JUNE 2025

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FORTESCUE LIMITED
WYLOO NORTH MINE AND TRANSPORT OPTIONS: TERRESTRIAL VERTEBRATE FAUNA ASSESSMENT

Document Status						
***ecologia* project number: 1995**						
Rev.	**Author(s)**	**Reviewer**	**Date**	**Approved for Issue**		
				Name	**Distributed To**	**Date**
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EXECUTIVE SUMMARY

Fortescue Limited (Fortescue) is investigating options to expand its Pilbara mining operations to potentially include several tenements in the Western Pilbara, which are collectively known as the Western Hub. Fortescue commissioned Ecologia Environment (*ecologia*) to undertake a two-phase detailed terrestrial vertebrate fauna assessment and targeted significant fauna survey of the Wyloo North survey area and consolidate the results of previous surveys undertaken within the survey area, to support future environmental impact assessments.

A total of 17 fauna assessments were identified within 50 km of the survey area, with eight of these assessments found to overlap the survey area. Data associated with six detailed surveys; one targeted significant fauna survey and one significant fauna monitoring program were consolidated as part of the current assessment. Detailed and targeted significant fauna surveys undertaken by *ecologia* as part of the 2024 assessment were designed to address data deficiencies and survey gaps identified during the desktop assessment and literature review and supplement existing datasets.

Survey Effort

Extensive cumulative survey effort has been undertaken within the survey area, comprising a total of 57 systematic trapping sites (23,175 trap nights), 1,220 nights of targeted northern quoll cage trapping, 255 motion cameras (7,318 recording nights), at least 147 hours of avifauna surveys, 211 hours of active searches, 22 acoustic Autonomous Recording Unit (ARU) sites targeting night parrots (133 recording nights), 169 ultrasonic ARU sites targeting significant bat taxa (608 recording nights), 52 hours of nocturnal spotlighting, 122 hours of targeted searches and cave habitat assessments in rocky habitats (northern quoll and significant bats), 39 hours of grey falcon searches and one Pilbara olive python eDNA sampling site. Survey techniques utilised were undertaken in accordance with relevant EPA technical guidelines and significant fauna survey guidelines. Species accumulation curves for trapped fauna and avifauna indicate that cumulative survey effort was adequate and additional effort is unlikely to have resulted in a significant increase in species recorded.

Fauna Habitat

A total of nine broad fauna habitat types were identified within the survey area: Plain (alluvial) (902 ha, 2.1%), Hills/Ranges/Plateaux (17,069 ha, 38.8%), Gorge/Gully (1,126 ha, 2.6%), Drainage Line/River/Creek (major) (2,232 ha, 5.1%), Drainage Line/River/Creek (minor) (580 ha, 1.3%), Lower Slopes/Hillslopes (2,898 ha, 6.6%), Hummock Grassland (10,345 ha, 23.5%), Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways) (6,540 ha, 14.9%) and Shrubland (open) (2,251ha, 5.1%). The Hills/Ranges/Plateaux habitat type is the dominant feature of the survey area, encompassing ridges, mesas, cliffs, outcrops and breakaways which provide denning/roosting, foraging and dispersal habitat for significant fauna.

Fauna Assemblage

One hundred and fifty-seven vertebrate fauna taxa were recorded during the current survey, comprising 26 mammals, 55 reptiles, 74 birds and two amphibians. An additional 26 birds, seven mammals, 20 reptiles, one amphibian and five fish have previously been recorded within the survey area for a cumulative total of 216 vertebrate fauna taxa, representing 63.5% of species potentially occurring within the survey area. Three introduced species (European cattle, donkey and cat) were recorded during the current survey and an additional three species (horse, house mouse and laughing turtle dove) have previously been recorded within the survey area.

Significant Fauna

Eleven significant fauna species have been recorded in the survey area, including:

- Northern quoll (*Dasyurus hallucatus*) – Endangered EPBC Act and BC Act.
- Pilbara leaf-nosed bat (*Rhinonicteris aurantia* (Pilbara form)) – Vulnerable EPBC Act and BC Act.

- Ghost bat (*Macroderma gigas*) – Vulnerable EPBC Act and BC Act.
- Pilbara olive python (*Liasis olivaceus barroni*) - Vulnerable EPBC Act and BC Act.
- Fork-tailed swift (*Apus pacificus*) - Migratory EPBC Act and BC Act.
- Osprey (*Pandion cristatus*) - Migratory EPBC Act and BC Act.
- Peregrine falcon (*Falco peregrinus*) - Other Specially Protected Fauna BC Act.
- Gane's blind snake (*Anilios ganei*) – Priority 1.
- Lined soil-crevice skink (*Notoscincus butleri*) – Priority 3.
- Western pebble-mound mouse (*Pseudomys chapmani*) – Priority 4.
- Fortescue grunter (*Leiopotherapon aheneus*) – Priority 4.

The northern quoll was recorded on 35 occasions during the current survey, comprising one secondary sign (scat), two captures (one male, one female) and 42 motion camera visits (eight individuals). An additional 570 northern quoll records have been recorded within the survey area during previous surveys. Critical denning habitat for the northern quoll occurs within the Rocky Escarpments and Gorge/Gully, with Drainage Line/River/Creek (major), Hills/Ranges/Plateaux and Lower Slopes and Hillslopes providing dispersal and foraging habitat for the species.

Ultrasonic calls belonging to the Pilbara leaf-nosed bat were recorded at seven sites during the current survey, with the species also recorded on 94 occasions during previous surveys. Historical low-call times recorded by GHD (2020) and Biologic (2013) indicate that Pilbara leaf-nosed bat roosting habitat may be present in or adjacent to the survey area; however, the location of a roost was not identified during subsequent targeted surveys and no low-time calls were recorded in these areas during the current survey. Rocky Escarpment and Gorge/Gully habitat within the survey area represent critical roosting habitat for the Pilbara leaf-nosed bat. Based on the regular detection rates and distribution of Pilbara leaf-nosed bat records within the survey area, all habitat types within the survey area provide priority foraging habitat for the Pilbara leaf-nosed bat.

Primary evidence of the ghost bat was recorded at three sites (CB003, WNGB03 and WNGB05) during the current survey and secondary evidence (middens) were recorded at five caves. An additional 14 ghost bat records (sightings, calls and middens) were recorded during previous surveys. Gorge/Gully and Rocky Escarpments represent critical roosting habitat for the ghost bat, with habitat surrounding Duck Creek associated with a concentration of ghost bat foraging records. The ghost bat may utilise all other habitat types within the survey area while foraging and dispersing. The records obtained to date indicate that at least three caves within the survey area provide confirmed diurnal roosting habitat for the species, with an additional 16 caves providing nocturnal shelter and potential roosting habitat based on the presence of middens and/or echolocation call recordings at cave entrances.

The Gane's blind snake was recorded at a single site within Gorge/Gully habitat during the current survey. The lined soil-crevice skink was recorded at two sites within the Hummock Grassland habitat type during the current survey and four additional sites during previous surveys. Mounds belonging to the western pebble-mound mouse were recorded on three occasions during the current survey, with an additional eight mounds recorded during previous surveys.

Although not recorded during the current survey, the Pilbara olive python, fork-tailed swift, osprey, peregrine falcon and Fortescue grunter have previously been recorded within the survey area. Rocky Escarpments, Gorge/Gully and Hills/Range/Plateaux provide critical habitat for the Pilbara olive python, with Drainage Line/River/Creek (major) habitat providing foraging and dispersal habitat for the species.

The grey falcon (*Falco hypoleucos* [VU]) was assessed as highly likely to occur within the survey area while a further two species (long-tailed dunnart (*Antechinomys longicaudata*) [P4] and Pilbara barking gecko (*Underwoodisaurus seorsus* [P2]) are considered moderately likely to occur within the survey area. These species have not been recorded within the survey area during current or previous surveys.

TABLE OF CONTENTS

TABLES

FIGURES

MAP FIGURES

APPENDICES

1 INTRODUCTION

1.1 PROJECT BACKGROUND

Fortescue Limited (Fortescue) is investigating options to expand its Pilbara mining operations to potentially include several tenements in the Western Pilbara, which are collectively known as the Western Hub. The Western Hub is located approximately 80 kilometres (km) west-northwest of Tom Price, and the Wyloo North project area (hereafter referred to as "the survey area") comprises the southwestern section of the Western Hub (43,943 ha) (Map 1). Ecologia Environment (*ecologia*) was engaged by Fortescue to complete a two-phase detailed terrestrial vertebrate fauna assessment and targeted significant fauna survey to supplement previous survey effort undertaken within the survey area.

1.2 SURVEY OBJECTIVES

The primary objective of the surveys was to facilitate environmental approvals (i.e. Part IV *Environmental Protection Act* 1986 (EP Act*), Environmental Protection and Biodiversity Conservation Act* 1999 (EPBC Act), *Mining Act* 1978 and the *Biodiversity Conservation Act* 2016 (BC Act)) for the future development of the survey area.

The following components were completed as part of this assessment:

1. Complete a desktop assessment of the survey area (including literature review and database searches), including consolidation of previous survey effort and identification of sampling gaps.
2. Conduct a detailed fauna habitat assessment of the survey area, including extrapolation and refinement of previous fauna habitat mapping and identification of critical significant fauna habitat within the survey area.
3. Undertake a detailed two-phase terrestrial vertebrate fauna survey to supplement previous survey effort within the survey area.
4. Conduct targeted surveys for significant species potentially occurring in the survey area.

1.3 LEGISLATIVE AND REGULATORY FRAMEWORK

The survey was designed and undertaken to comply with the following statutory legislation and policies (definitions can be seen in Appendix A):

- *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act);
- *Biodiversity Conservation Act* 2016 (BC Act); and
- *Environmental Protection Act* 1986 (EP Act).

The assessments complied with all necessary Environmental Protection Authority (EPA) and Commonwealth guidelines, including but not limited to:

- Technical Guidance – Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment (EPA, 2020);
- Environmental Protection Authority (EPA) Environmental Factor Guideline: Terrestrial Fauna (EPA, 2016);
- EPBC Act Referral Guideline for the Endangered Northern Quoll (Commonwealth of Australia 2016);
- Survey Guidelines for Australia's Threatened Mammals (DSEWPaC, 2011a), Bats (DSEWPaC, 2010), Birds (DEWHA, 2010a), Frogs (DEWHA, 2010b) and Reptiles (DSEWPaC, 2011b);
- Guidelines for Determining the Likely Presence and Habitat Usage of Night Parrot (*Pezoporus occidentalis*) in Western Australia (DBCA, 2024); and
- Interim Guideline for Preliminary Surveys of Night Parrot (*Pezoporus occidentalis*) in Western Australia (DBCA, 2017).

115.65°E 115.7°E 115.75°E 115.8°E 115.85°E 115.9°E 115.95°E 116°E 116.05°E 116.1°E 116.15°E 116.2°E 116.25°E 116.3°E 116.35°E 116.4°E 116.45°E 116.5°E 116.55°E 116.6°E 116.65°E 116.7°E 116.75°E 116.8°E 116.85°E 116.9°E 116.95°E 117°E 117.05°E 117.1°E 117.15°E 117.2°E 117.25°E 117.3°E 117.35°E 117.4°E 117.45°E 117.5°E 117.55°E

22.05°S 22.1°S 22.15°S 22.2°S 22.25°S 22.3°S 22.35°S 22.4°S 22.45°S 22.5°S 22.55°S 22.6°S 22.65°S 22.7°S 22.75°S 22.8°S 22.85°S 22.9°S

MOUNT STUART ROAD

MOUNT STUART RED HILL ROAD

MOUNT BROCKMAN ROAD

Hamersley (PIL)

NANUTARRA WITTENOOM ROAD

Ashburton (GAS)

ASHBURTON DOWNS ROAD

PARABURDOO TOM PRICE ROAD

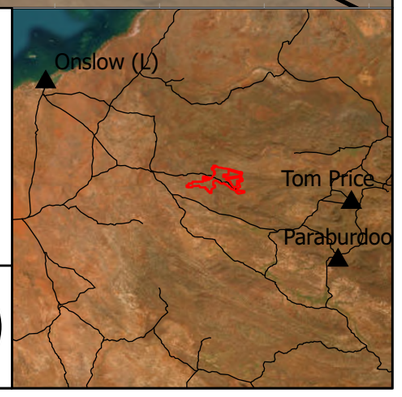
Survey area

Road

IBRA 7 region and subregion

GAS: Ashburton

PIL: Hamersley



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Project No.: 1995
Author: SP
Created Date: 19 May 2025
Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Scale: 1:500,000 @A3

Map 1: Location of survey area.

