Bodies habitat in the western extent of the Study Area are considered to be most suitable for migratory shorebirds with those located east of Brand Highway providing more marginal habitat.

Peregrine Falcon

The Peregrine Falcon has been recorded at least once during every BBUS event undertaken to date, with six records during BBUS03 (Winter). The species has been recorded in Agriculture, Jarrah Marri Forest and Wetland habitat types.

The Peregrine Falcon is uncommon but wide-ranging across Australia. Their habitats are diverse and range from highly modified landscapes to remnant bushland but often favouring open areas due to their hunting strategy (BirdLife Australia, 2023b). Within the Survey Area, the Peregrine Falcon may utilise any habitats for foraging and may roost within the Flooded Gum and Marri Jarrah Forest habitats. Breeding may occur in habitats with tall trees and near water sources.

FIGURE 3.2

Conservation Significant Species' Locations

Legend

 Project Area

Conservation Significant Species' Records

-  Black-tailed Godwit (*Limosa limosa*)
-  Blue-billed Duck (*Oxyura australis*)
-  Carnaby's Black-Cockatoo (*Zanda latirostris*)
-  Common Greenshank (*Tringa nebularia*)
-  Forest Red-tailed Black-Cockatoo (*Calyptorhynchus banksii naso*)
-  Peregrine Falcon (*Falco peregrinus*)
-  Red-necked Stint (*Calidris ruficollis*)
-  Ruff (*Calidris pugnax*)
-  Sharp-tailed Sandpiper (*Calidris acuminata*)
-  Wood Sandpiper (*Tringa glareola*)



Scale 1:110,000 at A4
GDA2020 MGA Zone 50



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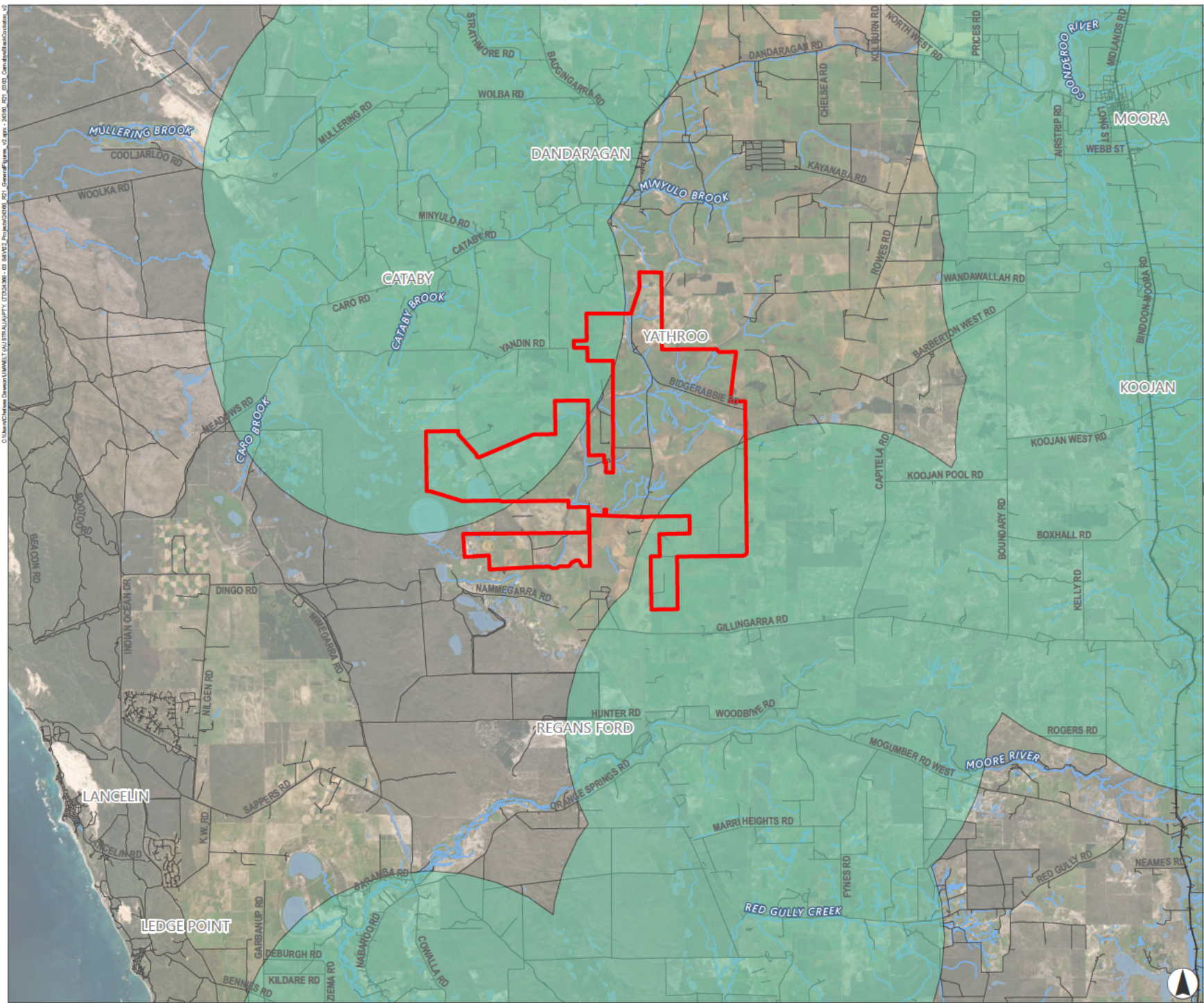
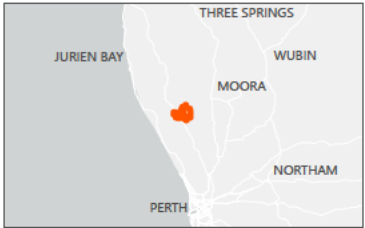


FIGURE 3.3

Carnaby's Black-Cockatoo Known Breeding Areas

Legend

- Survey Area
- Carnabys Cockatoo Confirmed Breeding Areas within the Swan Coastal Plain and Jarrah Forest IBRA Regions (DBCA-054)
- + Railway
- Road
- Watercourse
- Waterbody



0 2 4

Kilometres

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Table 3.4 Known Conservation Significant Species Assessment

Common Name	Taxon	Cth Status	WA Status	Recorded in Desktop Assessment	Preferred Habitat	Expected Utilisation
Blue-billed Duck	<i>Oxyura australis</i>	-	P4	X	The species is found on terrestrial wetlands in temperate regions, that are freshwater to saline, and may be natural or artificial. It nests in rushes, sedges, Lignum (<i>Muehlenbeckia cunninghamii</i>) and paperbark (<i>Melaleuca spp.</i>)	Foraging and potential breeding in the Wetland and Water Bodies habitat types.
Black-tailed Godwit	<i>Limosa limosa</i>	EN, MI	MI	X	The Black-tailed Godwit is a non-breeding migrant to Australia. In Australia, the Black-tailed Godwit occupies a primarily coastal habitat. The species is commonly found in sheltered bays, estuaries and lagoons with large intertidal mudflats or sandflats, or spits and banks of mud, sand or shell-grit; occasionally recorded on rocky coasts or coral islets. It is also found in shallow and sparsely vegetated, near-coastal, wetlands; such as saltmarsh, saltflats, river pools, swamps, lagoons and floodplains. There are a few inland records, around shallow, freshwater and saline lakes, swamps, dams and bore-overflow. They also use lagoons in sewage farms and saltworks (Higgins & Davies, 1996).	Non-breeding visitor. Foraging and roosting in the Wetland and Water Bodies habitat types.
Ruff	<i>Calidris pugnax</i>	MI	MI	X	The Ruff is a rare but regular visitor to Australia, being recorded in all states and territories. In Australia, it is found on generally fresh, brackish or saline wetlands with exposed mudflats at the edges. It can also be found in terrestrial wetlands including lakes, swamps, pools, lagoons, tidal rivers, swampy fields and flood lands, and occasionally on sheltered coasts, in harbours, estuaries and seashores. They have been known to visit sewage farms and saltworks (Higgins & Davies, 1996).	Non-breeding visitor. Foraging and roosting in the Wetland and Water Bodies habitat types.
Sharp-tailed Sandpiper	<i>Calidris acuminata</i>	VU, MI	MI	X	The Sharp-tailed Sandpiper is a non-breeding migrant to Australia. In Australia, they prefer muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation. This includes lagoons, swamps, lakes and pools near the coast, and dams, waterholes, soaks, bore drains and bore swamps, salt pans and hypersaline salt lakes inland and have been recorded on saltworks and sewage farms. They have been recorded on flooded paddocks, sedgeland and other ephemeral wetlands, leaving when they dry. Other habitats include intertidal mudflats in sheltered bays, inlets, estuaries or seashores, and also swamps and creeks lined with mangroves. They tend to occupy coastal mudflats mainly after ephemeral terrestrial wetlands have dried out, moving back during the wet season. Sometimes they occur on rocky shores and rarely on exposed reefs (Higgins & Davies, 1996).	Non-breeding visitor. Foraging and roosting in the Wetland and Water Bodies habitat types.
Red-necked Stint	<i>Calidris ruficollis</i>	MI	MI	X	The Red-necked Stint is a non-breeding migrant to Australia. In Australia, it is mostly found in coastal areas, including in sheltered inlets, bays, lagoons and estuaries with intertidal mudflats, often near spits, islets and banks and, sometimes, on protected sandy or coralline shores. Occasionally they have been recorded on exposed or ocean beaches, and sometimes on stony or rocky shores, reefs or shoals. They have also been recorded on saltworks and sewage farms; saltmarsh; ephemeral or permanent shallow wetlands near the coast or inland, including lagoons, lakes, swamps, riverbanks, waterholes, bore drains, dams, soaks and pools in saltflats. They sometimes use flooded paddocks or damp grasslands and have occasionally been recorded on dry gibber plains, with little or no perennial vegetation (Higgins & Davies, 1996).	Non-breeding visitor. Foraging and roosting in the Wetland and Water Bodies habitat types.
Common Greenshank	<i>Tringa nebularia</i>	EN, MI	MI	X	The Common Greenshank is a non-breeding migrant to Australia where it occurs in all types of wetlands (Higgins & Davies 1996). It can occur in sheltered coastal habitats, typically with large mudflats and saltmarsh, mangroves or seagrass. Habitats also include embayments, harbours, river estuaries, deltas and lagoons and they are recorded less often in round tidal pools, rock-flats and rock platforms. The species also uses both permanent and ephemeral freshwater wetlands, including swamps, lakes, dams, rivers, creeks, billabongs, waterholes and inundated floodplains, claypans and saltflats. They have been recorded using artificial wetlands, including sewage farms and saltworks dams, inundated rice crops, and bores (Higgins & Davies, 1996).	Non-breeding visitor. Foraging and roosting in the Wetland and Water Bodies habitat types.
Peregrine Falcon	<i>Falco peregrinus</i>	-	OS	X	The Peregrine Falcon is uncommon but wide-ranging across Australia. Habitat is extremely diverse, from rainforest to arid scrub, and from coastal heath to alpine. Habitat consists of cliffs, gorges,	Permanent occupancy. Foraging and dispersal in all habitat types. Species may also breed and roost in habitat

Forest Red-tailed Black-cockatoo	<i>Calyptrorhynchus banksii naso</i>	VU	VU	X	timbered watercourses, riverine, wetland plains, open woodlands, pylons, spires and buildings (Morcombe, 2004; Pizzey & Knight, 2012). The Forest Red-tailed Black-cockatoo inhabits the dense Jarrah (<i>Eucalyptus marginata</i>), Karri (<i>E. diversicolor</i>) and Marri (<i>Corymbia calophylla</i>) forests in the far southwest of WA. In the Wheatbelt region, they sometimes occupy Wandoo (<i>E. wandoo</i>), Salmon Gum (<i>E. salmonophloia</i>) or Gimlet (<i>E. salubris</i>) woodlands (BirdLife Australia, 2023c). The subspecies does not regularly undertake seasonal movements like other species of black-cockatoo found in southwest WA and will primarily undertake movements in response to the availability of resources. They are also known to breed almost year-round, using hollows of mature trees as nesting sites (Johnstone & Kirkby, 2019).	types with tall trees such as Flooded Gum Forest and Marri Jarrah Forest. Foraging in all habitat types except Paperbark Dampland, Other and Cleared. Roosting in Flooded Gum Forest, Marri Jarrah Forest, and Pine Plantation. Breeding in Flooded Gum Forest, Marri Jarrah Forest, Disturbed Woodland, and Scattered Trees habitat types.
Carnaby's Black-cockatoo	<i>Zanda latirostris</i>	EN	EN	X	Carnaby's Cockatoo is endemic to, and widespread in, the south-west of Western Australia. Breeding mainly occurs in the wheatbelt, from the Stirling Ranges north-west to near Three Springs, but has also been recorded on the coastal plain to the south-west, around Bunbury (Higgins, 1999; Saunders, 1974). Carnaby's Cockatoo occurs in uncleared or remnant native eucalypt woodlands, especially those that contain Salmon Gum and Wandoo, and in shrubland or kwongan heathland dominated by hakea, dryandra, banksia and grevillea species. It also occurs in remnant patches of native vegetation on land otherwise cleared for agriculture (Saunders, 1974, 1986). The species forages seasonally in pine plantations in areas that receive high rainfall, e.g. the Swan Coastal Plain (Saunders, 1974; Sedgwick, 1968, 1973) and around the Perth metropolitan area on both native and non-native plants, such as liquid amber. It also forages in forests containing Marri, Jarrah or Karri (Nichols & Nichols, 1984; Saunders, 1980).	Foraging in all habitat types except Paperbark Dampland, Other and Cleared. Roosting in Flooded Gum Forest, Marri Jarrah Forest, and Pine Plantation. Breeding in Flooded Gum Forest, Marri Jarrah Forest, Disturbed Woodland, and Scattered Trees habitat types.

Note. P1–P4=Priority 1–Priority 4 species listed by DBCA, EN=Endangered, MI=Migratory, VU=Vulnerable, OS=Other Specially Protected.

The only conservation significant species recorded flying during the BBUS program were the Carnaby's Black-cockatoo, Forest Red-tailed Black-cockatoo, and Peregrine Falcon. None of these species were recorded flying within RSA (**Table 3.5**).

The Carnaby's Black-cockatoo was recorded flying at a maximum height of 50 m AGL on three occasions undertaking directional flights comprising 1 or 2 individuals. The Forest Red-tailed Black-cockatoo was recorded flying at a maximum height of 8 m AGL and the Peregrine Falcon at a maximum height of 40 m AGL.

Table 3.5 Conservation Significant Species Maximum Flight Height Records

Common Name	Taxon	<50 m	50-59 m	>60 m	Total
Peregrine Falcon	<i>Falco peregrinus</i>	6	-	-	6
Forest Red-tailed Black-cockatoo	<i>Calyptrorhynchus banksii naso</i>	1	-	-	1
Carnaby's Black-cockatoo	<i>Zanda latirostris</i>	39	3	-	42

Note. Species without flight observations are excluded.

The ERMs generated for each conservation significant species with flight observations are provided in **Figure 3.4**. As none of these species were observed flying within RSA during the BBUS program, 0 seconds of observed flight per hour of survey per hectare were within the RSA height range. Due to the small sample size of flight observations for the Forest Red-tailed Black-cockatoo and Peregrine Falcon, conclusions that can be drawn for these species are limited. However, the Carnaby's Black-cockatoo was observed on 42 instances, all of which were below RSA. A majority of this flight time occurred below 30 m AGL (99%) which is significantly below the RSA. The ERM (**Figure 3.4**) for Carnaby's Black-cockatoo was based on 15 records with a mean convergence of 0.93 meaning the flight behaviour for the species is approaching our significance threshold of 0.95. Based on similar flight behaviours, this generalisation can likely be applied to the Forest Red-tailed Black-cockatoo as well. For the Peregrine Falcon, the sample size is too low to conclude that a majority of flights are below RSA, and the species is known to fly at RSA due to its hunting strategy.

