

Basic and Targeted Vertebrate Fauna Survey and Assessment

Katanning Gold Project

Prepared for: Ausgold Exploration Pty Ltd

Version 1. May, 2026



RECORD OF DISTRIBUTION

No. of copies	Report File Name	Report Status	Date	Prepared for:	Initials
Electronic	2025-0137-006-GT V1	DRAFT	19 March 2026	Ausgold Exploration Pty Ltd	ST
Electronic	2025-0137-006-GT V1	FINAL	27 May 2026	Ausgold Exploration Pty Ltd	ST

Suggested Citation: Terrestrial Ecosystems (2026) *Basic and targeted vertebrate fauna survey and assessment for the Katanning Gold Project*, Unpublished report for Ausgold Exploration Pty Ltd, Perth.

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EXECUTIVE SUMMARY

Ausgold Exploration Pty Ltd (Ausgold) is planning mining on its tenements which are ~35km east-north-east of Katanning in Western Australia (WA). The survey area was ~4,356ha, but additional investigations for some species were undertaken beyond the survey area. Also, the survey effort for Black-Cockatoo habitat trees assessment and camera trapping was not equal across the survey area due to access constraints in some areas.

Most of the survey area is farmland and was cleared many decades ago. The most substantial patch of native bushland is around and to the south-east of the Woorgabup Nature Reserve (R24072) and the Rifle Range Reserve (R12423). This area was assessed by Western Wildlife (2018) who reduced Matiske Consulting's (2018) 10 vegetation communities to four fauna habitats:

- Wandoo woodland;
- York Gum Woodland;
- Mallet woodland; and
- Banksia heath.

There are multiple small areas of remnant native vegetation patches on farming properties across the survey area and multiple ephemeral drainage lines and creeks that run in a north-westerly direction, with many of these having remnant vegetation along both banks. There is a disused mining pit in care and maintenance, and farm housing and sheds in the survey area.

The bushland area around the Woorgabup Nature Reserve (R24072) and Rifle Range Reserve (R12423) contains a Carnaby's Black-Cockatoo nest recorded as active in 2021, as well as foraging and roosting sites. These two reserves and the large remnant block of native vegetation on M70/1426 and a remnant patch south of the Rifle Range Reserve, support a population of Red-tailed Phascogales, which is listed as conservation dependent at the State level and Vulnerable at the Commonwealth level. The inland form of the Western Rosella was observed infrequently in the bushland area, indicating that it likely forages there and possibly breeds in tree hollows in this region.

A survey of remnant bushland within 1km of the project area recorded 88.6ha of very poor, 265.7ha of good, 217.1ha of very good and 44.3ha of excellent Red-tailed Phascogale habitat.

Overall, Terrestrial Ecosystems recorded 11,220 significant trees in the surveys (including extra patches within 6km of study area) and of those, 1,115 (which is 9.9% of significant trees) were assessed from the ground level to have at least one hollow that could potentially be used as a nesting site for Black-Cockatoos. Within a 12km radius of the survey area, there is more than 6,700ha of good quality nesting habitat and 360ha of foraging habitat.

The Woorgabup Nature Reserve and Rifle Range Reserve, and many of the larger blocks of remnant vegetation support Western Grey Kangaroos and Common Brush-tailed Possums. Foxes and feral cats are also widespread across the survey area. Ausgold's State and Federal referrals explicitly exclude any vegetation clearing within the Woorgabup Nature Reserve and Rifle Range Reserve even though large areas are coincident with granted mining tenements. The proposal under assessment commits to 'exclusion zones' in R24072 and R12423 and another parcel of mapped Eucalypt Woodland TEC on Ausgold's freehold land on M70/1426.

1. INTRODUCTION

1.1 BACKGROUND

Ausgold Exploration Pty Ltd (Ausgold) is planning additional exploration followed by mining on its tenements, which are ~35km east-northeast of Katanning in Western Australia (WA; Figure 1). This project is on the Katanning Greenstone Belt in the southwest corner of the Yilgarn Craton.

Terrestrial Ecosystems (2021, 2022a, b, c, 2024a, 2025) has undertaken numerous surveys and assessments on the Ausgold's tenements. The project has been submitted to the Commonwealth Government under the *Environment Protection and Biodiversity Act 1999 (EPBC Act; EPBC 2025/10232)*, and a delegate of the Minister for the Environment and Water decided that the proposed action is a controlled action and that it will be assessed by preliminary documentation with further information required to assess the relevant impacts of the proposed action. Ausgold has requested Terrestrial Ecosystems to provide some of this additional information to contribute to Ausgold's response to the Commonwealth Government's request for information. This report provides information on the survey work undertaken in late 2025 and early 2026, and updates the earlier report, inclusive of all data (Terrestrial Ecosystems 2025).

1.2 SURVEY OBJECTIVES AND SCOPE OF WORKS

For the 2025/26 surveys, guided by Ausgold, Terrestrial Ecosystems undertook additional Black-Cockatoo habitat tree assessments and, using criteria it established, surveyed and then rated nominated remnant patches of native bushland with a 1km radius of the project area for suitability to provide habitat for the Red-tailed Phascogale (*Phascogale calura*), which had previously been recorded in the project area.

This fauna risk assessment methodology broadly followed that described in the Environmental Protection Authority's (2020) *Technical Guidance – Terrestrial vertebrate fauna surveys for environmental impact assessment*.

The objectives of the entire vertebrate fauna assessment were to:

- indicate the vertebrate fauna assemblage (reptiles, amphibians, small mammals and birds) on and near the survey area so that potential impacts on the fauna might be adequately assessed;
- assess whether the survey area supports species of conservation significance;
- assess the impact and environmental risks associated with the proposed development on the fauna assemblage; and
- make recommendations for mitigating potential impacts on the vertebrate fauna associated with exploration and mining activity.

To achieve these objectives, Terrestrial Ecosystems has:

- reviewed Terrestrial Ecosystems fauna survey database [includes WA Museum, Atlas of Living Australia (AoLA)] to identify potential vertebrate fauna within the survey area and surrounds;
- searched the Commonwealth government's online database to identify fauna species of national environmental significance that are protected under the *EPBC Act* potentially occurring in the survey area and surrounds;
- reviewed previous fauna surveys conducted in the vicinity of the survey area in the bioregion to provide a context;
- undertaken multiple site visits;
- undertaken multiple camera trapping surveys and a nocturnal survey of remnant vegetation within the survey area;
- undertaken an assessment of Black-Cockatoo habitat trees in the survey area and the surrounds;

- surveyed nominated remnant bushland areas within a 1km radius of the project area for suitability to provide habitat for the Red-tailed Phascogale;
- provided a discussion on the likelihood of *EPBC Act 1999* and the *Biodiversity Conservation Act 2016 (BC Act)* listed species being present in the survey area; and
- provided recommendations on mitigating and minimising potential impacts on species of conservation significance.

2. EXISTING ENVIRONMENT

2.1 LOCATION OF SURVEY AREA

The survey area is located within the Avon Wheatbelt 2 (AW2 - Rejuvenated Drainage) sub-bioregion. This subregion has a gently undulating landscape of low relief (Beecham 2001). The remaining native vegetation in the subregion includes proteaceous scrub-heaths, Rock Sheoak, Wandoo, York and Salmon Gum with Jam, Casuarina and Banksia woodlands. The landforms and soils vary from granites to laterite gravels, interacting with varying sands and loams (Beecham 2001).

The project area includes the Woorgabup Nature Reserve (R24072) and Rifle Range Reserve (R12423) and is within the sheep farming area of the south-west of Western Australia (WA).

Mattiske Consulting (2018, 2020, 2026) has undertaken flora and vegetation assessments for parts of the Ausgold tenements and Western Wildlife (2018) reported on the vertebrate fauna in the bushland in and around the Woorgabup Nature Reserve (R24072) and the Rifle Range Reserve (R12423). Terrestrial Ecosystems (2021, 2022a, b, c, 2024a, 2025) has undertaken a camera-trapping program and a Black-Cockatoo habitat tree assessment in portions of the survey area.

2.2 CLIMATE

The climate in the survey area is characterised as warm Mediterranean (Beecham 2001). Katanning, located ~35km to the west-southwest, has an annual rainfall of around 480mm, although this amount varies considerably from year to year. The highest mean maximum and minimum temperatures in Katanning are in January (Bureau of Meteorology 2025). The lowest mean daily maximum temperatures occur in July (Chart 1). Rainfall predominantly occurs between May and August, and winter rains result from low-pressure cells moving easterly.

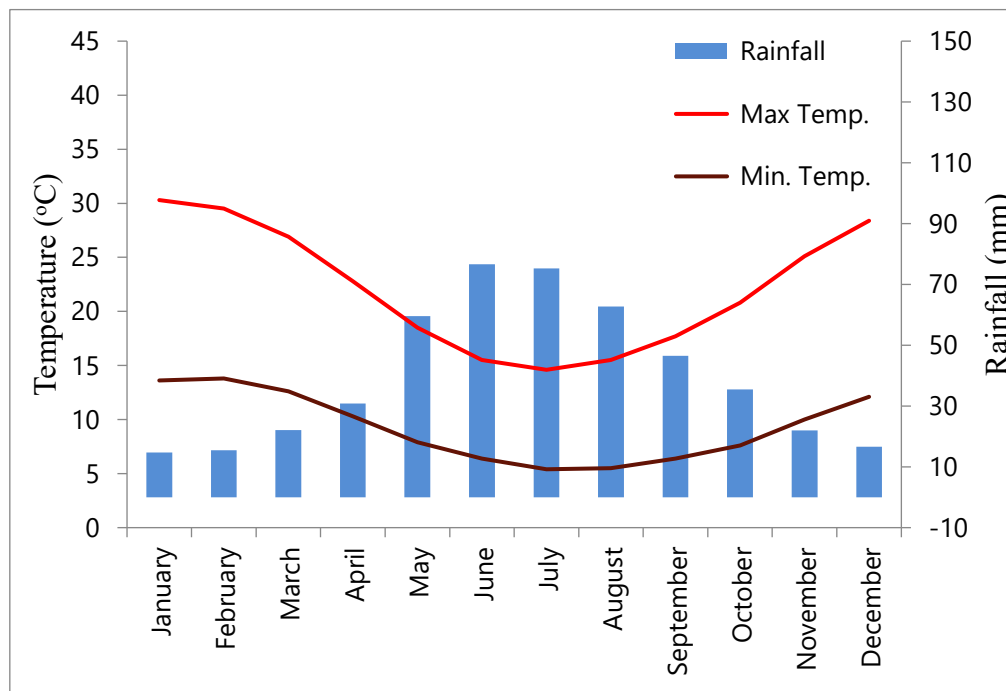


Chart 1. Climatic averages for Katanning

2.3 REGIONAL BIOLOGICAL FAUNA CONTEXT OF SURVEY AREA

The frogs, reptiles, mammals, and birds in the region have been surveyed for other environmental assessments and research purposes and are therefore well-known. Fauna surveys and assessments undertaken in the vicinity of the survey area that have been reviewed for this assessment include:

- Burbidge, A.H., Rolfe, J.K., McKenzie, N.L. and Roberts, J.D. (2004). Biogeographic patterns in small ground-dwelling vertebrates of the Western Australian wheatbelt, *Records of the Western Australian Museum*, Supplement No 67, 109-137;
- Mattiske Consulting Pty Ltd and Moloch Fauna Consultants (1996) *Flora, Vegetation and Vertebrate Fauna Survey Wishbone, Moulyinning and Candlelight Town and Railway Siding Reserves*. Unpublished report for Dumbleyung Land Conservation District Committee, Perth;
- Short, J., Hide, A. and Stone, M. (2011) Habitat requirements of the endangered red-tailed phascogale, *Phascogale calura*. *Wildlife Research*, 38, 359-369; and
- Western Wildlife (2018) *Katanning Gold Project Level 1 Vertebrate Fauna Survey and Carnaby's Black-Cockatoo Habitat Survey, October 2017*, Unpublished report for Ausgold Exploration Pty Ltd, Perth.

Data in the Atlas of Living Australia and the Western Australian Museum (WAM) have also been added to the information contained in Appendix B and the compilation of species lists for the survey area.

2.4 FAUNA SPECIES AT RISK

Beecham (2001) reported multiple vertebrate fauna species of conservation significance at risk in the subregion, including Red-tailed Phascogale (*Phascogale calura*), Western Brush Wallaby (*Notamacropus irma*), Brush-tailed Phascogale (*Phascogale tapoatafa*), Carnaby's Black-Cockatoo (*Zanda latirostris*) and Baudin's Black-Cockatoo (*Zanda baudinii*).

3. METHODOLOGY

3.1 DATABASE SEARCHES

A search of the *EPBC Act 1999* matters of national environmental significance (MNES) was undertaken for the survey area and surrounds to prepare a list of species of conservation significance of interest to the Commonwealth Government (Appendix A). Additionally, a desktop search of the Terrestrial Ecosystems' fauna survey database was conducted to develop an understanding of the vertebrate fauna assemblages in the relevant section of the bioregion near the survey area.

Other, more general texts were also used to provide supplementary information on the vertebrate fauna in the bioregion, including Tyler et al. (2000) for frogs, Storr et al. (1983, 1990, 1999, 2002) for reptiles, Johnstone and Storr (1998, 2004) for birds, and Van Dyck and Strahan (2008) for mammals.

Collectively, these sources of information were used to create lists of species expected to utilise the survey area and similar habitats near the survey area. It should be noted that these lists will include species recorded in the subregion but possibly vagrants, and they will not generally be found in the survey area due to a lack of suitable habitat (e.g., wetland and water birds). Vagrants can be recorded almost anywhere. Many bird, mammal, reptile and amphibian species have specific habitat requirements that may be present in the subregion but not in the survey area. Additionally, the ecology of many species is often poorly understood, and it can sometimes be challenging to identify those species whose specific habitat requirements are not met in a particular portion of the subregion due to differences in habitat. Consequently, many species will be included in the lists produced from database searches but will not be present in the actual survey area.

There are errors in most databases, including the Atlas of Living Australia and the WAM collection. These errors occur due to misidentification of individuals, taxonomic name changes, and incorrect coordinates entered into the database. Terrestrial Ecosystems could not verify the primary records, so it used the provided information. Obvious errors have been removed; however, readers should be aware that species lists and fauna surveys reported in the appendices may still contain these errors.

3.2 TARGETED SURVEYS AND ASSESSMENTS

3.2.1 Black-Cockatoos

A Black-Cockatoo significant habitat tree assessment was undertaken in and around the bushland surrounding Woorgabup Nature Reserve (R24072), Rifle Range Reserve (R12423), the remnant bushland in Jackson, Jinkas and Olympia areas (Terrestrial Ecosystems 2021, 2022a, b, c, 2024a) and other bushland patches on farming properties, accessible road verges and paddocks in the survey area.

In 2025, additional trees were assessed at client-selected areas within 6km of the study area. These areas were approximately 200*200m and this part of the survey recorded significant tree details.

The presence of Black-Cockatoos was assessed based on evidence of foraging in the survey area, roosting by being present in the survey area at dawn and dusk, nesting opportunities by examining trees for suitable breeding hollows, and when hollows were present by knocking on the tree trunk and observing the hollow entrance to see whether Black-Cockatoos appeared at the entrance or left the tree hollow, and a visual inspection of some hollows using a camera mounted on an extension pole. Significant Black-Cockatoo habitat trees were recorded following the Commonwealth Government's guidelines (Department of Agriculture Water and the Environment 2022) as follows:

- the GPS location;
- the diameter at breast height (DBH) and the tree's approximate height;

- photograph the tree;
- any hollows had the entrance dimensions estimated from ground level, the hollow's height above the ground estimated, and hollow orientation recorded. Other notable observations of each tree hollow (i.e. historical use for breeding/feeding, presence of bees etc) will also be recorded;
- each tree had a numbered metal tag attached (Plate 1);
- recorded evidence that a tree hollow has been or is being used for breeding from ground level;
- record evidence of Black Cockatoos in the survey area; and
- investigate evidence that any of the trees support a roosting site.



Plate 1. Metal tree tag

3.2.2 Black-Cockatoo foraging habitat assessment to support an *EPBC* referral

The Commonwealth Government's (Department of Agriculture Water and the Environment 2022) referral guidelines indicate that an assessment of foraging opportunities for Black-Cockatoos is required within a 12km radius of a survey area if a referral under the *EPBC Act* is to be submitted. To meet this requirement, a survey of all remnant bushland within a 12km radius of the project area was undertaken to map areas that provided foraging and potential breeding habitat for Black-Cockatoos. Habitat areas are classified into three types:

- Good quality nesting habitat (GQ) – presence of suitable nesting trees in high abundance;
- Poor quality nesting habitat (PQ) – none to sporadic presence of potentially suitable nesting trees; and
- Foraging habitat (FH) – appropriate habitat containing foraging species for Carnaby's Black-Cockatoos.

This visual survey was conducted from a vehicle using binoculars from publicly accessible roads of trees on private property. Areas that could not be visually assessed were classified by inference from aerial photographs and confirmed by nearby habitats.

Singular trees and small groves within paddocks were mainly excluded from the assessment, however, a few were included during the mapping assessment if they were located within an appropriate area of good-quality nesting habitat.

Most areas that provided foraging habitats consisted of groves of introduced *Pinus* species and trees along the edges of nearby roadways, as well as vegetation in remnant blocks of native vegetation. Several blocks of native vegetation, which provided foraging areas, comprised a mixture of native *Banksia* and *Hakea* shrubs (i.e., not large trees).

Poor quality nesting habitat included vegetation not appropriate for nesting or foraging, planted vegetation on properties, riparian vegetation not suitable for nesting, mallee and other inappropriate Eucalypt species, as well as possible future nesting tree species that were smaller than the specified diameter at breast height (DBH) ranges (i.e. immature trees, etc).

Good-quality nesting habitats were those areas with tree species known to be used as nesting sites by Carnaby's Black-Cockatoos that were over 300mm or 500mm DBH, depending on the tree species, located within large patches of vegetation, as well as on the edges of roads.

3.2.3 Tree hollow inspections

An inspection of known tree hollows was undertaken in December 2025 and January 2026 within R24072 and R12423. A selection of tree hollows identified in earlier assessments were investigated using a 10m pole-camera for nesting Black-Cockatoos. Hollows greater than 10m were not examined. This was undertaken to examine for presence of fauna in accessible significant tree hollows previously recorded.

3.2.4 Chuditch, Western Grey Kangaroos, Western Brush Wallaby, Quenda, Red-tailed Phascogales, foxes and feral cats

Camera traps can provide a non-invasive assessment method for determining the presence of a threatened species in a survey area; however, they do not confirm the absence of a species. To determine whether species of conservation significance such as Chuditch, Western Brush Wallaby, Quenda, and Red-tailed Phascogale, or common species such as Western Grey Kangaroos, were present, camera trapping was conducted. Camera trapping was undertaken in and around the Woorgabup Nature Reserve, the Rifle Range Reserve, and remnant bushland in the Jackson, Jinkas, and Olympia projects, as well as in other relatively large remnant patches of native vegetation on the Harris and Ramm farms and other remnant parcels of land.

Camera traps (Reconyx HC600) were attached to a star picket approximately 600mm above the ground (Plate 2) or a tree and had a non-reward lure of universal bait (oats, peanut butter, sardines and fish oil; Plate 3) placed ~3-5m in the detection zone of the camera. The non-reward lure increased the propensity for fauna to be recorded by a camera trap. Seventy-five camera traps were deployed in the Woorgabup Nature Reserve and Rifle Range Reserve, seven in the Jinkas area, three in the Olympia area, 10 in the Jackson area, 15 on E70/3952 (including Lot 8313) and 11 on M70/1426 at the north-east woodland.

Fifty camera traps were deployed between 4-6 November 2025 and retrieved between 8-9 December 2025. Of these, eight were in the Smith reserve, five in Ausgold north-east paddock 'islands', three in Lot 6973 'island', three in undeveloped Wes Road Reserve, six in Ausgold's South Oxonia strips, three in Ausgold homestead strip, 10 in Browne's reserve and 12 in Badgebup NE.

Camera trapping has been conducted at 194 locations, with most camera traps remaining on site for approximately 30 days. A total of 7,250 nights of camera trapping has been completed, and the locations are shown in Figures 4-12.



Plate 2. Camera trap



Plate 3. Non-reward bait pod

3.2.5 Nocturnal survey

On the evening of 27 August 2021, Terrestrial Ecosystems staff spent ~3 hours walking through the Woorgabup Nature Reserve and Rifle Range Reserve with thermal binoculars and spotlights.

3.2.6 Red-tailed Phascogale habitat assessment

Native vegetation in remnant patches of bushland within 1km of the project area was surveyed for its suitability to support Red-tailed Phascogales. The criteria in Table 1 were used to rate each parcel of native vegetation for its suitability to support Red-tailed Phascogales. The rating is not an indication of the possible presence of Red-tailed Phascogales, as the presence of predators was not assessed, and this would largely determine whether Red-tailed Phascogales were in a bushland area.

The Red-tailed Phascogale is a small ground-dwelling and semi-arboreal dasyurid with a body mass of about 60g (39-68g) for males and 42g (37.5 – 48g) for females, with a tail longer than its body [(i.e. males BL 113mm (104-122), tail 140mm (134-145); females 101mm (93-105), 131mm (119-144) tail] (Kitchener 1981). They are opportunistic feeders on the ground and eat a wide range of invertebrates (e.g. Myriapoda, Araneidae, Isoptera, Blattodea, Hemiptera, Orthoptera, Coleoptera, Hymenoptera, Formicidae and Diptera), and cockroaches and beetles seem to be the preferred foods (Kitchener 1981). Hollow logs, tree hollows, and the skirts and stumps of grass trees are the preferred retreat sites (Kitchener 1981, Short and Hide 2015b).

Preferred habitat is long-unburnt areas with an upper storey of hollow-forming Eucalyptus (e.g. *Eucalyptus wandoo*, *E. accedens*, *E. gardneri*, *E. falcata*, *E. loxophleba*, *E. salmonophloia*) and the presence of Casuarina (*C. huegeliana*) over a shrub layer (e.g. *Dryandra*, *Banksia*, *Gastrolobium*, *Olearia*) over a ground cover of grasses, sedges and herbs (Kitchener 1981, Short and Hide 2015b). The best habitat has numerous tree hollows for shelter and a semi-continuous canopy that provides some protection against predation by feral cats and foxes (Woinarski et al. 2014). Given the size of this small dasyurid, entrance holes in trees of 30-40mm are preferred.

Based on the above information, the following four criteria were used to determine the suitability of various remnant areas in the vicinity of the Ausgold project area for Red-tailed Phascogales. Plates 4-9 show labelled examples to aid the descriptions.

Table 1. Criteria used to rate remnant bushland for providing suitable habitat for Red-tailed Phascogales

Habitat rating	Description
Very poor/Linkage habitat	Open ground, no native or few trees and/or shrubs with no or sparse seasonal ground cover and isolated from better quality areas. (e.g. paddocks, non-native woodlands, road verges).
Good/Opportunistic habitat	Areas that have few mature trees and logs with hollows and a limited continuous understorey of shrubs, grasses, sedges and herbs. It is connected to better-quality habitat, serving as a movement corridor.
Very good/Supporting habitat	Areas with patches of continuous understorey, mature eucalyptus species, many fallen logs and/ or Eucalyptus with hollows in the 30-40mm range.
Excellent/Core habitat	Patches of long-unburnt areas greater than 1ha with areas of greater than 10% semi-continuous canopy of mature Eucalypts with multiple hollows in the 30-40mm range, with some connectivity among the understorey of shrubs, grasses, sedges and herbs.

Each of the four rated phascogale habitats were mapped.



Plate 4. Very poor phascogale habitat



Plate 5. Fair phascogale habitat



Plate 6. Good foraging but not nesting habitat – overall fair



Plate 7. Good nesting but not foraging habitat – overall fair



Plate 8. Good phascogale habitat



Plate 9. Excellent phascogale habitat

3.3 STAFFING

Dr Scott Thompson was the team leader and coordinated the overall survey. A team of Terrestrial Ecosystems zoologists undertook the habitat assessments, Black Cockatoo surveys, Red-tailed Phascogale assessments, and camera trapping (Table 2). Drs. G. and S. Thompson drafted this report.

Senior scientists possess relevant postgraduate qualifications, extensive experience in conducting fauna assessments in Western Australia, and have published research articles on biodiversity, fauna assemblages, species of conservation significance, trapping techniques, and temporal variations in trapped fauna assemblages. They are, therefore, appropriately trained and experienced to undertake the survey and prepare the assessment.

Dr Scott Thompson is the only environmental practitioner in Western Australia who holds independent specialist certification (CEnvP – Ecology Specialist) in combination with postgraduate tertiary qualifications and is a licenced pest management technician (LPMT). This unique set of skills and qualifications ensures that Scott undertakes fauna surveys, assessments, and control programs to the highest standard and with quality assurance. The qualifications and experience of the survey personnel are shown in Table 2.

Table 2. Survey personnel and their qualifications

Name	Qualifications	Experience	Role
Dr Scott Thompson	BSc. (Env. Sc.), MSc. (Env. Mngt.), PhD (Env. Sc./Mngt). Cert III (Vert Pest Mgt), CEnvP (Ecology Specialist)	> 20 years	Survey coordinator and Principal zoologist
Dr Graham Thompson	Post Grad. Dip. (Zool.), PhD (Zoology), Cert III (Vert Pest Mgt),	> 20 years	Principal zoologist
Ray Turnbull	BNat Res, Grad Dip (Ornith), Grad Cert (Ornith), Cert III (Vert Pest Mgt),	> 10 years	Senior Zoologist
Simon Pitt	BSc (Natural Resource Management); Dip (Policing); Cert III (Env and Rural Pest Mgt)	> 10 years	Senior Zoologist
Dr James Barr	BSc (Zool Biochem), Cert IV (Vet nursing), PhD (Behav Eco), Cert III (Env and Rural Pest Mgt)	> 10 years	Zoologist
Georgia Ford	BSc, MSc (Zoology)	> 6 years	Zoologist
Will Purser	BSc (Zoology), MSc	> 5 years	Zoologist
Joel Wilson	BSc (Zoology)	> 4 years	Zoologist

Name	Qualifications	Experience	Role
Ella Carstens	BSc (Env Sci)	> 2 years	Zoologist
Brody Altus	BSc (Zoology), MSc (Biol), Cert III (Env and Rural Pest Mgt)	> 3 years	Zoologist
Tom Raymond	BSc (Hons; Zool), Cert III (Env and Rural Pest Mgt)	> 3 years	Zoologist
Stelleena Wipp	BSc (Hons; Env Agri), BSc (Env Biol)	> 3 years	Zoologist
Isaac Cable	BSc (Cons Wildlife Biol)	> 1 years	Zoologist
Lauren Hayles	BSc (Zoology)	> 1 years	Zoologist
Mitch Plozza	BSc (Cons Wildlife Biol), Cert IV (Cons Land Mgt), Cert IV (Hort), Cert III (Env and Rural Pest Mgt)	> 3 years	Zoologist
Michael Walsh	BSc (Cons Wildlife Biol), MSc (Biol)	> 3 years	Zoologist
Campbell Young	BSc (Zool)	> 1 year	Zoologist

3.4 FIELD ASSESSMENT TIMING

Extensive field assessments have been conducted over multiple survey periods. Table 3 provides details of the dates, activity and zoologists who undertook the work.