Earthstar Geographics

0 3 7 10 20

Kilometers

2 REGIONAL AND BIOLOGICAL CONTEXT

A review of background environmental information for the survey area was conducted, including, but not limited to, climate (Bureau of Meteorology, BOM), biogeography (IBRA 7) (DSEWPaC, 2012a), soil-landscape systems (land systems) (DPIRD, 2016b), the Surface Geology of Australia 1:1M spatial dataset (Geoscience Australia, 2012), the Atlas of Australian Soils (Northcote et al., 1960-1968), and pre-European native vegetation of Western Australia (Shepherd, Beeston, & Hopkins, 2002).

2.1 CLIMATE

The survey area is located in the Pilbara region of Western Australia (WA) and experiences an arid-tropical climate with two distinct seasons: a hot summer from October to April and a mild winter from May to September. Temperatures are generally high, with summer temperatures frequently approaching 40°C. Light frosts occasionally occur inland during the winter months of July and August. Climate data from the nearest long-term Bureau of Meteorology (BOM) weather station was obtained from Wyloo (Station No. 5028, 16 km south-west of survey area) for rainfall and Paraburdoo (Station No. 7185, 105 km southeast of survey area) for temperature. Maximum daytime temperatures frequently exceed 40°C between November and January, and minimum temperatures can drop below 14°C between June and September.

A total of 93.7 mm of rainfall was recorded during the 12 months prior to the phase one detailed survey, which was 36.4% of median annual rainfall (257.6 mm) (Figure 1) (BOM, 2024). Below average rainfall was recorded in the three months prior to the phase one detailed survey (77.7 mm, 72.8%) and targeted survey (63.7 mm, 72.8%). Above average rainfall was recorded prior to the phase two detailed survey (45 mm, 144.2%).

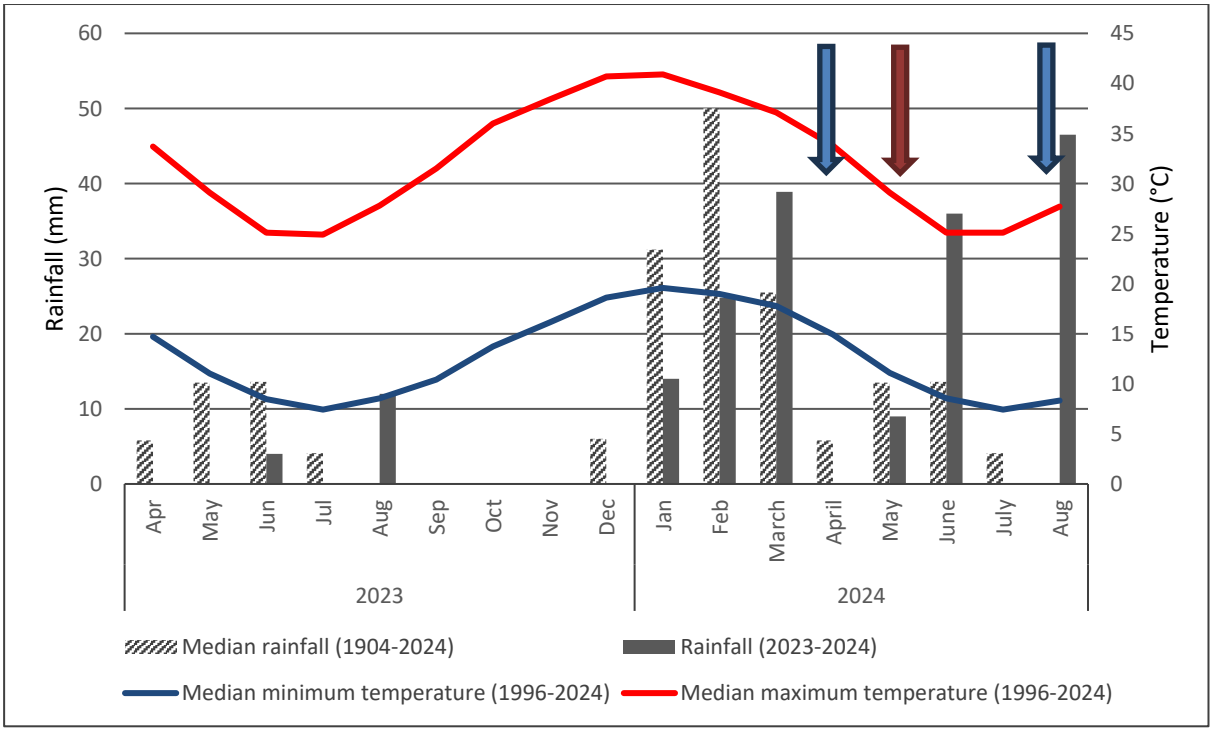


Figure 1: Climate data from Wyloo (rainfall) and Paraburdoo Aero (temperature). Blue arrows indicate timing of detailed vertebrate fauna surveys and the red arrow indicates timing of targeted significant fauna surveys.

2.2 IBRA 7 BIOREGIONS

The Interim Biogeographic Regionalisation for Australia (IBRA) classifies the Australian continent into regions or bioregions on the basis of similar geology, landform, vegetation, fauna and climate characteristics (DSEWPaC, 2012b). The survey area is situated entirely within the Pilbara bioregion according to IBRA 7 (DSEWPaC, 2012b). The Pilbara region is further divided into four subregions: Chichester (PIL01), Fortescue Plains (PIL02), Hamersley (PIL03) and Roebourne (PIL04), with the entirety of the survey area occurring within the Hamersley subregion (Map 1).

The Hamersley subregion comprises the southern section of the Pilbara Craton. Low mulga (*Acacia aneura* and close relatives) woodland occurs over tussock grasses on fine textured soils in valley floors, and *Eucalyptus leucophloia* open woodlands over *Triodia brizoides* (and other *Triodia* species) occur on skeletal soils of the ranges (Kendrick, 2001). The climate is semi-arid tropical, with an average rainfall of 300 mm, falling mainly in summer cyclonic events, and the subregional area is 6,215,092 ha (Kendrick, 2001).

2.3 LAND SYSTEMS

In 2016 the Department of Primary Industries and Regional Development (DPIRD) consolidated soil-landscape mapping of Western Australia from two technical reports created by the Department of Agriculture and Food (Department of Agriculture Resource Management Technical Reports RMTR No. 280 (Purdie, Tille, & Schoknecht, 2016) and RMTR No. 313 (Tille, 2006)). The resulting spatial dataset, *Soil-landscape mapping covering Western Australia at the best available scale (Version 05.01)* (DPIRD, 2016a), is a compilation of various surveys at different scales varying between 1:20,000 and 1:3,000,000. Mapping conforms to a nested hierarchy established to deal with the varying levels of information resulting from the variety of scales in mapping to provide soil-landscape data for all Western Australia.

Six land systems are associated with the survey area, with the majority of the survey area (66.9%) comprised of the Newman Land System (Map 2, Table 1).

Table 1: Land systems within the survey area.

Land system	Description	Extent within survey area (ha)	Extent within survey area (%)
Boolgeeda	Stony lower slopes and plains below hill systems supporting hard and soft spinifex grasslands or mulga shrublands	3,856	8.8
Capricorn	Rugged sandstone hills, ridges, stony foot slopes and interfluves supporting low acacia shrublands or hard spinifex grasslands with scattered shrubs	130	0.3
Newman	Rugged jaspilite plateaux, ridges and mountains supporting hard spinifex grasslands	29,444	66.9
River	Narrow, seasonally active flood plains and major river channels supporting moderately close, tall shrublands or woodlands of acacias and fringing communities of eucalypts sometimes with tussock grasses or spinifex	1,795	4.1
Robe	Low plateaux, mesas and buttes of limonite supporting soft spinifex and occasionally hard spinifex grasslands	3,818	8.7
Rocklea	Basalt hills, plateaux, lower slopes and minor stony plains supporting hard spinifex and occasionally soft spinifex grasslands with scattered shrubs	4,900	11.2
Total		**43,943**	**100**

2.4 SURFACE GEOLOGY OF AUSTRALIA

The Surface Geology of Australia 1:1,000,000 scale spatial dataset is a seamless national coverage of outcrop and surficial geology (Geoscience Australia, 2012). Fourteen surface geological units are associated with the survey area (Table 2, Map 3) and approximately one third

of the survey area is comprised of two geological units, Brockman Iron Formation (15.2%) and colluvium 38491 (14.5%).

Table 2: Surface geology associated with the survey area (Geoscience Australia 2012).

Surface geological unit	Description	Extent within survey area (ha)	Extent within survey area (%)
alluvium 38485	Channel and flood plain alluvium; gravel, sand, silt, clay; may be locally calcreted	2,852	6.5
Beasley River Quartzite	Fine to coarse grained sandstone; locally silicified.	186	0.4
Boolgeeda Iron Formation	Fine-grained, finely laminated, dark grey-brown to black flaggy iron-formation, minor chert, jaspilite, shale.	2,824	6.4
Brockman Iron Formation	Banded iron-formation, chert, mudstone and siltstone.	6,664	15.2
Bunjinah Formation	Pillowed and massive basaltic flows; basaltic breccia; and basaltic volcanic sandstone; minor chert; amygdaloidal basalt flows occur in upper parts of formation; metamorphosed.	1,237	2.8
colluvium 38491	Colluvium and/or residual deposits, sheetwash, talus, scree; boulder, gravel, sand; may include minor alluvial or sand plain deposits, local calcrete and reworked laterite	6,418	14.5
Jeerinah Formation	Shale, sandstone, siltstone, mudstone, dolomite, local microbanded chert, jaspilite, conglomerate; fine-grained massive rhyolite; mafic tuff with local accretionary lapilli and agglomerate; thin basalt/dolerite and andesitic basalt flows.	3,105	7.1
Marra Mamba Iron Formation	Chert, ferruginous chert, jaspilite, banded iron-formation, minor shale, siltstone, mudstone.	2,337	5.3
Mount McRae Shale and Mount Sylvia Formation	Interbedded shale, chert, banded iron-formation	1,389	3.2
Robe Pisolite	Pisolitic, oolitic and massive limonite, minor terrigenous siliciclastic material, goethite and hematite deposits; developed along palaeodrainage lines; dissected by present day drainage.	3,085	7.0
Turee Creek Group	Turbidites, shallow marine carbonates, and fluvial to marine siliclastic rocks.	249	0.6
Weeli Wolli Formation	Banded iron-formation (commonly jaspilitic), mudstone, siltstone; common interlayered metadoleritic sills.	5,434	12.4
Wittenoom Formation	Calcitic dolomite, interbedded chert and shale in upper and lower parts, volcaniclastic sandstone.	2,201	5
Woongarra Rhyolite	Rhyolite, rhyodacite, rhyolitic volcaniclastic breccia and banded iron formation.	5,960	13.6
Total		**43,943**	**100**

2.5 ATLAS OF AUSTRALIAN SOILS

The Atlas of Australian Soils (Northcote et al., 1960-1968) was compiled by the CSIRO in the 1960s to provide a consistent national description of Australia's soils. The original maps used scales from 1:250,000 to 1:500,000. In 1991 the National Resource Information Centre used these maps to create the Digital Atlas of Australian Soils which describes over 14,000 soil units and their distribution across Australia.

Three soil types of the Atlas of Australian Soils are associated with the survey area (Table 3, Map 4). The majority of the survey area (87.7%) is comprised of Fa15, which is characterised by basalt ranges with narrow winding valley plains and shallow soils.

Table 3: Atlas of Australian Soil units associated with the survey area (Northcote *et al*. 1960-1968).