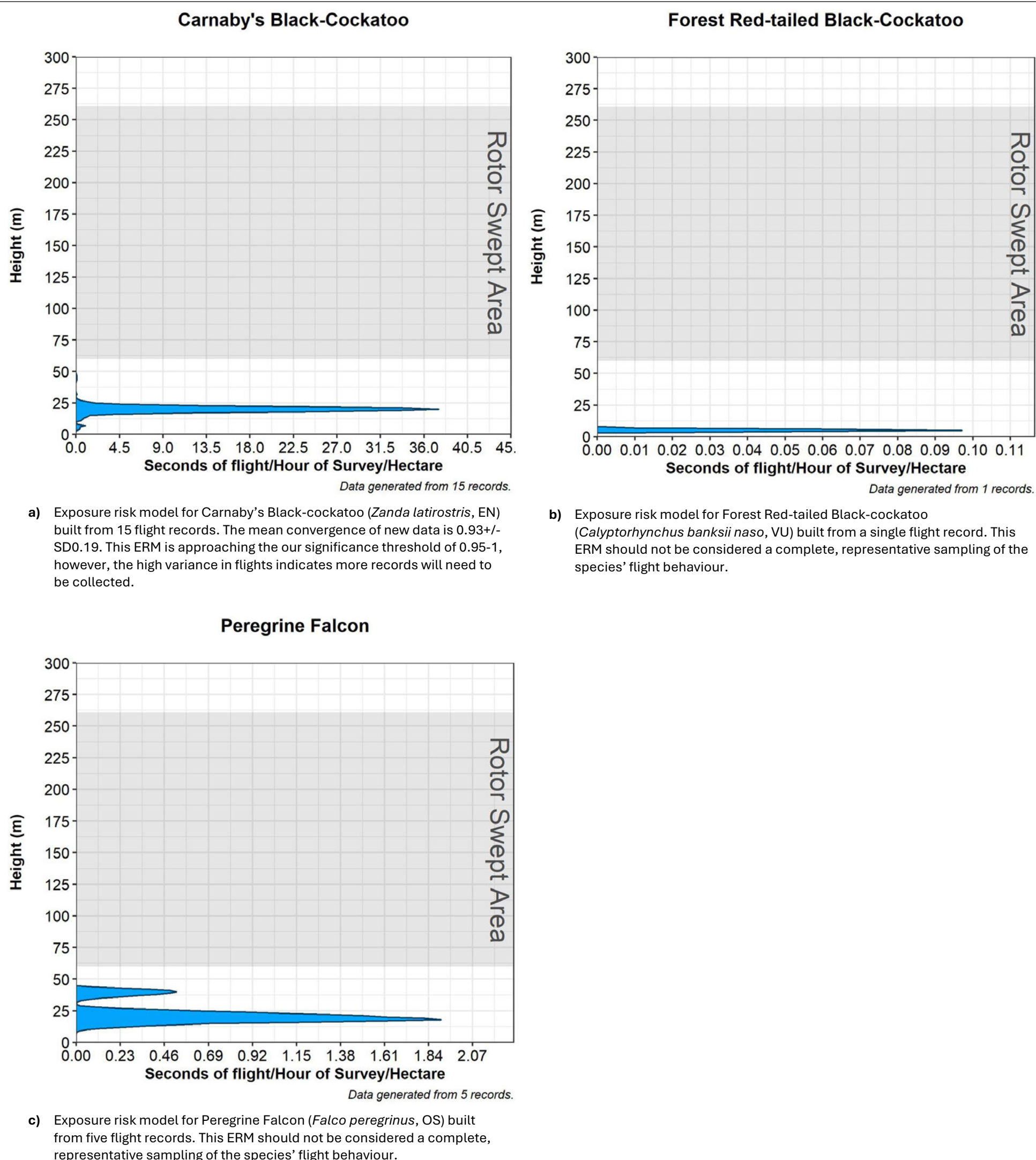


Figure 3.4 Exposure Risk Models for the Carnaby's Black-cockatoo, Forest Red-tailed Black-cockatoo and Peregrine Falcon

3.2.2.2 Raptors

A total of 12 unique raptor species were recorded within the Survey Area during the BBUS program, including 11 diurnal raptor species and 1 nocturnal raptor species (**Table 3.6**).

The most commonly recorded raptor species was the Nankeen Kestrel (*Falco cenchroides*) followed by the Whistling Kite (*Haliastur sphenurus*) and Wedge-tailed Eagle (*Aquila audax*). The Nankeen Kestrel, Black-shouldered Kite (*Elanus axillaris*), Wedge-tailed Eagle, Whistling Kite, and Peregrine Falcon were all recorded during every BBUS event.

Only one raptor species recorded within the Survey Area is conservation significant (Peregrine Falcon) and is discussed above in **Section 3.2.2.1**.

Table 3.6 Raptors Records within the Survey Area

Common Name	Taxon	Spring	Summer	Autumn	Winter	Total
Accipitridae						
Black-shouldered Kite	<i>Elanus axillaris</i>	1	1	1	1	4
Brown Goshawk	<i>Accipiter fasciatus</i>	-	1	-	-	1
Little Eagle	<i>Hieraaetus morphnoides</i>	2	1	-	1	4
Spotted Harrier	<i>Circus assimilis</i>	-	1	-	-	1
Swamp Harrier	<i>Circus approximans</i>	7	-	-	-	7
Wedge-tailed Eagle	<i>Aquila audax</i>	8	8	11	1	28
Whistling Kite	<i>Haliastur sphenurus</i>	6	2	11	10	29
Falconidae						
Australian Hobby	<i>Falco longipennis</i>	-	1	-	1	2
Brown Falcon	<i>Falco berigora</i>	2	-	-	-	2
Nankeen Kestrel	<i>Falco cenchroides</i>	60	18	5	7	90
Peregrine Falcon*	<i>Falco peregrinus</i>	1	1	1	6	9
Strigidae						
Boobook Owl	<i>Ninox boobook</i>	-	1	-	-	1

Note. *Species listed as Other Specially Protected under the BC Act and also presented in **Table 3.3**.

Flight observations for raptor species are provided in **Table 3.7**. Species with recorded flights within RSA include the Australian Hobby (*Falco longipennis*), Black-shouldered Kite, Brown Falcon (*Falco berigora*), Little Eagle (*Hieraaetus morphnoides*), Nankeen Kestrel, Wedge-tailed Eagle, and Whistling Kite. Only the Nankeen Kestrel (28 records, mean convergence of 0.96) has sufficient sampling to meet our significance threshold; however, the Wedge-tailed Eagle (16 records, mean convergence of 0.94), and Whistling Kite (16 records, mean convergence of 0.94) are approaching sufficient sampling size to undertake preliminary assessment. The ERMs generated for raptor species with flight observations recorded from BBUS02–BBUS04 are provided in **Figure 3.5** and **Figure 3.6**.

The Nankeen Kestrel was observed flying at RSA for 2% of its total flight time suggesting it only rarely or occasionally occurs at RSA. The Wedge-tailed Eagle was observed flying at RSA for 84.2% of flight time, and the Whistling Kite for 65.5%, suggesting these species regularly occur at RSA.

Table 3.7 Raptor Maximum Flight Height Records

Common Name	Taxon	<50 m	50–59 m	60–99 m	100–149 m	150–199 m	200–249 m	250–299 m	>300 m	Total
Australian Hobby	<i>Falco longipennis</i>	2	-	-	-	-	-	-	-	2
Black-shouldered Kite	<i>Elanus axillaris</i>	2	-	1	1	-	-	-	-	4
Brown Falcon	<i>Falco berigora</i>	1	-	-	1	-	-	-	-	2
Brown Goshawk	<i>Accipiter fasciatus</i>	1	-	-	-	-	-	-	-	1
Little Eagle	<i>Hieraaetus morphnoides</i>	2	1	-	1	-	-	-	-	4
Nankeen Kestrel	<i>Falco cenchroides</i>	59	10	7	6	-	1	-	-	83
Peregrine Falcon*	<i>Falco peregrinus</i>	6	-	-	-	-	-	-	-	6
Spotted Harrier	<i>Circus assimilis</i>	1	-	-	-	-	-	-	-	1
Swamp Harrier	<i>Circus approximans</i>	3	3	1	-	-	-	-	-	7
Wedge-tailed Eagle	<i>Aquila audax</i>	6	3	3	4	3	3	1	1	24
Whistling Kite	<i>Haliastur sphenurus</i>	12	-	8	2	1	-	-	-	23

Note. *Species listed as Other Specially Protected under the BC Act and also presented in **Table 3.5**.

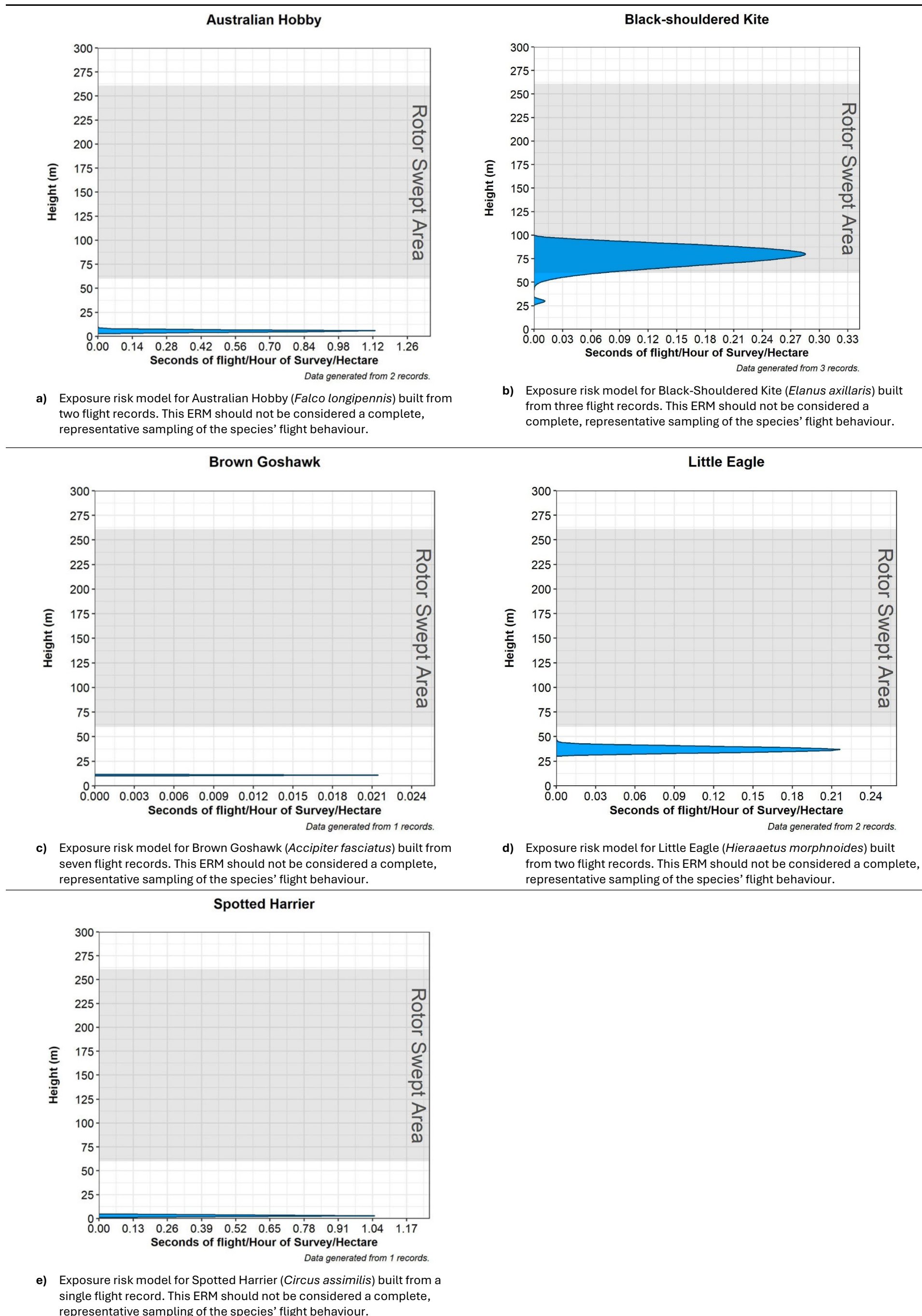


Figure 3.5 Exposure Risk Models for the Australian Hobby, Black-shouldered Kite, Brown Goshawk, Little Eagle, and Spotted Harrier

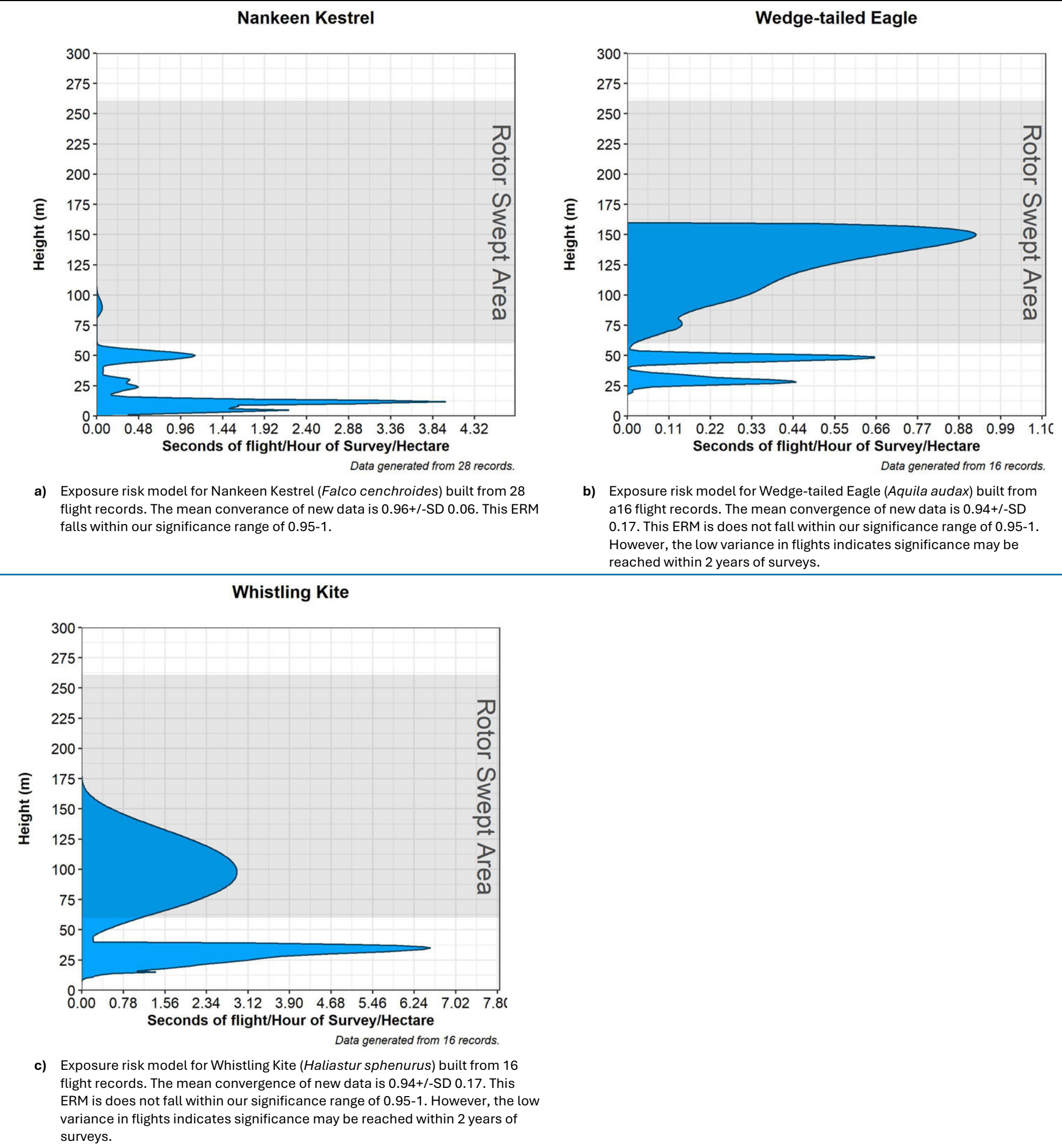


Figure 3.6 Exposure Risk Models for Nankeen Kestrel, Wedge-tailed Eagle, and Whistling Kite

3.2.2.3 At-risk Species

Excluding raptors, a total of 15 non-conservation significant species were recorded flying within the RSA height range during the BBUS program (**Table 3.8**). The Australian Raven (*Corvus coronoides*) recorded the greatest number of flight observations at RSA (17 of 125) followed by the Straw-necked Ibis (*Threskiornis spinicollis*) (11 of 13).