Table 3. Field work dates

Field assessment activity	Zoologist staff	Dates
Black cockatoo tree assessment	Georgia Ford; Ray Turnbull	23-31 August 2021
Spotlighting	Georgia Ford; Ray Turnbull	27 August 2021
Black-Cockatoo roost assessment	Georgia Ford; Ray Turnbull	27 and 29 August 2021
Camera trapping	Georgia Ford; Ray Turnbull; Ella Carstens; Will Purser	23 August – 24 September 2021
Black-Cockatoo tree assessment	Georgia Ford; Ray Turnbull; Ella Carstens; Will Purser	19-24 September 2021
Camera trapping	Georgia Ford; Ray Turnbull; Ella Carstens; Will Purser	22 September – 3 November 2021
Black-Cockatoo tree assessment	Dr Scott Thompson; Joel Wilson	8-12 August 2022
Black-Cockatoo tree assessment	Brody Altus; Joel Wilson	23-28 October 2022
Regional habitat assessment	Dr James Barr	6-10 February 2023
Black-Cockatoo tree assessment	Stelleena Wipp; Isaac Cable	7-11 August 2023
Black-Cockatoo tree assessment	Stelleena Wipp; Isaac Cable	14-18 August 2023
Black-Cockatoo tree assessment	Stelleena Wipp; Isaac Cable	22-25 August 2023
Black-Cockatoo tree assessment	Stelleena Wipp; Isaac Cable	28 August – 5 September 2023
Black-Cockatoo tree assessment	Tom Raymond; Brody Altus; Mitch Plozza; Isaac Cable; Joel Wilson	9-16 October 2023
Black-Cockatoo tree assessment	Brody Altus; Stelleena Wipp	27 November – 1 December 2023
Black-Cockatoo tree assessment	Mitch Plozza; Isaac Cable; Michael Walsh; Lauren Hayles	18-19 December 2023

Field assessment activity	Zoologist staff	Dates
Camera trapping	Tom Raymond; Brody Altus; Mitch Plozza; Isaac Cable; Joel Wilson	9 October – 20 November 2023
Black cockatoo tree assessment	Brody Altus; Stelleena Wipp	18-23 November 2024
Camera trapping	Brody Altus; Stelleena Wipp	22 November 2024 – 14 January 2025
Black-Cockatoo habitat assessment	Stelleena Wipp, Dr James Barr	11-15 October 2025
Camera trapping, Black-Cockatoo habitat assessment	Brody Altus, Campbell Young, Stelleena Wipp, Dr James Barr	20 October - 7 November 2025
Red-tailed Phascogale habitat assessment, Black-Cockatoo habitat assessment	Brody Altus, Stelleena Wipp	17-22 November 2025
Red-tailed Phascogale habitat assessment, Black-Cockatoo habitat assessment	Brody Altus, Campbell Young	1-7 December 2025
Camera trapping, Red-tailed Phascogale habitat assessment, Black-Cockatoo habitat assessment	Tom Raymond, James Barr	8-12 December 2025
Black-Cockatoo habitat assessment	Brody Altus, Campbell Young	27 January – 1 February 2026

3.5 ANIMAL ETHICS AND FAUNA LICENCING

Wildlife Animal Ethics Committee (WAEC) has approved an animal ethics application (WAEC 22-07-73) for surveying Black-Cockatoos, and generic fauna surveys are covered under WAEC 24-05-28.

The survey methods utilised by Terrestrial Ecosystems comply with our standard operating procedures (SOP) for animal trapping, handling, and management (Terrestrial Ecosystems 2023) which take into consideration the information in the SOPs developed by DBCA. On all occasions, the purpose is the humane and lawful use of fauna. All fauna camera trapping was conducted under a Regulation 27 licences #BA27000488, #BA27000872, and #BA27001134 issued to Dr Scott Thompson.

3.6 TAXONOMY AND NOMENCLATURE

Taxonomy and nomenclature for fauna species used in this report are generally based on the WA Museum species lists. Terrestrial Ecosystems has assumed that the identifications in the appendices or reports used to provide local and regional comparative data are correct, and we have corrected only obvious records where the nomenclature was known to be incorrect.

3.7 LIMITATIONS

There were farming areas within the survey area that the client did not have permission from the landowner to enter, and these areas were not assessed. These non-assessed areas are shown in the attached Figures.

This vertebrate fauna risk assessment is based on information contained in the Commonwealth Government database, as well as other published and unpublished fauna survey data for the bioregion, and multiple site visits conducted as part of targeted searches for species of conservation significance. It is acknowledged that multiple surveys conducted in different seasons, repeated over several years, are necessary to fully appreciate the fauna assemblage in the survey area.

The EPA's (2020) Technical Guidance on Terrestrial Fauna Surveys suggests that several variables may limit the effectiveness of fauna surveys. Limitations associated with each of these variables are assessed in Table 4.

Table 4. Fauna survey limitations and constraints

Possible limitations	Constraint	Comment
Availability of data and information	Yes, moderate	There is a lack of recent, detailed trapping data in similar habitats in the region; however, incidental records and historical reports are available for the region, with some of these data accessible in the Atlas of Living Australia.
Competency/experience of the survey team, including experience in the bioregion surveyed	No	The field zoologists and authors of this report possess appropriate undergraduate or postgraduate qualifications, have conducted multiple surveys and assessments in Western Australia, and are familiar with the vertebrate fauna in this bioregion.
Scope of the survey, e.g. where faunal groups were excluded from the survey	No	Targeted surveys achieved the stated objectives of identifying the presence of vertebrate fauna of conservation significance in the survey area.
Timing, weather and season	No	The weather was suitable for the various site visits.
Disturbance that may have affected results, e.g. fire, flood	No	Disturbances in the survey area have been considered in this assessment.
The proportion of fauna identified, recorded or collected	No	Targeted surveys were adequate to identify species of conservation significance in the survey area.
Adequacy of the survey intensity and proportion of survey achieved, e.g. the extent to which the area was surveyed	No	Targeted surveys were adequate to identify species of conservation significance in the survey area.
Access problems	No, moderate	Most sites were accessible; however, some farms were excluded from the assessment. All Black-Cockatoo foraging assessments within a 12km radius were conducted from roads and private properties where we had permission to enter.
Problems with data and analysis, including sampling biases	No	Data were collected in a format that enabled them to be properly analysed.

N/A = not applicable, Significant = major impact on outcome of the assessment, Moderate = impacted parts of the assessment, Negligible = almost no impact on the assessment

4. RESULTS

4.1 FAUNA HABITAT

Most of the survey area is farmland and was cleared many decades ago. The most substantial patch of native bushland outside the survey area is located to the south-east of the Woorgabup Nature Reserve and the Rifle Range Reserve. Western Wildlife (2018) assessed the vertebrate fauna in this area and reduced Mattiske Consulting's (2018) 10 vegetation communities to the following four fauna habitats:

- Wandoo woodland;
- York Gum Woodland;
- Mallet woodland; and
- Banksia heath.

Mattiske Consulting (2020) described the vegetation communities for a larger area, including tenements E70/2928, M70/211, and M70/488, which include the Woorgabup Nature Reserve and Rifle Range Reserve, as the following 10 communities. The many remnant patches of vegetation on farmland and in road reserves supported York Gums, Salmon Gums, Wandoo, Red Morell, *Banksia* sp., Brown Mallet, Sheoak, and a variety of exotic trees.

Table 5. Vegetation communities (taken from Table 5 in Mattiske Consulting 2020)

CODE	Description	Vegetation condition
W1	Open Woodland of <i>Eucalyptus wandoo</i> and <i>Eucalyptus longicornis</i> with occasional <i>Eucalyptus salmonophloia</i> over <i>Acacia acuminata</i> over <i>Vittadinia gracilis</i> , <i>Stackhousia monogyna</i> and a range of herbs and grasses on lower slopes and valley floors with sandy loams and some clays.	Very Good - Excellent
W2	Open Woodland of <i>Eucalyptus loxophleba</i> over <i>Acacia acuminata</i> and <i>Allocasuarina huegeliana</i> over a range of herbs and grasses on slopes and broader valley floors with sandy loams and some clays.	Completely Degraded – Degraded, Very Good
W3	Woodland of <i>Eucalyptus wandoo</i> over dense stands of <i>Allocasuarina huegeliana</i> with patches of <i>Banksia sessilis</i> and <i>Acacia acuminata</i> over <i>Hakea lissocarpha</i> , <i>Xanthorrhoea drummondii</i> and <i>Stackhousia monogyna</i> over a range of herbs and grasses on slopes and undulating hills with sandy-clays and gravels.	Excellent
W4	Open Woodland of <i>Eucalyptus wandoo</i> and <i>Eucalyptus longicornis</i> over <i>Allocasuarina huegeliana</i> over <i>Dodonaea humifusa</i> , <i>Rhagodia preissii</i> subsp. <i>preissii</i> over <i>Neurachne alopecuroidea</i> , <i>Austrostipa hemipogon</i> and a wide range of herbs and grasses on mid and upper slopes of undulating hills with sandy-clays and gravels.	Completely Degraded – Very Good – Excellent
W5	Open Woodland of <i>Eucalyptus wandoo</i> over <i>Allocasuarina huegeliana</i> over <i>Gastrolobium trilobum</i> , <i>Dodonaea humifusa</i> and <i>Xanthorrhoea drummondii</i> over <i>Neurachne alopecuroidea</i> , <i>Austrostipa hemipogon</i> , <i>Velleia trinervis</i> and a wide range of herbs and grasses on upper slopes and ridges of undulating hills with sandy-clays and gravels.	Excellent
W6	Open Woodland of <i>Eucalyptus loxophleba</i> over <i>Acacia acuminata</i> and dense stands of <i>Allocasuarina huegeliana</i> over <i>Acacia erinacea</i> over <i>Stackhousia monogyna</i> , <i>Stypandra glauca</i> , <i>Neurachne alopecuroidea</i> and a wide range of herbs and grasses on slopes and broader valley floors with sandy loams and some clays.	Completely Degraded – Very Good, Excellent
W7	Open Woodland of <i>Eucalyptus wandoo</i> and <i>Eucalyptus longicornis</i> over <i>Gastrolobium trilobum</i> , <i>Acacia acuminata</i> , <i>Acacia erinacea</i> , <i>Acacia lasiocarpa</i> var. <i>sedifolia</i> , <i>Hakea lissocarpha</i> , <i>Billardiera fusiformis</i> and patches of <i>Melaleuca atroviridis</i> and <i>Xanthorrhoea drummondii</i> over <i>Austrostipa hemipogon</i> , <i>Dampiera lavandulacea</i> , <i>Neurachne alopecuroidea</i> , <i>Desmocladius asper</i> , <i>Lomandra</i> spp. and a wide range of herbs and grasses on slopes and broader valley floors with sandy loams and some clays.	Excellent
W8	Woodland of <i>Eucalyptus astringens</i> subsp. <i>astringens</i> and <i>Eucalyptus kondininensis</i> with some <i>Eucalyptus gardneri</i> subsp. <i>gardneri</i> and occasional <i>Eucalyptus wandoo</i> and <i>Eucalyptus longicornis</i> over dense thickets of <i>Melaleuca atroviridis</i> over <i>Gastrolobium trilobum</i> , <i>Acacia lasiocarpa</i> var. <i>sedifolia</i> , <i>Beaufortia bracteosa</i> and <i>Daviesia ?incrassata</i> subsp. <i>teres</i> over a range of herbs and grasses on upper slopes and ridges with sandy gravels and clays.	Completely Degraded, Good - Excellent

CODE	Description	Vegetation condition
S1	Closed Heath of <i>Banksia armata</i> var. <i>ignicida</i> , <i>Banksia squarrosa</i> subsp. <i>squarrosa</i> , <i>Allocasuarina humilis</i> , <i>Gastrolobium trilobum</i> , <i>Grevillea insignis</i> subsp. <i>insignis</i> over <i>Hibbertia exasperata</i> , <i>Melaleuca subtrigona</i> , <i>Melaleuca pungens</i> , <i>Petrophile seminuda</i> , <i>Xanthorrhoea drummondii</i> and <i>Tetrapora preissiana</i> with patches of emergent <i>Eucalyptus incrassata</i> , <i>Eucalyptus dorrienii</i> and <i>Eucalyptus hebetifolia</i> over <i>Stackhousia monogyna</i> over a range of herbs and grasses on shallow upper slopes and ridges with sandy gravels and clays.	Excellent
S2	Open Heath of <i>Acacia lasiocarpa</i> var. <i>sedifolia</i> , <i>Banksia sessilis</i> , <i>Banksia armata</i> var. <i>ignicida</i> , <i>Banksia squarrosa</i> subsp. <i>squarrosa</i> , <i>Beaufortia bracteosa</i> , <i>Calothamnus quadrifidus</i> subsp. <i>quadrifidus</i> , <i>Dodonaea caespitosa</i> , <i>Dodonaea humifusa</i> , <i>Hakea lissocarpa</i> , <i>Hakea trifurcata</i> , <i>Melaleuca atroviridis</i> and <i>Xanthorrhoea drummondii</i> with patches of emergent <i>Eucalyptus kondinensis</i> , <i>Eucalyptus ?thamnoides</i> , <i>Eucalyptus wandoo</i> and <i>Allocasuarina huegeliana</i> over dense shrub layer and a range of herbs and grasses on shallow upper slopes and ridges with sandy gravels and clays.	Excellent

Multiple ephemeral creeks run mostly in a north-westly direction in the survey area, with many of these having remnant native vegetation along both banks. There is a mining pit in care and maintenance, along with multiple farming houses and sheds within the survey area.

4.2 BLACK-COCKATOOS

Overall, Terrestrial Ecosystems recorded 11,220 significant trees in the surveys and of those, 1,115 (9.95%) were assessed from the ground level to have at least one hollow that could potentially be used as a nesting site for Black-Cockatoos.

4.2.1 Woorgabup Nature Reserve and Rifle Range Reserve

The bushland surrounding Woorgabup Nature Reserve (R24072) and Rifle Range Reserve (R12423) supported multiple significant trees, many with at least one hollow, and some with multiple hollows. Carnaby's Black-Cockatoos (*Zanda latirostris*) were seen and heard on most days in this area in 2021-2022. Most sightings were of single males or pairs, but a flock of ~20 birds was observed flying across the north-west corner of the reserve out over the adjacent canola fields (24/8/2021; 0750hrs). On 27/8/2021, the surveyors conducted an evening roost watch to determine if and where any Black-Cockatoos may be roosting. At 1722hrs, a male cockatoo flew in from the south-west towards the centre of the reserve and was lost from view. The bird, however, was still calling, so the zoologists attempted to locate it. The bird was eventually located sitting in a large dead Wandoo north of the Dingo mine pit, near the northern boundary of the reserve. At 1735hrs, this bird, along with a previously undetected female, flew away to the southwest. Over the next several days, calls were often heard from this general area late in the day, and a male bird (presumably the same bird) was seen flying around the reserve. As a result of this behaviour, the surveyors conducted a second evening roost watch in this area to locate his roost/nest. On 29/8/2021 at 1715hrs, a male cockatoo flew in and landed in a large Wandoo. The bird remained sitting in this tree, alert and constantly scanning its surroundings. After about 15 minutes, it was seen climbing down the branch to a large fork in the tree, into which it put its head. It is highly likely that this fork contained a hollow. After several minutes of this behaviour, the male departed. On 31/8/2021, zoologists conducted tree assessments in this area to see if the male could be recorded again. The male bird was not sighted that morning, and tapping the tree trunk in which the male was seen putting his head resulted in nothing emerging from the hollow. However, whilst nailing the tag number into an adjacent Wandoo, a female cockatoo was seen to emerge from another hollow (0950hrs; Plate 10). These trees are ~50m apart, and it suggests that one nest hollow was in use, and it is likely that a second was as well. There was evidence of Carnaby's Black-Cockatoos feeding in the Banksia heathland in the southern section of the reserve, and one male was observed foraging in the area (Plate 11).



Plate 10. Carnaby's Black-Cockatoo emerging from a tree hollow



Plate 11. Carnaby's Black-Cockatoo feeding in the Banksia woodland

4.2.2 Jinkas

The Jinkas project area contains 15 significant trees, and one tree contained two hollows that may provide a suitable nesting site for Black-Cockatoos (Terrestrial Ecosystems 2022b). No Black-Cockatoos were nesting in the Jinkas area.

4.2.3 Jackson

The Jackson project area contains 429 significant trees, with 82 of these trees containing at least one hollow, and many with two or more hollows (Terrestrial Ecosystems 2022a). No Black-Cockatoos were nesting in the Jackson area.

4.2.4 Olympia

The Olympia project area contains 13 significant trees, and no trees contained hollows that would provide a suitable nesting site for Black-Cockatoos (Terrestrial Ecosystems 2022c). No Black-Cockatoos were nesting in the Olympia area.

4.2.5 Other areas

Multiple significant trees have been identified and mapped along road verges and paddocks in 2021, 2023, 2024 and 2025. The location of significant Black-Cockatoo habitat trees is shown in Figures 14-28 with details of each tree provided in Appendix D and images of trees provided in Appendix E.

4.2.6 Black-Cockatoo foraging habitat within a 12km radius

The assessment of foraging and potential breeding habitats within a 12km radius of the project area yielded the areas shown in Table 6 (see Figure 40).

Table 6. Black-Cockatoo habitat types within 12km radius of the survey area

Black-Cockatoo habitat type	Area (ha) within 12km radius
Good quality nesting habitat (GQ) – presence of suitable nesting trees in high abundance	6,706.9
Poor quality nesting habitat (PQ) – no to sporadic presence of potential suitable nesting trees	5,673.3
Foraging habitat (FH) – appropriate habitat containing foraging species for Carnaby's Cockatoos.	364.4
Total	12,745

4.3 RED-TAILED PHASCOGALE

Red-tailed Phascogale were recorded on camera traps in bushland within the Woorgabup Nature Reserve, Rifle Range Reserve, M70/1426, and three separate areas on E70/3952. The location of Red-tailed Phascogale records are shown in Figures 32, 33, 35 and 36. They were not recorded in the Jinkas, Jackson or Olympia areas (Terrestrial Ecosystems 2021, 2022c, b, a).

The remnant bushland within 1km of the project area was examined and rated based on the criteria in Table 7, mapped (Figure 41), and the total area for each category calculated (Table 7).

Table 7. Area of Red-tailed Phascogale habitat within 1km of the project area

Habitat rating	Description	Area (ha)
Very poor/Linkage habitat	Open ground, no native or few trees and/or shrubs with no or sparse seasonal ground cover and isolated from better quality areas. (e.g. paddocks, non-native woodlands, road verges).	88.6
Good/Opportunistic habitat	Areas that have few mature trees and logs with hollows and a limited continuous understorey of shrubs, grasses, sedges and herbs. It is connected to better-quality habitat, serving as a movement corridor.	265.7
Very good/Supporting habitat	Areas with patches of continuous understorey, mature eucalyptus species, many fallen logs and/ or Eucalyptus with hollows in the 30-40mm range.	217.1
Excellent/Core habitat	Patches of long-unburnt areas greater than 1ha with areas of greater than 10% semi-continuous canopy of mature Eucalypts with multiple hollows in the 30-40mm range, with some connectivity among the understorey of shrubs, grasses, sedges and herbs.	44.3

4.4 CAMERA TRAPPING

Camera trapping recorded multiple species, including Western Grey Kangaroo (Plate 12), Australia Raven (*Corvus coronoides*), rabbits, and Common Brushtail Possum (*Trichosurus vulpecula*; Plate 13) being among the most abundant (Table 8). Feral cats and foxes were the next most common (Terrestrial Ecosystems 2021, 2022c, b, a). The Red-tailed Phascogale [listed under the *EPBC Act* as Vulnerable and under the *WA BC Act 2016* as a 'species of special conservation interest (conservation dependent fauna)] was recorded on six camera traps in the Woorgabup Nature Reserve, Rifle Range Reserve and surrounding bush blocks, in a large remnant block of native vegetation on M70/1426 and three areas on E70/3952.



Plate 12. Western Grey Kangaroo



Plate 13. Common Brushtail Possum



Plate 14. Feral cat



Plate 15. Fox



Plate 16. Red-tailed Phascogale



Plate 17. Gould's Goanna



Plate 18. Rabbit



Plate 19. Carnaby's Black-Cockatoo

Table 8. Camera trap results on Woorgabup Nature Reserve, Rifle Range Reserve, and the remnant bushland in Jackson, Jinkas and Olympia

Camera #	Western Grey Kangaroo	Cat	Fox	Australian Raven	Phascogales	Possum	Echidna	Rabbit	Magpie	Common Bronzewing	Australian Ringneck Parrot	Bobtail	Currawong	Galah	Carnaby Black-Cockatoo	Elegant Parrot
C1	X			X		X										
C2	X			X			X									
C3							X									
C4	X															
C5	X					X	X									
C6	X			X		X										
C7	X		X	X		X										
C8	X	X		X	X	X	X									
C9	X					X	X									
C10	X		X	X		X			X		X					
C11	X			X		X										
C12	X			X		X				X						
C13	X			X			X									
C14	X		X	X		X					X					
C15	X		X				X									
C16	X		X	X		X	X									
C17	X		X	X		X										
C19	X	X	X	X		X										
C20	X		X	X	X	X					X	X				
C21	X			X		X	X					X				
C22	X			X	X	X					X					
C23	X			X		X							X			
C24	X		X	X		X										
C25	X			X												
C26	X			X												
C27	X			X		X						X	X			
C28	X		X	X												
C29				X		X	X									
C30	X			X		X										

Camera #	Western Grey Kangaroo	Cat	Fox	Australian Raven	Phascogales	Possum	Echidna	Rabbit	Magpie	Common Bronzewing	Australian Ringneck Parrot	Bobtail	Currawong	Galah	Carnaby Black-Cockatoo	Elegant Parrot
C31	X			X		X										
C32	X			X		X										
C33	X		X	X		X	X									
C34	X			X		X	X									
C35	X	X		X		X	X									
C36	X			X		X	X			X			X			
C37	X			X			X									
C38	X			X		X	X									
C39	X		X	X		X	X						X			
C40	X		X	X												
C41	X		X	X		X										
C42	X			X							X	X				
C43	X		X	X												
C44	X		X	X		X		X								
C45	X		X	X		X										
C46	X			X									X			
C47	X		X	X						X						
C48	X		X	X		X										
C49	X			X						X						
C50	X			X		X							X	X		
C51	X		X								X					
C52	X		X													
C53	X					X										
C54	X				X	X	X	X								
C55	X			X												
C56	X															
C57	X					X										
C58	X															
C59	X			X	X	X										
C60	X					X	X									
C61	X			X		X										

Camera #	Western Grey Kangaroo	Cat	Fox	Australian Raven	Phascogales	Possum	Echidna	Rabbit	Magpie	Common Bronzewing	Australian Ringneck Parrot	Bobtail	Currawong	Galah	Carnaby Black-Cockatoo	Elegant Parrot
C62	X			X			X			X						
C63	X			X												
C64	X					X	X									
C65	X		X	X	X	X							X			
C66	X	X				X										
C67	X					X	X		X	X	X					
C68	X			X												
C69	X															
C70	X			X		X										
C71	X		X												X	
C72	X			X			X				X		X			
C73	X		X	X									X			
C74	X			X		X	X						X			
C75	X			X		X										
C76			X	X												
C77		X		X			X	X								
C78			X	X				X		X						X
C79		X	X	X		X		X								
C80		X	X	X		X		X			X					
C81		X	X	X		X			X							
C82		X	X	X		X		X	X		X					
C83			X	X				X		X						
C84		X	X	X							X					
C85			X	X							X					
C86			X	X												
C87			X	X		X										
C88			X	X		X										X
C89			X	X		X				X						
C90	X		X			X					X					
C91	X		X								X					
C92				X		X				X	X			X		

Camera #	Western Grey Kangaroo	Cat	Fox	Australian Raven	Phascogales	Possum	Echidna	Rabbit	Magpie	Common Bronzewing	Australian Ringneck Parrot	Bobtail	Currawong	Galah	Carnaby Black-Cockatoo	Elegant Parrot
C93				X		X			X		X			X		
C94			X	X					X	X						
C95			X	X		X				X	X	X				

Table 9. Camera trap results for the other large native vegetation blocks

Camera #	Western Grey Kangaroo	Cat	Fox	Australian Raven	Red-tailed Phascogale	Possum	Magpie	Common Bronzewing	Australian Ringneck Parrot	Bobtail	Grey Currawong	Galah	Willie Wagtail	Yellow-throated Miner	Grey Butcherbird	Yellow-footed Antechinus	Gould's Goanna	Dugite	Red Wattlebird	Magpie-lark	White-browed Babbler	Australian Owllet-nightjar	Crested Pigeon	Skink	Black-faced Cuckoo-shrike	Carpet Python	House Mouse	Black Rat	Western Pygmy Possum
C96	X	X	X			X	X			X			X	X	X	X													
C97			X			X	X			X				X	X														
C98					X	X	X	X							X		X	X											
C99		X	X			X	X		X	X									X										
C100		X				X	X			X																	X		
C101			X	X		X		X		X				X													X		
C102			X			X	X																				X		
C103			X	X		X	X	X	X	X		X		X						X									
C104	X	X		X		X		X		X							X												
C105	X		X	X		X	X	X						X						X									
C106				X		X				X				X															
C107			X			X								X			X												
C108			X	X		X	X			X				X						X								X	X
C109		X	X	X		X		X			X										X						X		
C110	X	X	X	X	X	X	X															X							
C111		X		X		X		X				X															X		
C112	X			X	X	X	X	X						X									X						
C113			X																										
C114						X	X							X	X		X										X		

Camera #	Western Grey Kangaroo	Cat	Fox	Australian Raven	Red-tailed Phascogale	Possum	Magpie	Common Bronzewing	Australian Ringneck Parrot	Bobtail	Grey Currawong	Galah	Willie Wagtail	Yellow-throated Miner	Grey Butcherbird	Yellow-footed Antechinus	Gould's Goanna	Dugite	Red Wattlebird	Magpie-lark	White-browed Babbler	Australian Owllet-nightjar	Crested Pigeon	Skink	Black-faced Cuckoo-shrike	Carpet Python	House Mouse	Black Rat	Western Pygmy Possum
C115	X		X	X		X								X		X							X						
C116				X		X	X			X				X															
C117				X		X	X	X		X				X													X		X
C118		X		X		X	X	X					X							X					X				
C119		X		X		X	X	X		X			X							X									
C120		X		X		X			X	X				X												X			
C121			X	X	X	X	X												X										

During the November 2024 camera trapping survey, Western Grey Kangaroos (*Macropus fuliginosus*: Plate 12) where recorded on 23 camera traps, foxes (*Vulpes vulpes*: Plate 15) on 13, rabbits (*Oryctolagus cuniculus*: Plate 18) on 8 and feral cats (*Felis catus*: Plate 14) on four camera traps. The Red-tailed Phascogale (*Phascogale calura*: Plate 16) was recorded on two camera traps in November 2024.