Map code	Description	Extent within survey area (ha)	Extent within survey area (%)
BD1	BD1 Plains and levees, usually of small extent, flanking the main rivers: chief soils are recent loams (Um5.2, Um5.12), and sands (Uc5.32) close to the rivers; red earths (Gn2.13), (Dr4.13) soils, and light clays (Uf1.3) on more eroded areas.	1,473	3.4
Fa13	Fa13 Ranges of banded jaspilite and chert along with shales, dolomites, and iron ore formations; some areas of ferruginous duricrust as well as occasional narrow winding valley plains and steeply dissected pediments. This unit is largely associated with the Hamersley and Ophthalmia Ranges. The soils are frequently stony and shallow and there are extensive areas without soil cover: chief soils are shallow stony earthy loams (Um5.51) along with some (Uc5.11) soils on the steeper slopes. Associated are (Dr2.33, Dr2.32) soils on the limited areas of dissected pediments, while (Um5.52) and (Uf6.71) soils occur on the valley plains.	3,920	8.9
Fa15	Fa15 Ranges of basalt along with shale, chert, jaspilite, and dolomite; some narrow winding valley plains. The soils are frequently shallow and there are extensive areas without soil cover: chief soils are shallow stony loams (Um5.51) along with (Um6.23) soils. (Dr2.33) soils occur on lower slopes extending onto the narrow valley plains where they are associated with (Uf6.71) and (Um5.52) soils.	38,550	87.7
Total		**43,943**	**100**

2.6 VEGETATION

The Western Australian Land Use and Vegetation Data Project (Shepherd et al., 2002) produced a 1:250,000 scale digital spatial dataset of the pre-European native vegetation of Western Australia, compiled from previous vegetation mapping exercises, primarily by J.S. Beard from 1964 to 1981, with updates reflecting the National Vegetation Information System (NVIS) standards. Three vegetation associations (82, 103, and 567) are mapped within the survey area (Table 4, Map 5), with most of the survey area (80.7%) comprised of vegetation association 82 which is characterised by *Triodia wiseana* hummock grassland and low *Eucalyptus* steppe.

The pre-European and current extent of each vegetation association is available from the Statewide Vegetation Statistics dataset (Government of Western Australia, 2018). The National Objectives and Targets for Biodiversity Conservation 2001-2005 (DEH, 2001) recognise that the retention of 30% or more of the pre-clearing extent of an ecological community is necessary if Australia's biological diversity is to be protected, as this is the threshold below which species loss appears to accelerate exponentially (EPA, 2000). Vegetation associations at less than 30% of their pre-European extent are classified as either 'Vulnerable' (10-30%) or 'Endangered' (< 10 %) (DER, 2014). The current extent of all vegetation associations in the Hamersley bioregion within the survey area are well above this 30% threshold (Table 4) and are classified as 'Least concern' (DER, 2014).

Table 4: Vegetation associations of the survey area.

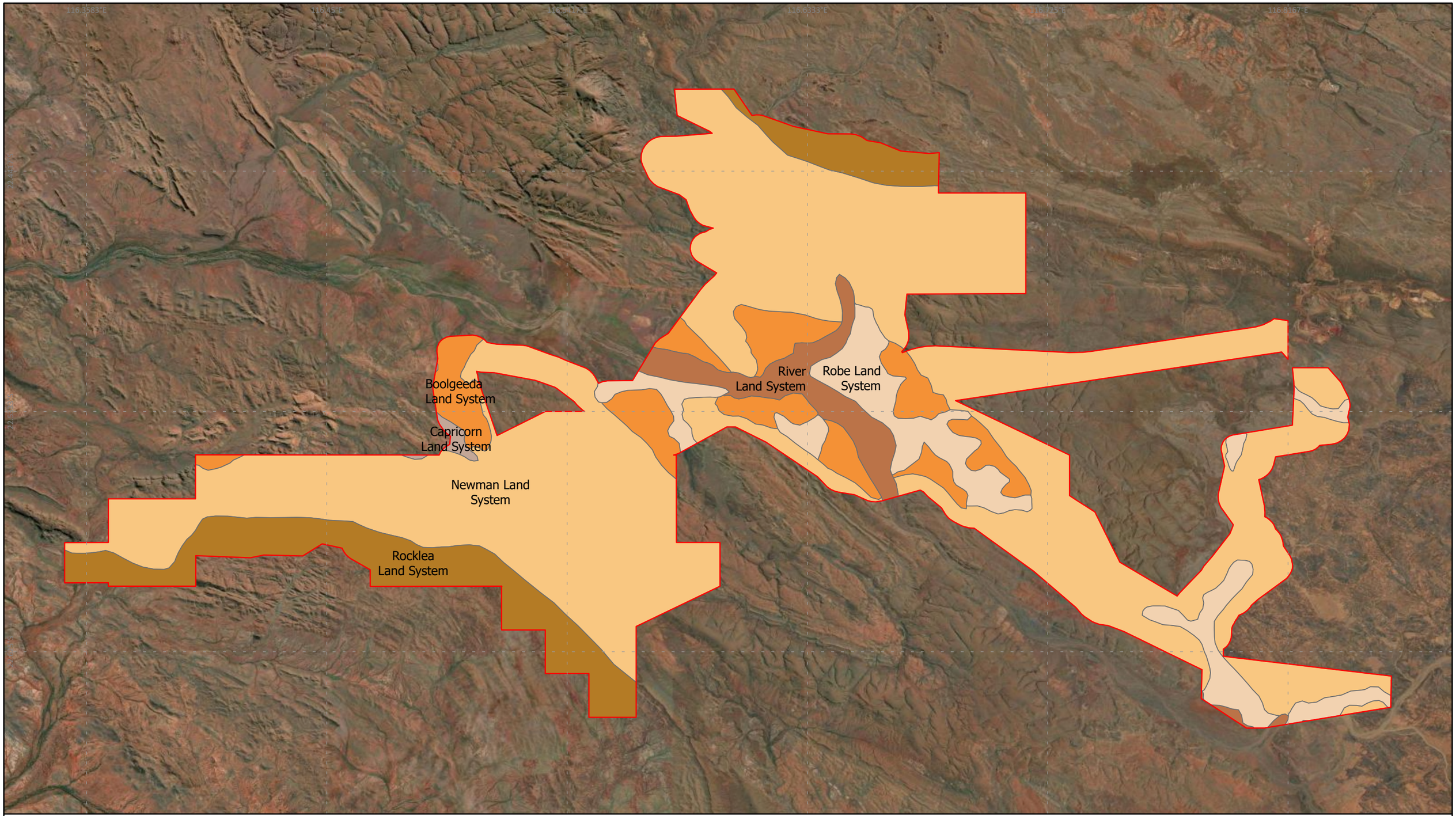
Shepherd et al. (2002) vegetation association	Description	Pre-European extent within Hamersley IBRA region (ha)	Percentage remaining within Hamersley IBRA region	Current percentage protected for conservation within Hamersley IBRA region	Extent within survey area (ha)	Extent within survey area (%)
82	Hummock grasslands, low tree steppe; snappy gum over *Triodia wiseana*.	2,177,574	99.4	12.0	35,444	80.7
103	Hummock grasslands, shrub steppe; snakewood over soft spinifex & *Triodia wiseana*.	614,056	100	2.0	7,302	16.6
567	Hummock grasslands, shrub steppe; mulga & kanji over soft spinifex & *Triodia basedowii*	776,823	99.7	22.4	1197	2.7
Total					**43,943**	**100**

2.7 LAND USE, LAND TENURE AND CONSERVATION RESERVES AND NATIONALLY IMPORTANT WETLANDS

The Department of Climate Change, Energy, the Environment and Water (DCCEEW) (DCCEEW, 2023) and the DBCA's legislated lands and waters database were queried for Ramsar Wetlands, Nationally Important Wetlands, and DBCA managed lands and waters occurring in the vicinity of the survey area.

Two unnamed ESAs are located 64.2 km south-east, and 69.5 km north-east of the survey area. Two Nationally Important Wetlands (Kookhabinna Gorge and Yadjiyugga Claypan) and two DBCA Managed Lands and Waters (Barlee Range Nature Reserve and Cane River Conservation Park) are located more than 50 km from the survey area (Map 6).

Pastoral activities associated with Mount Stuart station along with mining tenements (numerous mines and exploration tenements) are the dominant land uses in the vicinity of the survey area.



Land system

- Boolgeeda Land System
- Capricorn Land System
- Newman Land System
- River Land System
- Robe Land System
- Rocklea Land System

Survey area

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Project No.: 1995
Author: SP
Created Date: 19 May 2025
Coordinate System: GCS GDA 1994
Scale: 1:150,000 @A3

Map 2: Land systems (DPIRD 2016).

Earthstar Geographics

0 2 3 5 10 Kilometers

116.3583°E 116.45°E 116.5417°E 116.6333°E 116.725°E 116.8167°E

22.4417°S 22.5167°S 22.6°S

Marra Mamba Iron Formation

Brockman Iron Formation

Wittenoom Formation

Mount McRae Shale and Mount Sylvia Formation

Boolgeeda Iron Formation

colluvium 38491

alluvium 38485

Beasley River Quartzite

Turee Creek Group

Woongarra Rhyolite

Robe Pisolite

Weeli Wolli Formation

Bunjinah Formation

Jeerinah Formation

Survey area

Surface geology

- Beasley River Quartzite
- Boolgeeda Iron Formation
- Brockman Iron Formation
- Bunjinah Formation
- Jeerinah Formation
- Marra Mamba Iron Formation
- Mount McRae Shale and Mount Sylvia Formation
- Robe Pisolite
- Turee Creek Group
- Weeli Wolli Formation
- Wittenoom Formation
- Woongarra Rhyolite
- alluvium 38485
- colluvium 38491

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Project No.: 1995
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Created Date: 19 May 2024
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Scale: 1:150,000 @A3

Map 3: Surface geology (1:1,000,000) of the survey area (Geoscience Australia 2012).

0 2 3 5 10 Kilometers

Earthstar Geographics

116.3583°E 116.45°E 116.5417°E 116.6333°E 116.725°E 116.8167°E

22.4417°S

22.525°S

Fa13

BD1

Fa15

Survey area

Soils

- BD1
- Fa13
- Fa15

ecologia ENVIRONMENT

Project No.: 1995
Author: SP
Created Date: 02 August 2024
Coordinate System: GCS GDA 1994
Scale: 1:150,000 @A3

Map 4: Atlas of Australian Soils map units associated with the survey area (Northcote et al. 1960-1968).

Earthstar Geographics

0 2 3 5 10 Kilometers

116.3583°E
116.45°E
116.5417°E
116.6333°E
116.725°E
116.8167°E
22.4417°S
22.5333°S
22.625°S

567
103
82

Survey area

Vegetation association

82

103

567

ecologia ENVIRONMENT

Project No.: 1995
Author: SP
Created Date: 19 May 2025
Coordinate System: GCS GDA 1994
Scale: 1:150,000 @A3

Map 5: Pre-European vegetation associations (Shepherd et al. 2002).

Earthstar Geographics

0 2 3 5 10 Kilometers

N

115.6667°E
116°E
116.3333°E
116.6667°E
117°E
117.3333°E
22°S
22.3333°S
22.6667°S
23°S

Cane River Conservation Park

Yadjiyugga Claypan

Kookhabinna Gorge

Barlee Range Nature Reserve

Survey area
Study area
Nationally Important Wetlands
Environmentally Sensitive Areas
Legislated Lands and Waters

ecologia ENVIRONMENT

Project No.: 1995
Author: SP
Created Date: 19 May 2025
Coordinate System: GCS GDA 1994
Scale: 1:625,000 @A3

Map 6: DBCA Legislated Lands and Nationally Important Wetlands near the survey area.

0 7 10 20 40 Kilometers

Earthstar Geographics

3 DESKTOP ASSESSMENT

3.1 DATABASE METHODOLOGY

Searches of the databases listed in Table 5 along with a review of relevant survey data was undertaken to identify vertebrate fauna and significant species previously recorded within 50 km of the survey area (the "study area").

Habitat preferences were sourced, where available, from relevant taxonomic literature or Threatened Species Profiles (SPRATs). The presence of potentially suitable habitat within the survey area was assessed based on the availability of broad landforms, soils, and vegetation associations in comparison to cited preferred habitat for each species.

Table 5: Databases queried for the desktop study.