The ERMs generated for non-listed and non-raptor species with flight observations recorded from BBUS02–BBUS04 are provided in **Figure 3.7** and **Figure 3.8**. The following species have sufficient sampling size to meet our significant threshold (0.95-1.0):

- Australia Magpie (*Gymnorhina tibicen*) – 29 records, mean convergence 0.97.
- Australian Raven – 72 records, mean convergence 0.99.
- Galah (*Eolophus roseicapilla*) – 96 records, mean convergence 0.99.
- Tree Martin (*Petrochelidon nigricans*) – 59 records, mean convergence 0.98.
- Western Corella (*Cacatua pastinator*) – 57 records, mean convergence 0.98.

Based on input data used to generate the ERM for the Australian Magpie, Australian Raven, Galah, and Western Corella, these species spent <1% of recorded flight time at RSA per hour of survey per hectare. Input data for the Tree Martin indicated this species spent 1.05% of flight time at RSA. Therefore, these 5 species are considered likely to only rarely occur at RSA.

The following species are approaching the significance threshold with a low variance in flights indicating significance may be reached within two years of surveys:

- Australian Shelduck (*Tadorna tadornoides*) – 8 records, mean convergence 0.88).
- Australian Wood Duck (*Chenonetta jubata*) – 6 records, mean convergence 0.83).
- Straw-necked Ibis – 5 records, mean convergence 0.80).
- Welcome Swallow (*Hirundo neoxena*) – 18 records, mean convergence 0.94).

All remaining species do not have sufficient sampling to meet our significance threshold.

Table 3.8 Bird Species Recorded Flying at RSA

Common Name	Taxon	<50 m	50–59 m	60–99 m	100–149 m	150–199 m	200–249 m	250–299 m	>300 m	Total
Australian Magpie	<i>Gymnorhina tibicen</i>	50	1	2	-	-	-	-	-	53
Australian Pelican	<i>Pelecanus conspicillatus</i>	-	-	1	-	-	-	-	-	1
Australian Raven	<i>Corvus coronoides</i>	100	8	14	3	-	-	-	-	125
Australian Shelduck	<i>Tadorna tadornoides</i>	9	1	1	-	-	-	-	-	11
Australian Wood Duck	<i>Chenonetta jubata</i>	7	-	1	-	-	-	-	-	8
Brown Songlark	<i>Cincloramphus cruralis</i>	-	-	3	-	-	-	-	-	3
Galah	<i>Eolophus roseicapilla</i>	178	2	2	-	-	-	-	-	182
Little Black Cormorant	<i>Phalacrocorax sulcirostris</i>	-	1	2	-	-	-	-	-	3
Little Pied Cormorant	<i>Microcarbo melanoleucos</i>	4	-	1	1	-	-	-	-	6
Straw-necked Ibis	<i>Threskiornis spinicollis</i>	2	-	4	3	2	1	-	1	13
Tree Martin	<i>Petrochelidon nigricans</i>	55	6	3	-	1	-	-	-	65
Welcome Swallow	<i>Hirundo neoxena</i>	29	1	2	-	1	-	-	-	33
Western Corella	<i>Cacatua pastinator</i>	69	2	2	-	-	-	-	-	73
White-faced Heron	<i>Egretta novaehollandiae</i>	13	-	1	-	-	-	-	-	14
Yellow-billed Spoonbill	<i>Platalea flavipes</i>	1	-	-	-	-	1	-	-	2

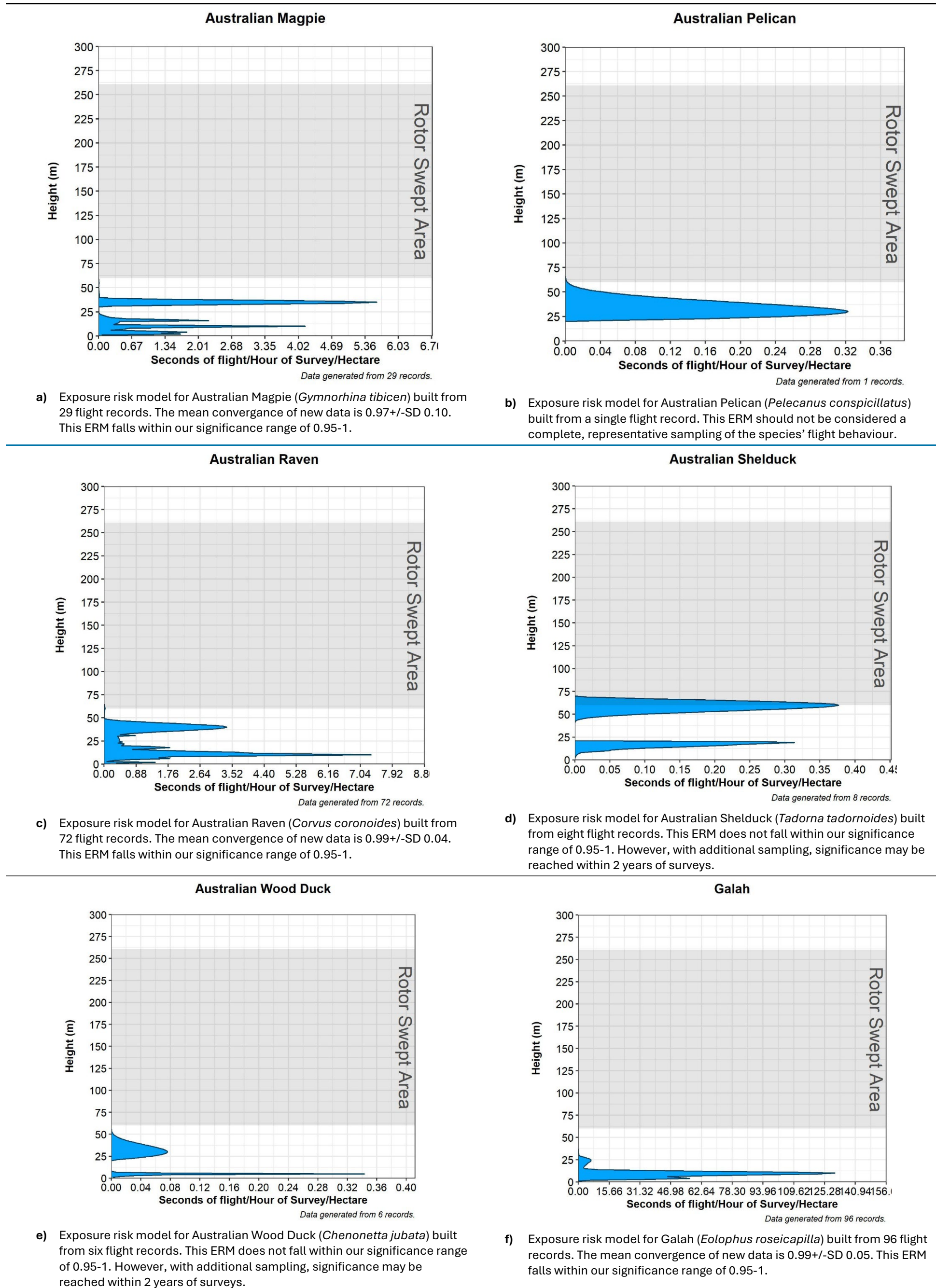
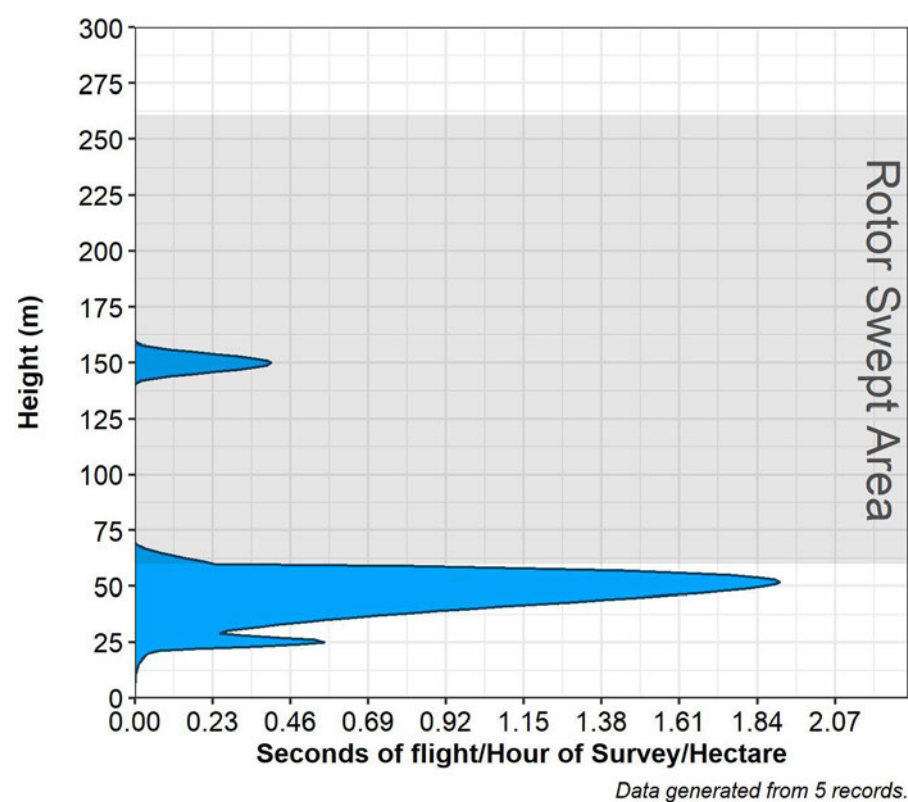


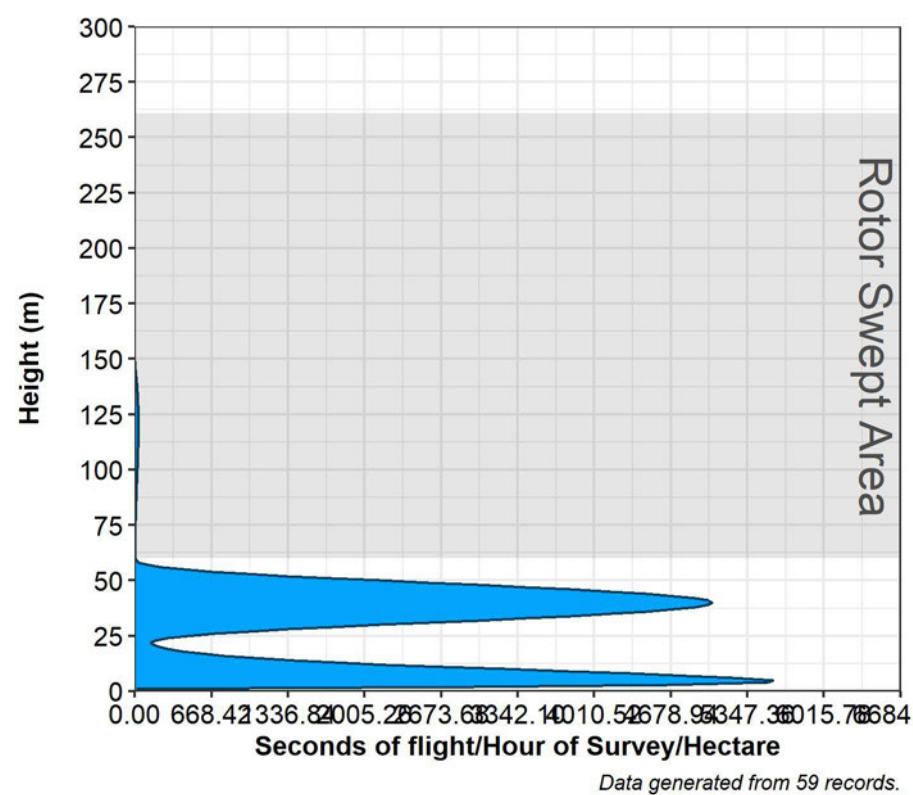
Figure 3.7 ERM's generated for the Australian Magpie, Australian Pelican, Australian Raven, Australian Shelduck, Australian Wood Duck and Galah

Straw-necked Ibis



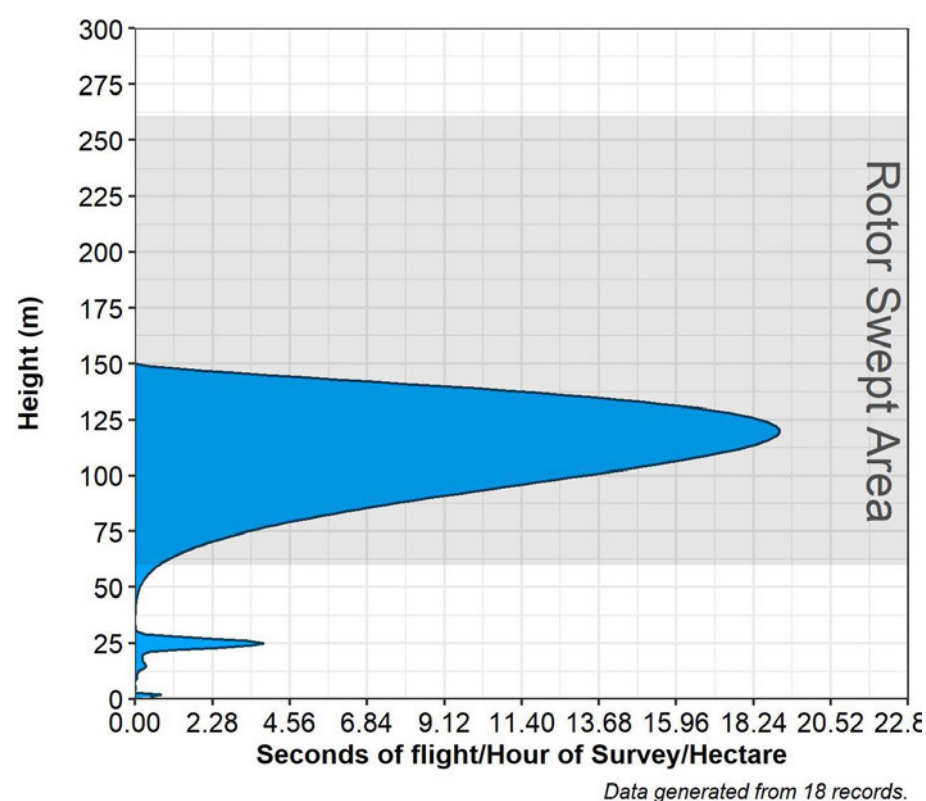
- a) Exposure risk model for Straw-neck Ibis (*Threskiornis spinicollis*) built from five flight records. This ERM does not fall within our significance range of 0.95-1. However, with additional sampling, significance may be reached within 2 years of surveys.

Tree Martin



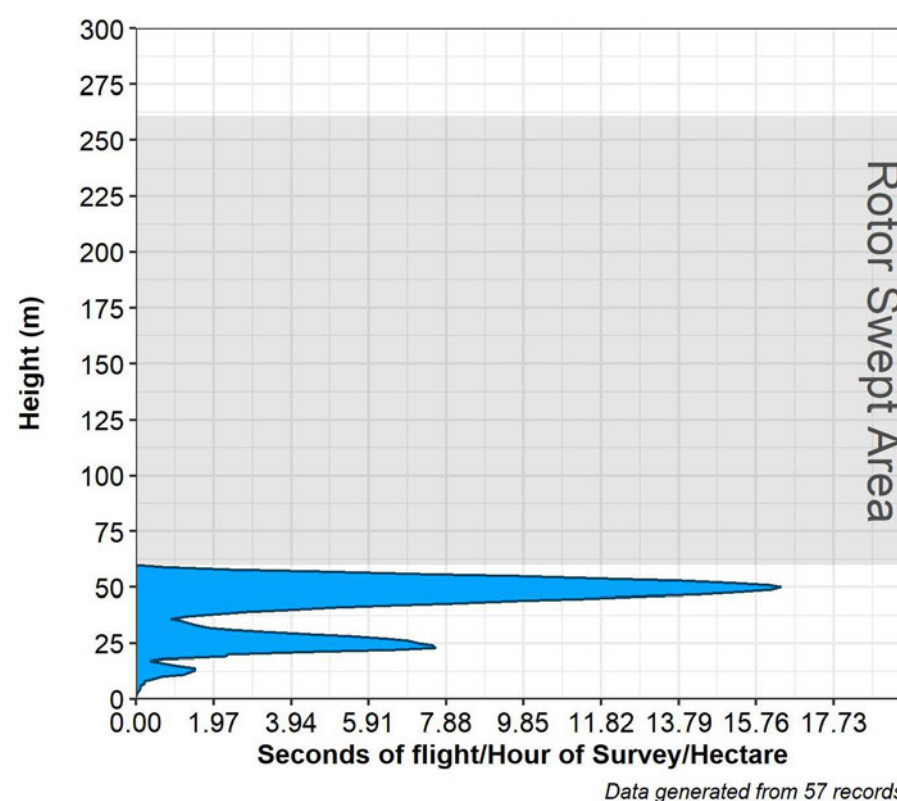
- b) Exposure risk model for Tree Martin (*Petrochelidon nigricans*) built from 59 flight records. The mean convergence of new data is 0.99+/-SD 0.09. This ERM falls within our significance range of 0.95-1.