Table 10. Camera trapping results for the November 2024 survey

Camera #	Western Grey Kangaroo	Cat	Rabbit	Fox	Australian Raven	Red-tailed Phascogale	Possum	Magpie	Common Bronzewing	Bobtail	Grey Currawong	Willie Wagtail	Yellow-throated Miner	Gould's Goanna	Magpie-lark	White-browed Babbler	Skink	Black-faced Cuckoo-shrike	Australian Pipit	Carnaby Back-Cockatoo	Gray shrike thrush	Dwarf Bearded dragon	Yellow rumped thornbill	Owl sp
122	X			X																				
123	X			X		X																		
124			X		X							X			X									
125	X			X	X		X																	
126	X		X		X	X						X												
127	X	X	X							X		X		X				X	X	X	X			
128	X	X	X	X																		X		
129	X			X																				
130	X		X							X		X												
131	X		X										X		X								X	
132	X			X							X													

Camera #	Western Grey Kangaroo	Cat	Rabbit	Fox	Australian Raven	Red-tailed Phascogale	Possum	Magpie	Common Bronzewing	Bobtail	Grey Currawong	Willie Wagtail	Yellow-throated Miner	Gould's Goanna	Magpie-lark	White-browed Babbler	Skink	Black-faced Cuckoo-shrike	Australian Pipit	Carnaby Back-Cockatoo	Gray shrike thrush	Dwarf Bearded dragon	Yellow rumped thornbill	Owl sp
133	X			X							X													
134	X			X													X							
135	X			X						X														
136	X				X			X																
137	X	X	X							X						X								
138	X			X					X		X													
139	X																							
140	X										X													
141	X										X													
142	X			X																				
143	X			X							X													X
144	X	X	X	X								X	X	X										

The vertebrate fauna recorded in the spring and summer of 2025/2026 camera trapping program are shown in Table 11. Based on records per camera trap, Western Grey Kangaroos (40 of 50 camera traps), foxes (29 or 50 camera traps), Australian Raven (27 of 50 camera traps) and the Australian Magpie (15 of 50 camera traps) were the most abundant records. Red-tailed Phascogales were not recorded on any of the camera traps.

Table 11. Camera trap survey results for Spring and Summer 2025/26

Trap #	Aust. Ringneck Parrot	Australian Magpie	Australian Raven	Bobtail	Brushtail Possum	Grey Butcher Bird	Cat	Common Bronzewing	Echidna	Fox	Goulds Goanna	Grey Currawong	Magpie Lark	Mardo	Western Grey Kangaroo	White Browed Babbler	Willie Wagtail	Yellow Throated Miner	Rainbow Bee-Eater	Rabbit	Farm dog	Galah	Sheep
145		X	X				X			X					X								
146		X	X							X					X								
147			2							X							X						
148			2							X					X								
149			X						X	X					2								
150			X						X	3					X								
151			X							2					X		X		X	X			

Trap #	Aust. Ringneck Parrot	Australian Mgpie	Australian Raven	Bobtail	Brushtail Possum	Grey Butcher Bird	Cat	Common Bronzewing	Echidna	Fox	Goulds Goanna	Grey Currawong	Magpie Lark	Mardo	Western Grey Kangaroo	White Browed Babbler	Willie Wagtail	Yellow Throated Miner	Rainbow Bee-Eater	Rabbit	Farm dog	Galah	Sheep
152							X	2								X							
153										X			X		X								
154			X							X					X								
155				X																			
156		X	X					X							X								
157	2	X													X								
158						X									X								
159		X	X		X					X													
160		X			X			X		X					X								
161		X			X			X		X	X				X								
162		X	X							X					X								
163		2					X			X					X								
164			X							X					X								
165		X													X								X
166		X					X			X					X			X				X	X
167		2					X								X							X	
168			X	2						X	X			X									
169										X													
170		3	2								X												
171			X							X					X								
172		X		X						X	X				X					X			
173			X												X					X	X		
174				X						X					X					X			
175			X							X					X					X			
176			X												X								
177			2							X					X								
178			X									X			2	X				X			
179	X	X	X	X					X		X				X								
180										X					2								
181			X	X					X						X								
182			2	X						X					2								

Trap #	Aust. Ringneck Parrot	Australian Mgie	Australian Raven	Bobtail	Brushtail Possum	Grey Butcher Bird	Cat	Common Bronzewing	Echidna	Fox	Goulds Goanna	Grey Currawong	Magpie Lark	Mardo	Western Grey Kangaroo	White Browed Babbler	Willie Wagtail	Yellow Throated Miner	Rainbow Bee-Eater	Rabbit	Farm dog	Galah	Sheep
183										X					X								
184			X												X								
185				X					X	X		X			X								
186				X				X		X					2								
187			X						X						X								
188			X	X					X		X				X								
189				2					X	2					X								
190				2							X				2								
191			X						X						X								

4.5 FERAL PREDATORS AND INTRODUCED SPECIES

The fox was recorded in multiple areas, including the Woorgabup Nature Reserve, Rifle Range Reserve, Jinkas, Olympia, Jackson, M70/1426 and E70/3952 and in both habitat remnants surveyed in November 2024 and the spring and summer of 2025/26. Foxes are widespread and abundant and the feral cat was also recorded in all areas and is widespread and abundant.

4.6 SPOTLIGHTING SURVEY

The nocturnal survey recorded beehives, and many common species, including Western Grey Kangaroos, foxes, feral cats, Common Brushtail Possum and Southern Boobooks. A Tawny Frogmouth and Australian Owlet-nightjar were heard calling.

4.7 BIOREGIONAL VERTEBRATE FAUNA ASSEMBLAGE

Appendix B provides a summary of the available fauna survey data near the survey area. There are appreciable differences in the recorded fauna assemblages within and among fauna surveys. These differences are partially due to the low survey effort deployed by some of the surveys and they also reflect variations in soils and vegetation as well as temporal variations in the fauna assemblages.

Tables 12-16 provide a list of vertebrate species potentially found near the survey area that have been compiled based on the fauna survey report results shown in Appendix B.

Table 12. Fish potentially found near the survey area

Family	Species	Common name
Atherinidae	<i>Leptatherina wallacei</i>	Western Hardyhead
Percichthyidae	<i>Bostockia porosa</i>	Nightfish

Family	Species	Common name
	<i>Nannoperca vittata</i>	Western Pygmy Perch
Galaxiidae	<i>Galaxias occidentalis</i>	Western Galaxias

Table 13. Birds potentially found near the survey area

Family	Species	Common Name
Anatidae	<i>Anas superciliosa</i>	Pacific Black Duck
	<i>Anas gracilis</i>	Grey Teal
Columbidae	<i>Phaps chalcoptera</i>	Common Bronzewing
	<i>Ocyphaps lophotes</i>	Crested Pigeon
Cuculidae	<i>Chrysococcyx lucidus</i>	Shining Bronze-Cuckoo
Aegothelidae	<i>Aegotheles cristatus</i>	Australian Owllet-nightjar
Ardeidae	<i>Egretta novaehollandiae</i>	White-faced Heron
Accipitridae	<i>Aquila audax</i>	Wedge-tailed Eagle
Alcedinidae	<i>Dacelo novaeguineae</i>	Laughing Kookaburra
Falconidae	<i>Falco berigora</i>	Brown Falcon
	<i>Falco peregrinus</i>	Peregrine Falcon
Timaliidae	<i>Zosterops lateralis</i>	Silvereye
Cacatuidae	<i>Eolophus roseicapilla</i>	Galah
Psittaculidae	<i>Polytelis anthopeplus</i>	Regent Parrot
	<i>Neophema elegans</i>	Elegant Parrot
	<i>Barnardius zonarius</i>	Australian Ringneck
	<i>Glossopsitta porphyrocephala</i>	Purple-crowned Lorikeet
Climacteridae	<i>Climacteris rufus</i>	Rufous Treecreeper
Maluridae	<i>Malurus pulcherrimus</i>	Blue-breasted Fairywren
	<i>Malurus splendens</i>	Splendid Fairywren
Meliphagidae	<i>Manorina flavigula</i>	Yellow-throated Miner
	<i>Acanthagenys rufogularis</i>	Spiny-cheeked Honeyeater
	<i>Anthochaera lunulata</i>	Western Wattlebird
	<i>Anthochaera carunculata</i>	Red Wattlebird
	<i>Gavicalis virescens</i>	Singing Honeyeater
	<i>Ptilotula ornata</i>	Yellow-plumed Honeyeater
	<i>Epthianura albifrons</i>	White-fronted Chat
	<i>Gliciphila melanops</i>	Tawny-crowned Honeyeater
	<i>Lichmera indistincta</i>	Brown Honeyeater
	<i>Phylidonyris novaehollandiae</i>	New Holland Honeyeater

Family	Species	Common Name
	<i>Phylidonyris niger</i>	White-cheeked Honeyeater
	<i>Nesoptilotis leucotis</i>	White-eared Honeyeater
	<i>Melithreptus chloropsis</i>	Gilbert's Honeyeater
	<i>Melithreptus brevirostris</i>	Brown-headed Honeyeater
Pardalotidae	<i>Pardalotus punctatus</i>	Spotted Pardalote
	<i>Pardalotus striatus</i>	Striated Pardalote
Acanthizidae	<i>Sericornis frontalis</i>	White-browed Scrubwren
	<i>Calamanthus campestris</i>	Rufous Fieldwren
	<i>Acanthiza inornata</i>	Western Thornbill
	<i>Acanthiza apicalis</i>	Inland Thornbill
	<i>Acanthiza chrysorrhoa</i>	Yellow-rumped Thornbill
	<i>Acanthiza uropygialis</i>	Chestnut-rumped Thornbill
	<i>Smicrornis brevirostris</i>	Weebill
	<i>Gerygone fusca</i>	Western Gerygone
Pomatostomidae	<i>Pomatostomus superciliosus</i>	White-browed Babbler
Campephagidae	<i>Coracina novaehollandiae</i>	Black-faced Cuckooshrike
	<i>Lalage tricolor</i>	White-winged Triller
Neosittidae	<i>Daphoenositta chrysoptera</i>	Varied Sittella
Falcunculidae	<i>Falcunculus frontatus</i>	Crested Shrike-tit
Pachycephalidae	<i>Colluricincla harmonica</i>	Grey Shrikethrush
	<i>Pachycephala pectoralis</i>	Golden Whistler
	<i>Pachycephala rufiventris</i>	Rufous Whistler
Artamidae	<i>Artamus cinereus</i>	Black-faced Woodswallow
	<i>Artamus cyanopterus</i>	Dusky Woodswallow
	<i>Cracticus torquatus</i>	Grey Butcherbird
	<i>Cracticus nigrogularis</i>	Pied Butcherbird
	<i>Gymnorhina tibicen</i>	Australian Magpie
	<i>Strepera versicolor</i>	Grey Currawong
Rhipiduridae	<i>Rhipidura leucophrys</i>	Willie Wagtail

Family	Species	Common Name
	<i>Rhipidura albiscapa</i>	Grey Fantail
Monarchidae	<i>Grallina cyanoleuca</i>	Magpie-lark
	<i>Myiagra inquieta</i>	Restless Flycatcher
Corvidae	<i>Corvus coronoides</i>	Australian Raven
Petroicidae	<i>Microeca fascians</i>	Jacky Winter
	<i>Petroica boodang</i>	Scarlet Robin
	<i>Petroica goodenovii</i>	Red-capped Robin
	<i>Melanodryas cucullata</i>	Hooded Robin
	<i>Eopsaltria griseogularis</i>	Western Yellow Robin
	<i>Drymodes brunneopygia</i>	Southern Scrub-Robin
Locustellidae	<i>Poodytes gramineus</i>	Little Grassbird

Family	Species	Common Name
	<i>Cincloramphus cruralis</i>	Brown Songlark
	<i>Cincloramphus mathewsi</i>	Rufous Songlark
Hirundinidae	<i>Hirundo neoxena</i>	Welcome Swallow
	<i>Petrochelidon ariel</i>	Fairy Martin
	<i>Petrochelidon nigricans</i>	Tree Martin
Zosteropidae	<i>Zosterops lateralis</i>	Silvereye
Dicaeidae	<i>Dicaeum hirundinaceum</i>	Mistletoebird
Motacillidae	<i>Anthus novaeseelandiae</i>	Australasian Pipit

Table 14. Amphibians potentially found near the survey area

Family	Species	Common Name
Limnodynastidae	<i>Heleioporus albopunctatus</i>	Western Spotted Frog
	<i>Limnodynastes dorsalis</i>	Western Banjo Frog
	<i>Neobatrachus pelobatoides</i>	Humming Frog
Myobatrachidae	<i>Crinia georgiana</i>	Quacking Frog
	<i>Crinia insignifera</i>	Sin-bearing Froglet

Family	Species	Common Name
	<i>Crinia pseudinsignifera</i>	Bleating Froglet
	<i>Myobatrachus gouldii</i>	Turtle Frog
	<i>Pseudophryne guentheri</i>	Gunther's Toadlet
Pelodryadidae	<i>Litoria adelaidensis</i>	Slender Tree Frog
	<i>Litoria cyclorhyncha</i>	Spotted-thighed Frog
	<i>Litoria moorei</i>	Motorbike Frog

Table 15. Mammals potentially found near the survey area

Family	Species	Common Name
Tachyglossidae	<i>Tachyglossus aculeatus</i>	Short-beaked Echidna
Bovidae	<i>Ovis aries</i>	Sheep
Suidae	<i>Sus scrofa</i>	Pig
Canidae	<i>Felis catus</i>	Cat
	<i>Vulpes vulpes</i>	Red Fox
Molossidae	<i>Austronomus australis</i>	White-striped Freetail Bat
	<i>Mormopterus planiceps</i>	Southern Free-tail Bat
Vespertilionidae	<i>Chalinolobus gouldii</i>	Gould's Wattled Bat
	<i>Chalinolobus morio</i>	Chocolate Wattled Bat
	<i>Nyctophilus geoffroyi</i>	Lesser Long-eared Bat
	<i>Nyctophilus major</i>	Greater Long-eared Bat

Family	Species	Common Name
	<i>Vespadelus finlaysoni</i>	Finlayson's Cave Bat
	<i>Vespadelus regulus</i>	Southern Forest Bat
Dasyuridae	<i>Antechinus flavipes</i>	Yellow-footed Antechinus
	<i>Dasyurus geoffroyi</i>	Chuditch
	<i>Phascogale calura</i>	Red-tailed Phascogale
	<i>Sminthopsis crassicaudata</i>	Fat-tailed Dunnart
	<i>Sminthopsis granulipes</i>	White-tailed Dunnart
	<i>Sminthopsis murina</i>	Slender-tailed Dunnart
Myrmecobiidae	<i>Myrmecobius fasciatus</i>	Numbat
Burramyidae	<i>Cercartetus concinnus</i>	Southwestern Pygmy Possum

Family	Species	Common Name
Macropodidae	<i>Macropus fuliginosus</i>	Western Grey Kangaroo
	<i>Notamacropus irma</i>	Western Brush Wallaby
Phalangeridae	<i>Trichosurus vulpecula</i>	Common Brushtail Possum

Family	Species	Common Name
Potoroidae	<i>Bettongia penicillata</i>	Woylie
Tarsipedidae	<i>Tarsipes rostratus</i>	Honey Possum
Leporidae	<i>Oryctolagus cuniculus</i>	Rabbit
Muridae	<i>Mus musculus</i>	House Mouse
	<i>Rattus rattus</i>	Black Rat

Table 16. Reptiles potentially found near the survey area

Family	Species	Common Name
Agamidae	<i>Ctenophorus cristatus</i>	Crested Dragon
	<i>Ctenophorus maculatus</i>	Spotted Dragon
	<i>Ctenophorus ornatus</i>	Ornate Crevice Dragon
	<i>Pogona minor</i>	Western Bearded Dragon
Carphodactylidae	<i>Underwoodisaurus milii</i>	Barking Gecko
Diplodactylidae	<i>Crenadactylus ocellatus</i>	Clawless Gecko
	<i>Diplodactylus granariensis</i>	Wheatbelt Stone Gecko
	<i>Diplodactylus pulcher</i>	Beautiful Gecko
	<i>Hesperoedura reticulata</i>	Reticulated Velvet Gecko
	<i>Strophurus spinigerus</i>	South-western Spiny-tailed Gecko
Elapidae	<i>Echiopsis curta</i>	Bardick
	<i>Neelaps calonotos</i>	Black-striped Burrowing Snake
	<i>Notechis scutatus</i>	Tiger Snake
	<i>Suta gouldii</i>	Gould's Snake
	<i>Suta nigriceps</i>	Short-tailed Snake
	<i>Pseudonaja affinis</i>	Dugite
	<i>Pseudonaja mengdeni</i>	Western Brown Snake
	<i>Simoselaps bertholdi</i>	Jan's Banded Snake
	<i>Suta fasciata</i>	Rosen's Snake
Gekkonidae	<i>Christinus marmoratus</i>	Marbled Gecko
	<i>Gehyra variegata</i>	Variegated Gehyra

Family	Species	Common Name
Pygopodidae	<i>Aprasia repens</i>	Southwest Sandplain Worm Lizard
	<i>Delma australis</i>	Marble-faced Delma
	<i>Delma fraseri</i>	Fraser's Delma
	<i>Lialis burtonis</i>	Burton's Legless Lizard
	<i>Pygopus lepidopodus</i>	Common Scaly-foot
Pythonidae	<i>Morelia spilota</i>	Carpet Python
Scincidae	<i>Cryptoblepharus buchanani</i>	Buchanan's Snake-eyed Skink
	<i>Ctenotus impar</i>	Odd-striped Ctenotus
	<i>Ctenotus schomburgkii</i>	Barred Wedgesnout Ctenotus
	<i>Egernia kingii</i>	King's Skink
	<i>Hemiergis peronii</i>	Lowlands Earless Skink
	<i>Lerista distinguenda</i>	South-western Orange-tailed Slider
	<i>Menetia greyii</i>	Common Dwarf Skink
	<i>Morethia obscura</i>	Shrubland Pale-flecked Morethia
	<i>Tiliqua occipitalis</i>	Western Blue-tongued Lizard
	<i>Tiliqua rugosa</i>	Bobtail
Typhlopidae	<i>Anilius australis</i>	Austral Blind Snake
Varanidae	<i>Varanus gouldii</i>	Gould's Goanna
	<i>Varanus rosenbergi</i>	Heath Monitor
Chelidae	<i>Chelodina oblonga</i>	Southwestern Snake-neck Turtle

4.8 FAUNA OF CONSERVATION SIGNIFICANCE

Vertebrate fauna of conservation significance are protected by the Commonwealth *EPBC Act 1999*, and this list includes species covered by international treaties such as the Japan-Australia Migratory Bird Agreement (JAMBA) and China-Australia Migratory Bird Agreement (CAMBA), and the Western Australia (WA) *BC Act 2016*. The *BC Act 2016* provides for the publication of the *Wildlife Conservation (Specially Protected Fauna) Notice*, which lists species under multiple categories. In addition, DBCA maintains a list of fauna that require monitoring under four priority categories based on current knowledge of their distribution, abundance and threatening processes. The *EPBC Act 1999* and *BC Act 2016* impose legislative requirements for managing anthropogenic impacts to minimise the effects of disturbances on species and their habitats. Priority species have no statutory protection, except that the DBCA wishes to monitor potential impacts on these species. Environmental consultants and proponents of developments are encouraged to avoid and minimise impacts on these species. Definitions of the significant fauna under the *BC Act 2016* are provided in Appendix C.

The fauna species that have special status in either State or Commonwealth government legislation, or are on the DBCA Priority species list, and are potentially present in the vicinity of the survey area, are listed in Table 17. Although they were recorded in the search of the MNES online database of migratory species, waders and shorebirds that typically would be found around the edge of salt lakes, clay pans, estuaries, marshes and wetlands have been excluded from Table 17 as there is no suitable habitat within the survey area.

Two threatened species of fauna were identified under the *EPBC Act 1999* and the *BC Act 2016*, as well as a specially protected species under the *BC Act 2016*, as occurring in the survey area. One species on the DBCA's Threatened and Priority Fauna List also occurs in the survey area. Two other species may be infrequently recorded in the survey area. The following assessment evaluates the likelihood of each species listed in Table 17 being present in the survey area.

Table 17. Assessment of the potential presence of species of conservation significance in the survey area

Species	BC Act and DBCA priority species list	Commonwealth EPBC Act	Comment on the potential presence of a species
Australasian Bittern <i>Botaurus poiciloptilus</i>	Endangered	Endangered	Not present in the survey area due to a lack of suitable habitat.
Night Parrot <i>Pezoporus occidentalis</i>	Critically Endangered	Critically Endangered	Not present in the survey area due to a lack of suitable habitat.
Dibbler <i>Parantechinus apicalis</i>	Endangered	Endangered	It was not recorded in the survey area or the surroundings, so it is unlikely to be present.
Carnaby's Black-Cockatoo <i>Zanda latirostris</i>	Endangered	Endangered	Forages and breeds in the survey area.
Numbat <i>Myrmecobius fasciatus</i>	Endangered	Endangered	Not present in the survey area.
Forest Red-tailed Black-Cockatoo <i>Calyptorhynchus banksii naso</i>	Vulnerable	Vulnerable	Not observed in the survey area or recorded in the adjacent area, so it is unlikely to be present.
Red-tailed Phascogale <i>Phascogale calura</i>	Conservation dependent	Vulnerable	Present in the survey area.
Malleefowl <i>Leipoa ocellata</i>	Vulnerable	Vulnerable	Locally extinct in this area.

Species	BC Act and DBCA priority species list	Commonwealth EPBC Act	Comment on the potential presence of a species
Chuditch <i>Dasyurus geoffroii</i>	Vulnerable	Vulnerable	It was not recorded in the survey area or the surroundings, so it is unlikely to be present.
Grey Falcon <i>Falco hypoleucos</i>	Vulnerable	Vulnerable	It was not recorded in the survey area or the surroundings, so it is unlikely to be present.
Southern Whiteface <i>Aphelocephala leucopsis</i>	Vulnerable	Vulnerable	It was not recorded in the survey area or the surroundings, so it is unlikely to be present.
Fork-tailed Swift <i>Apus pacificus</i>	Migratory	Migratory	It may infrequently be seen flying in the region.
Grey Wagtail <i>Motacilla cinerea</i>	Migratory	Migratory	Highly unlikely to be seen in the survey area.
Western Rosella (inland form) <i>Platycercus icterotis xanthogenys</i>	P4		Present in the survey area.
Western Brush Wallaby <i>Notamacropus irma</i>	P4		It was not recorded in the survey area or the surroundings, so it is unlikely to be present.
Peregrine Falcon <i>Falco peregrinus</i>	OS		It may be seen very infrequently in the survey area.

Results of the Commonwealth EPBC Act 1999 protected matters database search are provided in Appendix A.

Australasian Bittern (*Botaurus poiciloptilus*) – Endangered under the BC Act 2016 and EPBC Act 1999

The Australasian Bittern (*Botaurus poiciloptilus*) is a large-sized semi-aquatic and terrestrial heron standing nearly a metre tall with a head and body length of about 0.65–0.75m. It is sometimes called the Brown Bittern and is not endemic to Australia. It is a broad and sturdy bird that is mainly speckled brown, with an upper part patterned in dark brown, buff, and black, and an underpart streaked in brown and buff. It has a broad neck; the side of the neck is dark brown, but the throat and brow are pale. The bill is brown, and the legs are olive-green to yellowish green. In flight, it resembles an owl, with the neck outstretched, the legs dangling, a wide wingspan of slightly over a metre, and a general brown appearance (Birdlife Australia 2017a, eBird n.d., SWIFFT n.d.). Males and females are similar, but juveniles are different to adults, with paler plumage and much buff flecking on the back (Department of Climate Change Energy the Environment and Water 2024, Atlas of Living Australia n.d.).

Australasian Bittern is a cryptic, well-camouflaged, and elusive species, usually roosting in reeds, rushes, or sedge grasses, where it is challenging to spot (Department of Climate Change Energy the Environment and Water 2024, eBird n.d., SWIFFT n.d.). When disturbed, it often adopts a “frozen” posture with its neck and bill pointing skywards and relying on its cryptic colouration to avoid detection (Birdlife Australia 2017a). The Australasian Bittern is considered to be partly nocturnal as it actively forages before dawn and dusk (Birdlife Australia 2017a, Department of Climate Change Energy the Environment and Water 2024). However, it has been observed foraging during daylight hours, especially in winter (Fitzsimons 2022) and during the breeding seasons (SWIFFT n.d.). It is mostly solitary but can be found in pairs or occasionally in groups of up to 12. The species has a distinctive booming call, and it is often heard more than seen (Atlas of Living Australia n.d.).