Database	Search details
DCCEEW Protected Matters Database	Records of matters of national significance under the EPBC Act within 50 km of the survey area.
DBCA Threatened and Priority Fauna Database	Fauna records within 50 km of the survey area
BirdLife Australia's Birdata Database	All bird records within 50 km of the survey area.
Atlas of Living Australia Database	All fauna records within 50 km of the survey area.
IBSA Database	All IBSA vertebrate fauna surveys within 50 km of the survey area.
Fortescue PAR Fauna Databases	Fauna records from the Plant and Animal Register (PAR) – significant species, feral species and relocation activities within 100 km of the survey area.

The results of the database searches and the literature review were compiled, and significant species were identified. The criteria listed in Table 6 were then applied to determine the likelihood of occurrence of these species within the survey area.

Table 6: Criteria used to assess the likelihood of occurrence of significant species and communities.

Rating	Criterion
Recorded	The species has been recorded within the survey area previously or during the current survey.
High (likely to occur)	The species is likely to occur within the survey area as suitable habitat is known to be present and there are existing records very close to the survey area (within ca. 5-15 km, depending on species mobility).
Moderate (possibly occurs)	The species may occur within the survey area as there are existing records in the vicinity of the survey area, and suitable habitat is likely to be present. OR The species may occur within the survey area as there is insufficient information available to exclude the possibility of occurrence.
Low (unlikely to occur)	The species is unlikely to occur within the survey area as suitable habitat is not present or is not likely to be present. OR Suitable habitat is present within the survey area, but the taxon has not been recorded despite reasonable survey effort.
Does not occur	The species is recognised as being locally extinct or extinct in the wild and does not occur within the survey area. OR The modelled distribution of the species does not occur within the survey area or surrounds, due to range contractions or taxonomic revisions.

3.2 DATABASE SEARCHES

According to database search results, 294 fauna species have been recorded within 50 km of the survey area comprising 23 mammals, 169 birds, 95 reptiles, four amphibians and three fish (Appendix B). An additional 46 species (16 mammals, five birds, 21 reptiles and four fish) were

identified from the literature review as having the potential to occur within the survey area. A detailed summary outlining the results of database searches can be seen in Table 7.

Based on the combined results of the database searches and literature review, a total of 340 species may occur within the survey area, comprising 39 mammals, 174 birds, 116 reptiles, four amphibians and seven fish (Appendix D).

Table 7: Summary of fauna database searches and literature review results.

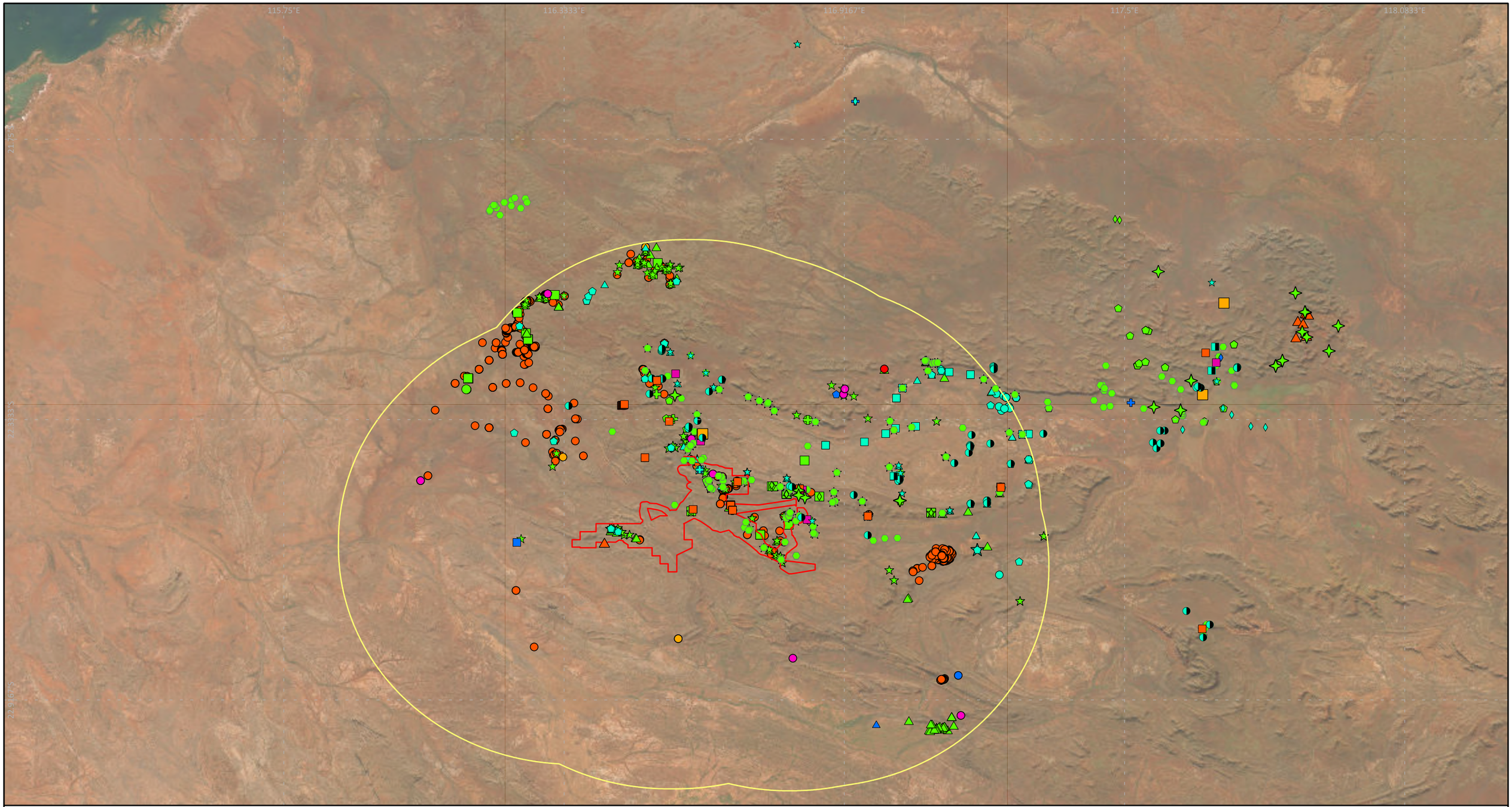
Database	Mammals	Birds	Reptiles	Amphibians	Fish
Atlas of Living Australia (ALA)	20	147	93	4	3
Fortescue PAR database search (100 km)	6	4	3	0	1
DBCA Threatened and Priority Fauna Search (50 km)	6	7	4	0	1
Birdlife Australia Birdata	0	133	0	0	0
DCCEEW Protected Matters Search	3	18	1	0	0
Literature Review	38	132	103	4	6
Total	**38**	**174**	**115**	**4**	**7**

3.3 SIGNIFICANT FAUNA

DBCA Threatened and Priority fauna database and Fortescue PAR database search results identified five Threatened species (three mammals, one reptile and one bird), one Specially Protected bird, four Migratory birds and seven Priority species (three mammals, three reptiles and one fish) (Map 7). Although the DBCA Threatened and Priority fauna database identified two records of the striated grasswren (*Amytornis striatus striatus* [P4]), taxonomic revisions have led to the reclassification of these records as the Pilbara grasswren (*Amytornis whitei*) which is not listed at a state or national level (DBCA, 2025). These records will not be discussed further.

The EPBC Act Protected Matters Report identified 12 additional avifauna taxa (seven Threatened birds and five Migratory birds) as having the potential to occur within the survey area (Appendix B). Species listed as Marine under the EPBC Act are not discussed as part of the significant fauna likelihood of occurrence assessment as these species are not listed at a state or national level, are generally common and widespread in the Pilbara and the survey area does not encompass marine habitats.

Where possible, duplication of records between the Fortescue PAR records and DBCA database records has been rectified; however, there is the potential that some duplicates remain.



DBCA database

EPBC: Endangered
- Northern quoll

EPBC: Vulnerable
- Grey falcon
- Pilbara olive python
- Ghost bat
- Pilbara leaf-nosed bat

EPBC: Migratory
- Common sandpiper
- Fork-tailed swift
- Oriental plover
- Eastern osprey

BC: Other Specially Protected
- Peregrine falcon

BC: Priority 1
- Gane's blind snake

BC: Priority 2
- Pilbara barking gecko

Priority 4
- Striated grasswren
- Northern short-tailed mouse
- Fortescue grunter
- Lined soil-crevice skink
- Western pebble-mound mouse
- Long-tailed dunnart

FMG database

EPBC: Endangered
- Northern quoll

EPBC: Vulnerable
- Ghost bat
- Grey Falcon
- Pilbara leaf-nosed bat
- Pilbara olive-python

EPBC: Migratory
- Eastern osprey
- Fork-tailed swift
- Oriental plover

BC: Other Specially Protected
- Peregrine falcon

BC: Priority 1
- Gane's blind snake

Priority 4
- Northern short-tailed mouse
- Fortescue grunter
- Lined soil-crevice skink
- Western pebble-mound mouse
- Long-tailed dunnart

Fortescue Plant and Animal Register

EPBC: Endangered
- Northern quoll

EPBC: Vulnerable
- Pilbara olive-python
- Survey area
- Study area (50 km)

ecologia ENVIRONMENT

Project No.: 1995
Author: SP
Created Date: 19 May 2025
Coordinate System: GCS GDA 1994
Scale: 1:850,000 @A3

Map 7: DBCA (50km) and Fortescue (100 km) significant fauna records in the vicinity of the survey area.

Earthstar Geographics

0 9 20 30 60 Kilometers

3.4 LITERATURE REVIEW

The literature review, including IBSA database search, identified an ongoing significant fauna monitoring program, 12 detailed fauna surveys and four targeted fauna surveys undertaken within 50 km of the survey area. Of the literature reviewed, one targeted survey, six detailed surveys and the ongoing significant fauna monitoring program were found to intersect the survey area. The locations of surveys which intersect the survey area are shown in Map 8 and the locations of sampling sites associated with these surveys are shown in Map 9.

Key findings associated with reports which were available at the time of the consolidation are outlined in Table 8, with a list of regional fauna records, including updated species names to align with the current Western Australian Museum (WAM) checklist of terrestrial vertebrates, provided in Appendix D.

Detailed fauna survey:

- Elevation-Hendrix Terrestrial Vertebrate Fauna Assessment (*ecologia*, 2023b);
- Cobra Terrestrial Vertebrate Fauna Assessment (*ecologia*, 2023a);
- Wyloo Terrestrial Vertebrate Fauna Assessment (*ecologia*, 2022c);
- J6 Terrestrial Vertebrate Fauna Assessment (*ecologia*, 2022a);
- Western Hub Fauna Surveys. Level 2 Fauna Surveys and Targeted Conservation Significant Fauna Assessment (GHD, 2020);
- Eliwana Project: Consolidated Vertebrate Fauna Survey (Ecoscape Australia, 2018);
- Eliwana and Flying Fish Terrestrial Vertebrate Fauna Assessment (*ecologia*, 2015b);
- The Edge Terrestrial Vertebrate Fauna Survey (Biologic, 2013);
- Delphine Terrestrial Vertebrate Fauna Assessment (*ecologia*, 2015a);
- Mt Farquhar Terrestrial Vertebrate Fauna Assessment (*ecologia*, 2012);
- Beasley River Limonites Baseline Fauna Survey (Biota, 2009); and
- Fauna Habitats and Fauna Assemblage of the Brockman Syncline 4 Project, near Tom Price (Biota, 2005).

Targeted significant fauna survey:

- Strike Resources: Paulsens Iron Ore Project Supplementary Targeted Northern Quoll Survey (*ecologia*, 2020);
- Western Hub 2: Elevation-Hendrix-Boolgeeda Targeted Significant Terrestrial Vertebrate Fauna Assessment (Stantec, 2021);
- Loras Cobras Conservation Significant Terrestrial Vertebrate Fauna (360 Environmental, 2021); and
- Loras Targeted Significant Vertebrate Fauna Assessment (*ecologia*, 2022b).