Welcome Swallow



- c) Exposure risk model for Welcome Swallow (*Hirundo neoxena*) built from 18 flight records. The mean convergence of new data is 0.94+/-SD 0.23. This ERM does not fall within our significance range of 0.95-1. However, with additional sampling, significance may be reached within 2 years of surveys.

Western Corella



- d) Exposure risk model for Western Corella (*Cacatua pastinator*) built from 28 flight records. The mean convergence of new data is 0.98+/-SD 0.09. This ERM falls within our significance range of 0.95-1.

Figure 3.8 ERM's Generated for the Straw-necked Ibis, Tree Martin, Welcome Swallow and Western Corella

3.3 Bat Utilisation Survey

3.3.1 Species Assemblage

A total of seven bat species were detected within the Survey Area during BBUS01 (Spring) and BBUS02 (Summer) with BBUS03 (Autumn) and BBUS04 (Winter) bat call data yet to be analysed. Three call groups were unable to be resolved but represent potential species that have been confirmed and include no conservation significant species. Bat species detected within the Survey Area are presented in **Table 3.9**.

Bat species with the highest call detections were the Southern Forest Bat (*Vespadelus regulus*) (3,439) and Gould's Wattled Bat (*Chalinolobus gouldii*) (2,481).

Table 3.9 Bat Call Detections

Common Name	Scientific Name	Spring	Summer	Total
Gould's Wattled Bat	<i>Chalinolobus gouldii</i>	488	1,993	2,481
Chocolate Wattled Bat	<i>Chalinolobus morio</i>	5	19	24
Lesser Long-eared Bat	<i>Nyctophilus geoffroyi</i>	25	67	92
Inland Broad-nosed Bat	<i>Scotorepens balstoni</i>	2	5	7
Southern Forest Bat	<i>Vespadelus regulus</i>	1,587	1,852	3,439
White-striped Free-tailed Bat	<i>Austronomus australis</i>	162	226	388
Western Free-tailed Bat	<i>Ozimops kitcheneri</i>	20	65	85
Unresolved Calls				
-	<i>C. gouldii</i> or <i>O. kitcheneri</i>	214	1,109	1,323
-	<i>V. regulus</i> or <i>Nyctophilus</i> sp.	27	26	53
-	<i>V. regulus</i> or <i>C. morio</i>	15	-	15

3.3.2 Species of Interest

No conservation significant bat species were detected during either the desktop assessment or the BBUS program as likely or known to occur within the Survey Area.

Although suitable for detection, the method of species identification via passive ultrasonic recordings is unsuitable for determining flight heights. Bat call data collected at the meteorological mast will be analysed as part of the year two BBUS summary report to provide additional information about recorded bat flight heights. However, bat flight heights and behaviours can be deduced based on foraging strategies utilised by species. Species including the White-striped Free-tailed Bat (*Austronomus australis*), Gould's Wattled Bat, and Western Free-tailed Bat (*Ozimops kitcheneri*) forage aerially above the canopy and as such are highly susceptible to injury or mortality as a result of turbines.

3.4 Post-survey Likelihood of Occurrence

Species presented in **Table 3.10** include all 16 conservation significant bird species (i.e. listed under the EPBC Act, BC Act, or as Priority species by DBCA) which were assessed as:

- having a ‘Known’ likelihood of occurrence based on being recorded during field surveys
- having a ‘High’ likelihood of occurring
- having a ‘Moderate’ likelihood of occurring.

No conservation significant bat species met the above criteria.

Likelihood of occurrence assessments reflect the results of the BBUS program completed to date as well as all other vertebrate fauna surveys that have been undertaken (see Umwelt, 2025a, 2025b). Any conservation significant species that were determined as having a ‘Very Low’ or ‘Low’ likelihood of occurrence are excluded. The detailed likelihood of occurrence for all conservation significant species identified during the desktop assessment or field surveys is provided in **Appendix C**.

Table 3.10 Post-survey Likelihood of Occurrence – Bird Species

Common Name	Scientific Name	WA Status	Cth Status	Likelihood of Occurrence
Black-tailed Godwit	<i>Limosa limosa</i>	MI	EN & MI	Known
Blue-billed Duck	<i>Oxyura australis</i>	P4	-	Known
Carnaby's Black-cockatoo	<i>Zanda latirostris</i>	EN	EN	Known
Common Greenshank	<i>Tringa nebularia</i>	MI	EN & MI	Known
Peregrine Falcon	<i>Falco peregrinus</i>	OS	-	Known
Red-necked Stint	<i>Calidris ruficollis</i>	MI	MI	Known
Ruff	<i>Calidris pugnax</i>	MI	MI	Known
Sharp-tailed Sandpiper	<i>Calidris acuminata</i>	MI	VU & MI	Known
Wood Sandpiper	<i>Tringa glareola</i>	MI	MI	Known*
Forest Red-tailed Black-cockatoo	<i>Calyptorhynchus banksii naso</i>	VU	VU	Known
Common Sandpiper	<i>Actitis hypoleucos</i>	MI	MI	High
Curlew Sandpiper	<i>Calidris ferruginea</i>	CR	CR & MI	High
Glossy Ibis	<i>Plegadis falcinellus</i>	MI	MI	High
Pacific Golden Plover	<i>Pluvialis fulva</i>	MI	MI	High
Fork-tailed Swift	<i>Apus pacificus</i>	MI	MI	Moderate
Long-toed Stint	<i>Calidris subminuta</i>	MI	MI	Moderate

Note. *Species recorded during the Basic and Targeted Fauna Assessment (Umwelt, 2025a).

4.0 Conclusion

The BBUS program at the Yathroo Wind Farm comprised four seasonal surveys from 2024-2025 that employed a range of methods to record bird and bat utilisation of the Survey Area. During the BBUS program, a total of 127 bird species and seven bat species were detected. This included nine conservation significant bird species, with Carnaby's Black-cockatoo being the most frequently recorded conservation significant species. The conservation significant bird species recorded within the Survey Area during the BBUS program were:

- Black-tailed Godwit – Endangered under the EPBC Act; Migratory under the EPBC and BC Act.
- Blue-billed Duck – Listed Priority 4 by DBCA.
- Carnaby's Black-cockatoo – Endangered under the EPBC and BC Act.
- Common Greenshank – Endangered under the EPBC Act; Migratory under the EPBC and BC Act.
- Forest Red-tailed Black-cockatoo – Vulnerable under the EPBC and BC Act.
- Peregrine Falcon – Other Specially Protected under the BC Act.
- Red-necked Stint – Migratory under the EPBC and BC Act.
- Ruff – Migratory under the EPBC and BC Act.
- Sharp-tailed Sandpiper – Vulnerable under the EPBC Act; Migratory under the EPBC and BC Act.

Additionally, the Wood Sandpiper (Migratory – EPBC and BC Act) was recorded during the Basic and Targeted Fauna Survey completed in October 2024 and is therefore known to occur within the Survey Area (Umwelt, 2025a). An additional six conservation significant bird species were determined as likely to occur (i.e. a 'High' or 'Moderate' likelihood of occurrence) within the Survey Area based on desktop assessment and BBUS results:

- Common Sandpiper – Migratory under the EPBC and BC Act.
- Curlew Sandpiper – Critically Endangered under the EPBC and BC Act; Migratory under the EPBC Act.
- Glossy Ibis – Migratory under the EPBC and BC Act.
- Pacific Golden Plover – Migratory under the EPBC and BC Act.
- Fork-tailed Swift – Migratory under the EPBC and BC Act.
- Long-toed Stint – Migratory under the EPBC and BC Act.

No conservation significant bat species were detected or assessed as having the potential to occur in the Study Area.

Flight height data collected for birds indicated that most conservation significant species with flight observations flew below RSA. However, a small sample size for the Peregrine Falcon means that definitive conclusions based on the ERM for this species cannot be drawn and expected occurrence at RSA should be supplemented by published literature or additional survey effort. Several raptor and non-listed species were recorded flying within RSA, including Nankeen Kestrel, Wedge-tailed Eagle, and Welcome Swallow.

Habitat mapping identified 12 distinct habitat types within the Survey Area, with cleared agricultural land comprising the majority. Key habitats for conservation significant species include Wetlands, Marri–Jarrah Forest, Flooded Gum Forest, and Banksia Woodland.

These findings will inform impact assessments to support environmental approvals and future monitoring requirements.

5.0 References

- Atlas of Living Australia. (2025). *Atlas of Living Australia Occurrence Dataset* [Database interrogation]. <https://doi.org/10.26197/ala.81ab5fc1-8f96-491a-8cd1-31d409a930d7>
- Australasian Bat Society. (2025). *BatMap* [Database]. <https://www.ausbats.org.au/batmap.html>
- Benshemesh, J. (2007). *National Recovery Plan for Malleefowl *Leipoa ocellata**. Department for Environment and Heritage. <https://www.dcceew.gov.au/sites/default/files/documents/malleefowl.pdf>
- BirdLife Australia. (2023a). *Blue-billed Duck* [Text before updates sourced from: Marchant, S. et al (eds) 1990-2006 Handbook of Australian, New Zealand and Antarctic Birds. Volume 1 to 7.]. BirdLife Australia. <https://hazab.birdlife.org.au/species/blue-billed-duck/>
- BirdLife Australia. (2023b). *Peregrine Falcon* [Text before updates sourced from: Marchant, S. et al (eds) 1990-2006 Handbook of Australian, New Zealand and Antarctic Birds. Volume 1 to 7.]. BirdLife Australia. <https://hazab.birdlife.org.au/species/peregrine-falcon/>
- BirdLife Australia. (2023c). *Red-tailed Black-Cockatoo*. [Text before updates sourced from: Marchant, S. et al (eds) 1990-2006 Handbook of Australian, New Zealand and Antarctic Birds. Volume 1 to 7.]. BirdLife Australia. <https://hazab.birdlife.org.au/species/red-tailed-black-cockatoo/>
- BirdLife Australia. (2025). *Birddata Database* [Database interrogation]. <https://birddata.birdlife.org.au/explore>
- BirdLife International. (2024). *Species factsheet: Far Eastern Curlew *Numenius madagascariensis**. <https://datazone.birdlife.org/species/factsheet/far-eastern-curlew-numenius-madagascariensis>
- Bureau of Meteorology (BOM). (2025). *Climate Data Online* [Database interrogation]. <http://www.bom.gov.au/climate/dwo/IDCJDW6028.latest.shtml>
- Carboneras, C., & Kirwan, G. M. (2020). Blue-billed Duck (*Oxyura australis*), version 1.0. In J. del Hoyo, A. Elliott, J. Sargatal, & E. de Juana (Eds.), *Birds of the World*. Cornell Lab of Ornithology. <https://doi.org/10.2173/bow.blbduc1.01>
- Cornell Lab of Ornithology. (2025). *eBird Database* [Database]. <https://ebird.org/home>
- Department of Biodiversity, Conservation and Attractions (DBCA). (2017). *Ramsar Sites (DBCA-010)*. Spatial data. Last updated 13 September 2017. Department of Biodiversity, Conservation and Attractions (DBCA). <https://catalogue.data.wa.gov.au/dataset/ramsar-sites>
- Department of Biodiversity, Conservation and Attractions (DBCA). (2018a). *Carnabys Cockatoo Confirmed Breeding Areas within the Swan Coastal Plain and Jarrah Forest IBRA Regions (DBCA-054)* [Dataset]. <https://catalogue.data.wa.gov.au/dataset/carnabys-cockatoo-confirmed-breeding-areas>
- Department of Biodiversity, Conservation and Attractions (DBCA). (2018b). *Directory of Important Wetlands in Australia—Western Australia (DBCA-045)*. Spatial data. Last updated 27 April 2018. Department of Biodiversity, Conservation and Attractions (DBCA). <https://catalogue.data.wa.gov.au/dataset/directory-of-important-wetlands-in-western-australia>
- Department of Biodiversity, Conservation and Attractions (DBCA). (2024a). *Black Cockatoo Roosting Sites—Buffered (DBCA-064)* [Dataset]. <https://catalogue.data.wa.gov.au/dataset/black-cockatoo-roosting-sites-buffered>

Department of Biodiversity, Conservation and Attractions (DBCA). (2024b). *DBCA Threatened and Priority Fauna Database*. Database interrogation. Department of Biodiversity, Conservation and Attractions (DBCA).

Department of Biodiversity, Conservation and Attractions (DBCA). (2024c). *NatureMap: DBCA Fauna and Threatened and Priority Fauna Databases*.

Department of Biodiversity, Conservation and Attractions (DBCA). (2025). *Black Cockatoo Breeding Sites—Buffered (DBCA-063)* [Dataset]. <https://catalogue.data.wa.gov.au/dataset/black-cockatoo-breeding-sites-buffered>

Department of Climate Change, Energy, the Environment and Water (DCCEEW). (2023a). *Conservation Advice for *Aphelocephala leucopsis* (Southern Whiteface)*. <https://www.environment.gov.au/biodiversity/threatened/species/pubs/529-conservation-advice-31032023.pdf>

Department of Climate Change, Energy, the Environment and Water (DCCEEW). (2023b). *Interim Biogeographic Regionalisation for Australia (IBRA) Version 7 (Subregions)*. Spatial data. Last updated 17 October 2023. Department of Climate Change, Energy, the Environment and Water (DCCEEW). <https://fed.dcceew.gov.au/datasets/interim-biogeographic-regionalisation-for-australia-ibra-version-7-subregions/>

Department of Climate Change, Energy, the Environment and Water (DCCEEW). (2024a). *Protected Matters Search Tool: Interactive Map*. Interrogation of Species Profile and Threats (SPRAT) Database Using Protected Matters Search Tool. Department of Climate Change, Energy, the Environment and Water (DCCEEW). <https://pmst.awe.gov.au/>

Department of Climate Change, Energy, the Environment and Water (DCCEEW). (2024b). *Zanda baudinii—Baudin’s Cockatoo, Baudin’s Black-Cockatoo, Long-billed Black-cockatoo*. Species Profile and Threats Database. http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=769

Desmond, A. (2001). *Swan Coastal Plain 1 (SWA1—Dandaragan Plateau subregion) (A Biodiversity Audit of Western Australia’s 53 Biogeographical Subregions in 2002, p. 11)*. Department of Conservation and Land Management.

Desmond, A., & Chant, A. (2002). *Geraldton Sandplain 3 (GS3—Lesueur Sandplain subregion) (A Biodiversity Audit of Western Australia’s 53 Biogeographical Subregions in 2002, p. 21)*. Department of Conservation and Land Management. <https://www.dpaw.wa.gov.au/about-us/science-and-research/biologicalsurveys/117-a-biodiversity-audit-of-wa>

Department of Primary Industries and Regional Development (DPIRD). (2019). *Pre-European Vegetation (DPIRD-006)*. Spatial data. Last updated 23 July 2019. Department of Primary Industries and Regional Development (DPIRD). <https://catalogue.data.wa.gov.au/dataset/pre-european-dpird-006>

Department of Primary Industries and Regional Development (DPIRD). (2023). *Native Vegetation Extent (DPIRD-005)*. Spatial data. Last updated 19 June 2023. Department of Primary Industries and Regional Development (DPIRD). <https://catalogue.data.wa.gov.au/dataset/native-vegetation-extent>

Department of Primary Industries and Regional Development (DPIRD). (2025). *Soil landscape mapping—Zones (DPIRD-017)*. Spatial data. Last updated 28 January 2025. Department of Primary

Industries and Regional Development (DPIRD). <https://catalogue.data.wa.gov.au/dataset/soil-landscape-land-quality-zones>

Department of Water and Environmental Regulation (DWER). (2018). *Hydrographic Catchments—Basins (DWER-027)*. Spatial data. Last updated 19 June 2018. Department of Water and Environmental Regulation (DWER). <https://catalogue.data.wa.gov.au/dataset/hydrographic-catchments-basins>

Geering, A., Lindsay, A., & Harding, S. (2007). *Shorebirds of Australia*. CSIRO Publishing.