The global population of the Australasian Bittern is estimated to be 1,500–4,000 mature individuals, with the largest subpopulation estimated to be <1,000 mature individuals (Birdlife Australia 2017a). However, this population is declining. Although the rate of this decline in Australia is not well understood, the area of

occupancy of the species in Australia is assumed to have declined by 70% between 1977 and 2008 (Department of Climate Change Energy the Environment and Water 2022). From the most recent reports, the Australasian Bittern population in Australia is currently estimated to be <2000 mature individuals (Birdlife International 2016), and its population in Western Australia is estimated to be <150 mature individuals (Department of Biodiversity Conservation and Attractions 2018, Herring et al. 2021).

The extent of occurrence of the Australasian Bittern is estimated to be 10,200,000km², primarily in Australia and New Zealand, with outlier occurrences in New Caledonia and Uvea (Birdlife International 2016, Department of Biodiversity Conservation and Attractions 2018). In Australia, it has been recorded around coastal and inland wetlands across all the states and territories (Department of Environment Land and Water 2024), with the highest occurrences in the southeastern part of the country: New South Wales, Victoria, and Tasmania.

In Western Australia, the Australasian Bittern occurs in wetland complexes in the south-west from Perth to Esperance, and vagrants have been reported along the coast in the Gascoyne, the Pilbara and Kimberly regions (Department of Biodiversity Conservation and Attractions 2018, Atlas of Living Australia n.d.). The species occurrence in Western Australia has been predominantly reported from the Forrestdale Lake, James Swamp, and Thomsons Lake in the southern Perth metropolitan area, Benger Swamp near Harvey, Lake Qualeup west of Kojonup, the Muir-Unicup system, wetlands along the south coast from Augusta east to Cape Arid, and the Vasse-Wonnerup system near Busselton.

The Australasian Bitterns are mostly sedentary (Department of Climate Change Energy the Environment and Water 2024); however, they can exhibit local (short-distance) movement for the regular dispersal of young birds (Department of Biodiversity Conservation and Attractions 2018) and in response to habitat conditions (mainly flooding and drought) or seasonal movements during winter (Garnett et al. 2011, Birdlife International 2016). In context, the Bittern in Rice Project (<https://www.bitternsinrice.com.au/>) has reported a dispersal of approximately 400-600km of individuals from inland rice fields to coastal wetlands in southeastern Australia.

Shallow and well-vegetated wetlands are generally considered the most suitable habitats for the Australasian bittern. Across Australia, the Australasian Bittern predominantly utilises freshwater (but can tolerate brackish) swamps composed of reeds, sedges, rushes, cumbungi, and other fringing or emergent vegetation of about 0.5–3.5 metres in height (SWIFFT n.d.). This species has also been reported to inhabit bore drains with tussocky vegetation (Department of Environment Land and Water 2024), as well as rice fields (Herring et al. 2019). The Riverina's rice fields attract approximately 500–1000 individuals to breed, representing ~40% of the global population and ~60% of the national population (Birdlife International 2016, Herring et al. 2019). The conditions in Australian rice fields are suggested to be more reliable than in natural wetlands, thus providing a suitable habitat (Birdlife Australia 2017a). However, it has also been reported to use short open pasture and shallow ephemeral wetlands with no fringing or emergent vegetation (Fitzsimons 2022).

The Australasian Bittern is carnivorous, feeding on a variety of small to medium-sized prey, including fish, eels, frogs, snails, crustaceans (e.g. crayfish), insects, reptiles, small mammals (mice) and birds (Birdlife International 2016, Department of Biodiversity Conservation and Attractions 2018, SWIFFT n.d.). The species usually forages up to 0.3 m depth in the water, and like other herons, it uses various techniques, including standing and waiting, slow stalking, and active pursuit, to capture prey (Birdlife Australia 2017a). Given the observed predation rate of the Australasian Bittern on other endangered species, e.g., 17 captures of the growling grass frog (*Litoria raniformis*) at a mean rate of one every 21 minutes of hunting time in south-eastern Australia (Menkhorst and Knight 2018), the Australasian Bittern may contribute to the decline of other endangered species.

There is no empirical data to suggest the home range or territory size of the Australasian Bittern. However, the species is known to establish feeding and breeding territories within loose colonies, and territories contain a mixture of tall and short sedges (Department of Environment Land and Water 2024).

There are currently no listed critical habitats within Australia for the Australasian Bittern under the *EPBC Act*. In Western Australia, all wetlands in which the Australasian bittern is known to breed and/or forage are considered

critical habitats, especially the Muir-Unicup system, Lake Pleasant View / Mt Manypeaks wetlands, and Cape le Grand wetlands (Department of Biodiversity Conservation and Attractions 2018).

The Australasian Bitterns have a regular breeding season from September to February, but can breed during inland flooding (Birdlife Australia 2017a). Males make booming calls to attract mates and may boom when environmental conditions are suitable for breeding. Booming calls occur from September to December in southern Western Australia, with peaks in October and November (Department of Biodiversity Conservation and Attractions 2018). Females lay about 3-6 pale olive, green-brown eggs per clutch (usually 4-5 eggs per clutch in Western Australia), and incubate the eggs for 25 days (Department of Biodiversity Conservation and Attractions 2018, Department of Environment Land and Water 2024). Fledglings occur after four weeks. Using an extrapolated mean annual survival of other heron genera, the generation length of the Australasian Bittern is estimated as 5.5 years (Birdlife International 2016, 2024).

The nests of Australasian Bitterns are a shallow structure of dry or green reeds, constructed by trampling reed vegetation up to 1m above the water level (Birdlife Australia 2017a, SWIFFT n.d.). In Western Australia, the nests are usually flat and 30-40cm in diameter, and built approximately 5-10cm above water using broken lengths of *Baumea*, *Gahnia*, and *Typha* species with fine sedges (Department of Biodiversity Conservation and Attractions 2018).

Across Australia, the known threats to the Australasian Bittern population include destruction of habitat through drainage of wetlands for agriculture, salinisation of swamps following clearance of catchments, and over-grazing of swamp vegetation by livestock (Garnett et al. 2011, Birdlife Australia 2017a). Other possible threats include habitat degradation due to fire and predation of eggs, chicks, and immature birds by introduced predators (e.g. red foxes) (Department of Environment Land and Water 2024).

In Western Australia, the main threatening processes to the Australasian Bittern population include altered hydrology and secondary salinisation of wetlands due to broad-scale vegetation clearing and the modification of wetlands, impacted water levels in wetlands due decline in rainfall and climate change in recent decades, and reduction in the density of vegetation cover due to intense and frequent bushfires in wetlands that form the core habitat (Department of Biodiversity Conservation and Attractions 2018).

It is highly unlikely to be present in or near the survey area due to the lack of semi-permanent water, surrounded by dense stands of *Typha*, *Baumea*, and sedges.

Night Parrot (*Pezoporus occidentalis*) – Critically endangered under the *BC Act 2016* and *EPBC Act 1999*

The Night Parrot is a small, arid-adapted, nocturnal, ground-feeding parrot (Johnstone and Storr 1998, Threatened Species Scientific Committee 2016a). Its length is 22-25cm, with a body mass of approximately 104g (Threatened Species Scientific Committee 2016a), although it was suggested that they were semi-nomadic, the Night Parrots in south-western Queensland appear to be sedentary (Murphy 2015).

The Night Parrot was probably distributed initially over much of semi-arid and arid Australia (Garnett et al. 1993, Threatened Species Scientific Committee 2016a). Records in north-west and western Queensland in the early 1990-2000s were in a broad cross-section of the habitats available (Garnett et al. 1993, Cupitt and Cupitt 2008, Boles et al. 2016). There have been recent sightings in the Pilbara in 1980, 2005 and 2017, central WA in 1979, north-eastern South Australia in 1979, western Queensland (including Pullen-Pullen-Mt Windsor-Diamantina population) in 1980, 1990, 1993, 2006 and 2013-17 (Davis and Metcalf 2008, Garnett et al. 2011, Charalambous 2016, Pickrell 2016, AG staff 2017, Palaszczuk and Miles 2017, Rykers 2017, AG staff 2018), Pilbara in 2017 (Jones 2017) and the northern Goldfields (Jackett et al. 2017). Garnett et al. (2011) suggested that there were between 50-250 mature individuals in less than 5% of its previous range.

Wilson's (1937) summary of observations provided information on the early records of Night Parrots' preferred habitat and breeding sites. Recent information indicates its preferred habitat appears to be in *Triodia*

grasslands, chenopod shrublands, shrubby samphire and floristically diverse habitats dominated by large-seeded species (Threatened Species Scientific Committee 2016a, McCarthy 2017, Murphy et al. 2017b). At Pullen Pullen Reserve it nests in large, more or less ring-shaped *Triodia*, and the nest consists of a tunnel (25-30° and 0° to the ground; 20-33cm long) through an apron of dead spinifex leaves that leads to a chamber under a live hummock, with a shallow depression (3-4cm) excavated into the gravelly/sandy soil (Murphy et al. 2017a). In the northern Goldfields, the nest was again in a spinifex hummock, it was circular, with an excavated depression (~1.5-2.0cm) in sandy substrate (Hamilton et al. 2017, Jackett et al. 2017). The entrance tunnel was 62cm long, and was downward sloping (27°) with the entrance 28cm above the ground (Hamilton et al. 2017). It has clutches of two to four sub-elliptical, white eggs with a lustrous appearance (Murphy et al. 2017a). Breeding followed significant rains in March for the observations in Pullen-Pullen Reserve and in April in the northern Goldfields (Hamilton et al. 2017, Murphy et al. 2017a), but it is thought that breeding generally occurs between April and October (Murphy et al. 2017a).

Murphy et al. (2017b) placed a GPS tag on Night Parrots and reported that the two birds called at dusk from their diurnal roosts among spinifex hummocks and then flew to more floristically diverse habitats dominated by large-seeded, prolifically seeding species to feed.

The survey area is in the medium priority area for Night Parrots based on the Department of Parks and Wildlife (2017b) assessment of where they might be found.

There are no large spinifex hummocks in the survey area that could provide roosting and nesting sites for this species, and no recent Night Parrot records are available near the survey area, making it highly unlikely for the species to be present in the area.

Carnaby's Black-Cockatoo (*Zanda latirostris*) - Endangered under the *BC Act 2016* and *EPBC Act 1999*

Carnaby's Black-Cockatoo (*Zanda latirostris*) is a large, pied cockatoo. Garnett et al. (2011) and the DSEWPac (2011) reported that Carnaby's Black-Cockatoo inhabits the south-west of Western Australia, from Kalbarri to east Esperance on the south coast. It breeds inland and moves to the coastal areas when chicks have fledged (Saunders et al. 1985). Carnaby's Black-Cockatoos are highly gregarious, usually seen in trios, small parties or large flocks (up to 5000 birds)(Perry 1948). These flocks typically consist of males, females, and immature birds.

Carnaby's Black-Cockatoos are partly migratory and partly sedentary (Higgins 1999). In the drier regions of their geographic range, where most of the native vegetation has been cleared (e.g. wheatbelt), Carnaby's Black-Cockatoos are postnuptial migrants (Saunders 1980, Saunders and Ingram 1995). After breeding, individuals in these areas migrate to feed in higher rainfall areas, including the Swan Coastal Plain, and to a lesser extent, forests dominated by *E. marginata* (Jarrah), *C. calophylla* (Marri) and *E. diversicolor* (Karri; Saunders 1980). On the Swan Coastal Plain, Carnaby's Black-Cockatoos have been recorded foraging in most suburbs and in pine plantations within the greater Perth metropolitan area (Perry 1948). Vagrants have been recorded on Rottnest Island (Winnett 1989) and Garden Island (Wykes et al. 1999). These latter two sightings clearly indicate that Carnaby's Black-Cockatoo will fly considerable distances over non-vegetated areas to forage.

Garnett et al. (2011) estimated that there were between 10,000 and 60,000 birds in the population.

Saunders (1980) recorded non-breeding cockatoos at Coomallo Creek foraging within a 50km radius of their breeding area, whereas cockatoos at Manmanning moved a much greater distance to the coastal plain during their non-breeding season. These data suggest that Carnaby's Black-Cockatoo move from areas where there is little food to southern and western coastal areas where food is presumably more plentiful during summer and autumn (Davies 1966, Saunders 1980).

Carnaby's Black-Cockatoo breeds between July and November, mostly in eucalypt woodland (Saunders 1980, 1986). Carnaby's Black-Cockatoo nests in tree hollows that are created by fire, fungi, termites or old age, with hollows between 2.5 and 12m above the ground (Saunders 1979, Higgins 1999). Hollows are large, ranging from 10 to over 250cm in depth (Higgins 1999). These hollows are usually in live or dead smooth-barked

Eucalyptus salmonophloia (Salmon Gum) or *Eucalyptus wandoo* (Wandoo). However, Carnaby's Black-Cockatoo will also nest in *E. longicornis* (Red Morrell), *E. loxophleba* (York Gum), *E. gomphocephala* (Tuart), *E. rudis* (Flooded Gum), *E. salubris* (Gimlet), *E. occidentalis* (Swamp Yate) and *C. calophylla* (Higgins 1999, Cale 2003). When breeding, they most often forage in the surrounding shrubland and kwongan heath (Higgins 1999). On the Swan Coastal Plain, breeding could occur in *E. gomphocephala*, *E. rudis*, *E. occidentalis* and *C. calophylla*. Adults return to the same breeding area each year (Saunders 1977) and some use the same tree hollow for many years in succession to raise their chicks; others shift their nests among a number of trees in the same area (Saunders and Ingram 1998).

At Coomallo Creek, Carnaby's Black-Cockatoo travelled on average 1.4km from their nests to forage, whereas at Manmanning they foraged more widely and travelled an average of 2.5km from their nest to forage (Saunders 1980). At Manmanning, road and railway reserves were extensively used for foraging, presumably as this was the closest food source to their nests. The availability of food near the nest influenced the time spent incubating eggs and fledging body mass (Saunders 1980). At Manmanning, Carnaby's Black-Cockatoo traversed agricultural land to forage in remnant plots of uncleared land.

Saunders (1980) reported Carnaby's Black-Cockatoo at Coomallo Creek (breeding area) foraged mostly on native plants, with the only exception being *Erodium* sp.. Higgins (1999) reported the habitat of Carnaby's Black-Cockatoo was uncleared or remnant woodlands dominated by *Eucalyptus*, particularly *E. wandoo* and *E. salmonophloia* and often in shrubland or kwongan heathland dominated by *Hakea*, *Dryandra*, *Banksia* and *Grevillea* and seasonally in *Pinus* plantations and less often in *C. calophylla*, *E. diversicolor* or *E. marginata*.

Carnaby's Black-Cockatoo breeds, roosts, and forages in the survey area. There are numerous significant Black-Cockatoo habitat trees within the survey area (Appendices D and E). One active and one probable Carnaby's Black-Cockatoo nesting site were recorded in the Rifle Range Reserve.

Within a radius of 12km, there are 6,706.9ha of habitat that provide mature trees, some of which would provide suitable nesting hollows and another 5,673.3ha that provide poor quality nesting habitat. In addition, there is >350ha of vegetation that would provide a suitable foraging habitat. There is good-quality foraging habitat for Black-Cockatoos in the survey area and within a 12km radius. The removal of Black-Cockatoo foraging habitat within the survey area will reduce foraging opportunities, as it will require Carnaby's Black-Cockatoo to travel further to forage.

Numbat (*Myrmecobius fasciatus*) - Endangered under the *BC Act 2016* and *EPBC Act 1999*

The numbat (*Myrmecobius fasciatus*) is a small termitivorous marsupial once found throughout southern semi-arid and arid Australia, but it is now confined to two natural populations and some translocation sites in south-west Western Australia (Threatened Species Scientific Committee 2018) and elsewhere in Australia.

Head and body lengths range from 200-250mm, while tails can be between 150-180mm in length (Threatened Species Scientific Committee 2018). Males weigh nearly one and a half times that of females, with maximum weights of 700g and 550g, respectively. They are easily recognised by their reddish-brown fur that extends from the head to the upper back and white banding across their back that becomes more distinct towards their rump, where this pattern is broken up with dark to black bands (Threatened Species Scientific Committee 2018). The striping patterns on the back are unique to each individual and provide an effective non-invasive method of determining individuals (Thorn et al. 2022). Numbats also have a horizontal black stripe that runs through their eyes and partway down their backs. The fur on the underside of the numbat is off-white, while the tail consists of long brown hairs, typically with white tips, and the underside near the body is a deep brick red colour.

Historically, the numbat had occupied much of southern arid and semi-arid Australia (Threatened Species Scientific Committee 2018) but colonial settlement, and in particular the introduction of feral predators and land clearing, has led to an excessive decline in population and a contraction in its geographical distribution. Natural populations now exist in *Dryandra* Woodland and the Upper Warren region (Seidlitz et al. 2021). The

Department of Biodiversity, Conservation and Attractions has translocated the Numbat to numerous locations within WA and elsewhere with varying levels of success (e.g. Batalling forest block, Boyagin Nature Reserve, Dragon Rocks Nature Reserve, Mount Gibson, Tutanning Nature Reserve, Cocanarup Timber Reserve, Stirling Range National Park), and elsewhere in Australia (e.g. New South Wales - Scotia Sanctuary; South Australia – Yookamurra) (Seidlitz et al. 2021).

Numbats are a solitary and territorial animal that rarely shares their home range with individuals of the same sex, with one pair of adults occupying an area of approximately 50ha in Jarrah and Wandoo woodlands (Department of Parks and Wildlife 2017a). In more arid populations, home ranges appear to be larger and will decrease during the cooler seasons (Department of Parks and Wildlife 2017a). In Scotia Sanctuary, there is a difference between male and female home ranges, with the latter having a median home range roughly a third the size of males (i.e. 96.6ha vs 28ha) (Department of Parks and Wildlife 2017a).

The historical habitat for the Numbat ranged from Mulga woodlands, sand plains, and hummock grasslands in arid zones to eucalypt woodlands and forests in south-western Australia (Threatened Species Scientific Committee 2018). Numbats are semi-fossorial and diurnal (Northover et al. 2023) and seek refuge in hollow logs, tree hollows, and burrows (National Environmental Science Program Threatened Species Research Hub 2019). This provides security from natural predators such as wedge-tailed eagles, brown falcons, little eagles, Gould's goanna, carpet pythons, and invasive predators like cats and foxes (Threatened Species Scientific Committee 2018).

The numbat's diet consists primarily of termites, but ants will be eaten incidentally (Threatened Species Scientific Committee 2018). Numbats spend much of their day feeding and will consume approximately 10% of their body weight daily. This equates to around 20,000 termites per day (Department of Parks and Wildlife 2017a). Termites are sourced from shallow, subsurface soil galleries, termite mounds, tree trunks or fallen wooden debris (Department of Parks and Wildlife 2017a). Numbats have been observed eating up to 25 different species of termites and will make preferences based on availability and abundance (Cooper and Withers 2004b).

Numbats have a very short breeding window, with mating typically occurring in December/January (Threatened Species Scientific Committee 2018). Young are typically born in the summer, but as late as April, with a gestation of 14 days. Numbats have an average litter size of 4 and, like some other *Dasyurids*, they do not live in a pouch. Instead, they attach to the mother's nipples, and a large fold of skin protects the young (Department of Biodiversity Conservation and Attractions et al. nd). Young will stay attached to their mother for 6-7 months, and then they are deposited in the nest and at 8-9 months, the joeys will begin to explore the entrance of the nest (Department of Biodiversity Conservation and Attractions et al. nd). The young will be weaned off their mother's milk at 10-11 months, and by 12 months, they will be fully independent and move on to find their own territories (Department of Biodiversity Conservation and Attractions et al. nd).

The main threats to numbat populations include predation from invasive species, habitat loss, inappropriate fire regimes, and climate change (Northover et al. 2023). Disease could be a threat from captive-bred numbats, as all records of disease outbreaks in numbats have occurred in captive populations. Therefore, this quarantine period needs to be strictly adhered to for captive release programs (Northover et al. 2023).

Invasive predators such as foxes and feral cats have been a major threat to reintroduction efforts for establishing numbat populations throughout Australia and have also caused strain on the two existing populations in Western Australia. Following a significant decline in numbat populations in the 1970s, the DBCA implemented its Western Shield Program, deploying 1080 baits on a broad scale across endemic and introduced numbat habitats (Northover et al., 2023). These efforts were attributed to an abundance spike in the 80s and 90s (Northover et al. 2023). In 2015, DBCA implemented the Dryandra Numbat Woylie (Predator Management) Project. As part of this project, DBCA established partnerships with the Peel-Harvey Catchment Council (PHCC) and Project Numbat to engage farmers and private landholders in expanding feral management to lands surrounding numbat and woylie populations (Northover et al. 2023). Farmers and private

landholders received training and licensing support to manage feral animals on their properties (Northover et al. 2023). These efforts have led to the abundance of numbats increasing, and continued efforts will be required to maintain this trend (Threatened Species Scientific Committee 2018). Feral cat predation has been identified at several numbat translocation sites and caused a major decline in numbat populations at Dryandra in 2009 (Northover et al. 2023). Feral cat involvement in this decline was evidenced by a two-year intensive study on the causes of mortality in numbats and woylie at Dryandra where it was also linked to decreased fox activity due to past fox management efforts (Northover et al. 2023). In response, feral cat baits such as Eradicat® and Felixer™ grooming traps have been deployed in the area with great success, and the latter method of cat control poses minimal risk to numbats (Northover et al. 2023). Maintaining an invasive predator-free habitat within the fenced reserves is crucial to preserving the numbat population and supporting future translocation efforts.

Habitat loss and fragmentation severely decreased the population potential for the numbat, as many remnant areas of eucalypt-dominant habitats are now considered too small to maintain viable subpopulations, meaning that translocation possibilities are becoming increasingly sparse (Threatened Species Scientific Committee 2018). Habitat fragmentation can also lead to increased instances of predation (Northover et al. 2023). Timber harvesting has been attributed to mixed effects on the numbat population. In some instances, the availability of logs and dens can be increased, including in the Upper Warren region of Dryandra (Northover et al. 2023). Clearing can also lead to numbats utilising other areas in their habitat in the Dryandra woodland (Northover et al. 2023). Illegal firewood harvesting can decrease the presence of termites through its impact on substrates, such as hollow logs and dead wood removal (Threatened Species Scientific Committee 2018).

Frequent fires pose a threat to numbat populations through direct numbat death and increased chances of predation (Threatened Species Scientific Committee 2018). Large, hot fires can also lead to a decrease in food and habitat opportunities. These effects are most keenly observed in numbat populations in the arid zone (Northover et al. 2023). These risks are considered low at Dryandra where there have been very few large fires (Northover et al. 2023). Studies on fire effects on numbats at Dryandra have found that termite abundance is unaffected by fires, whereas the time of year the fire occurs will affect log abundance (Northover et al. 2023). Burns occurring later in the year (October) will have a lower log replenishment rate than those burnt earlier in the year (March) (Northover et al. 2023). With these findings in mind, the DBCA and the Australian Wildlife Conservancy (AWC) have adjusted their burning regimes and continue to research and develop them to reduce large-scale fires and provide the best chance for fire recovery. This includes doing burns outside of denning season, burning in mosaic patterns, and creating fire breaks around active den sites (Northover et al. 2023).

Climate change is a long-recognised threat to numbat populations, but there is a lack of research about the potential impact of climate change on numbat habitat (Northover et al. 2023). One reason climate change is considered a threat is that current knowledge of the genetic and behavioural adaptations of past populations of numbats is lacking. As such, we cannot say whether current populations will thrive in past environments (Northover et al. 2023). One example of this could be found during 2018-2019, when there was a severe drought at Scotia and Yookamurra reserves, leading to a decline in numbat populations, which only increased after average rainfall conditions were returned (Northover et al. 2023). Extreme heat conditions can also have adverse effects on translocation efforts, as seen when a translocation of numbats to the AWC's Newhaven sanctuary in Central Australia resulted in most numbats dying of heat stress or being unable to make or find suitable burrows (Northover et al. 2023). This came as a surprise since many studies have confirmed that numbats possess physiological adaptations to arid environments (Cooper and Withers 2002, Cooper et al. 2003, Cooper and Withers 2004a). To combat the changing environment, a more expansive meta-population of numbats needs to be established across a broader range of environments. This can be achieved through targeted gene flow where numbats with favourable genes would be translocated to less favourable areas to increase chances of survival (Northover et al. 2023).

The numbat has not been recorded in the vicinity of the survey area for many years and was not recorded in the camera trapping program, so it is not present in the survey area.

Forest Red-tailed Black-Cockatoo (*Calyptrorhynchus banksii naso*) - Vulnerable under the *BC Act 2016* and *EPBC Act 1999*

The Forest Red-tailed Black-Cockatoo is one of three large black-cockatoos found in Western Australia. *Calyptrorhynchus banksii naso* frequents the humid to sub-humid south-west of Western Australia from Gingin in the north, to Albany in the south and west to Cape Leeuwin and Bunbury (Department of Sustainability Environment Water Population and Communities 2011). It was mostly seen in the Perth hills, but small numbers of birds were seen at Mundijong, Baldivis, Karnup, Stakehill, Pinjarra, Coolup and in the Lake Clifton area (Johnstone et al. 2011). In 2011, the number of Forest Red-tailed Black-Cockatoos on the coastal strip north from Rockingham to the northern metropolitan suburbs increased. The reason for the recent increase in abundance is unknown.

Forest Red-tailed Black-Cockatoo nest hollows have been recorded between 6.5 and 33m above the ground, with entrance sizes ranging from 10 x 12cm to 44 x 150cm and a depth of 0.3-8.2m (Johnstone et al. 2013b, a). Breeding occurs throughout the year, but peaks in April-June and August-October, with an incubation period of 29-31 days. A female broods her hatchling for the first 3-10 days after hatching and then leaves the nest each day at dawn, returning to feed the chick at dusk. Hatchlings are fully feathered at about 48 days. Most nests are in Marri, but they have also been recorded in Jarrah, Blackbutt, Bullich and Wandoo. Nest sites are often clustered in an area.

Johnstone and Kirkby (2011) reported the Forest Red-tailed Black-Cockatoo to feed mostly on seeds from *C. calophylla*, *E. marginata*, but also on *Allocasuarina fraseriana* (Sheoak), *Persoonia longifolia* (Snottygobble), *Eucalyptus patens* (Blackbutt) and introduced species such as *M. azedarach* (Cape Lilac) and *Corymbia citriodora* (Lemon-scented Gum).

Loss of breeding habitat in the form of suitable hollows and adequate feeding resources in the vicinity of nesting hollows to enable adults to feed chicks is a primary threat. Abbott (1998) reported that trees within its known breeding distribution were not a factor in limiting breeding. He estimated there were about 15,000 birds and Garnett *et al.* (2011) thought about 10% of these birds bred each year. Competition for nesting hollows by other cockatoos, Wood Ducks, Galahs and feral Honeybees appears to be a significant threat (Garnett et al. 2011).