Significant fauna monitoring:

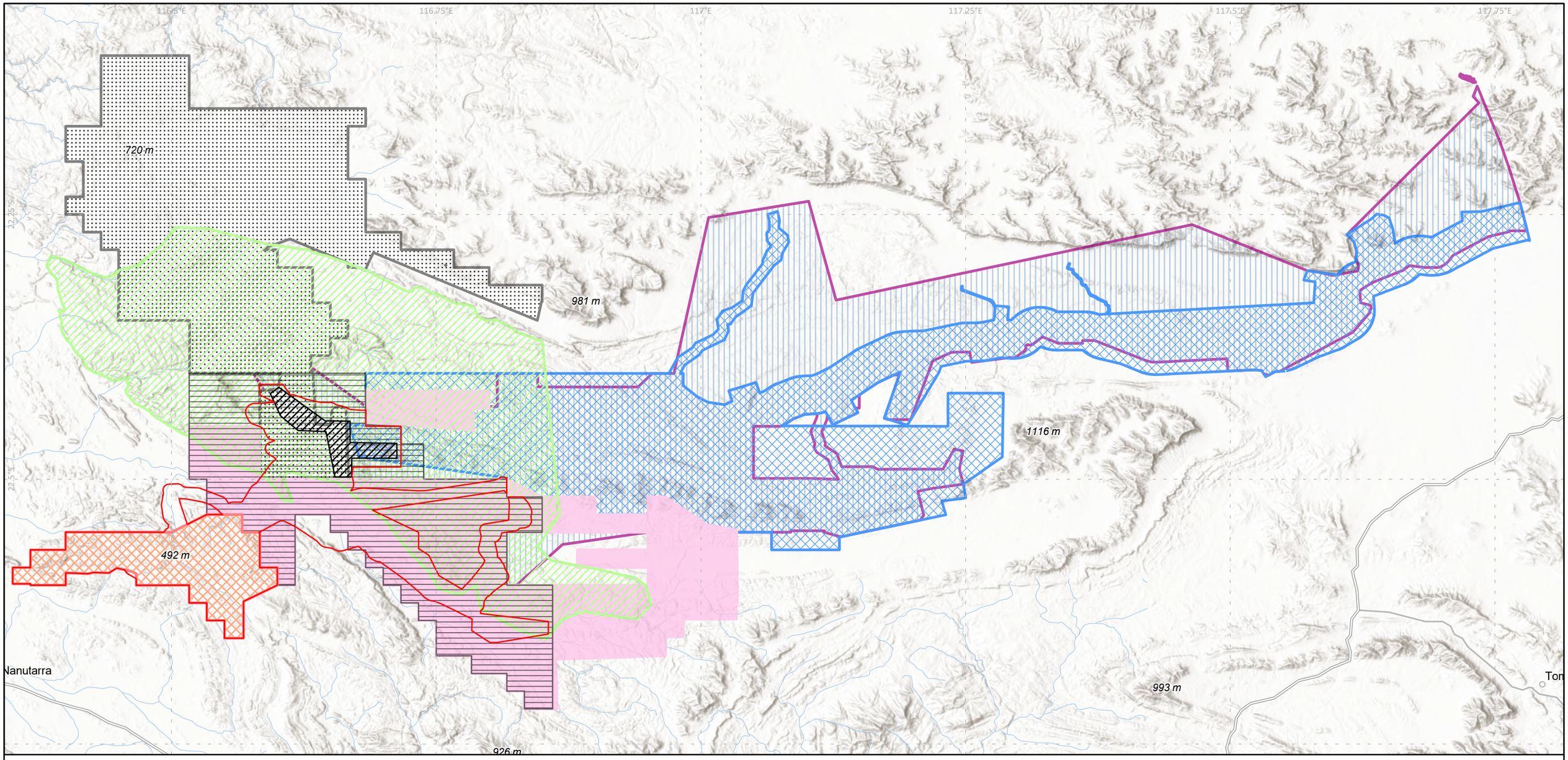
- Fortescue Annual Fauna Monitoring Program - Operational Sites, Nullagine and North Star 2021 – 2023 (Spectrum, 2021, 2022, 2023).

A summary of the results of detailed and targeted surveys is provided in Table 8 and a list of regional fauna records obtained during detailed fauna surveys undertaken in the vicinity of the survey area is shown in Appendix D.

Table 8: Summary of literature reviewed. Light green shading denotes surveys undertaken within the past five years (2020-2025) that intersect the survey area. Light blue shading denotes surveys undertaken >5 years which intersect the survey area.

Survey	Proximity to survey area	Mammals (introduced)	Birds	Reptiles	Amphibians	Fish	Significant fauna recorded
Detailed fauna survey							
Elevation-Hendrix Terrestrial Vertebrate Fauna Assessment (ecologia 2023b)	Overlaps	25 (3)	67	40	1	0	Northern quoll, Pilbara leaf-nosed bat, lined soil-crevice skink, western pebble-mound mouse, peregrine falcon
Wyloo Terrestrial Vertebrate Fauna Assessment (ecologia 2022c)	Overlaps	27 (3)	70	58	2	2	Northern quoll, Pilbara leaf-nosed bat, ghost bat, western pebble-mound mouse, lined soil-crevice skink, fork-tailed swift
Western Hub Fauna Surveys GHD 2020 (GHD 2020)	Overlaps	28 (5)	83	60	2	0	Northern quoll, Pilbara leaf-nosed bat, ghost bat, western pebble-mound mouse, grey falcon, lined soil-crevice skink and Gane's blind snake
The Edge Terrestrial Vertebrate Fauna Survey (Biologic 2013)	Overlaps	24 (3)	78	51	2	2	Northern quoll, western pebble-mound mouse, Pilbara leaf-nosed bat and lined soil-crevice skink
Delphine Terrestrial Vertebrate Fauna Assessment (ecologia 2013)	Overlaps	26 (4)	100	58	3	6	Northern quoll, western pebble-mound mouse, Pilbara leaf-nosed bat, lined soil-crevice skink, osprey, grey falcon and Fortescue grunter
Eliwana Project: Consolidated Vertebrate Fauna Survey (Ecoscape 2018)	Overlaps	32(5)	88	75	3	1	Northern quoll, Pilbara olive python, Pilbara leaf-nosed bat, ghost bat, long-tailed dunnart, western pebble-mound mouse, peregrine falcon, fork-tailed swift and lined soil-crevice skink
Eliwana and Flying Fish Terrestrial Vertebrate Fauna Assessment (ecologia 2015)	<5 km	24 (5)	76	60	2	1	Pilbara olive python, western pebble-mound mouse, Pilbara leaf-nosed bat, ghost bat and lined soil-crevice skink
Cobra Terrestrial Vertebrate Fauna Assessment (ecologia 2023)	<5 km	21 (2)	59	32	3	0	Western pebble-mound mouse, Pilbara leaf-nosed bat, lined soil-crevice skink, peregrine falcon, Gane's blind snake
J6 Terrestrial Vertebrate Fauna Assessment (ecologia 2022a)	<15 km	26 (1)	67	45	2	0	Northern quoll, western pebble-mound mouse, Pilbara leaf-nosed bat, lined soil-crevice skink, fork-tailed swift, peregrine falcon
Mt Farquhar Terrestrial Vertebrate Fauna Assessment (ecologia 2012b)	<30 km	20 (4)	56	34	0	2	Pilbara leaf-nosed bat, peregrine falcon and Pilbara barking gecko
Beasley River Limonites Baseline Fauna Survey (Biota 2009)	<50 km	14 (1)	45	29	1	0	Northern short-tailed mouse, Pilbara leaf-nosed bat, Pilbara olive python
Fauna Habitats and Fauna Assemblage of the Brockman Syncline 4 Project, near Tom Price (Biota 2005)	<50 km	20 (5)	83	54	2	0	Lined soil-crevice skink and western pebble-mound mouse

Survey	Proximity to survey area	Mammals (introduced)	Birds	Reptiles	Amphibians	Fish	Significant fauna recorded
Targeted significant fauna survey							
Western Hub 2: Elevation-Hendrix-Boolgeeda Targeted Significant Terrestrial Vertebrate Fauna Assessment (Stantec 2021)	Overlaps	4	1	1	0	0	Pilbara leaf-nosed bat, ghost bat, northern quoll, Pilbara olive python, peregrine falcon
Loras Cobras Conservation Significant Terrestrial Vertebrate Fauna Assessment (360 Environmental 2021)	<5 km	17	20	4	0	0	Northern quoll, western pebble-mound mouse, Pilbara leaf-nosed bat, Pilbara olive python
Strike Resources: Paulsens Iron Ore Project Supplementary Targeted Northern Quoll Survey (*ecologia,* 2021)	<5 km	1	0	0	0	0	Northern quoll
Loras Targeted Significant Vertebrate Fauna Assessment (ecologia 2022b)	<20 km	4	0	0	0	0	Northern quoll, western pebble-mound mouse, Pilbara leaf-nosed bat, ghost bat



Survey area

Survey details

- Annual Fauna Monitoring Program 2023 - Operational Sites, Nullagine and North Star (Spectrum 2024)
- Annual Fauna Monitoring Program 2022 - Operational Sites, Nullagine and North Star (Spectrum 2023)
- Delphine Terrestrial Vertebrate Fauna Assessment (ecologia 2013)
- Eliwana Project: Consolidated Vertebrate Fauna (Ecoscape 2018)
- The Edge Terrestrial Vertebrate Fauna Assessment (Biologic 2013)
- Western Hub Fauna Surveys (GHD 2020)
- Elevation-Hendrix Terrestrial Vertebrate Fauna Assessment (ecologia 2023b)
- Western Hub 2: Elevation-Hendrix-Boolgeeda Targeted Significant Terrestrial Vertebrate Fauna Assessment (Stantec 2021)
- Wyloo Terrestrial Vertebrate Fauna Assessment (ecologia 2022c)

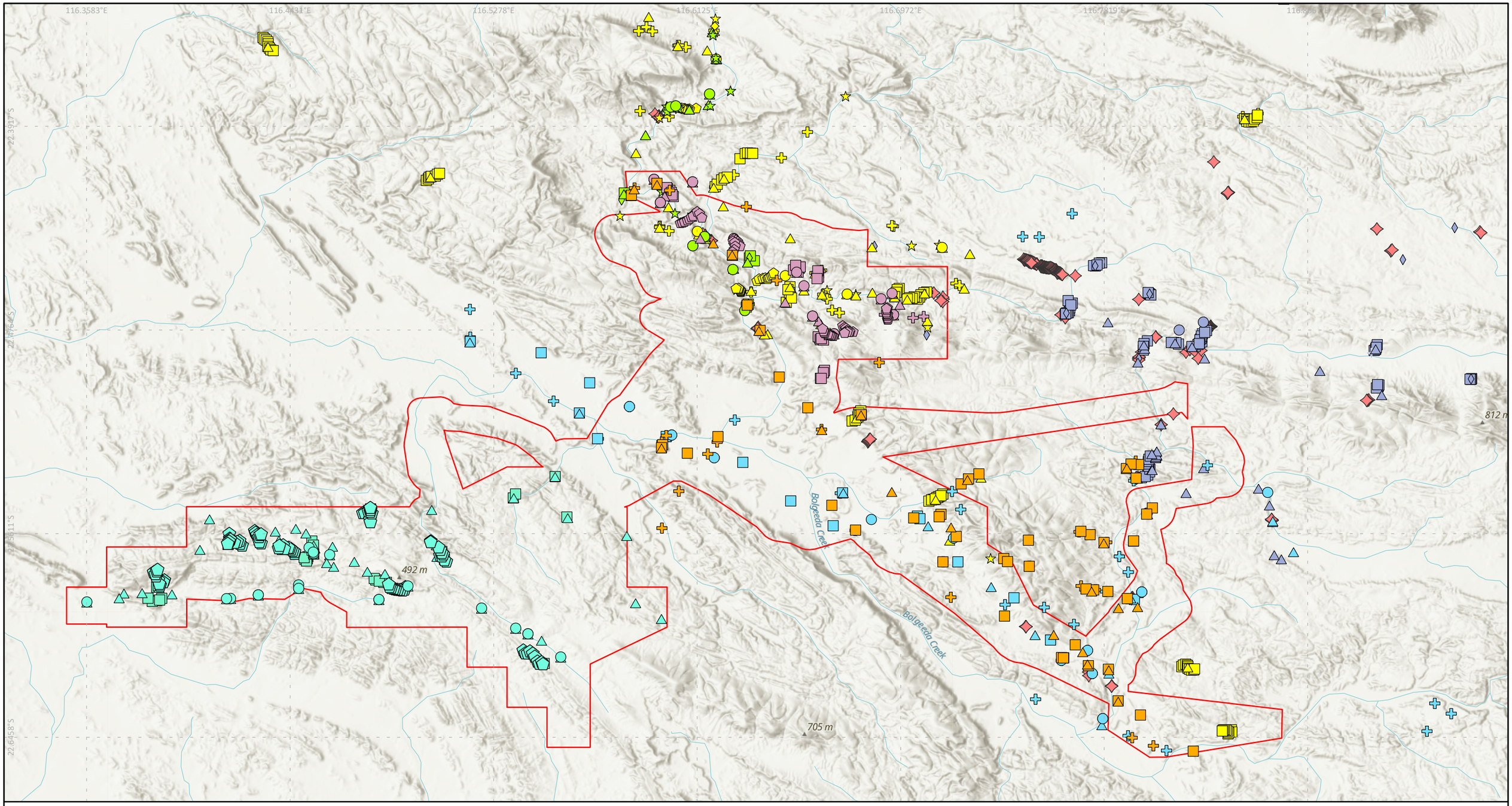
ecologia ENVIRONMENT

Project No.: 1995
Author: CE
Created Date: 21 May 2025
Coordinate System: GCS GDA 1994
Scale: 1:400,000 @A3

Map 8: Location of surveys which intersect the Wyloo North survey area.