Gregory, P. (2020). Southern Whiteface (*Aphelocephala leucopsis*), version 1.0. In J. del Hoyo, A. Elliott, J. Sargatal, D. A. Christie, & E. de Juana (Eds.), *Birds of the World*. Cornell Lab of Ornithology. <https://doi.org/10.2173/bow.souwhi1.01>

Higgins, P. J. (1999). *Handbook of Australian, New Zealand and Antarctic Birds. Volume 4: Parrots to Dollarbird*. Oxford University Press.

Higgins, P. J., & Davies, S. J. J. F. (1996). *Handbook of Australian, New Zealand & Antarctic Birds. Volume 3 Snipe to Pigeons*. Oxford University Press.

Johnstone, R. E., & Kirkby, T. (2019). *Black Cockatoo Research Project*. Western Australian Museum. <https://museum.wa.gov.au/sites/default/files/Black%20Cockatoo%20Research%20Project%20-%20Final%20Report%202019%20DOH.pdf>

Johnstone, R. E., Kirkby, T., & Sarti, K. (2017). The Distribution, Status Movements and Diet of the Forest Red-Tailed Black Cockatoo in the South-West with Emphasis on the Greater Perth Region, Western Australia. *The Western Australian Naturalist*, 30(4). <https://museum.wa.gov.au/sites/default/files/2017%20Forest%20Red-tails%20in%20SW%2C%20emphasis%20on%20Perth%20region%20-%20Johnstone%20et%20al%2030%284%29%20with%20cover.pdf>

Johnstone, R. E., & Storr, G. M. (1998). *Handbook of Western Australian Birds Vol. 1: Non-Passerines Emu to Dollarbird* (1st ed.). Western Australian Museum.

Marchant, S., & Higgins, P. J. (1990). *Handbook of Australian, New Zealand & Antarctic Birds. Volume 1 Ratites to Ducks* (Vol. 7).

Marchant, S., & Higgins, P. J. (1993). *Handbook of Australian, New Zealand and Antarctic Birds. Volume 2 Raptors to Lapwings*. Oxford University Press.

Mitchell, K., Williams, K., & Desmond, A. (2002). *Swan Coastal Plain 2 (SWA2 – Swan Coastal Plain subregion) (A Biodiversity Audit of Western Australia's 53 Biogeographical Subregions in 2002, p. 18)*. Department of Conservation and Land Management. <https://www.dpaw.wa.gov.au/about-us/science-andresearch/biological-surveys/117-a-biodiversity-audit-of-wa>

Morcombe, M. (2004). *Field Guide to Australian Birds* (Revised). Steve Parish Publishing.

Nichols, O. G., & Nichols. (1984). The reptilian, avian and mammalian fauna on the Mount Saddleback State Forest, Western Australia. *Western Australian Naturalist*, 15, 179–189.

Pizzey, G., & Knight, F. (2012). *The Field Guide to the Birds of Australia* (9th ed.). Harper Collins.

Pouillot, R., Delignette-Muller, M.-L., Denis, ean-B., Chen, Y., & Havelaar, A. (2024). *mc2d: Tools for Two-Dimensional Monte-Carlo Simulations* (Version 0.2.1) [R]. <https://cran.r-project.org/web/packages/mc2d/index.html>

- Saunders, D. (1974). The Occurrence of the White-Tailed Black Cockatoo, *Calyptrorhynchus baudinii*, in Pinus Plantations in Western Australia. *Wildlife Research*, 1, 45–54.
<https://doi.org/10.1071/WR9740045>
- Saunders, D. (1979). Distribution and Taxonomy of the White-tailed and Yellow-tailed Black-Cockatoos *Calyptrorhynchus* spp. *Emu*, 79(4), 215–227.
- Saunders, D. (1980). Food and Movements of the Short-Billed Form of the White-Tailed Black Cockatoo. *Wildlife Research*, 7(2), 257. <https://doi.org/10.1071/WR9800257>
- Saunders, D. (1986). Breeding-Season, Nesting Success and Nestling Growth in Carnabys Cockatoo, *Calyptrorhynchus-Funereus-Latirostris*, Over 16 Years at Coomallo Creek, and a Method for Assessing the Viability of Populations in Other Areas. *Wildlife Research*, 13(2), 261–273.
<https://doi.org/10.1071/WR9860261>
- Sedgwick, E. H. (1968). A Collie Bird List. *Western Australian Naturalist*, 10(8), 189–194.
- Sedgwick, E. H. (1973). Birds of the Harvey District. *Western Australian Naturalist*, 12(6), 131–139.
- Umwelt. (2025a). *Yathroo Wind Farm: Basic and Targeted Fauna Assessment*. Umwelt (Australia) Pty Ltd. Unpublished report prepared for Neoen Australia Pty Ltd, August 2025.
- Umwelt. (2025b). *Yathroo Wind Farm: Targeted Fauna Habitat Assessment*. Umwelt (Australia) Pty Ltd. In preparation.

Appendix A

Desktop Assessment Results



Table A.1 Desktop Assessment Results – Birds

Family	Common Name	Scientific Name	Introduced / Vagrant	Cth Listing	WA Listing	ALA	BirdLife	DBCA	NatureMap	PMST	Ecologia (2017)
Casuariidae	Emu	<i>Dromaius novaehollandiae</i>				X	X		X		X
Anatidae	Black Swan	<i>Cygnus atratus</i>				X	X		X		
	Freckled Duck	<i>Stictonetta naevosa</i>							X		
	Australian Shelduck (Mountain Duck)	<i>Tadorna tadornoides</i>				X	X		X		
	Pink-eared Duck	<i>Malacorhynchus membranaceus</i>				X	X		X		
	Australian Wood Duck (Wood Duck, Maned Duck)	<i>Chenonetta jubata</i>				X	X		X		
	Australasian Shoveler	<i>Spatula rhynchotis</i>				X	X		X		
	Pacific Black Duck	<i>Anas superciliosa</i>				X	X		X		
	Mallard	<i>Anas platyrhynchos</i>	Introduced			X	X		X		
	Grey Teal	<i>Anas gracilis</i>				X	X		X		
	Chestnut Teal	<i>Anas castanea</i>				X	X		X		
	Hardhead	<i>Aythya australis</i>				X	X		X		
	Blue-billed Duck	<i>Oxyura australis</i>			P4	X	X	X	X		
	Musk Duck	<i>Biziura lobata</i>				X	X		X		
Megapodiidae	Malleefowl	<i>Leipoa ocellata</i>		VU	VU			X	X	X	
Phasianidae	Stubble Quail	<i>Coturnix pectoralis</i>				X	X		X		X
Podargidae	Tawny Frogmouth	<i>Podargus strigoides</i>				X	X				
Aegothelidae	Australian Owlet-nightjar	<i>Aegotheles cristatus</i>				X			X		

Apodidae	Pacific Swift (Fork-tailed Swift)	<i>Apus pacificus</i>	MI	MI				X	
Otididae	Australian Bustard	<i>Ardeotis australis</i>						X	
Cuculidae	Horsfield's Bronze Cuckoo	<i>Chalcites basalis</i>				X	X		
	Black-eared Cuckoo	<i>Chalcites osculans</i>				X			
	Shining Bronze Cuckoo	<i>Chalcites lucidus</i>				X	X		
	Pallid Cuckoo	<i>Heteroscenes pallidus</i>				X	X	X	
	Fan-tailed Cuckoo	<i>Cacomantis flabelliformis</i>				X	X	X	X
Columbidae	Domestic Pigeon (Rock Dove)	<i>Columba livia</i>	Introduced				X		
	Spotted Turtle Dove	<i>Spilopelia chinensis</i>	Introduced			X	X	X	
	Laughing Turtle Dove	<i>Spilopelia senegalensis</i>	Introduced			X	X	X	
	Common Bronzewing	<i>Phaps chalcoptera</i>				X	X	X	X
	Brush Bronzewing	<i>Phaps elegans</i>				X			
	Crested Pigeon	<i>Ocyphaps lophotes</i>				X	X	X	
	Spinifex Pigeon	<i>Geophaps plumifera</i>				X		X	
Rallidae	Black-tailed Nativehen	<i>Tribonyx ventralis</i>				X	X	X	
	Dusky Moorhen	<i>Gallinula tenebrosa</i>				X	X	X	
	Eurasian Coot	<i>Fulica atra</i>				X	X	X	
	Australasian Swamphe	<i>Porphyrio melanotus</i>				X	X	X	
	Spotless Crake	<i>Zapornia tabuensis</i>				X			
Podicipedidae	Australasian Grebe (Black-throated Grebe)	<i>Tachybaptus novaehollandiae</i>				X	X	X	
	Hoary-headed Grebe	<i>Poliocephalus poliocephalus</i>				X	X	X	
	Great Crested Grebe	<i>Podiceps cristatus</i>				X	X		
Turnicidae	Little Buttonquail	<i>Turnix velox</i>				X		X	

Recurvirostridae	Black-winged Stilt	<i>Himantopus himantopus</i>			X	X		X	
	Banded Stilt	<i>Cladorhynchus leucocephalus</i>			X	X		X	
	Red-necked Avocet	<i>Recurvirostra novaehollandiae</i>			X	X		X	
Charadriidae	Banded Lapwing	<i>Vanellus tricolor</i>			X	X		X	
	Red-kneed Dotterel	<i>Erythrogonyx cinctus</i>			X	X		X	
	Pacific Golden Plover	<i>Pluvialis fulva</i>	MI	MI			X	X	
	Red-capped Plover	<i>Charadrius ruficapillus</i>			X	X		X	
	Hooded Plover (Hooded Dotterel)	<i>Thinornis cucullatus</i>			X	X		X	
	Black-fronted Dotterel	<i>Elseyornis melanops</i>			X	X		X	
Rostratulidae	Australian Painted Snipe	<i>Rostratula australis</i>	EN	EN					X
Scolopacidae	Far Eastern Curlew (Eastern Curlew)	<i>Numenius madagascariensis</i>	CR & MI	CR					X
	Bar-tailed Godwit	<i>Limosa lapponica</i>	MI	MI		X			
	Ruddy Turnstone	<i>Arenaria interpres</i>	VU & MI	MI	X				
	Red Knot	<i>Calidris canutus</i>	VU & MI	EN					X
	Ruff	<i>Calidris pugnax</i>	MI	MI		X			
	Sharp-tailed Sandpiper	<i>Calidris acuminata</i>	VU & MI	MI		X	X	X	X
	Curlew Sandpiper	<i>Calidris ferruginea</i>	CR & MI	CR	X	X	X	X	X
	Long-toed Stint	<i>Calidris subminuta</i>	MI	MI		X			
	Red-necked Stint	<i>Calidris ruficollis</i>	MI	MI	X	X	X	X	
	Pectoral Sandpiper	<i>Calidris melanotos</i>	MI	MI		X			X
	Common Sandpiper	<i>Actitis hypoleucos</i>	MI	MI	X	X	X	X	X
	Wood Sandpiper	<i>Tringa glareola</i>	MI	MI	X		X	X	

Laridae	Common Greenshank	<i>Tringa nebularia</i>	EN & MI	MI	X	X	X	X	X
	Silver Gull	<i>Chroicocephalus novaehollandiae</i>			X	X		X	
	Greater Crested Tern (Crested Tern)	<i>Thalasseus bergii</i>	MI	MI	X				
	Fairy Tern	<i>Sternula nereis</i>			X	X			X
	Whiskered Tern	<i>Chlidonias hybrida</i>				X			
Anhingidae	Australasian Darter	<i>Anhinga novaehollandiae</i>			X	X		X	
Phalacrocoracidae	Little Pied Cormorant	<i>Microcarbo melanoleucos</i>			X	X		X	
	Little Black Cormorant	<i>Phalacrocorax sulcirostris</i>			X	X		X	
	Great Cormorant	<i>Phalacrocorax carbo</i>			X	X		X	
Threskiornithidae	Australian White Ibis	<i>Threskiornis molucca</i>			X	X		X	
	Straw-necked Ibis	<i>Threskiornis spinicollis</i>			X	X		X	X
	Glossy Ibis	<i>Plegadis falcinellus</i>	MI	MI		X	X	X	
Ardeidae	Yellow-billed Spoonbill	<i>Platalea flavipes</i>			X	X		X	
	Australasian Bittern	<i>Botaurus poiciloptilus</i>	EN	EN	X		X	X	
	Australian Little Bittern (Black-backed Bittern)	<i>Ixobrychus dubius</i>			X				
	Nankeen Night Heron (Rufous Night Heron)	<i>Nycticorax caledonicus</i>			X	X		X	
	Eastern Cattle Egret	<i>Bubulcus coromandus</i>			X				
	White-necked Heron	<i>Ardea pacifica</i>			X	X		X	
	Great Egret (Eastern Great Egret)	<i>Ardea alba</i>			X	X		X	
	White-faced Heron	<i>Egretta novaehollandiae</i>			X	X		X	X
Pelecanidae	Australian Pelican	<i>Pelecanus conspicillatus</i>			X	X		X	
Pandionidae	Osprey	<i>Pandion haliaetus</i>	MI	MI	X	X		X	X

Accipitridae	Black-shouldered Kite	<i>Elanus axillaris</i>			X	X	X	X
	Square-tailed Kite	<i>Lophoictinia isura</i>			X	X	X	X
	Black-breasted Buzzard	<i>Hamirostra melanosternon</i>					X	
	Little Eagle	<i>Hieraaetus morphnoides</i>			X	X	X	
	Wedge-tailed Eagle	<i>Aquila audax</i>			X	X	X	
	Brown Goshawk	<i>Accipiter fasciatus</i>			X	X	X	
	Collared Sparrowhawk	<i>Accipiter cirrocephalus</i>			X	X		
	Swamp Harrier	<i>Circus approximans</i>			X	X	X	
	Spotted Harrier	<i>Circus assimilis</i>			X	X		
	Black Kite	<i>Milvus migrans</i>			X		X	
	Whistling Kite	<i>Haliastur sphenurus</i>			X	X	X	
	Brahminy Kite	<i>Haliastur indus</i>			X			
Tytonidae	Eastern Barn Owl	<i>Tyto javanica</i>			X	X		
Strigidae	Boobook Owl	<i>Ninox boobook</i>			X	X	X	
Alcedinidae	Laughing Kookaburra	<i>Dacelo novaeguineae</i>	Introduced		X	X	X	X
	Sacred Kingfisher	<i>Todiramphus sanctus</i>			X	X	X	
	Red-backed Kingfisher	<i>Todiramphus pyrrhopygius</i>			X		X	
Meropidae	Rainbow Bee-eater	<i>Merops ornatus</i>			X	X	X	
Falconidae	Australian Kestrel (Nankeen Kestrel)	<i>Falco cenchroides</i>			X	X	X	X
	Australian Hobby	<i>Falco longipennis</i>			X	X	X	X
	Brown Falcon	<i>Falco berigora</i>			X	X	X	
	Grey Falcon	<i>Falco hypoleucos</i>	VU	VU	X			X
	Peregrine Falcon	<i>Falco peregrinus</i>		OS	X	X	X	X
Cacatuidae	Red-tailed Black-Cockatoo	<i>Calyptorhynchus banksii</i>	VU	VU	X	X	X	
	Baudin's Black-Cockatoo	<i>Zanda baudinii</i>	EN	EN	X			