The Forest Red-tailed Black-Cockatoo has not recently been recorded in or near the survey area, and it is outside the geographic distribution as indicated by the Commonwealth Government (Department of Agriculture Water and the Environment 2022) referral guidelines, so it is unlikely to be in the survey area.

Red-tailed Phascogale (*Phascogale calura*) – Vulnerable under the *EPBC Act 1999* and Conservation Dependent under the *BC Act 2016*

Phascogale calura is a medium-sized marsupial with distinctive features that help it thrive in its environment. Adults have a body length of 90–140 mm (head-body) and a tail length of 130–160 mm, with males being slightly larger than females (Bradley 2000, Threatened Species Scientific Committee 2016b). The fur is soft, dense, and variable in colour, and generally dark grey to brown, with a pale belly. The most striking feature is the black stripe running from the back of the head down the length of the back, which helps distinguish it from other similar species. The tail is long, bushy, and tipped with a tuft of fur, providing balance and aiding in communication. Its strong, sharp claws make it an excellent climber, although it is primarily terrestrial when foraging (Bradley 2000).

The geographic range of *P. calura* is restricted to southwestern Australia, specifically within the south-western wheatbelt of Western Australia, in a strip 150km in a north-south direction from Brookton to Katanning, and about 80 km wide from Williams to Dumbleyung (Kitchener 1981, Short and Hide 2012). There are sparse records of this phascogale extending from the western margin of the Jarrah Forest to the east to Hyden and Newdegate, and to the south to Bremer Bay (Short and Hide 2012). The species is generally confined to

fragmented patches of native bushland containing suitable habitat, making it vulnerable to local extinction where the habitat is lost.

Red-tailed Phascogales were successfully translocated to the Wadderin Sanctuary north of Narembeen (WA) in 2009 (Short and Hide 2015a); an unfenced reserve near Kojonup in 2010 (Short and Hide 2015a, de Visser et al. 2024) and to the Mount Gibson Wildlife Sanctuary in 2017 (Anderson et al. 2024).

Phascogale calura is generally nocturnal, with its movement being influenced by both food availability and the presence of predators. This home range varies (1.5-8ha) in size depending on food availability and the quality of shelter (Woinarski et al. 2014).

The species uses a combination of running, climbing, and occasionally jumping between trees or other structures to navigate its environment. The bushy tail plays a crucial role in balancing while climbing and manoeuvring through trees and shrubs.

Phascogale calura occupy areas of remnant vegetation of varying sizes from very small to very large, many on private agricultural land. They have a preference for woodlands of Wandoo (*Eucalyptus wandoo*) and Rock Sheoak (*Allocasuarina huegeliana*) in upland areas and Swamp Sheoak (*Casuarina obesa*), York Gum (*E. loxophleba*) and Wandoo in lowland areas (Bradley 2009, Short et al. 2011). This species requires a mixture of trees, dense undergrowth, and a variety of hollow logs, rocks, and tree hollows, which provide shelter from predators (Woinarski et al. 2014).

The species predominantly feeds on invertebrates, including insects, spiders, and other arthropods (Kitchener 1981), but as an opportunistic feeder and will adjust its diet depending on the availability of prey, such as small vertebrates like lizards or frogs. While it primarily hunts by foraging on the ground, it is a capable climber and will forage in the vegetation.

Breeding in *P. calura* is seasonal, with mating occurring in July, and females give birth to litters of 6-8 young (Kitchener 1981, Bradley 2009). The young are born in a highly undeveloped state and are carried in the mother's pouch for several weeks after birth.

After emerging from the pouch, the young continue to nurse and grow in the safety of the mother's den or nest until they are weaned at about 8–10 weeks of age. At this point, the young begin to forage independently but remain dependent on the mother for shelter and protection. Sexual maturity is typically reached by 6–8 months of age. The species exhibits no significant sexual dimorphism, though males tend to be slightly larger than females.

Breeding success is closely tied to the availability of shelter and food. Habitat fragmentation can negatively impact reproductive success by reducing the number of available nesting sites and lowering resource availability.

The major threats to *Phascogale calura* are:

- habitat loss;
- invasive predators such as red foxes (*Vulpes vulpes*) and feral cats (*Felis catus*); and
- fire resulting in the destruction of habitats that are relied on for shelter and food.

Red-tailed Phascogales were recorded in the bushland surrounding the Woorgabup Nature Reserve and Rifle Range Reserve, and other bushland fragments on M70/1426 and E70/3952. In the Woorgabup Nature Reserve and Rifle Range Reserves, the Red-tailed Phascogales were recorded in or very near wandoo and banksia woodland but could be using a variety of areas where trees contain suitable-sized retreats and nesting hollows.

Malleefowl (*Leipoa ocellata*) – Vulnerable under the BC Act 2016 and EPBC Act 1999

Malleefowl are a medium sized, predominantly ground dwelling bird that is comparable in size to that of a large domestic fowl. Adults' range between 1.5 and 2.5kg with males being slightly larger. They can be difficult

to find in the wild because of how well they camouflage, although they are commonly seen near their large distinctive breeding mounds.

Appearance-wise, they have a distinctive grey, black and white banding across their bodies and wings, while their neck and head are greyish with a white stripe under their eye, and their belly and breast are a cream-white in appearance (Department of Parks and Wildlife 2016b). From the front of the crown to their nape, Malleefowl have a dark crest that will raise when the bird is alarmed (Department of Parks and Wildlife 2016b).

Malleefowl is not sexually monomorphic but the sexes do have differing calling patterns. Males will make either deep two-toned bellowing or booming calls or loud clucks, while females will make high-pitched crowing, soft crooning, or low grunting calls (Department of Parks and Wildlife 2016b).

Historically, the range of the Malleefowl in Western Australia spans from north of Carnarvon to east of Esperance, and they have also been recorded over the majority of the southern WA (Parsons et al. 2008). With colonisation, the natural geographical range of the Malleefowl has contracted and this contraction is predicted to continue (Parsons et al. 2008). This contraction is primarily attributed to use of land for grazing and introduced predators (e.g. foxes: Benshemesh 2007, Parsons et al. 2008).

The Malleefowl is a sedentary, ground-dwelling bird that can wander up to several kilometres from their normal activity area (Department of Parks and Wildlife 2016b). They do not defend a territory, and their home ranges will often overlap with other individuals (Department of Parks and Wildlife 2016b). These birds will move throughout their home range predominantly on foot, but they can fly (Benshemesh 2007). They mostly fly to a nocturnal roosting site, which provides some protection against terrestrial predators.

Malleefowl, as their name suggests, are most commonly found in mallee shrubland and woodlands (Department of Parks and Wildlife 2016b). Other vegetation types they have been frequently found in include Mulga (*Acacia aneura*), Broombush (*Melaleuca uncinata*), Scrub Pine (*Callitris verrucosa*), Eucalyptus woodlands and coastal heathlands (Department of Parks and Wildlife 2016b). For habitats with the vegetation types listed above to be suitable, they require sandy soils and plenty of leaf litter to build their nest mounds (Department of Parks and Wildlife 2016b).

Malleefowl is an opportunistic forager whose diet is affected by seasonal availability, but it mainly consists of a mixture of plant and insect materials (Animal Plant Mineral 2012).

Malleefowl are known for building large mounds on the ground to make their nests during the breeding season. To successfully incubate their eggs, they will add or remove leaf litter and sand to maintain an optimal temperature of between 32-34°C (Hossain et al. 2022). Malleefowl mounds can consist of sand, rock and/or pebble, and can be between three-five metres in diameter (Sackmann and Jamieson 2018) and up to one meter in height (Parvin et al. 2021).

According to the National Malleefowl Monitoring manual there are 7 profiles for Malleefowl nest mounds (National Malleefowl Recovery Team 2016). Their descriptions are as follows:

1. Typical crater with raised rim. This is the typical shape of an inactive (dormant) mound.
2. Mound fully dug out. The crater slopes down steeply, and at the base the sides drop vertically to form a box-like structure with sides usually 20-30cm deep. Often litter will have been raked into windrows and may have started to enter the mound.
3. Mound with litter. This is the next stage after Profile 2. Litter will have been raked into the mound by Malleefowl, and thick layers of litter are evident on the surface. There may or may not be some sand mixed with the litter at this stage.
4. Mound mounded up (no crater) an active but unopened Malleefowl mound.

5. Mound that has a sandy crater with peak in centre. An active mound which is in the process of being closed by Malleefowl.
6. Mound low and flat without peak or crater. A very long unused mound or a deliberately flattened mound late in a breeding season to capture heat from the sun.
7. Very large flat mound. Very broad and flat and will generally measure more than 10m in diameter. These mounds are thought to have been made by a species of megafauna, a bird similar to Malleefowl but much larger. The mega mound may have a more recent mound on top of it.

After an egg is laid, the female Malleefowl will devote much of her energy and time to foraging to ensure she produces large yolk-rich eggs that are yet to be laid. Meanwhile, the male will tend to the mound and ensure it stays at optimum incubation temperatures (Weathers and Seymour 1998), however, often both parents will regulate the temperature in the mound. While traditionally thought to be behaviourally monogamous, some studies have shown that they exhibit extra-pair paternity and polygyny (Stenhouse 2022). Malleefowl has a high fecundity, producing up to 35 eggs per breeding season (Department of Parks and Wildlife 2016a), but it is generally within the 14-20 range (Priddel and Wheeler 2005). Higher food availability can lead to increased fecundity (Priddel and Wheeler 2005).

Land clearing and fragmentation are the biggest threats to Malleefowl populations (Benshemesh 2007). The ideal habitat for Malleefowl also unfortunately has the best soil conditions for wheat and sheep production, which has led to 80% of the wheat belts in Western Australia and the eastern states being cleared (Benshemesh 2007). While agriculture is the primary reason for Malleefowl habitat loss, there has also been an increased interest in these areas by mining and waste containment (Benshemesh 2007). The National Malleefowl Recovery Plan recommends that destructive mining be prohibited in suitable remnant vegetation and Malleefowl-dense areas unless there are clear long-term improvements for Malleefowl populations (Benshemesh 2007). Consequently, this clearing has also had the run-off effect of fragmenting any remaining suitable Malleefowl habitat (Benshemesh 2007).

Increased agricultural activity throughout Australia has led to a surge in sheep and other grazing animals in the Wheatbelt. This increased grazing has been shown to reduce the breeding densities of Malleefowl by between 85-90% (Benshemesh 2007). These grazing animals have also led to decreased food supplies and decreased vegetation cover for the Malleefowl, making them more vulnerable to predation and reducing their chances of survival due to being outcompeted for food resources (Benshemesh 2007). Introduced predators like foxes and cats have also heightened the risk of predation for the Malleefowl, drastically impacting chick survival rates and adult mortality rates (Benshemesh 2007). Foxes in particular are a significant threat because they will prey on Malleefowl during all life stages and are the only documented predators to target Malleefowl eggs, other than humans (Benshemesh 2007).

There are also some threats outlined in the National Recovery Plan for Malleefowl that have yet to have any proof of direct impact on Malleefowl populations but are included because they are highly likely to impact their populations in the future or will affect efforts to monitor/conservate existing populations. These include changing fire regimes, disease, inbreeding, chemical exposure and climate change (Benshemesh 2007).

Malleefowl is not present in the survey area.

Chuditch (*Dasyurus geoffroii*) – Vulnerable under the *BC Act 2016* and *EPBC Act 1999*.

The Chuditch is a medium size mammal, but the largest extant, carnivorous dasyurid in Australia. It is nocturnal and mostly solitary and has a distinctive appearance a white spotted pelt, pointed snout, large ears and eyes. Males (~1.3kg) are larger than females (~900g) and it has a bushy tail and a unique spot pattern.

It was formerly known from over 70% of Australia, but now it has a patchy distribution throughout the Jarrah forest and mixed Karri/Marri/Jarrah Forest of south-west WA and other isolated areas. There is a historical Chuditch record from 1974 near Kambalda. However, the extant population extends east to the Lake Johnston area, and it is relatively abundant in the Parker Range, Mount Holland, Forrestania and Jilbadji Nature Reserve on the eastern part of its geographic range.

Chuditch are solitary animals for most of their life and den in hollow logs, burrows, culverts, etc. and have also been recorded in tree hollows and rock cavities. Their core activity areas are 4km² and 0.9km² for males and females respectively and females tend to be territorial, although some areas may be shared by a mother and her adult daughter (Serena and Soderquist 1989).

Chuditch are opportunistic feeders and forage primarily on the ground at night. Their diet is predominantly mammals, and invertebrates can include birds, lizards, and reptile eggs (Glen et al. 2010).

Females enter oestrus, and mating occurs, in late April to early July. After a gestation period of about 17 days, the female gives birth to up to six young. The young are carried in the mother's pouch for about seven weeks before being left in a den while the mother forages.

Many factors may have contributed to the decline of the Chuditch, including habitat alteration caused by rabbit and livestock grazing, changing fire regimes, land clearing, predation and competition from feral dogs, foxes and feral cats, shooting and poisoning (Department of Environment and Conservation 2012a).

Chuditch was not recorded in the survey area or its surrounds, so it is unlikely to be present.

Grey Falcon (*Falco hypoleucos*) - Vulnerable under the *BC Act 2016* and *EPBC Act 1999*

The Grey Falcon (*Falco hypoleucos*) has an estimated wild population of <1000 (Threatened Species Scientific Committee 2020) and is the rarest member of the *Falco* genus in Australia, and in the top five rarest Falcon species in the world (Schoenjahn et al. 2019).

The Grey Falcon is a medium-sized falcon that has a pale-grey underbody with a medium-grey back, black outer wings, and off-white underwings (Mullin et al. 2019). Compared to other falcons, its lighter plumage stands out (Mullin et al. 2019). They stand at about 30-45cm tall, with wingspans ranging from 85-95cm (Morcombe 2017). Males have an average body mass of 390g, while females have an average 560g, displaying reverse sexual dimorphism (Schoenjahn et al. 2019). Grey Falcons are usually a quiet species, but during their breeding season, will make loud, slow "kek-kek-kek" or "kak-ak-ak-ak", which sounds similar to the call of a Peregrine Falcon but is slower, deeper, and harsher (Morcombe 2017).

This species is sparsely recorded throughout much of arid, semi-arid Australia and inland Australia. Their range has been reduced to northern WA, with only rare occurrences south of 26°S (Schoenjahn et al. 2019). When sighted, Grey Falcons have been observed in areas with annual rainfall less than 500mm, except during wet years followed by drought, which can cause the species to become marginally more widespread (Threatened Species Scientific Committee 2020). They have also been sighted outside of breeding season in Derby, Western Australia (Schoenjahn et al. 2019). There have been sightings further south; however, many Grey Falcon sightings are believed to be misidentifications (Schoenjahn et al. 2019).

The Grey Falcon is a wide-roaming bird commonly recorded in drainages, along watercourses, or anywhere where there is permanent water throughout arid and semi-arid regions of Western Australia. There is a suggestion that their movements are seasonal, tending to move within rainfall areas of 150 or 250mm on the middle latitudes of Australia in the spring, and moving towards the coast while avoiding the north in the rainy seasons (Olsen and Olsen 1986). During autumn and winter, Grey Falcons may move further north, where it is drier (Olsen and Olsen 1986) and are commonly referred to as being nomadic due to a lack of substantial studies on their movements (Schoenjahn et al. 2019). When recorded, they have been found as individuals or in pairs. In times of severe drought, groups of up to six falcons have been spotted around the junction of the

Murray and Darling rivers in the eastern states of Australia (Olsen and Olsen 1986), but there is no information regarding whether anything similar occurs in Western Australia.

The Grey Falcon is most likely to inhabit the timbered country in stony plains, shrublands (especially *Acacia*), grasslands (i.e. spinifex and tussock), and wooded areas of arid/semi-arid regions (Olsen and Olsen 1986). They can also inhabit open coastal woodlands, but this is primarily during seasons of drought (Olsen and Olsen 1986). It has been noted that in winter, Grey Falcons are more likely to be found in tussock grassland and open woodland.

Grey Falcons have been observed hunting in treeless areas and are known for having large foraging ranges. Their prey predominantly consists of birds, but they also hunt small mammals, reptiles, and insects (Olsen and Olsen 1986). Grey Falcons prefer ground-feeding and flocking birds, including parrots, pigeons, and wrens (Olsen and Olsen 1986). Their diet becomes more avian-based during the breeding season. While they are said to hunt in treeless areas, most accounts of their feeding have involved them feeding on the ground, especially near outback verges and tracks (Schoenjahn 2018).

Breeding habitat appears to be localised in zones with the highest annual average temperatures and in areas with persistently dry and winter-drought climatic conditions. The breeding season for grey falcons is reported to be from mid-late winter to the end of spring (June to November). During the breeding season, they nest in tall trees on watercourses and occasionally on man-made structures such as transmission line towers. Grey Falcons are said to be opportunistic and frequently use already existing structures from other bird species, typically corvids and other raptors, with rare reports indicating that they will make their nests (Schoenjahn 2018). Grey Falcons will lay clutches of one to four eggs (Threatened Species Scientific Committee 2020). Eggs take 35 days to incubate and another 49–52 days before they fledge (Schoenjahn 2018).

Even though multiple reports have recorded threats to the Grey Falcon, none of these have been substantiated and are often considered to be speculative (Schoenjahn 2018, Threatened Species Scientific Committee 2020). These are:

- Predation by cats;
- Increased temperatures in arid and semi-arid Australia;
- Small population size;
- Grazing by exotic herbivores;
- Nest shortage;
- Birdwatchers and photographers;
- Collision with traffic;
- Collision with fences and powerlines;
- Egg collecting;
- Falconry.

Predation by cats has been listed as the highest priority, as Grey Falcons roost on the bare ground and have been previously found in the stomach contents of feral cats (Threatened Species Scientific Committee 2020). A small population size means that the Grey Falcon is susceptible to demographic and genetic stochastic events, which could impact the long-term survival of the species, making it a very high threat (Threatened Species Scientific Committee 2020). Threats 2, 4, and 5 are also listed as very high priority, but there is no evidence that these have impacted Grey Falcons (Threatened Species Scientific Committee 2020). Disturbance by birdwatchers and photographers is a moderate threat to Grey falcons, as they may interrupt breeding success with repeated visits to known breeding sites (Threatened Species Scientific Committee 2020). Direct mortality from traffic, fences, and powerlines is also considered a moderate threat; however, unlike birdwatchers, there is substantial evidence for this threat (Threatened Species Scientific Committee 2020). Egg collecting and falconry are the least impactful of these threats because they are least likely to occur.

There are no records of this falcon in the Atlas of Living Australia near the survey area, and very few records exist in the southwest of Australia; therefore, it is highly improbable that it would be seen in the survey area.

Southern Whiteface (*Aphelocephala leucopsis*) - Vulnerable under the EPBC Act 1999 and BC Act 2016

The Southern Whiteface (*Aphelocephala leucopsis*) is a small, distinctive bird with a thornbill-like appearance, measuring ~11.5cm in length (Plate 1). It has a dark crown, extending from the forehead to the nape, and a white face. The upperparts are predominantly brownish-grey, and the underparts are white. Its short, pointed bill is finch like in appearance and adapted for feeding on seeds and insects (Nevill 2018). Some individuals have a distinct chestnut flank. The tail is black with a narrow white tip. It has a cream-coloured eye and grey legs. Adults are sexually monomorphic while juveniles lack a black rear band on the face (Schodde and Mason 1999).

There are two recognised subspecies of Southern Whiteface *A. l. leucopsis* (south-eastern southern whiteface) which is found throughout south-eastern and central Australia and *A. l. castaneiventris* (south-west southern whiteface) found in central and southern regions of Western Australia (Department of Climate Change Energy the Environment and Water 2023). The subspecies have overlapping ranges and hybridize in overlapping areas.

The Southern Whiteface's geographic distribution has declined substantially over the last 24 years with an estimated reduction in population of 30-50% every 10 years (Department of Climate Change Energy the Environment and Water 2023). The population of *A. l. leucopsis* is estimated at between 36,000 and 134,000 while the population of *A. l. castaneiventris* is estimated at between 236,000 and 954,000 (Department of Climate Change Energy the Environment and Water 2023).

The Southern Whiteface occurs across an area of over 4,910,000km² across Australia. However, within this area, its area of occupancy is estimated to be 34,400-140,000km² (Ehmke et al. 2021). In Western Australia, it can be found as far north as Carnarvon and from the WA west coast near Hamelin Bay through the Great Victoria Desert into the arid areas of South Australia.

In WA, the Southern Whiteface has been found in numerous IBRA's during surveys, including but not exclusive to the Pilbara, Carnarvon, Gascoyne, Yalgoo, Murchison, Coolgardie, Little Sandy Desert, Gibson Desert, Great Victoria Desert, Central Ranges, Geraldton Sand Plains, Avon Wheatbelt, Nullarbor, and Mallee.

The movements, home range, and social structure of Southern Whiteface are poorly understood. Some consider it sedentary; however, records indicate that birds will move locally to new areas, particularly in drought years (Higgins and Peter 2002). Craig and Moore (2020) recorded this bird being present and absent during surveys near Bungalbin in Western Australia, suggesting it was mobile, probably with a shifting activity area. In multiple Terrestrial Ecosystems surveys near the Mt Weld mining area, near Laverton in the Goldfields, there was evidence of shifts in its activity area (Terrestrial Ecosystems 2024b).

Its geographic distribution covers a wide range of habitat types. Acacias and Eucalypts usually dominate these habitats and consist of open woodlands and shrublands on ranges, foothills, lowlands, and plains (Higgins and Peter 2002). Critical habitat for this species is considered to be relatively undisturbed open woodlands and shrublands with an understorey of grass or shrubs near areas of low tree densities with a herbaceous understorey for foraging habitat, and living and dead trees with hollows and crevices, which are needed for roosting and nesting (Department of Climate Change Energy the Environment and Water 2023).

It forages on the ground, feeding on insects, spiders, and seeds found on bare ground or in leaf litter (Higgins and Peter 2002, Antos and Bennet 2006). These birds will generally forage in small groups of 2-8; however, they have been known to congregate in larger groups up to 70 birds and mixed flocks, particularly with other whiteface and thornbill species, and during the non-breeding season (Higgins and Peter 2002).

Southern Whiteface generally breeds between July and October, however, in arid regions, rainfall can affect breeding (Higgins and Peter 2002, Terrestrial Ecosystems 2024b). Birds nest in a variety of locations from hollows and crevices to low bushes and construct a large bulky domed nest of grass, bark, and roots (Higgins and Peter 2002). Clutches consist of 3-4 eggs. The incubation period is unknown, but young fledge between

14-19 days. Birds generally nest in pairs but examples of cooperative breeding have been observed (Higgins and Peter 2002). The generational length is estimated at 2.8 years (Bird et al. 2020).

The conservation advice for the Southern Whiteface lists habitat loss as one of the major threats to the species, particularly on the east coast of Australia (Department of Climate Change Energy the Environment and Water 2023).

Across much of the Southern Whiteface's range in WA, the threat to the species is a combination of secondary effects from overgrazing affecting understorey habitat, feral species predation, extreme climate events such as drought and climate change.

It has not been recorded in the other fauna surveys reported in the adjacent areas, nor did Western Wildlife (2018) record it in the Woorgabup Nature and Rifle Range Reserves. It is, therefore, unlikely to be in the survey area.

Fork-tailed Swift (*Apus pacificus*) - Migratory species under the *EPBC Act 1999* and *BC Act 2016*

This species breeds in northeast and mid-east Asia and winters in Australia and southern New Guinea. It is a visitor to most parts of Western Australia, arriving in the Kimberley in late September, the Pilbara in November, and the southwest land division in mid-December, and departing by late April. The Fork-tailed Swift is an almost exclusively aerial species, foraging and sleeping in flight. It rarely comes to ground, usually only for breeding. It is common in the Kimberley, uncommon to moderately common near northwest, west and southeast coasts and rare to scarce elsewhere. It is rarely seen in the wheatbelt.

Terrestrial Ecosystems assess that the Fork-tailed Swift may very infrequently be seen flying over the survey area, however, the Fork-tailed Swift is essentially an aerial species and would be highly unlikely to land in the survey area (Plate 20).

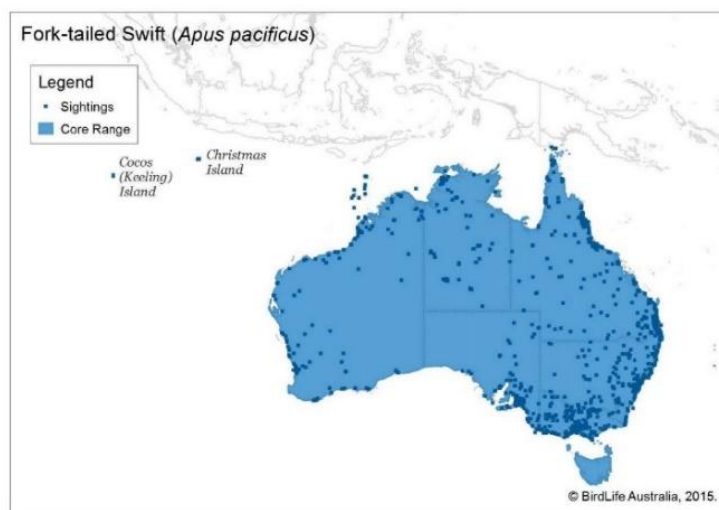


Plate 20. Range and actual reported sightings of the Fork-tailed Swift

(taken from <http://www.environment.gov.au/biodiversity/threatened/publications/epbc-act-referral-guidelines-migratory-birds>)

Grey Wagtail (*Motacilla cinerea*) - Migratory species under the *EPBC Act 1999* and *BC Act 2016*

The Grey Wagtail is a small, yellow-breasted bird with a grey back and head. Johnstone and Storr (2004) reported this migratory species to breed in the Palearctic from western Europe and north-west Africa to eastern Asia and wintering in Africa, south-east Asia, Indonesia, the Philippines, New Guinea and Australia. Its preferred habitat in Australia is banks and rocks in fast-running fresh water, including rivers, streams and creeks, where

it feeds on insects. The Atlas of Living Australia records two sightings on the south coast of Western Australia and none around the survey area (Plate 21).

It is highly unlikely to be observed in the survey area due to a lack of records and suitable habitat.