0 4 9 10 30 Kilometers

Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community, Esri, CGIAR



Survey area

Signficant Fauna Monitoring

- Fauna: Monitoring Site

ecologia (2022c) - Wyloo

- Fauna: Motion Camera
- Fauna: Sound Recorder
- Fauna: Cage Trap
- Fauna: Trap Site

ecologia (2023b) Elevation-Hendrix

- Fauna: Habitat Assessment
- Fauna: Motion Camera
- Fauna: Sound Recorder
- Fauna: Trap Site
- Fauna: Cage Trap

GHD (2020) - Western Hub

- Fauna: Active Search
- Fauna: Habitat Assessment
- Fauna: Motion Camera
- Fauna: Sound Recorder
- Fauna: Spotlighting
- Fauna: Cage Trap
- Fauna: Trap Site

Ecoscape (2018)

- Fauna: Motion Camera
- Fauna: Opportunistic Collection
- Fauna: Ornithological Survey
- Fauna: Sound Recorder
- Fauna: Trap Site

ecologia (2013) - Delphine

- Fauna: Motion Camera
- Fauna: Opportunistic Collection
- Fauna: Sound Recorder
- Fauna: Active Search
- Fauna: Trap Site

Biologic (2013)- The Edge

- Fauna: Habitat Assessment
- Fauna: Motion Camera
- Fauna: Sound Recorder
- Fauna: Trap Site

Stantec (2021)- Elevation-Hendrix-Boolgeeda

- Fauna: Habitat Assessment
- Fauna: Motion Camera
- Fauna: Sound Recorder

ecologia ENVIRONMENT

Project No.: 1995
Author: CE
Created Date: 21 May 2025
Coordinate System: GCS GDA 1994
Scale: 1:170,000 @A3

Map 9: Previous fauna sampling sites in the vicinity of the survey area.

0 2 4 6 10 Kilometers

4 SURVEY METHODOLOGY

4.1 SURVEY TIMING AND SEASONAL CONDITIONS

4.1.1 Detailed Vertebrate Fauna Assessments

The *Technical Guidelines: Terrestrial Vertebrate Fauna* (EPA, 2016) indicate that the optimal survey window for detailed fauna surveys is from March – May. The optimal survey window for reptiles is defined as occurring between September – April, while the optimal window for bird and amphibian surveys occurs immediately after significant rainfall events as defined by the *Technical Guidance – Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment* (EPA, 2020). As the guidelines do not stipulate an optimal timing for mammal surveys, all current and previous surveys are considered to be in compliance with Technical Guidance recommendations for mammal survey timing (EPA, 2020).

4.1.1.1 Current Survey

The detailed terrestrial vertebrate fauna surveys were conducted by four zoologists and one ornithologist between the 15th – 26th of April 2024 (phase one) and three zoologists and one ornithologist between the 12th – 23rd of August 2024 (phase two).

Phase one of the detailed fauna survey was undertaken during the optimal survey window for detailed fauna surveys as defined by the EPA (2016). The detailed fauna surveys were undertaken within the optimal survey window for reptiles, and temperatures and weather conditions observed during these surveys were conducive for reptile activity.

Although below average rainfall was recorded in the year preceding the surveys, above average rainfall was recorded in the three months prior to the phase two survey. Significant rainfall events were recorded immediately prior to the phase two survey, representing the optimal survey window for amphibian and bird surveys, as per EPA (2020).

Daily weather conditions recorded during the current field surveys are provided in Table 10.

4.1.1.2 Previous Surveys

Six detailed fauna surveys previously undertaken within the survey area are summarised in Table 9. Although four of these assessments were undertaken >5 years ago, these assessments have been included as they provide contextual data for the survey area. All detailed fauna surveys previously undertaken within the survey area were undertaken within optimal window as specified by the EPA (2016).

Four of the six detailed surveys previously undertaken within the survey area include at least one survey phase within the optimal timing for reptile surveys, with two surveys undertaken just outside the recommended survey window for reptiles. Previous surveys include at least one detailed survey phase immediately after (or during) significant rainfall events, coinciding with the optimal survey timing for birds and amphibians.

4.1.2 Targeted Surveys and Significant Fauna Monitoring

The EPBC Act *Referral Guideline for the Endangered Northern Quoll Dasyurus hallucatus* indicate that targeted northern quoll trapping surveys should be undertaken between April - September, with remote survey techniques (e.g. motion cameras) able to be utilised at all times of the year (Commonwealth of Australia, 2016).

Night parrot surveys were undertaken prior to the publication of the recent *Guidelines for Determining the Likely Presence and Habitat Usage of Night Parrot (Pezoporus occidentalis) in Western Australia* (DBCA, 2024).

No survey guidelines currently exist for the Pilbara olive python, grey falcon, Pilbara leaf-nosed bat, ghost bat, brush-tailed mulgara, western pebble-mound mouse or Fortescue grunter.

4.1.2.1 Current Survey

Targeted surveys for significant fauna were conducted by three *ecologia* zoologists between 20th – 29th May 2024.

The timing of the targeted northern quoll surveys undertaken as part of the current survey was in accordance with the timing outlined in the EPBC Act *Referral Guideline for the Endangered Northern Quoll Dasyurus hallucatus* (Commonwealth of Australia, 2016).

Night parrot surveys were undertaken in the months following significant rainfall events, in accordance with the methods outlined in the interim survey guidelines for the night parrot (DBCA, 2017); however, long-term detection, as outlined in the *Guidelines for Determining the Likely Presence and Habitat Usage of Night Parrot (Pezoporus occidentalis) in Western Australia* (DBCA, 2024), was not undertaken as the field surveys pre-dated the release of the guidelines. Although below average rainfall was recorded prior to the targeted surveys, additional night parrot surveys were undertaken during the phase two detailed fauna surveys, which followed a period of above average rainfall, and this is not considered a limitation.

Previous Surveys

The timing of previous detailed surveys, targeted fauna surveys and three significant fauna monitoring surveys undertaken within the survey area are summarised in Table 9. The timing of all previous northern quoll surveys accords with the optimal timing outlined in the EPBC Act *Referral Guideline for the Endangered Northern Quoll Dasyurus hallucatus* (Commonwealth of Australia, 2016).

Night parrot surveys were undertaken during four previous surveys (*ecologia*, 2022c, 2023b; GHD, 2020; Stantec, 2021); however, were not undertaken during three fauna surveys previously undertaken within the survey area (Biologic, 2013; *ecologia*, 2015a; Ecoscape Australia, 2018). Night parrot surveys undertaken by GHD (2020) did not accord with the minimum recommended duration outlined in the interim survey guidelines for the night parrot (DBCA, 2017). Where targeted night parrot surveys were undertaken, these were conducted in the months following significant rainfall events, in accordance with the methods outlined in the interim survey guidelines for the night parrot (DBCA, 2017).

Targeted northern quoll, ghost bat, Pilbara leaf-nosed bat, Pilbara olive python, fork-tailed swift and peregrine falcon monitoring surveys were undertaken by Spectrum Ecology between 2021-2023 in accordance with Fortescue's Conservation Significant Fauna Monitoring Program (CSFMP). A small number of these sites intersect the survey area and have been included in the current assessment. Survey timing and methodologies associated with this ongoing monitoring program align with relevant state and national guidelines.

Table 9: Timing of detailed and targeted fauna surveys undertaken within the survey area between 2020-2025. Green shading indicates the current survey; blue shading indicates surveys/monitoring undertaken between 2020-2025.

Report	Note	Survey timing
Significant fauna monitoring		
Annual Fauna Monitoring Program 2021 (Spectrum Ecology, 2022)	Only a subset of sites within survey area	**Northern quoll (dry season):** 28 June – 2 August 2021 **Significant bats, birds and POP (wet season):** 7-18 January & 18-26 February 2021
Annual Fauna Monitoring Program 2022 – Operational Sites, Nullagine and North Star (Spectrum Ecology, 2023)	Only a subset of sites within survey area	**Northern quoll:** 20 May - 14 October 2022 **Significant bats, birds and POP (wet season):** 16-25 February 2022 & 8-18 March 2022
Annual Fauna Monitoring Program 2023 – Operational Sites, Nullagine and North Star (Spectrum Ecology, 2024)	Only a subset of sites within survey area	**Northern quoll (dry season):** 3 May - 24 August 2023 **Significant bats, birds and POP (wet season):** 31 Jan - 8 February 2023
Detailed fauna survey		
Wyloo North Mine and Transport Options: Terrestrial Vertebrate Fauna Assessment	Current survey	**Phase 1:** 15-26 April 2024 **Phase 2:** 12-23 August 2024 **Targeted:** 20-29 May 2024
Elevation-Hendrix Terrestrial Vertebrate Fauna Assessment (ecologia, 2023b)	All sampling sites located within survey area	**Phase 1:** 29 March -10 April 2022 **Phase 2:** 7-18 November 2022 **Targeted:** 13-20 July 2022
Wyloo Terrestrial Vertebrate Fauna Assessment (ecologia, 2022c)	All sampling sites located within survey area	**Phase 1:** 28 April -12 May 2021 **Phase 2:** 9-21 November 2021 **Targeted:** 2-11 August 2021 & 29 June - 8 July 2022
Western Hub Fauna Surveys. Level 2 Fauna Surveys and Targeted Conservation Significant Fauna Assessment (GHD, 2020)	Only a subset of sites within survey area	**Phase 1:** 23 May – 3 June 2019 **Phase 2:** 20-29 August 2019 **Targeted:** 20-25 July 2019, 14-16 August 2019
Eliwana Project: Consolidated Vertebrate Fauna Survey (Ecoscape Australia, 2018)	Only a subset of sites intersects survey area	**Phase 1:** 11-21 May 2017 **Targeted:** 17-27 February 2017, 3-13 April 2017, 18-26 July 2017
Delphine Terrestrial Vertebrate Fauna Assessment (*ecologia*, 2015a)	Only a subset of sites within survey area	**Phase 1:** 1-11 May 2012, 18-28 May 2012 **Phase 2:** 30 April – 10 May 2013 **Targeted:** 23-31 July 2012
The Edge Terrestrial Vertebrate Fauna Survey (Biologic 2013)	Only a subset of sites within survey area	**Phase 1:** 10-23 April 2013 **Targeted:** 1-11 July 2013

Report	Note	Survey timing
Targeted survey		
Western Hub 2: Elevation-Hendrix-Boolgeeda Targeted Significant Terrestrial Vertebrate Fauna Assessment (Stantec, 2021)	All sampling sites located within survey area	**Device deployment:** 14-22 April 2021 **Targeted:** 29 April - 6 May 2021 **Device collection:** 4-8 June 2021

Table 10: Daily temperatures recorded during the detailed phase of the current survey.