Psittaculidae	Carnaby's Black-Cockatoo	<i>Zanda latirostris</i>	EN	EN	X	X	X	X	X	X
	Galah	<i>Eolophus roseicapilla</i>			X	X		X		X
	Eastern Long-billed Corella	<i>Cacatua tenuirostris</i>	Introduced			X				
	Western Long-billed Corella	<i>Cacatua pastinator</i>			X	X		X		X
	Little Corella	<i>Cacatua sanguinea</i>			X	X		X		
	Regent Parrot	<i>Polytelis anthopeplus</i>			X	X		X		
	Red-capped Parrot	<i>Purpureicephalus spurius</i>			X	X		X		
	Western Rosella	<i>Platycercus icterotis</i>			X		X	X		
	Australian Ringneck	<i>Barnardius zonarius</i>			X	X		X		X
	Scarlet-chested Parrot	<i>Neophema splendida</i>			X					
	Purple-crowned Lorikeet	<i>Parvipsitta porphyrocephala</i>			X			X		
	Rainbow Lorikeet	<i>Trichoglossus moluccanus</i>	Introduced		X	X		X		
	Budgerigar	<i>Melopsittacus undulatus</i>			X			X		
Climacteridae	Rufous Treecreeper	<i>Climacteris rufus</i>				X		X		
Maluridae	Purple-backed Fairywren	<i>Malurus assimilis</i>			X	X		X		X
	Blue-breasted Fairywren	<i>Malurus pulcherrimus</i>			X	X				
	Splendid Fairywren	<i>Malurus splendens</i>			X	X		X		X
	White-winged Fairywren	<i>Malurus leucopterus</i>			X	X		X		
Meliphagidae	Southern Emu-wren	<i>Stipiturus malachurus</i>				X				
	Western Spinebill	<i>Acanthorhynchus superciliosus</i>			X	X		X		
	Crimson Chat	<i>Epthianura tricolor</i>			X	X		X		
	White-fronted Chat	<i>Epthianura albifrons</i>			X	X		X		
	Tawny-crowned Honeyeater	<i>Gliciphila melanops</i>			X	X		X		
	New Holland Honeyeater	<i>Phylidonyris novaehollandiae</i>			X	X		X		X

	White-cheeked Honeyeater	<i>Phylidonyris niger</i>	X	X	X	X
	Brown Honeyeater	<i>Lichmera indistincta</i>	X	X	X	X
	Brown-headed Honeyeater	<i>Melithreptus brevirostris</i>	X	X	X	
	Singing Honeyeater	<i>Gavicalis virescens</i>	X	X	X	X
	Yellow-plumed Honeyeater	<i>Ptilotula ornata</i>	X	X	X	
	Western Little Wattlebird (Western Wattlebird)	<i>Anthochaera lunulata</i>	X	X	X	X
	Red Wattlebird	<i>Anthochaera carunculata</i>	X	X	X	X
	Spiny-cheeked Honeyeater	<i>Acanthagenys rufogularis</i>		X		
	Yellow-throated Miner	<i>Manorina flavigula</i>	X	X	X	X
Pardalotidae	Spotted Pardalote	<i>Pardalotus punctatus</i>	X	X		
	Striated Pardalote	<i>Pardalotus striatus</i>	X	X	X	X
Acanthizidae	Weebill	<i>Smicrornis brevirostris</i>	X	X	X	X
	Rufous Fieldwren	<i>Calamanthus campestris</i>	X	X		
	Shy Groundwren (Shy Heathwren)	<i>Calamanthus cautus</i>		X		
	Spotted Scrubwren	<i>Sericornis maculatus</i>	X	X	X	X
	Western Gerygone	<i>Gerygone fusca</i>	X	X	X	X
	Inland Thornbill (Broad-tailed Thornbill)	<i>Acanthiza apicalis</i>	X	X	X	X
	Western Thornbill	<i>Acanthiza inornata</i>	X	X	X	X
	Yellow-rumped Thornbill	<i>Acanthiza chrysorrhoa</i>	X	X	X	X
	Southern Whiteface	<i>Aphelocephala leucopsis</i>				X
Pomatostomidae	White-browed Babbler	<i>Pomatostomus superciliosus</i>	X	X	X	
Artamidae	Masked Woodswallow	<i>Artamus personatus</i>	X		X	

	Black-faced Woodswallow	<i>Artamus cinereus</i>	X	X	X	X
	Dusky Woodswallow	<i>Artamus cyanopterus</i>	X	X	X	
	Australian Magpie	<i>Gymnorhina tibicen</i>	X	X	X	X
	Grey Butcherbird	<i>Cracticus torquatus</i>	X	X	X	X
	Pied Butcherbird	<i>Cracticus nigrogularis</i>	X	X	X	
	Grey Currawong	<i>Strepera versicolor</i>	X	X	X	
Campephagidae	Black-faced Cuckooshrike	<i>Coracina novaehollandiae</i>	X	X	X	X
	White-winged Triller	<i>Lalage tricolor</i>	X	X		
Neosittidae	Varied Sittella	<i>Daphoenositta chrysoptera</i>	X	X	X	
Oreoicidae	Crested Bellbird	<i>Oreoica gutturalis</i>	X	X	X	
Pachycephalidae	Western Whistler	<i>Pachycephala fuliginosa</i>	X	X	X	
	Rufous Whistler	<i>Pachycephala rufiventris</i>	X	X	X	X
	Grey Shrikethrush	<i>Colluricincla harmonica</i>	X	X	X	X
Rhipiduridae	Willie Wagtail	<i>Rhipidura leucophrys</i>	X	X	X	X
	Grey Fantail	<i>Rhipidura albiscapa</i>	X	X	X	X
Monarchidae	Magpie-lark	<i>Grallina cyanoleuca</i>	X	X	X	X
	Restless Flycatcher	<i>Myiagra inquieta</i>	X	X	X	
Corvidae	Little Crow	<i>Corvus bennetti</i>	X	X	X	
	Australian Raven	<i>Corvus coronoides</i>	X	X	X	X
Petroicidae	White-breasted Robin	<i>Quoyornis georgianus</i>	X	X	X	
	Western Yellow Robin	<i>Eopsaltria griseogularis</i>	X	X	X	
	Jacky Winter	<i>Microeca fascinans</i>	X	X		
	Scarlet Robin	<i>Petroica boodang</i>	X	X	X	
	Red-capped Robin	<i>Petroica goodenovii</i>	X	X	X	
Hirundinidae	White-backed Swallow	<i>Cheramoeca leucosterna</i>	X	X	X	

	Welcome Swallow	<i>Hirundo neoxena</i>			X	X	X	
	Fairy Martin	<i>Petrochelidon ariel</i>			X		X	
	Tree Martin	<i>Petrochelidon nigricans</i>			X	X	X	X
Acrocephalidae	Australian Reed Warbler	<i>Acrocephalus australis</i>			X	X	X	
Locustellidae	Little Grassbird	<i>Poodytes gramineus</i>			X	X	X	
	Brown Songlark	<i>Cincloramphus cruralis</i>			X	X	X	
	Rufous Songlark	<i>Cincloramphus mathewsi</i>			X	X	X	
Zosteropidae	Grey-breasted White-eye (Silvereye)	<i>Zosterops lateralis</i>			X	X	X	X
Dicaeidae	Mistletoebird	<i>Dicaeum hirundinaceum</i>			X	X	X	
Motacillidae	Grey Wagtail	<i>Motacilla cinerea</i>	MI	MI				X
	Australian Pipit	<i>Anthus australis</i>			X	X		X

Note. ALA=Atlas of Living Australia (2025), BirdLife=BirdLife Australia (2025), DBCA=Department of Biodiversity, Conservation, and Attractions (2024b), NatureMap=Department of Biodiversity, Conservation, and Attractions (2024c), PMST=Department of Climate Change, Energy, the Environment, and Water (2024), Ecologia=Ecologia (2017).

Table A.2 Desktop Assessment Results – Bats

Family	Scientific Name	Common Name	Cth Status	WA Status	ALA	BatMap	BirdLife	DBCA	NatureMap	PMST	Ecologia (2017)
Molossidae	White-striped Free-tailed Bat	<i>Austronomus australis</i>				X					
	Western Free-tailed Bat	<i>Ozimops kitcheneri</i>				X					
Vespertilionidae	Gould's Wattled Bat	<i>Chalinolobus gouldii</i>				X			X		
	Chocolate Wattled Bat	<i>Chalinolobus morio</i>				X					
	Lesser Long-eared Bat	<i>Nyctophilus geoffroyi</i>				X			X		
	Inland Broad-nosed Bat	<i>Scotorepens balstoni</i>				X					
	Southern Forest Bat	<i>Vespadelus regulus</i>				X			X		

Appendix B

BBUS Species Records



Table B.1 BBUS Species Records

Family	Common Name	Scientific Name	WA listing	Cth Listing	BBUS01	BBUS02	BBUS03	BBUS04	Total
Casuariidae	Emu	<i>Dromaius novaehollandiae</i>	-	-	3	1		2	6
Anatidae	Black Swan	<i>Cygnus atratus</i>	-	-	2	1	1	6	10
	Australian Shelduck	<i>Tadorna tadornoides</i>	-	-	11	5	6	15	37
	Pink-eared Duck	<i>Malacorhynchus membranaceus</i>	-	-	1	1	3	3	8
	Australian Wood Duck	<i>Chenonetta jubata</i>	-	-	10	2		13	25
	Australasian Shoveler	<i>Spatula rhynchotis</i>	-	-		3	1	3	7
	Pacific Black Duck	<i>Anas superciliosa</i>	-	-	7	2	5	7	21
	Grey Teal	<i>Anas gracilis</i>	-	-	6	3	3	8	20
	Chestnut Teal	<i>Anas castanea</i>	-	-	-	-	1	-	1
	Hardhead	<i>Aythya australis</i>	-	-	2	-	-	5	7
	Blue-billed Duck	<i>Oxyura australis</i>	P4	-	-	1	1	-	2
	Musk Duck	<i>Biziura lobata</i>	-	-	-	2	1	3	6
Phasianidae	Stubble Quail	<i>Coturnix pectoralis</i>	-	-	-	1	-	-	1
Cuculidae	Horsfield's Bronze Cuckoo	<i>Chalcites basalis</i>	-	-	-	-	-	7	7
	Shining Bronze Cuckoo	<i>Chalcites lucidus</i>	-	-	10	-	-	-	10
	Pallid Cuckoo	<i>Heteroscenes pallidus</i>	-	-	-	-	-	6	6
	Fan-tailed Cuckoo	<i>Cacomantis flabelliformis</i>	-	-	6	-	2	1	9
Columbidae	Common Bronzewing	<i>Phaps chalcoptera</i>	-	-	4	3	5	2	14
	Crested Pigeon	<i>Ocyphaps lophotes</i>	-	-	13	6	1	9	29
Rallidae	Dusky Moorhen	<i>Gallinula tenebrosa</i>	-	-	3	-	-	-	3
	Eurasian Coot	<i>Fulica atra</i>	-	-	7	1	2	2	12

Podicipedidae	Australasian Grebe	<i>Tachybaptus novaehollandiae</i>	-	-	-	1	2	5	8
	Hoary-headed Grebe	<i>Poliocephalus poliocephalus</i>	-	-	2	1	1	5	9
Turnicidae	Painted Buttonquail	<i>Turnix varius</i>	-	-	1	-	-	-	1
Recurvirostridae	Pied Stilt	<i>Himantopus himantopus</i>	-	-	3	3	2	4	12
	Banded Stilt	<i>Cladorhynchus leucocephalus</i>	-	-	-	1	-	2	3
	Red-necked Avocet	<i>Recurvirostra novaehollandiae</i>	-	-	-	1	2	2	5
Charadriidae	Banded Lapwing	<i>Vanellus tricolor</i>	-	-	-	-	4	-	4
	Red-kneed Dotterel	<i>Erythronyx cinctus</i>	-	-	-	-	1	-	1
	Red-capped Plover	<i>Charadrius ruficapillus</i>	-	-	-	2	2	-	4
	Black-fronted Dotterel	<i>Elseya melanops</i>	-	-	2	2	2	2	8
Scolopacidae	Black-tailed Godwit	<i>Limosa limosa</i>	MI	EN, MI	-	1	-	-	1
	Ruff	<i>Calidris pugnax</i>	MI	MI	-	1	-	-	1
	Sharp-tailed Sandpiper	<i>Calidris acuminata</i>	MI	VU, MI	-	1	-	-	1
	Red-necked Stint	<i>Calidris ruficollis</i>	MI	MI	-	1	-	-	1
	Common Greenshank	<i>Tringa nebularia</i>	MI	EN, MI	-	1	-	-	1
Laridae	Silver Gull	<i>Chroicocephalus novaehollandiae</i>	-	-	1	1	1	3	6
Anhingidae	Australasian Darter	<i>Anhinga novaehollandiae</i>	-	-	2	-	-	-	2
Phalacrocoracidae	Little Pied Cormorant	<i>Microcarbo melanoleucos</i>	-	-	7	1	1	-	9
	Little Black Cormorant	<i>Phalacrocorax sulcirostris</i>	-	-	3	-	-	1	4
Threskiornithidae	Australian White Ibis	<i>Threskiornis molucca</i>	-	-	-	-	1	-	1
	Straw-necked Ibis	<i>Threskiornis spinicollis</i>	-	-	8	-	4	4	16
	Yellow-billed Spoonbill	<i>Platalea flavipes</i>	-	-	2	2	3	-	7
Ardeidae	Nankeen Night Heron	<i>Nycticorax caledonicus</i>	-	-	1	-	-	-	1
	White-necked Heron	<i>Ardea pacifica</i>	-	-	-	-	-	1	1
	White-faced Heron	<i>Egretta novaehollandiae</i>	-	-	9	12	1	5	27

Pelecanidae	Australian Pelican	<i>Pelecanus conspicillatus</i>	-	-	-	2	1	-	3
Accipitridae	Black-shouldered Kite	<i>Elanus axillaris</i>	-	-	1	1	1	1	4
	Little Eagle	<i>Hieraaetus morphnoides</i>	-	-	2	1	-	1	4
	Wedge-tailed Eagle	<i>Aquila audax</i>	-	-	8	8	11	1	28
	Brown Goshawk	<i>Accipiter fasciatus</i>	-	-	-	1	-	-	1
	Swamp Harrier	<i>Circus approximans</i>	-	-	7	-	-	-	7
	Spotted Harrier	<i>Circus assimilis</i>	-	-	-	1	-	-	1
	Whistling Kite	<i>Haliastur sphenurus</i>	-	-	6	2	11	10	29
	Boobook Owl	<i>Ninox boobook</i>	-	-	-	1	-	-	1
Alcedinidae	Laughing Kookaburra	<i>Dacelo novaeguineae</i>	-	-	14	9	21	26	70
	Sacred Kingfisher	<i>Todiramphus sanctus</i>	-	-	3	-	-	-	3
Meropidae	Rainbow Bee-eater	<i>Merops ornatus</i>	-	-	-	22	-	-	22
Falconidae	Nankeen Kestrel	<i>Falco cenchroides</i>	-	-	60	18	5	7	90
	Australian Hobby	<i>Falco longipennis</i>	-	-	-	1	-	1	2
	Brown Falcon	<i>Falco berigora</i>	-	-	2	-	-	-	2
	Peregrine Falcon	<i>Falco peregrinus</i>	OS	-	1	1	1	6	9
Cacatuidae	Forest Red-tailed Black-Cockatoo	<i>Calyptorhynchus banksii naso</i>	VU	VU	-	-	-	4	4
	Carnaby's Black-Cockatoo	<i>Zanda latirostris</i>	EN	EN	32	9	6	9	56
	Galah	<i>Eolophus roseicapilla</i>	-	-	103	44	59	84	290
	Western Corella	<i>Cacatua pastinator</i>	-	-	18	19	46	35	118
	Little Corella	<i>Cacatua sanguinea</i>	-	-	53	-	6	4	63
	Corella sp.	-	-	-	-	-	5	39	44
Psittaculidae	Regent Parrot	<i>Polytelis anthopeplus</i>	-	-	1	-	1	-	2
	Red-capped Parrot	<i>Purpleicephalus spurius</i>	-	-	5	2	5	5	17
	Australian Ringneck	<i>Barnardius zonarius</i>	-	-	78	80	114	143	415