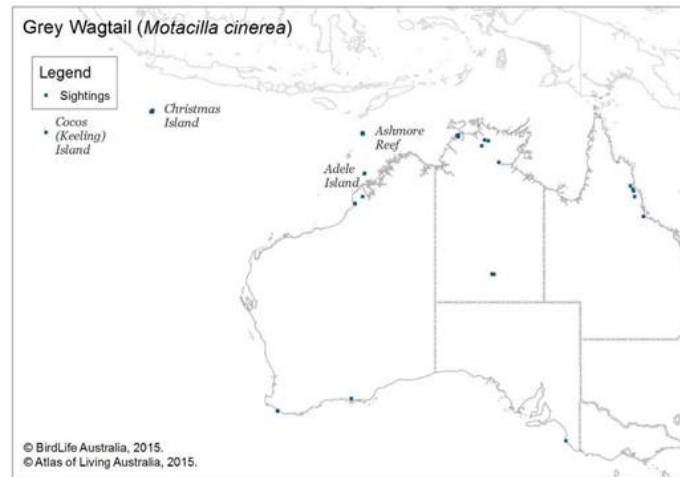


Plate 21. Reported sightings of the Grey Wagtail

(taken from <http://www.environment.gov.au/biodiversity/threatened/publications/epbc-act-referral-guidelines-migratory-birds>)

Western Rosella (inland form) (*Platycercus icterotis xanthogenys*) – Priority 4 species with DBCA

The Inland Western Rosella is a medium-sized parrot endemic to southwestern Australia. It measures approximately 248–259mm in length, and males weigh 57–94g and females 55–67g. Males display a vivid scarlet head and chest with yellow cheek patches, while females are less brightly coloured, often with duller cheek patches and more green on the head and breast (Johnstone and Storr 2004).

This subspecies is found primarily in the drier semiarid regions of southern Western Australia, particularly within the Wheatbelt and to the east. Historical records include locations such as Wongan Hills, Kununoppin, Moorine Rock, and Parker Range. Hybrid zones exist between the inland and coastal subspecies, where interbreeding occurs, and plumage characteristics are blended (Johnstone and Storr 2004) .

Western Rosellas, including *P. i. xanthogenys*, are generally sedentary. They form mating pairs and tend to remain in one locality, although they may gather in small flocks at abundant food sources. Their flight is light and fluttery, less undulating than other rosella species.

The inland subspecies inhabits eucalypt and sheoak woodlands and scrubs, especially those containing Wandoo (*Eucalyptus wandoo*), Flooded Gum (*E. rudis*), Salmon Gum (*E. salmonophloia*), tall Mallee, and Rock Sheoak (*Allocasuarina huegeliana*) (Johnstone and Storr 2004). These environments are typically semi-arid with a heath understorey.

Platycercus i. xanthogenys primarily feeds on seeds from native and introduced plants, including subterranean clover (*Trifolium subterraneum*), sheoak (*Casuarina* spp.), capeweed (*Arctotheca calendula*), thistles (*Carduus* spp.), and flatweed (*Hypochaeris* spp.). They also consume nectar and insects, particularly during winter and spring, and feed them to their nestlings. Foraging occurs both on the ground and in the trees and shrubs.

Breeding occurs from August to December (Johnstone and Storr 2004). Nests are typically located in hollows of Marri, Wandoo, York Gum (*E. loxophleba*), Flooded Gum, and Salmon Gum (Johnstone and Storr 2004). Females incubate the eggs, while males provide food. Clutches range from two to seven eggs, with an average incubation period of 23–25 days, and fledglings leave the nest about five weeks after hatching (Johnstone and Storr 2004). Breeding success has been recorded at around 72%, though this varies with seasonal conditions (Department of Environment and Conservation 2009).

The Inland Western Rosella faces threats due to habitat loss, particularly in the Wheatbelt region. Clearing of native woodlands for agriculture has led to declines or local extinctions. It is now locally extinct in areas such as Coorow, Dandaragan, Moora, and Merredin.

Terrestrial Ecosystems (2021) sighted this species in the bushland surrounding the Woorgabup Nature and Rifle Range Reserves and again in the December 2023 field survey of significant trees so they may breed in the survey area. It will use a suitable-sized tree hollow as a nest site.

Western Brush Wallaby (*Notamacropus irma*) – Priority 4 species with the DBCA

Western Brush Wallabies are a large, grey wallaby species with a brown tinge to their neck and back; dark brown midline on head and back; grey chest and buff coloured stomach (Menkhorst and Knight 2018). They also possess distinctive black gloves, toes and a crest on the terminal part of their tail (Menkhorst and Knight 2018). Western Brush Wallabies also have a bold white stripe from mouth to ear, their eyes have a black border and are white inside (Menkhorst and Knight 2018).

The Western Brush Wallaby is found in the inland of southwestern Western Australia, although its distribution once spread from Kalbarri to Cape Arid (Department of Environment and Conservation 2012b).

The Western Brush Wallaby is a diurnal species that is most active during the early morning and late afternoon (Department of Environment and Conservation 2012b). During the hottest parts of the day, it can be found resting in shaded areas (Department of Environment and Conservation 2012b). When flushed from resting sites, it will burst out with its head held low and its tail almost straight horizontally (Gynther et al. 2013).

The Western Brush Wallaby prefers areas of open forest/woodland, but can be found in wet flats with low grasses or open scrub thickets (Gynther et al. 2013). In the wheatbelt, it has been found in large areas of mallee and heathland (Gynther et al. 2013).

Western Brush Wallabies feed mostly on grasses and forbs (Menkhorst and Knight 2018). From one study, it was reported that it consumed 29 species of plants that include *Carpobrotus edulis* (Sour fig), *Cynodon dactylon* (Scutch grass) and *Nuytsia floribunda* (Department of Environment and Conservation 2012b).

The breeding season of the Western Brush Wallaby has not been accurately described. However, joeys begin to appear around October to November, meaning that young could be born from April to May (Department of Environment and Conservation 2012b).

The main threat to Western Brush Wallabies is the increased presence of foxes and illegal hunting (Department of Environment and Conservation 2012b). Deforestation for agriculture has severely reduced the range of this species (Department of Environment and Conservation 2012b).

The Western Brush Wallaby is not present in the survey area.

Peregrine Falcon (*Falco peregrinus*) – Other specially protected fauna under the *BC Act 2016*

The Peregrine Falcon stands between 35 and 50cm tall, with females approximately 15% larger than males (Kinross 2023). Amongst Australian falcons, they are considered on the larger side with a powerfully built body and are identified by their black hood, deep white to brown (SW buff fronted form) chest with dark barring below the chest (Morcombe 2017). As they mature, Peregrine Falcons possess bright yellow cere and eye rings, and their beaks are dark grey (Morcombe 2017). When in flight, their tail is square-tipped, and their flight wings have rounded to blunt tips, with the wingspan of a peregrine falcon ranging from 85-100cm (Morcombe 2017).

The Peregrine Falcon is a widespread species found on almost every continent except Antarctica (Altwegg et al. 2013). In Western Australia, this species is considered uncommon to rare. This means they live in many habitats, ranging from rainforests to arid scrublands and coastal heath to alpine areas (Morcombe 2017).

The Peregrine Falcon is the fastest flying bird and can reach speeds of 300 km/hr whilst hunting (Australian Geographic n.d). In Australia, it will stay in the same territory for feeding and nesting (Australian Geographic n.d).

Peregrine Falcons have highly varied habitat usage, even thriving under extreme anthropogenic conditions by choosing to nest in active construction sites (Clayton et al. 1988). However, all their habitats require secure nesting sites and abundant food (Morcombe 2017).

The diet of a Peregrine Falcon is highly variable, consisting of many species, but the most consistent prey items are birds, although insects and mammals are also common in their diet (Olsen et al. 2004). Peregrine Falcons found in the goldfields of Western Australia have been observed eating mostly parrot species, such as the Purple-crowned Lorikeet, but will also eat microbats and small rodents (Palmer et al. 2019). Mammalian prey appears to make up a tiny portion of their diet, and may be a more opportunistic prey item (Palmer et al. 2019). In eastern Australia, populations of Peregrine Falcons may also prey on Silver Gulls and corvid species (Olsen et al. 2004).

In Australia, Peregrine Falcons will build their nests in a variety of habitats (Olsen et al. 2004). Critical features for suitable nesting sites consist of adequate protection from weather and predators, an appropriate substrate for creating scrapes to lay eggs, and suitable directional exposure for temperature control (Gahbauer et al. 2015). When this species experiences population pressure, younger mating pairs have been seen using nesting sites that older, more experienced pairs would pass over (Clayton et al. 1988).

Clutch size has been shown to vary based on location. For example, in France, clutch size averaged at four eggs, while in Australia, it is estimated to range between 2-3 eggs per clutch (Kinross 2023). Both male and female brood the eggs over the 29-35 day incubation period (Kinross 2023). Incubation times may be longer in cooler temperatures (Kinross 2023).

The main threat to the Peregrine Falcon in Australia is the use of pesticides. Before 1970, there was a severe decline in populations due to the use of DDT (dichloro-diphenyl-trichloroethane) by farmers (Mundy 2018). Most modern pesticides and rodenticides can be accumulated in predator species. This poses a threat to predatory species (Melbourne's Wild Heart n.d.). Because of how fast these birds can fly, they are also at risk of fatalities when they collide with structures (BirdLife Australia 2017b).

This falcon was recorded by Mattiske Consulting Pty Ltd and Molloch Fauna Consultants (1996), so it may infrequently be recorded in the survey area, but it will readily move if disturbed.

4.8.1 2025 records within State reserves R24072 and R12423

No notable fauna observations were made during the hollow assessments using a pole camera in R24072 or R12423.

4.8.2 2025 records of significant trees within the fauna study zone (FSZ)

Eight additional areas were assessed outside of the study area (Figure 42) with 18 200m x 200m plots counted.

5. DISCUSSION

5.1 ADEQUACY OF THE FAUNA SURVEY DATA FOR FAUNA HABITATS REPRESENTED IN THE SURVEY AREA

The EPA's (2020) technical guidance on terrestrial fauna surveys indicated that the type of survey should be determined based on:

- level of existing regional knowledge;
- type and comprehensiveness of recent local surveys;
- degree of existing disturbance or fragmentation at the regional scale;
- extent, distribution and significance of habitats;
- significance of species likely to be present;
- sensitivity of the environment to the proposed activities; and
- scale and nature of impact.

The survey area is ~4,356ha and comprises farmland and remnant patches of native bushland, including conservation areas. The level of knowledge of the vertebrate fauna in the vicinity of the survey area is limited due to a lack of surveys, with most of the recent data coming from Western Wildlife's Level 1 vertebrate fauna survey (2018), the Atlas of Living Australia and Terrestrial Ecosystems' camera trapping program (Terrestrial Ecosystems 2021, 2022a, b, c, 2024a, 2025). The fauna species of conservation significance in the survey area have been identified, and additional surveys are unlikely to provide new information that will alter the impact assessment. Habitat potentially suitable for the Red-tailed Phascogale within 1km of the project area has been identified, surveyed and rated.

5.2 AMPHIBIANS

Amphibians typically found in the surroundings of the survey area are listed in Table 14. The lack of permanent freshwater (other than farm dams, mine pits) in the survey area means that only those species able to survive away from permanent water on porous sandy soil (e.g. *Limnodynastes dorsalis* and *Myobatrachus gouldii*) are likely to be present in the survey area. Frogs in this area are normally only detected after rainfall. There are no amphibian species of conservation significance in the vicinity of the survey area.

5.3 REPTILES

Reptile species richness in the survey area will be depleted due to vegetation clearing many decades ago in much of the area, and the presence of foxes and feral cats in the bushland areas. The list provided in Table 16 represents species likely to be found over a large area of diverse habitat types. The herpetofauna assemblage in the survey area is expected to be like adjacent areas. There are no reptile species of conservation significance in the survey area.

It was pleasing to record a large Carpet Python in one of the remnant bushland blocks, as they have mostly been lost to the farming areas (Terrestrial Ecosystems 2024a).

5.4 BIRDS

Avian species richness in the survey area has been influenced by vegetation clearing for farming. The Wandoo, York Gum, Mallet Woodland, and Banksia heath in the surrounds of the Woorgabup Nature Reserve and Rifle Range Reserve are likely to support the highest diversity of avifauna, followed by a few other large remnant bush blocks. The abundance of farmland around the survey area will be a significant factor in determining the avifauna in the survey area.

The list provided in Table 13 represents species likely to be found over a large area of diverse habitat types.

Carnaby's Black-Cockatoo (Endangered), forages and breeds in the survey area and the inland form of the Western Rosella (Priority 4), also forages and potentially breeds in the woodlands within the survey area. The Peregrine Falcon, which is likely to be seen infrequently in the survey area, is listed as an otherwise specially protected species under the *BC Act* and is known to have a very large home range, so it is unlikely to be impacted by the proposed exploration or mining.

5.5 MAMMALS

The diversity of small terrestrial mammals potentially caught in the survey area would be low, given the highly disturbed nature of most of the area and the abundance of foxes and feral cats. Red-tailed Phascogales were recorded on the camera traps in the bushland in the Woorgabup Nature Reserve, Rifle Range Reserve, and other bushland fragments on M70/1426 and E70/3952. Western Grey Kangaroos, Common Brushtail Possums, Mardo and echidnas were also recorded. Feral cats and foxes were widespread and abundant.

5.6 FAUNA OF CONSERVATION SIGNIFICANCE

The endangered Carnaby's Black-Cockatoo is breeding, foraging, and roosting in the surrounds of the Woorgabup Nature Reserve and Rifle Range Reserve. The Red-tailed Phascogale is present in this same area, plus remnant bush fragments on M70/1426 and E70/3952.

An assessment of the available breeding and foraging opportunities for Carnaby's Black-Cockatoo within a 12km radius of the survey area demonstrates that many other areas have a similar habitat. To mitigate the loss of breeding hollows, it is recommended that for each tree with a hollow suitable for a Black-Cockatoo nest that is removed, three Cockatubes are erected at a suitable nearby location. Clearing trees outside Carnaby's Black-Cockatoo breeding season (i.e. July to mid-December) will ensure that eggs and chicks are not impacted by vegetation clearing.

The loss of habitat for the Red-tailed Phascogale will need to be addressed in the vertebrate fauna management and mitigation plan. If habitats containing Red-tailed Phascogales are being impacted, it is recommended that they be trapped immediately before vegetation clearing and moved to secure habitats. In addition, for each mature Wandoo, Red Morell and York Gum removed, one Red-tailed Phascogale nest box is erected in a nearby suitable habitat and location. Clearing trees outside the breeding season (i.e. July – October) will further reduce direct impacts on this species. If a habitat fragment containing Red-tailed Phascogales is to be involved in a land swap to achieve an environmental offset, then individuals in this area should be trapped and translocated to a more secure parcel of suitable native vegetation. Red-tailed Phascogales are vulnerable to predation by foxes and feral cats, which are abundant in the area. An effective fox and feral cat reduction plan would significantly increase the local Red-tailed Phascogale population.

The Priority 4 inland form of the Western Rosella was observed in the surroundings of the Woorgabup Nature Reserve and Rifle Range Reserve and is likely to occur occasionally in other large trees in remnant bush blocks and roadside verges, indicating foraging and potentially breeding in the survey area.

The Peregrine Falcon may be rarely recorded in the survey area, but given its large home range, it will forage in a wide range of areas. Clearing vegetation is unlikely to have a significant impact on this species.

6. POTENTIAL ENVIRONMENTAL IMPACTS

Further exploration and mine development in the survey area may potentially affect vertebrate fauna in numerous ways, including the death or injury of fauna during vegetation clearing, impacts from vehicles, and habitat loss.

6.1 ANIMAL DEATHS DURING THE CLEARING PROCESS AND DISPLACEMENT OF FAUNA

This loss of vegetation, particularly mature trees with hollows, in the area is likely to have an impact on Carnaby's Black-Cockatoo and the inland form of the Western Rosella. Clearing of mature trees may also impact low-density, undetected populations of the Vulnerable Red-tailed Phascogale. If sufficient bushland is cleared, common species such as the Western Grey Kangaroo and Common Brushtail Possum will also be forced to move to other areas.

Foxes and feral cats are present in the bushland and the surrounds of the remnant bush blocks and reserves, and are likely to regularly move through the paddocks from one bushland area to another. Both of these predators are known to search recently cleared vegetation for animals that the vegetation clearing has exposed. They will regularly prey on small reptiles and mammals in the survey area, including the Red-tailed Phascogale.

6.2 REDUCTION OR LOSS OF ACTIVITY AREAS AND CLOSURE OF BURROWS

Clearing native vegetation is likely to remove reptile and mammal burrows or foraging habitats that are currently in use or could be used again. Clearing vegetation that forms part of individuals' activity areas can force these animals into adjacent areas. These areas may offer fewer resources, placing individuals under survival pressure, and if it is farmland, then they will almost certainly be lost. It could also lead individuals to encroach on others' territories, thereby increasing competition for resources. Forced relocations could increase the possibility of predation.

6.3 EDGE EFFECTS

Clearing linear corridors and other large areas increases the habitat edges for fauna. Small mammals can respond both positively and negatively to edges depending on their ecological traits (Laurance 1991, 1994, Goosem and Marsh 1997, Goosem 2000). Edge and disturbance effects can lead to altered and, most often, higher levels of predation, restricting or increasing fauna movements and altering assemblage structure (Oxley et al. 1974, Paton 1994, Baker et al. 1998, Temple 1998, Luck et al. 1999, Goosem et al. 2001).

Goldingay and Whelan (1997) and Clarke and Oldland (2007) reported that edge effects can extend up to 150-200m from the edge for some species, meaning the impact area on vertebrate fauna is likely larger than the cleared footprint. Edge effects can disrupt ecological processes, such as predation, dispersal, and animal movements, and alter assemblage structure. Consequently, the impact area will always be much larger than the cleared area.

As large intact patches of remnant vegetation are not being cleared, the impact of edge effects is not likely to be significant.

6.4 HABITAT FRAGMENTATION

In addition to the direct impacts of vegetation clearing, the clearing of vegetation can isolate sections of established fauna communities. It may also alter long and medium-term patterns of movement around established home ranges, particularly for small mammals and reptiles.

Clearing vegetation in any of the remaining patches of native bushland or along roadside verges will reduce the size of the native vegetation areas available for native fauna and further fragment the survey area. The consequence is that it will be more difficult for many species to sustain a viable population, so species will be progressively lost from these areas.

6.5 INTRODUCED FAUNA AND WEEDS

Foxes and feral cats were recorded on camera traps in all large bush blocks of native vegetation and were also observed during tree assessments. Tracks and scats were regularly recorded, and fresh roadkill was observed during the field surveys. Foxes are, therefore, well-established in the area. Feral cats were recorded in most large remnant bush blocks where camera traps were deployed. Foxes and cats harm native fauna and can disrupt the natural balance of functioning ecosystems.

Introduced plant species can successfully and rapidly invade areas of cleared native vegetation or those that are otherwise disturbed by humans. Introduced plant species may replace native species that provide shelter or foraging areas for native fauna. Significant changes to vegetation structure will alter the habitats of fauna and, consequently, may influence the composition of fauna species. Preparing and implementing a weed management plan will reduce the threat posed by weeds to native fauna.

6.6 FIRE

Increased human activity is often associated with an altered fire regime, which leads to a degradation of natural ecosystems. Fire has been identified as one of the threatening processes for some species of conservation significance as numerous small mammal and bird species rely on long unburnt vegetation.

The sparseness of the undergrowth in most remnant patches of vegetation would suggest that these areas would not easily carry a wildfire. Still, if they did burn, the fragmented nature of the bushland means that faunal recolonisation would be very slow.

6.7 ANTHROPOGENIC ACTIVITY

Unnatural noises, vibrations, and vehicle and human movement in an area may be sufficient to force individuals or species of fauna to move from adjacent areas or alter their activity periods. This disturbance is likely to occur during initial vegetation clearing.

6.8 DUST

Dust generated from shifting topsoil can potentially degrade surrounding vegetation, reducing its ability to absorb sunlight and influencing photosynthetic rates. Degradation of these areas may potentially render habitats unsuitable for fauna.

7. VERTEBRATE FAUNA RISK ASSESSMENT

7.1 RISK ASSESSMENT

Fauna surveys to support environmental approvals are part of the environmental risk assessment undertaken to consider the potential impacts a development may have on biodiversity in a particular area and region. Potential impacts on fauna from the proposed development are identified and briefly described above. Tables 18, 19, and 20 summarise the risk assessment for this survey.

Any risk assessment is a product of the likelihood of an impact and its consequences. Likelihood and consequences are categorised and described below. The assessed risk level (likelihood X consequences) is then calculated as the overall risk for the development. This is followed by an assessment of the acceptability of the risks associated with each impact. Disturbances and vegetation clearing impact the fauna at multiple scales – site, local, landscape and regional. Each of these is considered in the risk assessment. This assessment should be considered in the context of the summary in Table 20. The risk assessment in Table 20 is based on clearing all vegetation within the disturbance envelope. However, this is not proposed, but the area of native vegetation to be cleared remains unknown until mine planning is further advanced.

Table 18. Fauna impact risk assessment descriptors

Likelihood		
Level	Description	Criteria
A	Rare	The environmental event may occur, or one or more species of conservation significance may be present in exceptional circumstances.
B	Unlikely	The environmental event could occur, or one or more species of conservation significance could be present at some time.
C	Moderate	The environmental event should occur, or one or more species of conservation significance should be present at some time.
D	Likely	The environmental event will probably occur, or one or more species of conservation significance will be present in most circumstances.
E	Almost certain	The environmental event is expected to occur, or one or more species of conservation significance is expected to be present in most circumstances.
Consequences		
Level	Description	Criteria
1	Insignificant	Insignificant impact on fauna of conservation significance or regional biodiversity, and the loss of individuals will be insignificant in the context of the availability of similar fauna or fauna assemblages in the area.
2	Minor	The impact on fauna is localised, and no significant impact on species of conservation significance in the survey area. Loss of species at the local scale.
3	Moderate	An appreciable loss of fauna in a regional context or a limited impact on species of conservation significance in the survey area.
4	Major	Significant impact on species of conservation significance or their habitat in the survey area and/or regional biodiversity and/or a significant loss in biodiversity at the landscape scale.
5	Catastrophic	Loss of species at the regional scale and/or a significant loss of species categorised as 'vulnerable' or 'endangered' under the <i>EPBC Act (1999)</i> at a regional scale.
Acceptability of Risk		
Level of risk	Management action required	
Low	No action required.	
Moderate	Avoid if possible, routine management with internal audit and review of monitoring results annually.	
High	Externally approved management plan to reduce risks, monitor major risks annually with external audit and review of management plan outcomes annually.	
EXtreme	Unacceptable, project should be redesigned or not proceed.	

Table 19. Levels of acceptable risk

		Likelihood				
		Rare or very low (A)	Unlikely or low (B)	Moderate (C)	Likely (D)	Almost certain (E)
Consequence	Insignificant (1)	Low	Low	Low	Low	Low
	Minor (2)	Low	Low	Low	Moderate	Moderate
	Moderate (3)	Low	Moderate	Moderate	High	High
	Major (4)	Moderate	Moderate	High	High	Extreme
	Catastrophic (5)	Moderate	High	High	Extreme	Extreme

Table 20. A risk assessment of the impact of ground disturbance activity on fauna

			Before management				With management		
	Potential impacts		Inherent risk			Risk controls	Residual risk		
Factor			Likelihood	Consequence	Significance		Likelihood	Consequence	Significance
Fauna survey data	Inadequate survey data to adequately assess the risks	Unknown loss of fauna, fauna of conservation significance, and fauna assemblages, and an incomplete fauna assessment.	B	2	Low				
	Inadequacy of comparative data	Limits on the availability of comparative data reduced the capacity to assess the uniqueness of the fauna assemblages in the survey area.	B	2	Low				
Clearing vegetation	Loss of fauna habitat – local scale	Loss of terrestrial fauna in the survey area.	E	3	High	Follow recommended protocols in the Vertebrate Fauna Management and Mitigation Plan	E	2	Mod
	Loss of fauna habitat – landscape scale	Loss of some fauna during vegetation clearing.	D	3	High	Follow recommended protocols in the Vertebrate Fauna Management and Mitigation Plan	D	2	Mod
	Loss of fauna habitat – regional scale	A small loss of some fauna in the region.	B	1	Low				
	Loss of a threatened ecological fauna community	Loss of an undetected threatened ecological fauna community.	A	3	Low				
	Habitat fragmentation	Fauna movement is restricted, resulting in the death of fauna and biodiversity loss.	E	3	High				
Death or loss of a species of conservation significance	Loss of a unique terrestrial fauna ecosystem	Loss of an ecosystem containing fauna with high species richness, abundance, and numerous top-of-the-food-chain predators.	B	3	Mod				
	Carnaby's Black-Cockatoo	Disturbance of Carnaby's Black-Cockatoo breeding and foraging habitat.	C	3	Mod	Follow recommended protocols in the Vertebrate Fauna Management and Mitigation Plan	B	2	Low

			Before management				With management		
	Western Rosella	Loss of a Western Rosella or a small population of Western Rosella	B	2	Low				
	Red-tailed Phascogale	Loss of a Red-tailed Phascogale or a small population of Red-tailed Phascogales	D	3	High	Follow recommended protocols in the Vertebrate Fauna Management and Mitigation Plan	B	2	Low
	Peregrine Falcon	Loss of a Peregrine Falcon or a small population of Peregrine Falcons	A	2	Low				
Human impacts	Increase or spread of weeds	Changes in vegetation, leading to a loss of habitat for fauna.	E	2	Mod				
	Road kills	Animals being killed by vehicles as they cross roads	C	2	Low				
	Increase in feral fauna, specifically the fox and cat	Increased predation on the native fauna	C	3	Low	Implementation of a feral predator management program.			
	Dust	Increased potential for dust	B	2	Low	Implementation of a dust management plan.	B	1	Low

7.2 NATIVE VEGETATION CLEARING PRINCIPLES AS THEY PERTAIN TO VERTEBRATE FAUNA

The *Environmental Protection Act (1986)* outlines 10 principles that are to be used in the assessment of native vegetation clearing permit applications, which are also applicable for other assessments and approvals (Table 21). Where possible, native vegetation should not be cleared if the following principles are compromised.