Survey phase	Date	Maximum temperature (°C)	Minimum temperature (°C)	Rainfall (mm)
Phase 1 detailed survey	15/04/2024	37.3	20.8	0
	16/04/2024	35.9	22.0	0
	17/04/2024	35.1	25.1	0
	18/04/2024	33.1	22.1	0
	19/04/2024	32.1	20.7	0
	20/04/2024	31.4	21.1	0
	21/04/2024	32.3	13.0	0
	22/04/2024	32.2	17.9	0
	23/04/2024	32.8	17.0	0
	24/04/2024	29.6	20.9	0
	25/04/2024	33.3	20.8	0
	26/04/2024	33.5	21.1	0
Targeted survey	20/05/2024	28.3	13.4	0
	21/05/2024	28.7	13.0	0
	22/05/2024	28.1	12.6	0
	23/05/2024	28.5	12.4	0
	24/05/2024	29.2	12.7	0
	25/05/2024	30.6	11.9	0
	26/05/2024	30.6	12.2	0
	27/05/2024	31.4	13.4	0
	28/05/2024	30.9	16.2	0
	29/05/2024	25.6	19.2	0
Phase 2 detailed survey	12/08/2024	30.4	12.7	0
	13/08/2024	30.7	12.0	0
	14/08/2024	27.8	13.5	0
	15/08/2024	27.8	10.3	0
	16/08/2024	31.3	11.2	0
	17/08/2024	30.9	11.7	0
	18/08/2024	22.5	13.5	0
	19/08/2024	25.0	7.7	0
	20/08/2024	29.8	9.3	0
	21/08/2024	33.0	10.8	0
	22/08/2024	30.2	16.8	0
	23/08/2024	29.3	15.7	0

4.2 SITE SELECTION

Site selection was based on the indicative habitat types identified within each survey area and was undertaken in accordance with the *Technical Guidance – Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment (EPA, 2020)*, which specifies that a minimum of two trapping sites should be installed within each habitat type. As the current survey was designed to build upon previous surveys, portions of the survey area which had been intensively surveyed recently were generally avoided, unless they contained habitat features of significance or encompassed an under-represented habitat type.

The abundance and significance of habitat types was also taken into consideration in selecting fauna trapping sites within the survey area, with widespread and significant habitat types receiving greater systematic trapping effort. Habitat types poorly represented by systematic trapping sites were sampled using additional sampling methods (motion cameras, ARUs, cage traps and spotlighting) and targeted searches, with specific focus on potentially sensitive habitats and habitat types with the potential to support significant species. Although the Plain (alluvial) habitat was not systematically sampled during the current survey due to a combination of heritage access restrictions and highly degraded condition of accessible areas, this is not considered to represent a limitation as previous sampling was undertaken within this habitat type by Biologic (2013) and Stantec (2021).

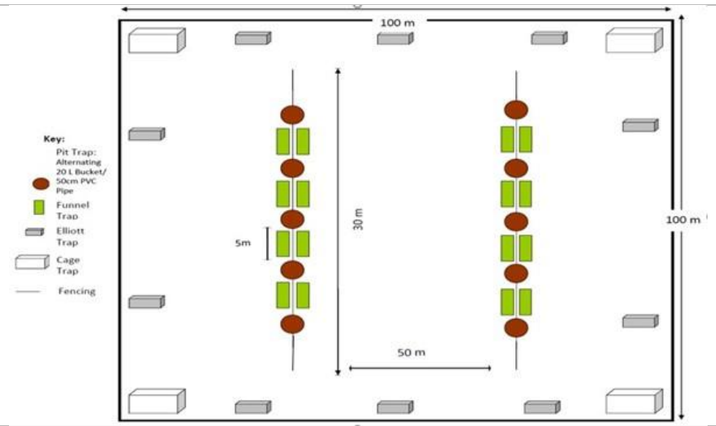
Habitat features known to provide shelter and foraging opportunities for significant fauna species (e.g. old-growth spinifex, sand-dunes, ridgelines, permanent pools, gorges and gullies) were targeted during the significant fauna surveys.

4.3 SAMPLING METHODS

The detailed and targeted surveys were undertaken using a variety of sampling techniques, both systematic and opportunistic in accordance with *Technical Guidance – Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment* (EPA, 2020). Broad methods utilised across the survey area during current and previous surveys are summarised in Table 11 below. Detailed discussion on methodologies associated with previous surveys can be found in each respective report and is not provided here.

The locations of current and previous sampling sites are shown in Map 10-Map 15, with habitat assessment sheets provided in Appendix E.

Table 11: Survey methodologies utilised at Wyloo North and corresponding sampling site codes (current survey only).

Technique	Methodology	Purpose and target groups	Site
Habitat assessment	Habitat assessments were undertaken within the survey area at sites considered representative of each habitat type. Habitat assessments were also undertaken at each systematic trapping site. The following parameters were recorded: • broad habitat type; • habitat condition • digital photographs; • landform type; • soil colour, type and characteristics; • type and extent of non-vegetative surface cover; • type of vegetation in lower, middle and upper strata; • observable fire history and evidence of any disturbance; • presence and extent of leaf litter and coarse woody debris; • presence of, or distance to, water sources; • presence of significant microhabitats such as tree hollows and rocky outcrops; and • notes on suitability for hosting significant fauna.	• Habitat assessment and habitat mapping • Significant fauna habitat identification and delineation	WNDP01-WNDP16, WNNP06-WNNP14
Systematic pitfall trapping site	**Pitfall traps:** Alternating series of 20 L buckets and 50 cm PVC pipe pitfall traps (five pits per line, 10 per site), dug into the ground to act as pitfall traps. No pits installed at sites situated on ridgelines, mesas gullies or escarpments. A 30 m long, 30 cm high fence was also installed per line, passing across the top of each pit to direct fauna into it. Shades provided to provide thermal protection and shelter for trapped animals. **Funnel traps**: placed at the ends of each fence to capture fauna that are not readily caught in pitfall traps (eight per trapping line, 16 per trapping site). At sites established within rocky habitats, additional funnel traps were used in the place of pitfall traps (10 per line, 20 per site). All funnel traps were covered with shades to reduce the likelihood of animals suffering from overheating. **Elliott traps:** five aluminium Elliott traps per line (10 per trapping site) baited with balls of 'universal bait' (oats, peanut butter and sardines). All Elliott traps were covered by shades to reduce the likelihood of animals suffering from overheating. **Cage traps:** four large, wire-framed Sheffield traps (22 cm x 22 cm x 55 cm) per line (four per trapping site) baited with balls of 'universal bait'. All cage traps were covered by shades to reduce the likelihood of animals suffering from overheating. Layout of a trap site is shown below. Two trapping lines per site. Traps were left open for at least seven nights and checked twice daily (when temperatures exceeded 26°C) within three hours of dawn and post-peak reptile activity periods.	• Baseline fauna assemblage • Mammals (small-medium sized non-volant) • Reptiles • Amphibians • Significant fauna	WNDP01-WNDP16
Systematic trapping layout		• Baseline fauna assemblage • Mammals (small-medium sized non-volant) • Reptiles • Amphibians • Significant fauna	WNDP01-WNDP16
Systematic bird surveys	Set-time surveys (20-minute set-time searches of 2 ha areas) were used to document the avifauna assemblage present at each of the systematic fauna trapping sites. A total of three set-time avifauna surveys were undertaken at each systematic trap site during each survey phase. During each survey the number of individuals of each species observed were recorded while actively searching similar habitat within a 2ha area surrounding the trapping site. Survey	•Birds • Significant fauna	WNDP01-WNDP16

Technique	Methodology	Purpose and target groups	Site
	methods utilised were in accordance with systematic survey methods recommended by BirdLife Australia. All avifauna surveys are conducted within three hours of dawn and dusk, during the peak activity period for most bird species.		
Active searches	Each systematic trapping site was actively searched for a period of 30 minutes to identify cryptic reptile and mammal species. Search methods utilised include but were not limited to sifting leaf litter, searching under and around old logs, stumps, and dead free-standing trees, investigating burrows and over-turning logs and stones.	• Mammals • Reptiles •Amphibians •Birds • Significant fauna	WNDP01-WNDP16
Opportunistic sampling	Fauna species not recorded through other sampling methods were opportunistically sampled as encountered in the survey area. Opportunistic sampling also included recording locations of significant and introduced species. Opportunistic avifauna surveys were conducted at sites considered to potentially support a different avifauna assemblage to systematic trapping locations, focussing on water sources and habitats with flowering shrubs or other important foraging resources.	•Mammals •Reptiles •Amphibians •Birds •Fish • Significant fauna	Various fauna records (no set site codes)
Targeted fauna searches	Areas likely to support significant fauna were targeted during the survey. Areas were selected based on existing records from previous surveys, database searches, geology, aerial imagery, and vegetation mapping. Supplementary search effort was undertaken in habitats likely to support significant fauna and habitats poorly represented by systematic trapping sites (due to accessibility and/or extent within the survey area). Grey falcon search transects were undertaken on foot within the Drainage Line/River/Creek (major) habitat type to identify suitably sized nests or primary sightings of the species. Particular focus was given to identifying intact nests located in large eucalypts or telecommunication towers, of a suitable size and condition to be utilised by grey falcons (Schoenjahn *et al.* 2020). Targeted searches were undertaken during the grey falcon breeding season (June-November) when detectability of the species and confirmation of nest utilisation is likely to be higher (Schoenjahn *et al.* 2020). Suitable nests were recorded, and secondary evidence of recent use (if present) was documented during searches of feeding debris and mutes within the drop zone below the nest. Targeted survey effort for the grey falcon was primarily focused within Drainage Line/River/Creek (major) habitat, as this habitat type represents suitable breeding and foraging habitat for the species. Cave floors were inspected for northern quoll scat, ghost bat scat/middens and olive python sloughs during targeted searches in rocky habitats. Permanent water bodies were investigated for evidence of Pilbara olive python occupancy. Ridgelines were searched (via helicopter) for evidence of the peregrine falcon (primary sightings or whitewash indicating a potential roost site).	• Significant fauna (grey falcon, northern quoll, ghost bat, Pilbara olive python)	Targeted grey falcon transect 1-6, WNQT01-WNQT05
Cage traps	Linear transects of cage traps were utilised to target the northern quoll, with cages baited with sardines or universal bait and spaced 100-200m apart. Traps were checked and cleared within three hours of sunrise. Traps were set for seven consecutive nights unless two or more individuals were captured twice within the same trapping transect, in which case traps within that transect were closed after four nights of trapping, to accord with EPA referral guidelines (Commonwealth of Australia 2016).	• Northern quoll	N/A
Motion cameras	Motion sensitive cameras capable of recording both normal (day) and infra-red (night) images were deployed in areas of interest, such as near permanent water or in gorges, to record cryptic or targeted species not normally recorded by other survey methods. In addition, suitable habitat for significant fauna likely to occur were targeted to determine their presence or absence. Targeted surveys for the northern quoll were undertaken using Reconyx HC500 Hyperfire, Browning Patriot Trail and X-Trail 3CR motion cameras. Cameras were set in linear transects, spaced at intervals of 100-200m, to facilitate northern quoll population analysis and identify other cryptic nocturnal species that inhabit rocky habitats. Five motion camera transects (WNMC01-WNMC05) were deployed at Wyloo North during the phase one detailed survey and retrieved during the first targeted survey. Cameras were set specifically to target northern quolls using methods outlined in Hohnen et al. (2013), enabling spot pattern analysis on captured individuals. Photographs were analysed post survey, and the entire suite of recorded fauna were identified. Each camera was set to record five images concurrently with no minimum time delay between triggers. Cameras were baited with a non-consumable sardine lure to encourage animals to occupy the camera's field of view and increase the number of camera trap photos available for identification purposes. All cameras were able to be triggered by movement using highly sensitive, passive infra-red motion sensors that function during the day and night.	•Mammals •Reptiles • Birds • Significant fauna	WNMC1-WNMC49
Ultrasonic Autonomous Recording Units (ARUs)	Bat echolocation calls were recorded using Wildlife Acoustics SM4BAT and Titley Chorus ultrasonic recorders. The ARU devices record the full spectrum of calls allowing greater accuracy and sensitivity when identifying bat species. Each ARU device was programmed to record from 30 minutes pre-dusk to 30 minutes post-dawn for each night and deployed for a minimum of three nights. ARUs were deployed with microphones facing towards the sky at a height of at least 1m above the ground, to record bat echolocation calls in the vicinity of the device. ARUs were deployed at all systematic survey sites, prospective cave entrances and potential flightpaths within the survey area to identify foraging and roosting habitat within the survey area.	• Bats	WNDP01-WNDP16, BD01-BD05, TB01-TB08