Maluridae	Purple-backed Fairywren	<i>Malurus assimilis</i>	-	-	2	-	10	1	13
	Splendid Fairywren	<i>Malurus splendens</i>	-	-	10	14	17	15	56
	White-winged Fairywren	<i>Malurus leucopterus</i>	-	-	6	3	8	1	18
	Southern Emu-wren	<i>Stipiturus malachurus</i>	-	-	-	-	1	-	1
Meliphagidae	Western Spinebill	<i>Acanthorhynchus superciliosus</i>	-	-	1	-	1	-	2
	White-fronted Chat	<i>Epthianura albifrons</i>	-	-	-	2	7	11	20
	Tawny-crowned Honeyeater	<i>Gliciphila melanops</i>	-	-	-	-	4	1	5
	Pied Honeyeater	<i>Certhionyx variegatus</i>	-	-	-	-	-	1	1
	New Holland Honeyeater	<i>Phylidonyris novaehollandiae</i>	-	-	-	-	1	-	1
	White-cheeked Honeyeater	<i>Phylidonyris niger</i>	-	-	-	-	2	6	8
	Brown Honeyeater	<i>Lichmera indistincta</i>	-	-	4	13	21	39	77
	Singing Honeyeater	<i>Gavicalis virescens</i>	-	-	8	7	8	8	31
	Western Wattlebird	<i>Anthochaera lunulata</i>	-	-	1	-	-	-	1
	Red Wattlebird	<i>Anthochaera carunculata</i>	-	-	8	4	28	16	56
	Yellow-throated Miner	<i>Manorina flavigula</i>	-	-	3	2	2	9	16
Pardalotidae	Spotted Pardalote	<i>Pardalotus punctatus</i>	-	-	-	-	28	15	43
	Striated Pardalote	<i>Pardalotus striatus</i>	-	-	15	5	35	11	66
Acanthizidae	Weebill	<i>Smicrornis brevirostris</i>	-	-	3	5	16	16	40
	Rufous Fieldwren	<i>Calamanthus campestris</i>	-	-	-	-	2	3	5
	Western Fieldwren	<i>Calamanthus campestris</i>	-	-	-	-	-	1	1
	Spotted Scrubwren	<i>Sericornis maculatus</i>	-	-	-	1	3	-	4
	Western Gerygone	<i>Gerygone fusca</i>	-	-	25	22	48	34	129
	Inland Thornbill	<i>Acanthiza apicalis</i>	-	-	2	2	16	4	24
	Western Thornbill	<i>Acanthiza inornata</i>	-	-	-	1	4	5	10
	Yellow-rumped Thornbill	<i>Acanthiza chrysorrhoa</i>	-	-	7	35	38	31	111

Pomatostomidae	White-browed Babbler	<i>Pomatostomus superciliosus</i>	-	-	-	1	-	-	1
Cinclosomatidae	Western Chestnut Quail-thrush	<i>Cinclosoma clarum</i>	-	-	-	-	-	2	2
Artamidae	Black-faced Woodswallow	<i>Artamus cinereus</i>	-	-	3	1	3	5	10
	Australian Magpie	<i>Gymnorhina tibicen</i>	-	-	44	27	60	55	186
	Grey Butcherbird	<i>Cracticus torquatus</i>	-	-	18	8	21	15	62
	Pied Butcherbird	<i>Cracticus nigrogularis</i>	-	-	14	10	2	35	61
Campephagidae	Black-faced Cuckooshrike	<i>Coracina novaehollandiae</i>	-	-	19	11	22	20	72
Neosittidae	Varied Sittella	<i>Daphoenositta chrysoptera</i>	-	-	-	-	-	1	1
Oreoicidae	Crested Bellbird	<i>Oreoica gutturalis</i>	-	-	1	-	-	-	1
Pachycephalidae	Western Whistler	<i>Pachycephala fuliginosa</i>	-	-	-	-	-	5	5
	Rufous Whistler	<i>Pachycephala rufiventris</i>	-	-	20	12	42	19	93
	Grey Shrikethrush	<i>Colluricincla harmonica</i>	-	-	2	-	4	11	17
Rhipiduridae	Willie Wagtail	<i>Rhipidura leucophrys</i>	-	-	28	15	20	19	82
	Grey Fantail	<i>Rhipidura albiscapa</i>	-	-	2	22	77	60	161
Monarchidae	Magpie-lark	<i>Grallina cyanoleuca</i>	-	-	10	18	26	39	93
	Restless Flycatcher	<i>Myiagra inquieta</i>	-	-	-	-	-	1	1
Corvidae	Torresian Crow	<i>Corvus orru</i>	-	-	-	-	-	2	2
	Little Crow	<i>Corvus bennetti</i>	-	-	2	-	-	-	2
	Australian Raven	<i>Corvus coronoides</i>	-	-	70	49	93	58	270
	Corvid sp.	-	-	-	-	-	-	16	16
Petroicidae	White-breasted Robin	<i>Quoyornis georgianus</i>	-	-	1	-	-	-	1
	Jacky Winter	<i>Microeca fascinans</i>	-	-	-	-	-	2	2
	Scarlet Robin	<i>Petroica boodang</i>	-	-	-	3	14	14	31
	Red-capped Robin	<i>Petroica goodenovii</i>	-	-	1	-	20	13	34

Hirundinidae	White-backed Swallow	<i>Cheramoeca leucosterna</i>	-	-	4	1	-	5	10
	Welcome Swallow	<i>Hirundo neoxena</i>	-	-	13	-	18	16	47
	Fairy Martin	<i>Petrochelidon ariel</i>	-	-	-	-	-	2	2
	Tree Martin	<i>Petrochelidon nigricans</i>	-	-	4	41	34	32	111
Locustellidae	Little Grassbird	<i>Poodytes gramineus</i>	-	-	1	-	-	-	1
	Brown Songlark	<i>Cincloramphus cruralis</i>	-	-	9	-	-	-	9
Zosteropidae	Silvereye	<i>Zosterops lateralis</i>	-	-	3	21	20	10	54
Motacillidae	Australian Pipit	<i>Anthus australis</i>	-	-	27	3	7	10	47
-	Raptor sp.	-	-	-	-	1	-	1	2
Total-					911	646	1,135	1,198	3,890

Appendix C

Detailed Likelihood of Occurrence

Appendix Table C.1 Detailed Conservation Significant Species' Likelihood of Occurrence

Scientific Name	Common Name	Cth Listing	WA Listing	ALA	BirdLife	DBCA	NatureMap	PMST	Ecologia	Recorded During Survey	Habitat Requirements	Likelihood of Occurrence
Known												
<i>Oxyura australis</i>	Blue-billed Duck	-	P4	X	X	X	X			X	The species is found on terrestrial wetlands in temperate regions, that are freshwater to saline with extensive bordering vegetation such as reedbeds or other dense vegetation, and waterbodies may be natural or artificial (Carboneras & Kirwan, 2020). It nests in rushes, sedges, Lignum <i>Muehlenbeckia cunninghamii</i> and paperbark Melaleuca (BirdLife Australia, 2023a).	The Blue-billed Duck was recorded on two occasions during the Summer and Autumn BBUS events. The species is likely to use wetland habitats within the Study Area during both the breeding and non-breeding season.
<i>Limosa limosa</i>	Black-tailed Godwit	EN & MI	MI		X					X	The Black-tailed Godwit is a non-breeding migrant to Australia. In Australia the Black-tailed Godwit occupies a primarily coastal habitat. The species is commonly found in sheltered bays, estuaries and lagoons with large intertidal mudflats or sandflats, or spits and banks of mud, sand or shell-grit; occasionally recorded on rocky coasts or coral islets. It is also found in shallow and sparsely vegetated, near coastal, wetlands, such as saltmarsh, salt flats, river pools, swamps, lagoons and floodplains. There are a few inland records, around shallow, freshwater and saline lakes, swamps, dams and bore-overflows. They also use lagoons in sewage farms and saltworks (Higgins & Davies, 1996).	A single Black-tailed Godwit was recorded during the Summer BBUS event. The species may use wetland habitats within the Study Area during the non-breeding season.
<i>Calidris pugnax</i>	Ruff	MI	MI		X					X	The Ruff is a rare but regular visitor to Australia, being recorded in all States and Territories. In Australia it is found on generally fresh, brackish of saline wetlands with exposed mudflats at the edges. It can also be found in terrestrial wetlands including lakes, swamps, pools, lagoons, tidal rivers, swampy fields and flood lands, and occasionally on sheltered coasts, in harbours, estuaries and seashores. They have been known to visit sewage farms and saltworks (Higgins & Davies, 1996).	A single Ruff was recorded during the Summer BBUS event. The species may use wetland habitats within the Study Area during the non-breeding season.
<i>Calidris acuminata</i>	Sharp-tailed Sandpiper	VU & MI	MI		X	X	X	X		X	The Sharp-tailed Sandpiper is a non-breeding migrant to Australia. In Australia, they prefer muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation. This includes lagoons, swamps, lakes and pools near the coast, and dams, waterholes, soaks, bore drains and bore swamps, saltpans and hypersaline saltlakes inland and have been recorded on saltworks and sewage farms. They have been recorded on flooded paddocks, sedgeland and other ephemeral wetlands, leaving when they dry. Other habitats include intertidal mudflats in sheltered bays, inlets, estuaries or seashores, and also swamps and creeks lined with mangroves. They tend to occupy coastal mudflats mainly after ephemeral terrestrial wetlands have dried out, moving back during the wet season. Sometimes they occur on rocky shores and rarely on exposed reefs (Higgins & Davies, 1996).	The Sharp-tailed Sandpiper was recorded during the Summer BBUS event. The species may use wetland habitats within the Study Area during the non-breeding season.
<i>Calidris ruficollis</i>	Red-necked Stint	MI	MI	X	X	X	X			X	The Red-necked Stint is a non-breeding migrant to Australia. Here, it is mostly found in coastal areas, including in sheltered inlets, bays, lagoons and estuaries with intertidal mudflats, often near spits, islets and banks and, sometimes, on protected sandy or coralline shores. Occasionally they have been recorded on exposed or ocean beaches, and sometimes on stony or rocky shores, reefs or shoals. They have also been recorded on saltworks and sewage farms; saltmarsh; ephemeral or permanent shallow wetlands near the coast or inland, including lagoons, lakes, swamps, riverbanks, waterholes, bore drains, dams,	The Red-necked Stint was recorded during the Summer BBUS event. The species may use wetland habitats within the Study Area during the non-breeding season.

Scientific Name	Common Name	Cth Listing	WA Listing	ALA	BirdLife	DBCA	NatureMap	PMST	Ecologia	Recorded During Survey	Habitat Requirements	Likelihood of Occurrence
<i>Tringa glareola</i>	Wood Sandpiper	MI	MI	X		X	X			X	soaks and pools in saltflats. They sometimes use flooded paddocks or damp grasslands and have occasionally been recorded on dry gibber plains, with little or no perennial vegetation (Higgins & Davies, 1996). The Wood Sandpiper uses well-vegetated, shallow, freshwater wetlands, such as swamps, billabongs, lakes, pools and waterholes. They are typically associated with emergent, aquatic plants or grass, and dominated by taller fringing vegetation, such as dense stands of rushes or reeds, shrubs, or dead or live trees, especially Melaleuca and River Red Gums Eucalyptus camaldulensis and often with fallen timber. They have also been known to frequent inundated grasslands, short herbage or wooded floodplains, where floodwaters are temporary or receding, and irrigated crops. This species has been recorded using artificial wetlands, including open sewage ponds, reservoirs, large farm dams, and bore drains (Higgins & Davies, 1996).	The Wood Sandpiper was recorded during the Basic and Targeted Fauna Survey in Spring 2024. The species may use wetland habitats within the Study Area during the non-breeding season.
<i>Tringa nebularia</i>	Common Greenshank	EN & MI	MI	X	X	X	X	X		X	The Common Greenshank does not breed in Australia; however, the species occurs in all types of wetlands in Australia (Higgins & Davies, 1996). It occurs in sheltered coastal habitats, typically with large mudflats and saltmarsh, mangroves or seagrass. Habitats include embayments, harbours, river estuaries, deltas and lagoons and are recorded less often in round tidal pools, rock-flats and rock platforms. The species uses both permanent and ephemeral terrestrial wetlands, including swamps, lakes, dams, rivers, creeks, billabongs, waterholes and inundated floodplains, claypans and saltflats. It will also use artificial wetlands, including sewage farms and saltworks dams, inundated rice crops and bores (Higgins & Davies, 1996).	A single Common Greenshank was recorded during the Summer BBUS event. The species may use wetland habitats within the Study Area during the non-breeding season.
<i>Falco peregrinus</i>	Peregrine Falcon	-	OS	X	X	X	X			X	The Peregrine Falcon is uncommon but wide-ranging across Australia. Habitat is extremely diverse, from rainforest to arid scrub, from coastal heath to alpine. Habitat consists of cliffs, gorges, timbered watercourses, riverine, wetland plains, open woodlands, pylons, spires and buildings (Pizzey & Knight 2021; Morcombe 2004).	The Peregrine Falcon has been recorded during every BBUS event undertaken to date. The species may use all habitats within the Study Area for foraging and dispersal and may breed in areas with tall trees.
<i>Calyptrorhynchus banksii naso</i>	Forest Red-tailed Black-cockatoo	VU	VU	X	X		X			X	The species inhabits the dense <i>Eucalyptus marginata</i> (Jarrah), <i>E. diversicolor</i> (Karri) and <i>Corymbia calophylla</i> (Marri) forests, using hollows of mature trees as nesting sites.	The Forest Red-tailed Black-Cockatoo was recorded during the Winter BBUS event and Basic and Targeted Fauna Survey. The species may use eucalypt woodland or banksia woodland habitats for foraging and roost in tall trees near water sources.
<i>Zanda latirostris</i>	Carnaby's Black-Cockatoo	EN	EN	X	X	X	X	X	X	X	Carnaby's Cockatoo is endemic to, and widespread in, the south-west of Western Australia. Breeding mainly occurs in the wheatbelt, from the Stirling Ranges north-west to near Three Springs, but has also been recorded on the coastal plain to the south-west, around Bunbury (Higgins 1999; Saunders 1974). Carnaby's Cockatoo occurs in uncleared or remnant native eucalypt woodlands, especially those that contain salmon gum and wandoo, and in shrubland or Kwongan heathland dominated by hakea, dryandra, banksia and grevillea species. It also occurs in remnant patches of native vegetation on land otherwise cleared for agriculture (Saunders 1974, 1986). The species forages seasonally in pine plantations in areas that receive high rainfall, e.g. the Swan	The Carnaby's Black-Cockatoo has been recorded during every BBUS event undertaken to date. The species may use eucalypt woodland, banksia woodland, and pine plantation habitats for foraging and roost in tall trees near water sources. The species may also use mature Marri and Flooded Gum trees scattered in paddocks or in remnant vegetation (Marri-Jarrah Forest and Flooded Gum Forest habitats) for nesting.