Table 21. Assessment of impact using the native vegetation clearing principles

Principle	Response
It comprises a high level of biological diversity.	The presence of the Carnaby's Black-Cockatoo, Red-tailed Phascogale, and Western Rosella requires the implementation of effective active management to protect these species. The potential level of impact will depend on the location and extent of the proposed vegetation clearing, exploration and mining operations.
It comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia.	Any loss of eggs or chicks of Carnaby's Black-Cockatoo or Western Rosella would be regrettable, and every effort should be made to minimise the possibility of this occurring. The unnecessary loss of Red-tailed Phascogales would be of concern, and appropriate management is required to protect these species.
It includes, or is necessary for the continued existence or, rare flora.	N/A
It comprises the whole or a part of, or is necessary for the maintenance of, a threatened ecological community.	The survey area does not include habitat, which, if lost, would threaten the survival of Carnaby's Black-Cockatoo, Red-tailed Phascogale, or Western Rosella populations. However, given their low abundance, all populations should be managed and protected.
It is significant as a remnant of native vegetation in an area that has been extensively cleared.	The survey area contains several remnant bushland areas and bushland corridors. Due to the historical habitat clearing across the Wheatbelt, all remaining areas of intact bushland are considered significant and should be avoided if possible.
It is growing in, or in association with, an environment associated with a watercourses or wetland.	Ephemeral creeks and drainage exist in the survey area. They typically run through farm paddocks and have vegetation on either side of the creek bed. Some of these tree-lined creeks will contain trees with hollows that could provide nesting sites for Black-Cockatoos and the Western Rosella.
The clearing of the vegetation is likely to cause appreciable land degradation.	The potential level of impact will depend on the location and extent of the proposed vegetation clearing and development.
The clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area.	Clearing vegetation will further reduce the availability of native bushland in this area. The loss of any remnant bushland in the Wheatbelt area is of concern.
The clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water.	N/A
The clearing of the vegetation is likely to cause, or exacerbate the incidence of flooding.	The region's native bushland is progressively diminishing. The area is not flood-prone due to its porous soil.

7.3 REFERRAL UNDER THE *EPBC ACT*

7.3.1 Carnaby's Black-Cockatoo

Clearing vegetation in the survey area could potentially impact Carnaby's Black-Cockatoo's foraging, roosting, and breeding habitat. The level and extent of impact can only be determined when more details are available on the potential areas of disturbance.

Department of Agriculture, Water, and the Environment (2022) provided thresholds for when a referral is required in a tabular form that has been reproduced in Table 22.

Table 22. Thresholds for when a referral is unlikely to be required (taken from Department of Agriculture Water and the Environment 2022)

Attribute	Referral threshold	Reasons
Night roosting habitat	Limited pruning or trimming of trees within night roosting sites is unlikely to require a referral to the minister.	These types of impacts are considered low intensity when black cockatoos are still able to use the site for roosting.
Foraging habitat	Clearing of any quality of foraging habitat under 1 hectare is unlikely to require a referral to the minister.	This patch size is similar to the minimum patch size for other <i>EPBC Act</i> listed entities.
Foraging habitat	Clearing of low-quality foraging habitat (habitat scoring 1-4) that is less than 10 ha is unlikely to require a referral to the minister.	Habitat on a site that scores 1-4 using the foraging quality scoring tool is not considered to provide significant foraging value or be critical to the survival of any of the species. This habitat will either not be known to be used for foraging, be highly impacted by plant disease, be highly isolated or be a considerable distance from known breeding or roosting areas.
Bushfire management	Responses to fire emergency management do not require a referral to the minister.	Refer to the Bushfire management and national environment law web page.
Forestry	Certain actions are exempt from the requirement for assessment and approval under the <i>EPBC Act</i> .	Sections 38-42, 43A and 43B of the <i>EPBC Act</i> .
Exotic foraging habitat	Removal of individual or multiple (up to 1 hectare) of predominantly exotic tree species (e.g. Cape Lilac trees, pine trees).	The importance of these trees is only considered significant when they are in native vegetation patches or forming patches greater than 1 hectare.

The Commonwealth Government (Department of Agriculture Water and the Environment 2022) has published referral guidelines that include criteria to determine whether a referral is required based on the quality of the foraging habitat. A preliminary assessment of whether clearing vegetation in the survey area triggers a referral based on foraging habitat quality is provided in Table 23.

Table 23. Black-Cockatoo foraging quality scoring tool

Carnaby's Black-Cockatoo		
	Start at a score of 10 if your site is native shrubland, kwongan heathland or woodland, dominated by proteaceous plant species such as <i>Banksia</i> spp. (including <i>Dryandra</i> spp.), <i>Hakea</i> spp. and <i>Grevillea</i> spp., as well as native eucalypt woodland and forest that contain foraging species, within the range of the species, including along roadsides and parkland cleared areas. Also includes planted native vegetation. This tool only applies to sites equal to or larger than 1 hectare in size.	The survey area contains a foraging habitat. Score 10
Attribute		
Foraging potential	Subtract 2 from your score if there is no evidence of feeding debris on your site.	Foraging was recorded in multiple areas during the surveys. Score 0
Connectivity	Subtract 2 from your score if you have evidence to conclude that there is no other foraging habitat within 12km of your site.	There are other foraging opportunities within 12km. Score 0
Proximity to breeding	Subtract 2 if you have evidence to conclude that your site is more than 12km from breeding habitat.	Breeding occurs in the survey area. Score 0
Proximity to roosting	Subtract 1 if you have evidence to conclude that your site is more than 20km from a known night roosting habitat.	Carnaby's Black-Cockatoo was recorded roosting in Woorgabup Nature Reserve and Rifle Range Reserve. Score 0
Impact from significant plant disease	Subtract 1 if your site has disease present (e.g. Phytophthora spp. or Marri canker) and the disease is affecting more than 50% of the preferred food plants present.	Dieback has not been recorded in the survey area. Score 0
		10

Based on Tables 22 and 23, clearing vegetation in the survey area could trigger a referral for the Carnaby's Black-Cockatoo. However, until information is available on the proposed vegetation clearing program and mining development, this rating system cannot be used to confirm whether a referral is required.

7.3.2 Red-tailed Phascogale

The Red-tailed Phascogale is a small, agile arboreal mammal; therefore, camera traps can often fail to record their presence in areas where they are in low abundance. This is why camera traps were typically deployed for approximately 30 days. Clearing vegetation in the survey area could potentially impact Red-tailed Phascogales. The level and extent of impact can only be determined when more details are available on the potential areas of disturbance.

7.3.3 Western Rosella (inland form)

Although a referral is not required for this species, impacts on this species will be of interest to State Government. This will almost certainly involve active management to mitigate the potential impacts consistent with other avifauna.

8. SUMMARY

Ausgold Exploration Ltd (Ausgold) is planning additional exploration followed by mining on its tenements which are ~35km east-north-east of Katanning in Western Australia (WA). The survey area was ~4,356ha, but because of access issues to some areas, the Black-Cockatoo habitat trees assessment and camera trapping were confined to a smaller area.

Most of the survey area is farmland and was cleared many decades ago. The most substantial patch of native bushland is around and to the south-east of the Woorgabup Nature Reserve (R24072) and the Rifle Range Reserve (R12423). This area was assessed by Western Wildlife (2018) who reduced Matiske Consulting's (2018) 10 vegetation communities to four fauna habitats:

- Wandoo woodland;
- York Gum Woodland;
- Mallet woodland; and
- Banksia heath.

There are multiple small areas of remnant native vegetation patches on farming properties across the survey area and multiple ephemeral drainage lines and creeks that run in a north-westerly direction, with many of these having remnant vegetation along both banks. There is a disused mining pit in care and maintenance, and farm housing and sheds in the survey area.

The bushland area around the Woorgabup Nature and Rifle Range Reserves contains a recently active Carnaby's Black-Cockatoo nest, as well as foraging and roosting sites. These two reserves and the large remnant block of native vegetation on M70/1426, support a population of Red-tailed Phascogales, which is listed as conservation dependent at the State level and Vulnerable at the Commonwealth level. The inland form of the Western Rosella was observed infrequently in the bushland area, indicating that it likely forages there and possibly breeds in tree hollows in this region.

A survey of remnant bushland within 1km of the project area recorded 88.6ha of very poor, 265.7ha of good, 217.1ha of very good and 44.3ha of excellent Red-tailed Phascogale habitat.

Overall, Terrestrial Ecosystems recorded 11,220 significant trees in the surveys and of those, 1,115 were assessed from the ground level to have at least one hollow that could potentially be used as a nesting site for Black-Cockatoos. Within a 12km radius of the survey area, there is more than 6,700ha of good quality nesting habitat and 360ha of foraging habitat.

The Woorgabup Nature Reserve and Rifle Range Reserve, and many of the larger blocks of remnant vegetation support Western Grey Kangaroos and Common Brush-tailed Possums, and the loss of vegetation could negatively impact these species. Foxes and feral cats are also widespread across the survey area.

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Figures

**Basic and Targeted Vertebrate Fauna Survey and Assessment
Katanning Gold Project**



Appendix A.

Results of the EPBC Act Protected Matters Search

**Basic and Targeted Vertebrate Fauna Survey and Assessment
Katanning Gold Project**





Australian Government

Department of Climate Change, Energy,
the Environment and Water

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Please see the caveat for interpretation of information provided here.

Report created: 03-Apr-2025

[Summary](#)

[Details](#)

[Matters of NES](#)

[Other Matters Protected by the EPBC Act](#)

[Extra Information](#)

[Caveat](#)

[Acknowledgements](#)

Summary

Matters of National Environment Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the [Administrative Guidelines on Significance](#).

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance (Ramsar	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	1
Listed Threatened Species:	40
Listed Migratory Species:	9

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at <https://www.dcceew.gov.au/parks-heritage/heritage>

A [permit](#) may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Lands:	29
Commonwealth Heritage Places:	None
Listed Marine Species:	17
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None
Habitat Critical to the Survival of Marine Turtles:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have

State and Territory Reserves:	71
Regional Forest Agreements:	None
Nationally Important Wetlands:	3
EPBC Act Referrals:	9
Key Ecological Features (Marine):	None
Biologically Important Areas:	None
Bioregional Assessments:	None
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

Listed Threatened Ecological Communities

[Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Status of Vulnerable, Disallowed and Ineligible are not MNES under the EPBC Act.

Community Name	Threatened Category	Presence Text	Buffer Status
Eucalypt Woodlands of the Western Australian Wheatbelt	Critically Endangered	Community likely to occur within area	In feature area

Listed Threatened Species

[Resource Information]

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.

Number is the current name ID.

Scientific Name	Threatened Category	Presence Text	Buffer Status
BIRD			
Aphelocephala leucopsis Southern Whiteface [529]	Vulnerable	Species or species habitat may occur within area	In feature area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat may occur within area	In feature area
Calidris acuminata Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat known to occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Calyptorhynchus banksii naso Forest Red-tailed Black-Cockatoo, Karrak [67034]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Leipoa ocellata Malleefowl [934]	Vulnerable	Species or species habitat known to occur within area	In feature area
Tringa nebularia Common Greenshank, Greenshank [832]	Endangered	Species or species habitat likely to occur within area	In buffer area only
Zanda latirostris listed as Calyptorhynchus latirostris Carnaby's Black Cockatoo, Short-billed Black-cockatoo [87737]	Endangered	Species or species habitat known to occur within area	In feature area
MAMMAL			
Dasyurus geoffroii Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat known to occur within area	In feature area
Myrmecobius fasciatus Numbat [294]	Endangered	Species or species habitat known to occur within area	In feature area
Parantechinus apicalis Dibbler [313]	Endangered	Species or species habitat likely to occur within area	In buffer area only
Phascogale calura Red-tailed Phascogale, Red-tailed Wambenger, Kenngoor [316]	Vulnerable	Species or species habitat known to occur within area	In feature area
PLANT			
Acacia brachypoda Western Wheatbelt Wattle [55594]	Endangered	Species or species habitat may occur within area	In buffer area only
Acacia depressa Echidna Wattle [5685]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
Acacia lanuginophylla Woolly Wattle [55575]	Endangered	Species or species habitat may occur within area	In feature area
Acacia leptalea Chinocup Wattle [56701]	Endangered	Species or species habitat known to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Adenanthos pungens subsp. effusus Sprawling Spiky Adenanthos [10742]	Endangered	Species or species habitat known to occur within area	In buffer area only
Adenanthos pungens subsp. pungens Spiky Adenanthos [19429]	Vulnerable	Species or species habitat known to occur within area	In feature area
Andersonia gracilis Slender Andersonia [14470]	Endangered	Species or species habitat may occur within area	In buffer area only
Banksia anatona Cactus Dryandra [82758]	Critically Endangered	Species or species habitat may occur within area	In buffer area only
Banksia oligantha Wagin Banksia [20697]	Endangered	Species or species habitat may occur within area	In buffer area only
Banksia pseudoplumosa False Plumed-Banksia [82760]	Endangered	Species or species habitat likely to occur within area	In buffer area only
Boronia capitata subsp. capitata a shrub [29156]	Endangered	Species or species habitat may occur within area	In buffer area only
Caladenia hoffmanii Hoffman's Spider-orchid [56719]	Endangered	Species or species habitat may occur within area	In buffer area only
Caladenia luteola Lemon Spider Orchid [68713]	Critically Endangered	Species or species habitat known to occur within area	In buffer area only
Caladenia melanema Ballerina Orchid, Ballerina Spider Orchid [65295]	Critically Endangered	Species or species habitat known to occur within area	In buffer area only
Calectasia pignattiana Stilted Tinsel Lily [82018]	Vulnerable	Species or species habitat known to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Conostylis seorsiflora subsp. trichophylla Hairy Mat Conostylis [13920]	Endangered	Species or species habitat known to occur within area	In buffer area only
Diuris purdiei Purdie's Donkey-orchid [12950]	Endangered	Species or species habitat known to occur within area	In buffer area only
Drakaea isolata Lonely Hammer-orchid [64669]	Endangered	Species or species habitat known to occur within area	In buffer area only
Duma horrida subsp. abdita Remote Thorny Lignum [87538]	Critically Endangered	Species or species habitat likely to occur within area	In buffer area only
Eremophila verticillata Whorled Eremophila [7032]	Endangered	Species or species habitat likely to occur within area	In buffer area only
Ricinocarpos trichophorus Barrens Wedding Bush [19931]	Endangered	Species or species habitat may occur within area	In buffer area only
Roycea pycnophylloides Saltmat [21161]	Endangered	Species or species habitat known to occur within area	In feature area
Styphelia disjuncta listed as Leucopogon sp. Ongerup (A.S.George 16682) [92782]	Vulnerable (listed as Leucopogon sp. Ongerup)	Species or species habitat known to occur within area	In buffer area only
Thelymitra psammophila Sandplain Sun-orchid [4908]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
Thelymitra stellata Star Sun-orchid [7060]	Endangered	Species or species habitat may occur within area	In buffer area only
Verticordia fimbrialepis subsp. fimbrialepis Shy Featherflower [24631]	Endangered	Species or species habitat likely to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Verticordia staminosa var. cylindracea Granite Featherflower [55823]	Endangered	Species or species habitat likely to occur within area	In buffer area only

Listed Migratory Species		[Resource Information]	
Scientific Name	Threatened Category	Presence Text	Buffer Status
Migratory Marine Birds			
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area	In feature area

Migratory Terrestrial Species			
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area	In feature area

Migratory Wetlands Species			
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area	In feature area
Calidris acuminata Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat known to occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area	In feature area
Calidris ruficollis Red-necked Stint [860]		Species or species habitat known to occur within area	In buffer area only
Pandion haliaetus Osprey [952]		Species or species habitat likely to occur within area	In buffer area only
Tringa nebularia Common Greenshank, Greenshank [832]	Endangered	Species or species habitat likely to occur within area	In buffer area only

Other Matters Protected by the EPBC Act

Commonwealth Lands

[Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Commonwealth Land Name	State	Buffer Status
Defence		
Defence - KATANNING TRAINING DEPOT [50157]	WA	In buffer area only
Unknown		
Commonwealth Land - [50360]	WA	In buffer area only
Commonwealth Land - [50348]	WA	In buffer area only
Commonwealth Land - [52068]	WA	In buffer area only
Commonwealth Land - [51630]	WA	In buffer area only
Commonwealth Land - [51008]	WA	In buffer area only
Commonwealth Land - [51009]	WA	In buffer area only
Commonwealth Land - [52148]	WA	In buffer area only
Commonwealth Land - [51624]	WA	In buffer area only
Commonwealth Land - [51644]	WA	In buffer area only
Commonwealth Land - [51646]	WA	In buffer area only
Commonwealth Land - [52208]	WA	In buffer area only
Commonwealth Land - [52061]	WA	In buffer area only
Commonwealth Land - [52060]	WA	In buffer area only
Commonwealth Land - [52144]	WA	In buffer area only
Commonwealth Land - [52067]	WA	In buffer area only
Commonwealth Land - [52069]	WA	In feature area
Commonwealth Land - [52078]	WA	In buffer area only
Commonwealth Land - [51618]	WA	In buffer area only
Commonwealth Land - [52222]	WA	In buffer area only
Commonwealth Land - [52209]	WA	In buffer area only
Commonwealth Land - [52225]	WA	In buffer area only

Commonwealth Land Name	State	Buffer Status
Commonwealth Land - [51037]	WA	In feature area
Commonwealth Land - [51623]	WA	In buffer area only
Commonwealth Land - [51629]	WA	In buffer area only
Commonwealth Land - [51010]	WA	In buffer area only
Commonwealth Land - [52073]	WA	In buffer area only
Commonwealth Land - [50353]	WA	In buffer area only
Commonwealth Land - [52159]	WA	In buffer area only

Listed Marine Species			[Resource Information]
Scientific Name	Threatened Category	Presence Text	Buffer Status
Bird			
Actitis hypoleucos			
Common Sandpiper [59309]		Species or species habitat known to occur within area	In feature area
Apus pacificus			
Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area	In feature area
Bubulcus ibis as Ardea ibis			
Cattle Egret [66521]		Species or species habitat may occur within area overfly marine area	In feature area
Calidris acuminata			
Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat known to occur within area	In feature area
Calidris ferruginea			
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area overfly marine area	In feature area
Calidris melanotos			
Pectoral Sandpiper [858]		Species or species habitat may occur within area overfly marine area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Calidris ruficollis Red-necked Stint [860]		Species or species habitat known to occur within area overfly marine area	In buffer area only
Chalcites osculans as Chrysococcyx osculans Black-eared Cuckoo [83425]		Species or species habitat known to occur within area overfly marine area	In feature area
Charadrius ruficapillus Red-capped Plover [881]		Species or species habitat known to occur within area overfly marine area	In buffer area only
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area	In feature area
Himantopus himantopus Pied Stilt, Black-winged Stilt [870]		Species or species habitat known to occur within area overfly marine area	In buffer area only
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area	In feature area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area overfly marine area	In feature area
Pandion haliaetus Osprey [952]		Species or species habitat likely to occur within area	In buffer area only
Recurvirostra novaehollandiae Red-necked Avocet [871]		Species or species habitat known to occur within area overfly marine area	In buffer area only
Thinornis cucullatus as Thinornis rubricollis Hooded Plover, Hooded Dotterel [87735]		Species or species habitat known to occur within area overfly marine area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Tringa nebularia			
Common Greenshank, Greenshank [832]	Endangered	Species or species habitat likely to occur within area overfly marine area	In buffer area only

Extra Information

State and Territory Reserves			[Resource Information]
Protected Area Name	Reserve Type	State	Buffer Status
Ballast Pit	Nature Reserve	WA	In buffer area only
Bockaring	Nature Reserve	WA	In buffer area only
Broomehill	Nature Reserve	WA	In buffer area only
Chinocup	Nature Reserve	WA	In buffer area only
Chinocup Dam	Nature Reserve	WA	In buffer area only
Chirelillup	Nature Reserve	WA	In buffer area only
Cobline	Nature Reserve	WA	In buffer area only
Coomelberrup	Nature Reserve	WA	In buffer area only
Corneecup	Nature Reserve	WA	In buffer area only
Coyrecup	Nature Reserve	WA	In buffer area only
Cronin	Nature Reserve	WA	In buffer area only
Dongolocking	Nature Reserve	WA	In buffer area only
Dumblebung Lake	Nature Reserve	WA	In buffer area only
East Collanilling	Nature Reserve	WA	In buffer area only
Gnarkaryelling	Nature Reserve	WA	In buffer area only
Gundaring Lake	Nature Reserve	WA	In buffer area only
Hobart Road	Nature Reserve	WA	In buffer area only
Hurdle Creek	Nature Reserve	WA	In buffer area only
Johns Well	Nature Reserve	WA	In buffer area only
King Rock	Nature Reserve	WA	In buffer area only

Protected Area Name	Reserve Type	State	Buffer Status
Mallee Plain	Nature Reserve	WA	In buffer area only
McDougall	Nature Reserve	WA	In buffer area only
Merilup	Nature Reserve	WA	In buffer area only
Moojebing	Nature Reserve	WA	In buffer area only
Moornaming	Nature Reserve	WA	In buffer area only
Mount Pleasant	Nature Reserve	WA	In buffer area only
NTWA Bushland covenant (0028)	Conservation Covenant	WA	In buffer area only
NTWA Bushland covenant (0031)	Conservation Covenant	WA	In buffer area only
NTWA Bushland covenant (0071)	Conservation Covenant	WA	In buffer area only
Peringillup	Nature Reserve	WA	In buffer area only
Tarin Rock	Nature Reserve	WA	In buffer area only
Unnamed WA01703	5(1)(h) Reserve	WA	In buffer area only
Unnamed WA05339	Nature Reserve	WA	In buffer area only
Unnamed WA09847	Nature Reserve	WA	In buffer area only
Unnamed WA10914	Nature Reserve	WA	In buffer area only
Unnamed WA10930	Nature Reserve	WA	In buffer area only
Unnamed WA12645	Nature Reserve	WA	In buffer area only
Unnamed WA13063	Nature Reserve	WA	In buffer area only
Unnamed WA16901	Nature Reserve	WA	In buffer area only
Unnamed WA19068	Nature Reserve	WA	In buffer area only
Unnamed WA19075	Nature Reserve	WA	In buffer area only
Unnamed WA19080	Nature Reserve	WA	In buffer area only
Unnamed WA19081	Nature Reserve	WA	In buffer area only
Unnamed WA19085	Nature Reserve	WA	In buffer area only
Unnamed WA19086	Nature Reserve	WA	In buffer area only
Unnamed WA20046	Nature Reserve	WA	In buffer area only
Unnamed WA20987	5(1)(g) Reserve	WA	In buffer area only

Protected Area Name	Reserve Type	State	Buffer Status
Unnamed WA23218	Nature Reserve	WA	In buffer area only
Unnamed WA24282	Nature Reserve	WA	In buffer area only
Unnamed WA24770	Nature Reserve	WA	In buffer area only
Unnamed WA24827	Nature Reserve	WA	In buffer area only
Unnamed WA25696	Nature Reserve	WA	In buffer area only
Unnamed WA25697	Nature Reserve	WA	In buffer area only
Unnamed WA26005	Nature Reserve	WA	In buffer area only
Unnamed WA27481	Nature Reserve	WA	In buffer area only
Unnamed WA28549	Nature Reserve	WA	In buffer area only
Unnamed WA31043	Nature Reserve	WA	In buffer area only
Unnamed WA32663	Nature Reserve	WA	In buffer area only
Unnamed WA40035	Nature Reserve	WA	In buffer area only
Unnamed WA41826	5(1)(g) Reserve	WA	In buffer area only
Unnamed WA43282	Nature Reserve	WA	In buffer area only
Unnamed WA43286	Nature Reserve	WA	In buffer area only
Unnamed WA43464	Nature Reserve	WA	In buffer area only
Unnamed WA46260	Nature Reserve	WA	In buffer area only
Unnamed WA49706	Nature Reserve	WA	In buffer area only
Unnamed WA53269	Conservation Park	WA	In buffer area only
Vagg	Nature Reserve	WA	In buffer area only
Williams 15411 & 15065	NRS Addition - Gazettal in Progress	WA	In buffer area only
Willoughby	Nature Reserve	WA	In buffer area only
Woodanilling	Nature Reserve	WA	In buffer area only
Woorgabup	Nature Reserve	WA	In feature area

Nationally Important Wetlands	[Resource Information]		
Wetland Name	State		Buffer Status

Wetland Name	State	Buffer Status
Coyrecup Lake	WA	In buffer area only
Dumbleyung Lake	WA	In buffer area only
Lake Grace System	WA	In buffer area only

EPBC Act Referrals [Resource Information]				
Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
CBH Broomehill Fixed Rail Outloading Facility	2021/9038		Completed	In buffer area only
JACKSON INFILL DRILL PROGRAM	2022/09266		Completed	In feature area
Katanning Infill Drill Program	2021/8882		Completed	In feature area
Controlled action				
Transmission Line Project	2011/6066	Controlled Action	Post-Approval	In buffer area only
Not controlled action				
Construction of Additional Grain Storage and Associated Infrastructure at an Exi	2008/4477	Not Controlled Action	Completed	In buffer area only
Improving rabbit biocontrol: releasing another strain of RHDV, sthrn two thirds of Australia	2015/7522	Not Controlled Action	Completed	In feature area
INDIGO Central Submarine Telecommunications Cable	2017/8127	Not Controlled Action	Completed	In feature area
Northam Cranbrook Road widening, Katanning, WA	2018/8238	Not Controlled Action	Completed	In buffer area only
Not controlled action (particular manner)				
INDIGO Marine Cable Route Survey (INDIGO)	2017/7996	Not Controlled Action (Particular Manner)	Post-Approval	In feature area

Caveat

1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data is available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance on the contents of this report.

3 DATA SOURCES

Threatened ecological communities

For threatened ecological communities where the distribution is well known, maps are generated based on information contained in recovery plans, State vegetation maps and remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species

Threatened, migratory and marine species distributions have been discerned through a variety of methods. Where distributions are well known and if time permits, distributions are inferred from either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc.) together with point locations and described habitat; or modelled (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where little information is available for a species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc.).

In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More detailed distribution mapping methods are used to update these distributions when time permits.

4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

The following groups have been mapped, but may not cover the complete distribution of the species:

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded breeding sites; and
- seals which have only been mapped for breeding sites near the Australian continent

The breeding sites may be important for the protection of the Commonwealth Marine environment.

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

- [-Office of Environment and Heritage, New South Wales](#)
- [-Department of Environment and Primary Industries, Victoria](#)
- [-Department of Primary Industries, Parks, Water and Environment, Tasmania](#)
- [-Department of Environment, Water and Natural Resources, South Australia](#)
- [-Department of Land and Resource Management, Northern Territory](#)
- [-Department of Environmental and Heritage Protection, Queensland](#)
- [-Department of Parks and Wildlife, Western Australia](#)
- [-Environment and Planning Directorate, ACT](#)
- [-Birdlife Australia](#)
- [-Australian Bird and Bat Banding Scheme](#)
- [-Australian National Wildlife Collection](#)
- [-Natural history museums of Australia](#)
- [-Museum Victoria](#)
- [-Australian Museum](#)
- [-South Australian Museum](#)
- [-Queensland Museum](#)
- [-Online Zoological Collections of Australian Museums](#)
- [-Queensland Herbarium](#)
- [-National Herbarium of NSW](#)
- [-Royal Botanic Gardens and National Herbarium of Victoria](#)
- [-Tasmanian Herbarium](#)
- [-State Herbarium of South Australia](#)
- [-Northern Territory Herbarium](#)
- [-Western Australian Herbarium](#)
- [-Australian National Herbarium, Canberra](#)
- [-University of New England](#)
- [-Ocean Biogeographic Information System](#)
- [-Australian Government, Department of Defence](#)
- [Forestry Corporation, NSW](#)
- [-Geoscience Australia](#)
- [-CSIRO](#)
- [-Australian Tropical Herbarium, Cairns](#)
- [-eBird Australia](#)
- [-Australian Government – Australian Antarctic Data Centre](#)
- [-Museum and Art Gallery of the Northern Territory](#)
- [-Australian Government National Environmental Science Program](#)
- [-Australian Institute of Marine Science](#)
- [-Reef Life Survey Australia](#)
- [-American Museum of Natural History](#)
- [-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania](#)
- [-Tasmanian Museum and Art Gallery, Hobart, Tasmania](#)
- [-Other groups and individuals](#)

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the [Contact us](#) page.

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Appendix B.

Vertebrate Fauna Recorded in Biological Surveys in the Region

**Basic and Targeted Vertebrate Fauna Survey and Assessment
Katanning Gold Project**



		Surveys A		B					C								D
				Wheatbelt-DU01	Wheatbelt-DU06	Wheatbelt-DU07	Wheatbelt-DU08	Wheatbelt-DU05	Candlelight Reserve	Candlelight Reserve	Moulyinning Reserve	Moulyinning Reserve	Wishbone Reserve 1	Wishbone Reserve 2	Candlelight Reserve 3	Moulyinning Reserve	
Family	Species	Common name															
Fish																	
Atherinidae	<i>Leptatherina wallacei</i>	Western Hardyhead	X														
Percichthyidae	<i>Bostockia porosa</i>	Nightfish	X														
	<i>Nannoperca vittata</i>	Western Pygmy Perch	X														
GalaXiidae	<i>GalaXias occidentalis</i>	Western Galaxias	X														
Amphibians																	
Limnodynastidae	<i>Heleioporus albopunctatus</i>	Western Spotted Frog	X														
	<i>Limnodynastes dorsalis</i>	Western Banjo Frog	X	1	2												
	<i>Neobatrachus pelobatoides</i>	Humming Frog	X	3		2	2										
Myobatrachidae	<i>Crinia georgiana</i>	Quacking Frog		1													
	<i>Crinia insignifera</i>	Sin-bearing Froglet						5									
	<i>Crinia pseudinsignifera</i>	Bleating Froglet	X	3													
	<i>Myobatrachus gouldii</i>	Turtle Frog	X	1													
	<i>Pseudophryne guentheri</i>	Gunther's Toadlet	X		1	2	1										
Pelodyridae	<i>Litoria adelaidensis</i>	Slender Tree Frog	X														
	<i>Litoria cyclorhyncha</i>	Spotted-thighed Frog	X														
	<i>Litoria moorei</i>	Motorbike Frog	X														
Reptiles																	
	<i>Ctenophorus maculatus</i>	Spotted Dragon	X														
	<i>Ctenophorus ornatus</i>	Ornate Crevice Dragon	X														
Agamidae	<i>Pogona minor</i>	Western Bearded Dragon	X			1	1										
Carphodactylidae	<i>Underwoodisaurus milii</i>	Barking Gecko	X														
Diplodactylidae	<i>Crenadactylus ocellatus</i>	Clawless Gecko	X	4	2	6			2	3	11	1	1				
	<i>Diplodactylus granariensis</i>	Wheatbelt Stone Gecko	X			3											
	<i>Diplodactylus pulcher</i>	Beautiful Gecko	X														
	<i>Hesperoedura reticulata</i>	Reticulated Velvet Gecko	X														
	<i>Strophurus spinigerus</i>	South-western Spiny-tailed Gecko	X														
Elapidae	<i>Echiopsis curta</i>	Bardick	X														
	<i>Neelaps calonotos</i>	Black-striped Burrowing Snake	X														
	<i>Notechis scutatus</i>	Tiger Snake	X														
	<i>Suta gouldii</i>	Gould's Snake	X								1	1		1			

Family	Species	Common name	Surveys		A					B					C							D	
										Wheatbelt-DU01	Wheatbelt-DU06	Wheatbelt-DU07	Wheatbelt-DU08	Wheatbelt-DU05	Candlelight Reserve	Candlelight Reserve	Moulyinning Reserve	Moulyinning Reserve	Wishbone Reserve 1	Wishbone Reserve 2	Candlelight Reserve 3	Moulyinning Reserve	
	<i>Suta nigriceps</i>	Short-tailed Snake	X																				
	<i>Pseudonaja affinis</i>	Dugite	X													1	1	1	1				
	<i>Pseudonaja mengdeni</i>	Western Brown Snake	X																				
	<i>Simoselaps bertholdi</i>	Jan's Banded Snake	X																				
	<i>Suta fasciata</i>	Rosen's Snake	X																				
Gekkonidae	<i>Christinus marmoratus</i>	Marbled Gecko	X																				
	<i>Gehyra variegata</i>	Variegated Gehyra	X																				
Pygopodidae	<i>Aprasia repens</i>	Southwest Sandplain Worm Lizard	X																				
	<i>Delma australis</i>	Marble-faced Delma	X													2							
	<i>Delma fraseri</i>	Fraser's Delma	X													1							
	<i>Lialis burtonis</i>	Burton's Legless Lizard	X																				
	<i>Pygopus lepidopodus</i>	Common Scaly-foot	X																				
Pythonidae	<i>Morelia spilota</i>	Carpet Python	X																				
Scincidae	<i>Cryptoblepharus buchananii</i>	Buchanan's Snake-eyed Skink	X								2	9							1				
	<i>Cryptoblepharus plagiocephalus</i>	Peron's Snake-eyed Skink		14	1																		
	<i>Ctenotus impar</i>	Odd-striped Ctenotus	X																				
	<i>Ctenotus schomburgkii</i>	Barred Wedgesnout Ctenotus	X																				
	<i>Egernia kingii</i>	King's Skink	X																				
	<i>Hemiergis peronii</i>	Lowlands Earless Skink	X			1																	
	<i>Lerista distinguenda</i>	South-western Orange-tailed Slider	X	5												2					1		
	<i>Menetia greyii</i>	Common Dwarf Skink	X	3	1	6	1	2								2							
	<i>Morethia obscura</i>	Shrubland Pale-flecked Morethia	X	3		5										2							
	<i>Tiliqua occipitalis</i>	Western Blue-tongued Lizard	X																				
	<i>Tiliqua rugosa</i>	Bobtail	X							1	1	1							2	2			
Typhlopidae	<i>Anilius australis</i>	Austral Blind Snake	X													1			2				
Varanidae	<i>Varanus gouldii</i>	Gould's Goanna	X																1				
	<i>Varanus rosenbergi</i>	Heath Monitor	X																				
Chelidae	<i>Chelodina oblonga</i>	Oblong Turtle	X																				
Birds																							
Anatidae	<i>Anas superciliosa</i>	Pacific Black Duck																	10				
	<i>Anas gracilis</i>	Grey Teal																	1				

Family	Species	Common name	Surveys A		B					C								D
					Wheatbelt-DU01	Wheatbelt-DU06	Wheatbelt-DU07	Wheatbelt-DU08	Wheatbelt-DU05	Candlelight Reserve	Candlelight Reserve	Moulyinning Reserve	Moulyinning Reserve	Wishbone Reserve 1	Wishbone Reserve 2	Candlelight Reserve 3	Moulyinning Reserve	
Columbidae	<i>Phaps chalcoptera</i>	Common Bronzewing								2	1	1					2	
	<i>Ocyphaps lophotes</i>	Crested Pigeon									2			2		1		
Cuculidae	<i>Chrysococcyx lucidus</i>	Shining Bronze-Cuckoo													1			
Aegothelidae	<i>Aegothales cristatus</i>	Australian Owlet-nightjar												1				
Ardeidae	<i>Egretta novaehollandiae</i>	White-faced Heron												2				
Accipitridae	<i>Aquila audax</i>	Wedge-tailed Eagle									3							
	<i>Dacelo novaeguineae</i>	Laughing Kookaburra							2									
Falconidae	<i>Falco berigora</i>	Brown Falcon													1			
	<i>Falco peregrinus</i>	Peregrine Falcon								2								
Timaliidae	<i>Zosterops lateralis</i>	Silvereye												1				
Cacatuidae	<i>Eolophus roseicapilla</i>	Galah								3	3			1				
Psittaculidae	<i>Polytelis anthopeplus</i>	Regent Parrot								4	3					2		
	<i>Neophema elegans</i>	Elegant Parrot								1						2		
	<i>Barnardius zonarius</i>	Australian Ringneck							2	34	7			4	4			
	<i>Glossopsitta porphyrocephala</i>	Purple-crowned Lorikeet								1								
Climacteridae	<i>Climacteris rufus</i>	Rufous Treecreeper	X							2								
Maluridae	<i>Malurus pulcherrimus</i>	Blue-breasted Fairywren	X									2						
	<i>Malurus splendens</i>	Splendid Fairywren	X												1			
Meliphagidae	<i>Manorina flavigula</i>	Yellow-throated Miner	X															
	<i>Acanthagenys rufogularis</i>	Spiny-cheeked Honeyeater	X														1	
	<i>Anthochaera lunulata</i>	Western Wattlebird	X															
	<i>Anthochaera carunculata</i>	Red Wattlebird	X						3		2					4		
	<i>Gavicalis virescens</i>	Singing Honeyeater	X									1				6	1	
	<i>Ptilotula ornata</i>	Yellow-plumed Honeyeater	X							9						2		
	<i>Epthianura albifrons</i>	White-fronted Chat	X															
	<i>Gliciphila melanops</i>	Tawny-crowned Honeyeater	X															
	<i>Lichmera indistincta</i>	Brown Honeyeater	X							1		12	1			5	18	
	<i>Phylidonyris novaehollandiae</i>	New Holland Honeyeater	X															
	<i>Phylidonyris niger</i>	White-cheeked Honeyeater	X									6						
	<i>Nesoptilotis leucotis</i>	White-eared Honeyeater	X									1	2	3			1	
	<i>Melithreptus chloropsis</i>	Gilbert's Honeyeater	X															

Family	Species	Common name	Surveys A		B					C								D
					Wheatbelt-DU01	Wheatbelt-DU06	Wheatbelt-DU07	Wheatbelt-DU08	Wheatbelt-DU05	Candlelight Reserve	Candlelight Reserve	Moulyinning Reserve	Moulyinning Reserve	Wishbone Reserve 1	Wishbone Reserve 2	Candlelight Reserve 3	Moulyinning Reserve	
	<i>Melithreptus brevirostris</i>	Brown-headed Honeyeater	X							6								
Pardalotidae	<i>Pardalotus punctatus</i>	Spotted Pardalote	X															
	<i>Pardalotus striatus</i>	Striated Pardalote	X							6	11						1	
Acanthizidae	<i>Sericornis frontalis</i>	White-browed Scrubwren	X												1		1	
	<i>Calamanthus campestris</i>	Rufous Fieldwren	X															
	<i>Acanthiza inornata</i>	Western Thornbill	X															
	<i>Acanthiza apicalis</i>	Inland Thornbill	X							12								
	<i>Acanthiza chrysorrhoa</i>	Yellow-rumped Thornbill	X							11								
	<i>Acanthiza uropygialis</i>	Chestnut-rumped Thornbill	X															
	<i>Smicromis brevirostris</i>	Weebill	X								2			7				
	<i>Gerygone fusca</i>	Western Gerygone	X							1								
Pomatostomidae	<i>Pomatostomus superciliosus</i>	White-browed Babbler	X							5	4			8				
Campephagidae	<i>Coracina novaehollandiae</i>	Black-faced Cuckooshrike	X							1	1	2						
	<i>Lalage tricolor</i>	White-winged Triller	X											2				
Neosittidae	<i>Daphoenositta chrysoptera</i>	Varied Sittella	X											4				
Falcunculidae	<i>Falcunculus frontatus</i>	Crested Shrike-tit (Western)	X															
Pachycephalidae	<i>Colluricincla harmonica</i>	Grey Shrikethrush	X								1	2		4			1	
	<i>Pachycephala pectoralis</i>	Golden Whistler	X											1			1	
	<i>Pachycephala rufiventris</i>	Rufous Whistler	X							1	4	1		2			2	
Artamidae	<i>Artamus cinereus</i>	Black-faced Woodswallow	X									6	3					
	<i>Artamus cyanopterus</i>	Dusky Woodswallow	X								3							
	<i>Cracticus torquatus</i>	Grey Butcherbird	X								1			2	1			
	<i>Cracticus nigrogularis</i>	Pied Butcherbird	X															
	<i>Gymnorhina tibicen</i>	Australian Magpie	X								4	2		4	4			
	<i>Strepera versicolor</i>	Grey Currawong	X							1				1	1			
Rhipiduridae	<i>Rhipidura leucophrys</i>	Willie Wagtail	X								1			2	1			
	<i>Rhipidura albiscapa</i>	Grey Fantail	X															
Monarchidae	<i>Grallina cyanoleuca</i>	Magpie-lark	X								1			2	1			
	<i>Myiagra inquieta</i>	Restless Flycatcher	X							1	2							
Corvidae	<i>Corvus coronoides</i>	Australian Raven	X							6	5	2		10			2	
Petroicidae	<i>Microeca fascinans</i>	Jacky Winter	X															

Family	Species	Common name	Surveys A		B					C								D
					Wheatbelt-DU01	Wheatbelt-DU06	Wheatbelt-DU07	Wheatbelt-DU08	Wheatbelt-DU05	Candlelight Reserve	Candlelight Reserve	Moulyinning Reserve	Moulyinning Reserve	Wishbone Reserve 1	Wishbone Reserve 2	Candlelight Reserve 3	Moulyinning Reserve	
	<i>Petroica boodang</i>	Scarlet Robin	X															
	<i>Petroica goodenovii</i>	Red-capped Robin	X							2				3				
	<i>Melanodryas cucullata</i>	Hooded Robin	X															
	<i>Eopsaltria griseogularis</i>	Western Yellow Robin	X															
	<i>Drymodes brunneopygia</i>	Southern Scrub-Robin	X															
Locustellidae	<i>Poodytes gramineus</i>	Little Grassbird	X															
	<i>Cincloramphus cruralis</i>	Brown Songlark	X															
	<i>Cincloramphus mathewsi</i>	Rufous Songlark	X															
Hirundinidae	<i>Hirundo neoxena</i>	Welcome Swallow	X															
	<i>Petrochelidon ariel</i>	Fairy Martin	X															
	<i>Petrochelidon nigricans</i>	Tree Martin	X							6	15							
Zosteropidae	<i>Zosterops lateralis</i>	Silvereye	X															
Dicaeidae	<i>Dicaeum hirundinaceum</i>	Mistletoebird	X															
Motacillidae	<i>Anthus novaeseelandiae</i>	Australasian Pipit	X															
Mammals																		
Tachyglossidae	<i>Tachyglossus aculeatus</i>	Short-beaked Echidna	X							1		1	1	1	1	1	1	
Bovidae	<i>Ovis aries</i>	Sheep	X															
Suidae	<i>Sus scrofa</i>	Pig	X															
Canidae	<i>Vulpes vulpes</i>	Red Fox	X									1		1	1			
Molossidae	<i>Austronomus australis</i>	White-striped Freetail Bat	X															
	<i>Mormopterus planiceps</i>	Southern Free-tail Bat	X															
Vespertilionidae	<i>Chalinolobus gouldii</i>	Gould's Wattled Bat	X															
	<i>Chalinolobus morio</i>	Chocolate Wattled Bat	X															
	<i>Nyctophilus geoffroyi</i>	Lesser Long-eared Bat	X															
	<i>Nyctophilus major</i>	Greater Long-eared Bat	X															
	<i>Vespadelus finlaysoni</i>	Finlayson's Cave Bat	X															
	<i>Vespadelus regulus</i>	Southern Forest Bat	X															
Dasyuridae	<i>Antechinus flavipes</i>	Yellow-footed Antechinus	X															
	<i>Dasyurus geoffroyi</i>	Chuditch	X															
	<i>Phascogale calura</i>	Red-tailed Phascogale	X															17
	<i>Sminthopsis crassicaudata</i>	Fat-tailed Dunnart	X						3									

Family	Species	Common name	Surveys A		B					C								D
					Wheatbelt-DU01	Wheatbelt-DU06	Wheatbelt-DU07	Wheatbelt-DU08	Wheatbelt-DU05	Candlelight Reserve	Candlelight Reserve	Moulyinning Reserve	Moulyinning Reserve	Wishbone Reserve 1	Wishbone Reserve 2	Candlelight Reserve 3	Moulyinning Reserve	
	<i>Sminthopsis granulipes</i>	White-tailed Dunnart	X															
	<i>Sminthopsis murina</i>	Slender-tailed Dunnart	X															
Myrmecobiidae	<i>Myrmecobius fasciatus</i>	Numbat	X															
Burramyidae	<i>Cercartetus concinnus</i>	Southwestern Pygmy Possum	X															
Macropodidae	<i>Macropus fuliginosus</i>	Western Grey Kangaroo	X															
	<i>Notamacropus irma</i>	Western Brush Wallaby	X															
Phalangeridae	<i>Trichosurus vulpecula</i>	Common Brushtail Possum	X															
Potoroidae	<i>Bettongia penicillata</i>	Woylie	X															
Tarsipedidae	<i>Tarsipes rostratus</i>	Honey Possum	X															
Leporidae	<i>Oryctolagus cuniculus</i>	Rabbit	X															
Thylacomyidae	<i>Macrotis lagotis</i>	Bilby	X															
Muridae	<i>Mus musculus</i>	House Mouse	X	1		3	3	9										
	<i>Rattus rattus</i>	Black Rat	X															

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C Mattiske Consulting Pty Ltd and Molloch Fauna Consultants (1996) *Flora, Vegetation and Vertebrate Fauna Survey Wishbone, Moulyinning and Candlelight Town and Railway Siding Reserves*. Unpublished report for Dumbleyung Land Conservation District Committee, Perth.

D Short, J., Hide, A. and Stone, M. (2011) Habitat requirements of the endangered red-tailed phascogale, *Phascogale calura*. *Wildlife Research*, 38, 359-369.

Appendix C.

Definitions of Significant Fauna under the *WA Biodiversity Conservation Act 2016* and Priority Species

Basic and Targeted Vertebrate Fauna Survey and Assessment
Katanning Gold Project



C.1 DEFINITIONS OF SIGNIFICANT FAUNA UNDER THE WA *BIODIVERSITY CONSERVATION ACT 2016* AND PRIORITY SPECIES

Threatened, Extinct and Specially Protected fauna or flora¹ are species² which have been adequately searched for and are deemed to be, in the wild, threatened, extinct or in need of special protection, and have been gazetted as such. The *Wildlife Conservation (Specially Protected Fauna) Notice 2018* and the *Wildlife Conservation (Rare Flora) Notice 2018* have been transitioned under regulations 170, 171 and 172 of the *Biodiversity Conservation Regulations 2018* to be the lists of Threatened, Extinct and Specially Protected species under Part 2 of the *Biodiversity Conservation Act 2016*. Categories of Threatened, Extinct and Specially Protected fauna and flora are:

T Threatened Species

Listed by order of the Minister as Threatened in the category of critically endangered, endangered or vulnerable under section 19(1), or is a rediscovered species to be regarded as threatened species under section 26(2) of the *Biodiversity Conservation Act 2016* (BC Act).

Threatened fauna is that subset of 'Specially Protected Fauna' listed under schedules 1 to 3 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for Threatened Fauna.

Threatened flora is that subset of 'Rare Flora' listed under schedules 1 to 3 of the *Wildlife Conservation (Rare Flora) Notice 2018* for Threatened Flora.

The assessment of the conservation status of these species is based on their national extent and ranked according to their level of threat using IUCN Red List categories and criteria as detailed below.

CR Critically endangered species

Threatened species considered to be "*facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with criteria set out in the ministerial guidelines*".

Listed as critically endangered under section 19(1)(a) of the BC Act in accordance with the criteria set out in section 20 and the ministerial guidelines. Published under schedule 1 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for critically endangered fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for critically endangered flora.

¹ The definition of flora includes algae, fungi and lichens

² Species includes all taxa (plural of taxon - a classificatory group of any taxonomic rank, e.g. a family, genus, species or any infraspecific category i.e. subspecies or variety, or a distinct population).

EN Endangered species

Threatened species considered to be *"facing a very high risk of extinction in the wild in the near future, as determined in accordance with criteria set out in the ministerial guidelines"*.

Listed as endangered under section 19(1)(b) of the BC Act in accordance with the criteria set out in section 21 and the ministerial guidelines. Published under schedule 2 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for endangered fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for endangered flora.

VU Vulnerable species

Threatened species considered to be *"facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with criteria set out in the ministerial guidelines"*.

Listed as vulnerable under section 19(1)(c) of the BC Act in accordance with the criteria set out in section 22 and the ministerial guidelines. Published under schedule 3 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for vulnerable fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for vulnerable flora.

Extinct Species

Listed by order of the Minister as extinct under section 23(1) of the BC Act as extinct or extinct in the wild.

EX Extinct species

Species where *"there is no reasonable doubt that the last member of the species has died"*, and listing is otherwise in accordance with the ministerial guidelines (section 24 of the BC Act).

Published as presumed extinct under schedule 4 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for extinct fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for extinct flora.

EW Extinct in the wild species

Species that *"is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; and it has not been recorded in its known habitat or expected habitat, at appropriate seasons, anywhere in its past range, despite surveys over a time frame appropriate to its life cycle and form"*, and listing is otherwise in accordance with the ministerial guidelines (section 25 of the BC Act).

Currently there are no threatened fauna or threatened flora species listed as extinct in the wild. If listing of a species as extinct in the wild occurs, then a schedule will be added to the applicable notice.

Specially Protected Species

Listed by order of the Minister as specially protected under section 13(1) of the BC Act. Meeting one or more of the following categories: species of special conservation interest; migratory species; cetaceans; species subject to international agreement; or species otherwise in need of special protection.

Species that are listed as threatened species (critically endangered, endangered or vulnerable) or extinct species under the BC Act cannot also be listed as Specially Protected species.

MI Migratory birds protected under an international agreement

Fauna that periodically or occasionally visit Australia or an external Territory or the exclusive economic zone; or the species is subject of an international agreement that relates to the protection of migratory species and that binds the Commonwealth; and listing is otherwise in accordance with the ministerial guidelines (section 15 of the BC Act).

Includes birds that are subject to an agreement between the government of Australia and the governments of Japan (JAMBA), China (CAMBA) and The Republic of Korea (ROKAMBA), and fauna subject to the *Convention on the Conservation of Migratory Species of Wild Animals* (Bonn Convention), an environmental treaty under the United Nations Environment Program. Migratory species listed under the BC Act are a subset of the migratory animals, that are known to visit Western Australia, protected under the international agreements or treaties, excluding species that are listed as Threatened species.

Published as migratory birds protected under an international agreement under schedule 5 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018*.

CD Species of special conservation interest (conservation dependant fauna)

Fauna of special conservation need being species dependent on ongoing conservation intervention to prevent it becoming eligible for listing as threatened, and listing is otherwise in accordance with the ministerial guidelines (section 14 of the BC Act).

Published as conservation dependent fauna under schedule 6 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018*.

OS Other specially protected species

Fauna otherwise in need of special protection to ensure their conservation, and listing is otherwise in accordance with the ministerial guidelines (section 18 of the BC Act).

Published as other specially protected fauna under schedule 7 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018*.

P Priority species

Possibly threatened species that do not meet survey criteria, or are otherwise data deficient, are added to the Priority Fauna or Priority Flora Lists under Priorities 1, 2 or 3. These three categories are ranked in order of priority for survey and evaluation of conservation status so that consideration can be given to their declaration as threatened fauna or flora.

Species that are adequately known, are rare but not threatened, or meet criteria for near threatened, or that have been recently removed from the threatened species or other specially protected fauna lists for other than taxonomic reasons, are placed in Priority 4. These species require regular monitoring.

Assessment of Priority codes is based on the Western Australian distribution of the species, unless the distribution in WA is part of a contiguous population extending into adjacent States, as defined by the known spread of locations

P1 Priority 1: Poorly-known species

Species that are known from one or a few locations (generally five or less) which are potentially at risk. All occurrences are either: very small; or on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, road and rail reserves, gravel reserves and active mineral leases; or otherwise under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes. Such species are in urgent need of further survey.

P2 Priority 2: Poorly-known species

Species that are known from one or a few locations (generally five or less), some of which are on lands managed primarily for nature conservation, e.g. national parks, conservation parks, nature reserves and other lands with secure tenure being managed for conservation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes. Such species are in urgent need of further survey.

P3 Priority 3: Poorly-known species

Species that are known from several locations, and the species does not appear to be under imminent threat, or from few but widespread locations with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several locations but do not meet adequacy of survey requirements and known threatening processes exist that could affect them. Such species are in need of further survey.

P4 Priority 4: Rare, Near Threatened and other species in need of monitoring

(a) Rare. Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection but could be if present circumstances change. These species are usually represented on conservation lands.

(b) Near Threatened. Species that are considered to have been adequately surveyed and that are close to qualifying for vulnerable but are not listed as Conservation Dependent.

(c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.

Appendix D.

Locations of significant Black-Cockatoo trees

**Basic and Targeted Vertebrate Fauna Survey and Assessment
Katanning Gold Project**



Appendix E.

Images of significant Black-Cockatoo trees

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