Scientific Name	Common Name	Cth Listing	WA Listing	ALA	BirdLife	DBCA	NatureMap	PMST	Ecologia	Recorded During Survey	Habitat Requirements	Likelihood of Occurrence
											Coastal Plain (Saunders 1974; Sedgwick 1968, 1973) and around the Perth metropolitan area on both native and non-native plants, such as liquid amber. It also forages in forests containing marri, jarrah or karri (Nichols & Nichols 1984; Saunders 1980).	
High												
<i>Pluvialis fulva</i>	Pacific Golden Plover	MI	MI			X	X				Within Australia, the Pacific Golden Plover is widespread in coastal regions, though there are also several inland records (in all states), sometimes far inland and usually along major river systems. In non-breeding grounds in Australia, they usually inhabit coastal habitats, and occasionally around inland wetlands. Pacific Golden Plovers usually occur on beaches, mudflats and sandflats (including vegetation such as mangroves, low saltmarsh such as <i>Sarcocornia</i> , or beds of seagrass) in sheltered areas including harbours, estuaries and lagoons, and in evaporation ponds in saltworks. They have also been recorded on islands, sand and coral cays and exposed reefs and rocks. They are less often recorded in terrestrial habitats, usually wetlands such as fresh, brackish or saline lakes, billabongs, pools, swamps and wet claypans, especially those with muddy margins and often with submerged vegetation or short emergent grass. Other terrestrial habitats inhabited include short (or, occasionally, long) grass in paddocks, crops or airstrips, or ploughed or recently burnt areas, and they are very occasionally recorded well away from water (Marchant & Higgins 1993).	The Pacific Golden Plover was detected from DBCA and NatureMap databases. The DBCA record was within the Study Area and is dated from 1991. The species may use wetland habitats within the Study Area during the non-breeding season.
<i>Calidris ferruginea</i>	Curlew Sandpiper	CR & MI	CR	X	X	X	X	X			The Curlew Sandpiper is a non-breeding migrant to Australia. In Australia, they mainly occur on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and around non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms. They have also been recorded inland, though less often, including around ephemeral and permanent lakes, dams, waterholes and bore drains, usually with bare edges of mud or sand. They occur in both fresh and brackish waters and forage at the edges of shallow pools and drains of intertidal mudflats and sandy shores. Curlew Sandpipers generally roost on bare dry shingle, shell or sand beaches, sandspits and islets in or around coastal or near-coastal lagoons and other wetlands, occasionally roosting in dunes during very high tides and sometimes in saltmarsh (Higgins & Davies, 1996).	The Curlew Sandpiper was detected from all database searches. The DBCA record was within the Study Area and is dated from 1991. The species may use wetland habitats within the Study Area during the non-breeding season.
<i>Actitis hypoleucos</i>	Common Sandpiper	MI	MI	X	X	X	X	X			The Common Sandpiper is a non-breeding visitor to Australia and can be found along all Australian coastlines and many inland areas. Habitats frequented by the Common Sandpiper include coastal and inland wetlands, estuaries and deltas of streams, mangroves, around lakes, pools, billabongs, reservoirs, dams and claypans, and occasionally piers and jetties (Geering et al., 2007; Higgins & Davies, 1996). Foraging habitat includes shallow water and on bare soft mud at the edges of wetlands, but sometimes into grassy areas adjoining wetlands (Higgins & Davies, 1996). Roost sites are typically on rocks or in roots or branches of vegetation, especially mangroves. The species is known to perch on posts, jetties, moored boats and other artificial structures, and to sometimes rest on mud or 'loaf' on rocks (Higgins & Davies, 1996).	The Common Sandpiper was detected from all database searches. The DBCA record was within the Study Area and is dated from 1990. The species may use wetland habitats within the Study Area during the non-breeding season.

Scientific Name	Common Name	Cth Listing	WA Listing	ALA	BirdLife	DBCA	NatureMap	PMST	Ecologia	Recorded During Survey	Habitat Requirements	Likelihood of Occurrence
<i>Plegadis falcinellus</i>	Glossy Ibis	MI	MI		X	X	X				Within Australia, the Glossy Ibis is generally located east of the Kimberley in Western Australia and Eyre Peninsula in South Australia. The species is also known to be patchily distributed in the rest of Western Australia. Their preferred habitat for foraging and breeding are freshwater marshes at the edges of lakes and rivers, lagoons, flood-plains, wet meadows, swamps, reservoirs, sewage ponds, rice-fields and cultivated areas under irrigation. The species is occasionally found in coastal locations such as estuaries, deltas, saltmarshes and coastal lagoons. Within Australia, the largest contiguous areas of prime habitat are inland and northern floodplains (Marchant & Higgins, 1990).	The Glossy Ibis was detected from the BirdLife, DBCA, and NatureMap databases. One recorded from the DBCA database is located within the Study Area from 1990, and another is from 1999 and is approximately 17 km from the Study Area. The species may use wetland habitats within the Study Area and flooded pastures or other wet areas during the non-breeding season.
Moderate												
<i>Apus pacificus</i>	Fork-tailed Swift	MI	MI					X			The Fork-tailed Swift is a non-breeding visitor to all states and territories of Australia, with scattered records along the coast of the Pilbara. This species is almost exclusively aerial and has been observed over inland plains, above foothills and in coastal areas in Australia. They have seldom been observed roosting on trees or the ground, and are thought to roost aerially. They often occur in areas of updraughts, such as along cliffs and have been overserved from less than 1 m to at least 300 m above the ground (Higgins, 1999).	The species was detected from the PMST database only during the desktop assessment. An ad-hoc review of the Cornell Lab of Ornithology (2025) eBird database has identified a record 30 km southwest of the Study Area in Lancelin from April 2025. The record is considered to have low–moderate reliability, but it is considered likely the species may occasionally utilise the airspace above the Study Area for foraging or dispersing, particularly during favourable conditions.
<i>Calidris subminuta</i>	Long-toed Stint	MI	MI		X						The Long-toed Stint is a summer visitor to Australia where it occurs in a variety of terrestrial wetlands. They prefer shallow freshwater or brackish wetlands including lakes, swamps, river floodplains, streams, lagoons and sewage ponds. The species is also fond of areas of muddy shoreline, growths of short grass, weeds, sedges, low or floating aquatic vegetation, reeds, rushes and occasionally stunted samphire. It has also been observed at open, less vegetated shores of larger lakes and ponds and is common on muddy fringes of drying ephemeral lakes and swamps (Higgins & Davies, 1996). The Long-toed Stint forages on wet mud or in shallow water, often among short grass, weeds and other vegetation on islets or around the edges of wetlands. They occasionally feed on open water, well away from the shore although this is more common in drying ephemeral wetlands. They roost or loaf in sparse vegetation at the edges of wetlands and on damp mud near shallow water, and in small depressions in the mud (Higgins & Davies, 1996).	The Long-toed Stint was detected from the BirdLife database and suitable habitat is present within the Study Area. The species may use wetland habitats within the Study Area occasionally during the non-breeding season.
Low												
<i>Limosa lapponica</i>	Bar-tailed Godwit	MI	MI		X						The Bar-tailed godwit usually forages at the edge of water or in shallow water within tidal estuaries and harbours. Roosting tends to occur on large intertidal sandflats, spits and banks. Nest is a depression on a dry elevated site such as hummock, often between clumps of grass or under thickets.	The Bar-tailed Godwit was only detected from the BirdLife database. There are no other records within a 20 km radius, and the species prefers coastal habitats which do not occur within the Study Area.
<i>Calidris canutus</i>	Red Knot	VU & MI	EN					X			The Red Knot is a non-breeding migrant to Australia. In Australasia it mainly inhabits intertidal mudflats, sandflats and sandy beaches of sheltered coasts, in	The Red Knot was only detected from the PMST database. The Study Area may only

Scientific Name	Common Name	Cth Listing	WA Listing	ALA	BirdLife	DBCA	NatureMap	PMST	Ecologia	Recorded During Survey	Habitat Requirements	Likelihood of Occurrence
<i>Calidris melanotos</i>	Pectoral Sandpiper	MI	MI		X			X			estuaries, bays, inlets, lagoons and harbours; sometimes on sandy ocean beaches or shallow pools on exposed wave-cut rock platforms or coral reefs. They are occasionally seen on terrestrial saline wetlands near the coast, such as lakes, lagoons, pools and pans, and recorded on sewage ponds and saltworks, but rarely use freshwater swamps. They rarely use inland lakes or swamps (Higgins & Davies, 1996).	provide marginal habitat for this species and is considered unlikely to support the species regularly.
<i>Pandion haliaetus</i>	Osprey	MI	MI								The Pectoral Sandpiper is a non-breeding visitor to Australia. In Australasia, it prefers shallow fresh to saline wetlands and has been recorded at coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands. The species is usually found in coastal or near coastal habitat but occasionally found further inland. It prefers wetlands that have open fringing mudflats and low, emergent or fringing vegetation, such as grass or samphire. They forage in shallow water or soft mud at the edge of wetlands (Higgins & Davies, 1996).	The Pectoral Sandpiper was detected from the BirdLife database and PMST database. The Study Area may only provide marginal habitat for this species and is considered unlikely to support the species regularly.
<i>Falco hypoleucos</i>	Grey Falcon	VU	VU	X	X		X	X			The Osprey occur in littoral and coastal habitats and terrestrial wetlands of tropical and temperate Australia and offshore islands. They are mostly found in coastal areas but occasionally travel inland along major rivers, particularly in northern Australia. They require extensive areas of open fresh, brackish or saline water for foraging (Marchant & Higgins, 1993). They frequent a variety of wetland habitats including inshore waters, reefs, bays, coastal cliffs, beaches, estuaries, mangrove swamps, broad rivers, reservoirs and large lakes and waterholes. They exhibit a preference for coastal cliffs and elevated islands in some parts of their range, but may also occur on low sandy, muddy or rocky shores and over coral cays.	The Osprey was detected from the ALA, BirdLife, NatureMap and PMST databases. However, the Study Area may only provide scattered marginal habitat for the species and is considered unlikely to regularly support the species.
<i>Falco hypoleucos</i>	Grey Falcon	VU	VU	X				X			The Grey Falcon inhabits lightly timbered inland plains, especially stony plains and lightly timbered acacia scrubland, and along inland drainage systems (Morcombe, 2004; Pizzey & Knight, 2012). They also occur in gibber deserts, sand ridges, pastoral lands, timbered watercourses and seldom in the driest deserts (Pizzey & Knight, 2012). This species is considered scarce to rare and is usually found singularly or sometimes in pairs (Morcombe, 2004).	The Grey Falcon was detected from the ALA and PMST databases. The species is rarely recorded within the region and is considered unlikely to occur within the Study Area.
Very Low												
<i>Arenaria interpres</i>	Ruddy Turnstone	VU & MI	MI		X						The Ruddy Turnstone is a non-breeding migrant to Australia, being common throughout and widespread within the country. It is mainly found on coastal regions with exposed rock coastlines or coral reefs. It also inhabits platforms and shelves, often with shallow tidal pools and rocky, shingle or gravel beaches. It has also been found on sand, coral or shell beaches, shoals, cays and dry ridges of sand or coral, along estuaries, harbours, bays and coastal lagoons, among low saltmarsh or on exposed beds of seagrass, around sewage ponds and on mudflats (Higgins & Davies, 1996).	The Ruddy Turnstone was only detected from the ALA database and habitat within the Study Area is considered unlikely to support the species.
<i>Botaurus poiciloptilus</i>	Australasian Bittern	EN	EN	X		X	X				The Australasian Bittern's preferred habitat is freshwater wetlands and rarely in estuaries or tidal wetlands. with tall dense vegetation. It favours permanent and seasonal freshwater habitats, particularly those dominated by sedges, rushes and reeds (e.g. <i>Phragmites</i> , <i>Cyperus</i> , <i>Eleocharis</i> , <i>Juncus</i> , <i>Typha</i> , <i>Baumea</i> , <i>Bolboschoenus</i>) or cutting grass (<i>Gahnia</i>) growing over a muddy or peaty	The Australasian Bittern was detected from ALA, DBCA, and NatureMap databases. Spatial occurrences for the species are located outside of the Study Area's bioregion and they are considered unlikely to occur

Scientific Name	Common Name	Cth Listing	WA Listing	ALA	BirdLife	DBCA	NatureMap	PMST	Ecologia	Recorded During Survey	Habitat Requirements	Likelihood of Occurrence
<i>Aphelocephala leucopsis</i>	Southern Whiteface	VU	-					X			substrate. In the south west, the Bittern is largely confined to coastal areas, especially along the south coast. It also occurs around swamps, lakes, pools, rivers and channels fringed with lignum <i>Muehlenbeckia</i>, canegrass <i>Eragrostis</i> or other dense vegetation (Marchant & Higgins, 1990). The Southern Whiteface occurs over most of mainland Australia south of the tropics. The species is described as preferring arid and semi-arid acacia and mallee woodland (Gregory, 2020). DCCEEW (2023a) considers critical habitat as areas of relatively undisturbed open woodlands and shrublands with an understorey of grasses or shrubs (or both); habitat with low tree densities and an herbaceous understorey litter cover which provides essential foraging habitat; and living and dead trees with hollows and crevices which are essential roosting habitat (DCCEEW, 2023a).	within the Study Area despite suitable habitat being available. The Southern Whiteface was only detected from the PMST database. The Study Area lacks the preferred habitat for this species, and it is unlikely to occur.
Excluded												
<i>Leipoa ocellata</i>	Malleefowl	VU	VU			X	X	X			The Malleefowl occurs in semi-arid to arid shrublands and low woodlands, especially those dominated by mallee and/or acacias. They require a sandy substrate and abundance of leaf litter for breeding. Densities of the birds are generally greatest in areas of higher rainfall and on more fertile soils where habitats tend to be thicker and there is an abundance of food plants (Benshemesh, 2007).	The Malleefowl was detected from the BirdLife, DBCA, and NatureMap databases. These are likely historical records, and no suitable habitat remains within the Study Area due to extensive clearing.
<i>Rostratula australis</i>	Australian Painted Snipe	EN	EN					X			The Australian Painted Snipe has been recorded at wetlands in all states of Australia. It generally inhabits shallow terrestrial freshwater (occasionally brackish) wetlands, including temporary and permanent lakes, swamps and claypans. It also uses inundated or waterlogged grassland or saltmarsh, dams, rice crops, sewage farms and bore drains. Typical sites include those with rank emergent tussocks of grass, sedges, rushes or reeds, or samphire; often with scattered clumps of lignum <i>Muehlenbeckia</i> or canegrass or sometimes tea-tree (<i>Melaleuca</i>). The Australian Painted Snipe sometimes utilises areas that are lined with trees, or that have some scattered fallen or washed-up timber (Marchant & Higgins, 1993).	The Australian Painted Snipe was only detected from the PMST database. No other records are present within the Study Area and the nearest DBCA record is over 20 km away and dated to more than 100 years ago.
<i>Numenius madagascariensis</i>	Far Eastern Curlew (Eastern Curlew)	CR & MI	CR					X			The Eastern Curlew is a large non-breeding migrant to Australia, found commonly along the north coast of Western Australia, but rarely south of Shark Bay. It is exclusively coastal and found on intertidal mudflats and sandflats, often with beds of seagrass, on sheltered coasts, especially estuaries, mangrove swamps, bays, harbours and lagoons (BirdLife International, 2024).	The Far Eastern Curlew was only detected from the PMST database. The species is a specialised marine/intertidal zone forager, and no suitable habitat is present within the Study Area.
<i>Thalasseus bergii</i>	Greater Crested Tern (Crested Tern)	MI	MI	X							Within Australia, the Crested Tern occurs along coastal Australia. It nests on sheltered sandy beaches, spits and banks above the high tide line and below vegetation. The species utilises offshore, estuarine areas, wetlands and mainland coastline (Higgins & Davies, 1996).	The Greater Crested Tern was only detected from the ALA database. The species is a marine species, and no suitable habitat is present within the Study Area.
<i>Zanda baudinii</i>	Baudin's Black-Cockatoo	EN	EN	X							Baudin's Cockatoo occurs in the south-west of WA. Their range varies substantially between the breeding and non-breeding seasons. During the breeding season (from October to January), the species nests in the far south-west of WA within jarrah, marri and karri forests. During the non-breeding season (from February), the range expands as flocks forage more widely, congregating on the central and northern parts of the Darling plateau, as far as Mundaring and	The Baudin's Black-Cockatoo was only detected from the ALA database. The Study Area is outside of the known range of this species.

Scientific Name	Common Name	Cth Listing	WA Listing	ALA	BirdLife	DBCA	NatureMap	PMST	Ecologia	Recorded During Survey	Habitat Requirements	Likelihood of Occurrence
<i>Motacilla cinerea</i>	Grey Wagtail	MI	MI					X			Gidgegannup (DCCEEW, 2024b; Saunders, 1974, 1979). Habitat mainly comprises eucalypt forests, especially jarrah (<i>Eucalyptus marginata</i>), marri (<i>Corymbia calophylla</i>) and karri forest (<i>Eucalyptus diversicolor</i>). They are less frequently recorded in woodlands of wandoo (<i>E. wandoo</i>), blackbutt (<i>E. patens</i>), flooded gum (<i>E. rudis</i>), yate (<i>E. cornuta</i>), partly cleared farmlands and urban areas. The Grey Wagtail is a non-breeding summer visitor to Australia, mostly in the north. It is associated with running water, sandy, rocky streams in escarpments and rainforests, sewerage ponds, ploughfields and airfields (Pizzey & Knight, 2012).	The Grey Wagtail was only detected from the PMST database. The species is an extremely rare vagrant and is unlikely to occur within the Study Area.



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