Technique	Methodology	Purpose and target groups	Site
	Echolocation calls recorded were analysed by bat specialist Dr Kyle Armstrong. To provide an indication of site proximity to a potential roost location, the period between sunset and the first detection, and the period between the last detection and sunrise was calculated. The presence or absence of low time calls (within 20 minutes of sunset or sunrise) are used to indicate proximity of the detector to a potential roost location.		
Ghost bat lures	Each lure consists of one portable speaker, two camera traps, two infrared spotlights and a bat detector. Portable speakers were loaded with a micro-SD card containing a sequence of sound files containing 'squabble' calls of the ghost bat (sensu Hanrahan et al. 2023), with sound files played for a 2-minute period, followed by a 2-minute period of silence. Each camera trap was programmed to record 3-minute black and white video files at high resolution continuously upon start up. Infrared spotlights were set to turn on when ambient illumination levels drop below the threshold required for quality colour video recordings. A bat detector was placed on the star picket, below the portable speaker to maximise the chance of echolocation call detection if a ghost bat approached the speaker. Each site was sampled for a single night, before the lure was relocated to a new location, ensuring that behavioural impacts associated with sampling over repeated nights are avoided. All sites sampled on the same night were located a minimum of 10km apart to avoid interference or movement of bats between sites. The distance at which ghost bats can hear the signals at night is unknown but assumed to be at least 100m (Kyle Armstrong, pers. comm.). Ghost bats can be distinguished in infrared and thermal video recordings from other bat species and insects based on the observation of any combination of the following morphological and behavioural features that provide an empirical basis for the identification: • flight pattern (four distinct behaviours classified as: 'circling' of the post containing the speaker; 'hover' in front of the speaker; 'long glide' towards the speaker; and 'drop in' whereby they would sometimes approach at c. 2 m above the speaker and then drop vertically towards it); • body size relative to other objects in the frame; • large ear size; • lack of a tail; • bright eyeshine of the reflected infrared light from their large eyes (infrared recordings only, though not always visible); and • corroboration with concurrently recorded diagnostic echolocation calls. All bats observed in videos are examined by single manual frame advancement to check for diagnostic features. The relatively high resolution and video frame rate provides a reasonable level of image quality.	• Ghost bat	WNGB01-WNGB13
Ghost bat lure layout		• Ghost bat	WNGB01-WNGB13
Acoustic Autonomous Recording Units (ARUs)	Targeted night parrot surveys were undertaken within suitable roosting (long-unburnt spinifex) and suitable foraging habitat. The surveys were undertaken in the months following significant rainfall events when breeding is more likely to occur and therefore, detectability of the species is expected to be higher. ARUs were deployed in areas supporting old, long unburnt spinifex (with particular focus on the species *Triodia longiceps*), as these areas represent prospective night parrot roosting habitat within the survey area. Wildlife Acoustics Song Meter SM4 recording units were deployed in suitable foraging habitat. Each recorder was programmed to record from 30 minutes pre-dusk to 30 minutes post-dawn for each night and deployed for a minimum of six nights.	•Night parrot	WNNP06-WNNP14
Nocturnal spotlighting	Nocturnal spotlighting was conducted from vehicles and on foot to target the Pilbara olive-python and other cryptic, nocturnal fauna species.	• Reptiles • Nocturnal mammals • Nocturnal birds	Spotlighting transect 1
Cave habitat assessments	To evaluate the suitability of prospective caves within the survey area and surrounding areas to act as diurnal roosts for the Pilbara leaf-nosed bat or ghost bat, cave habitat assessments were undertaken within the survey area.	• Nocturnal mammals	CB001-CB007, CB009, SP003-SP0014, TBD01-TBD02

Technique	Methodology	Purpose and target groups	Site
	As part of the assessment, cave morphology, geology and internal conditions were evaluated, and the following parameters were documented: • location; • assessed ghost bat usage; • basic geology; • entrance type and dimensions (gathered using a laser measuring device), entrance orientation; • cave grouping, insulation from above; • cave type (e.g. overhang, adit, crevice, cave with multiple chambers); • internal domed chamber, rear passages that may have a roost; • internal temperature and relative humidity; • local foraging opportunities and distance to disturbance; and • cave floorplan and photograph. Deep caves with ceiling heights of 2.5 m or greater, dark recesses and high levels of humidity were classified as potential roost caves for ghost bats (Bat Call, 2016). Deep, complex caves with low light levels and a suitable microclimate were categorised as potential roosts for the Pilbara leaf-nosed bat (Threatened Species Scientific Committee, 2016b). This species does not roost in overhangs, as they do not promote the warm, humid microclimates required by this species, therefore these structures were not considered to be potential roosts for the purposes of this survey (Threatened Species Scientific Committee, 2016b).		

4.4 SURVEY EFFORT

Extensive consolidated survey work has been undertaken within the survey area, as outlined in Table 12. A comprehensive breakdown of survey effort undertaken during the current fauna surveys is outlined in Table 13-Table 18 and a discussion of survey effort associated with previous surveys can be found in the respective survey reports. Sample sites associated with the current survey are shown in Map 10, with detailed site information for current survey sites provided in Appendix H. Consolidated sampling effort is shown in Map 11-Map 15.

Table 12: Cumulative survey effort undertaken within the survey area between 2020-2025. Green shading represents current survey, blue shading indicates surveys undertaken within the past five years.

Survey reference	Survey area	Sampling year	Systematic trapping (pit, cage, Elliott and funnel)	Targeted cage traps	Camera traps	Avifauna surveys	Active searches	ARU (acoustic)	ARU (ultrasonic)	Spotlighting	Ghost bat lure	Targeted searches
Ecologia Environment (current survey)	Wyloo North	2024	5,978 trap nights (16 sites)	-	1,142 nights (49 cameras)	22 hours	36 hours	54 recording nights (9 sites)	119 recording nights (29 sites)	4 hours	13 nights (13 sites)	40 hours (bats and quolls) + 36 hours (grey falcon)
Spectrum (2024)	Eliwana Mine	2023	-	-	900 nights (10 cameras)	1.33 hours (significant taxa only)	-	-	49 recording nights (7 sites)	7 hours	-	-
Spectrum (2023)	Eliwana Mine	2022	-	-	900 nights (10 cameras)	1.33 hours (significant taxa only)	-	-	49 recording nights (7 sites)	7 hours	-	-
Ecologia Environment (2023)	Elevation-Hendrix	2022	5,063 trap nights (11 sites)	250 trap nights	1,049 nights (25 cameras)	52 hours	35 hours	-	36 recording nights (18 sites)	-	-	35 hours (quolls and bats)
Ecologia Environment (2022)	Wyloo	2021-2022	6,156 trap nights (16 sites)	560 trap nights	1,118 nights (37 cameras)	45 hours	122 hours	30 recording nights (5 sites)	140 (58 sites)	27 hours	-	47 hours (quolls, bats, olive python) + 3 hours (grey falcon)
Spectrum (2022)	Eliwana Mine	2021	-	-	100 nights (10 cameras)	1.33 hours (significant taxa only)	-	-	49 recording nights (7 sites)	7 hours	-	1 Pilbara olive python eDNA sampling site
Stantec (2021)	Elevation-Hendrix-Boolgeeda	2021	-	-	196 nights (49 cameras)	-	-	36 recording nights (4 sites)	60 recording nights (15 sites)	-	-	Unquantified searches (Northern quoll, bats, olive python, peregrine falcon, pebble-mound mouse)
GHD (2020)	Western Hub	2019	1,064 trap nights (3 sites)	140 trap nights	1,877 nights (51 cameras)	8.5 hours	18 hours	13 recording nights (4 sites)	88 recording nights (26 sites)	-	-	Unquantified searches (bats)
Ecoscape (2018)	Eliwana Project	2017	-	-	-	-	1 search (effort not specified)	-	4 recording nights (2 sites)	-	-	-

Survey reference	Survey area	Sampling year	Systematic trapping (pit, cage, Elliott and funnel)	Targeted cage traps	Camera traps	Avifauna surveys	Active searches	ARU (acoustic)	ARU (ultrasonic)	Spotlighting	Ghost bat lure	Targeted searches
Biologic (2013)	The Edge	2013	4,620 trap nights (10 sites)	-	32 nights (14 cameras)	Minimum of 13.33 hours (10 sites)	-	-	10 sites (effort not specified)	-	-	-
Ecologia (2013)	Delphine	2012/2013	294 trap nights (1 site)	270 trap nights	4 cameras (effort not specified)	2 hours	1 search (effort not specified)	-	4 sites (effort not specified)	-	-	4 search transects (effort not specified)
Total			23,175 (57 sites)	1,220 nights	7,318 nights (255 cameras)	Minimum of 146.82 hours	211 hours + two searches (effort not specified)	133 nights (22 sites)	Minimum of 608 recording nights (169 sites)	52 hours	13 nights (13 sites)	122 hours (northern quoll) + 122 hours (bats) + 39 hours grey falcon +1 eDNA site (olive python) + unquantified bat searches and 4 search transects

Table 13: Detailed vertebrate fauna survey effort (current survey).

Site	Pit (nights)	Funnel (nights)	Elliott (nights)	Cage (nights)	Avifauna survey (mins)	Diurnal search (mins)	Ultrasonic ARU recording (nights)
Detailed Vertebrate Fauna Assessment (Phase 1)							
WNDP01	70	112	70	28	60	100	3
WNDP02	0	140	70	28	60	100	3
WNDP03	70	112	70	28	60	100	4
WNDP04	70	112	70	28	60	100	3
WNDP05	70	112	70	28	60	100	3
WNDP06	70	112	70	28	60	100	3
WNDP07	70	112	70	28	60	100	4
WNDP08	70	112	70	28	60	100	3
WNDP09	0	140	70	28	60	100	3
WNDP10	70	112	70	28	60	100	3
Total	**560**	**1,176**	**700**	**280**	**600**	**1,000**	**32**
Detailed Vertebrate Fauna Assessment (Phase 2)							
WNDP02	0	140	70	28	60	100	5
WNDP03	70	112	70	28	60	100	4
WNDP04	70	112	70	28	60	100	4
WNDP07	70	112	70	28	60	100	4
WNDP08	70	112	70	28	60	100	4
WNDP09	0	140	70	28	60	100	4
WNDP11	70	112	70	28	60	100	4
WNDP12	70	112	70	28	60	100	4
WNDP13	70	112	70	28	60	100	4
WNDP14	0	140	70	28	60	100	5
WNDP15	70	140	70	28	60	100	3
WNDP16	70	112	70	28	60	100	3
Total	**630**	**1,456**	**840**	**336**	**720**	**1,200**	**48**
Combined total	1,190	2,632	1,540	616	1,320	2,200	80

Table 14: Motion sensor camera survey effort.

Transect ID	Camera ID	Habitat	Nights deployed
WNQT01	WNMC01	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	30
	WNMC02	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	30
	WNMC03	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	30
	WNMC04	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	30
	WNMC05	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	30
	WNMC06	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	30
	WNMC07	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	30
	WNMC08	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	30
	WNMC09	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	30
	WNMC10	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	30
WNQT02	WNMC11	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	30
	WNMC12	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	30
	WNMC13	Hills/Ranges/Plateaux	30
	WNMC14	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	30
	WNMC15	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	30
	WNMC16	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	30
	WNMC17	Gorge/Gully	30
	WNMC18	Gorge/Gully	30
	WNMC19	Gorge/Gully	30
	WNMC20	Gorge/Gully	30
WNQT03	WNMC21	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	30
	WNMC22	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	30
	WNMC23	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	30
	WNMC24	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	30
	Wnmc25	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	30
	WNMC26	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	30
	WNMC27	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	30
	WNMC28	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	30

Transect ID	Camera ID	Habitat	Nights deployed
	WNMC29	Hummock Grassland	30
	WNMC30	Hummock Grassland	30
WNQT04	WNMC31	Drainage Line/River/Creek (major)	30
	WNMC32	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	29
	WNMC33	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	29
	WNMC34	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	29
	WNMC35	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	29
	WNMC36	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	29
	WNMC37	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	29
	WNMC38	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	29
	WNMC39	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	29
	WNMC40	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	29
WNQT05	WNMC41	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	28
	WNMC42	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	28
	WNMC43	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	28
	WNMC44	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	28
	WNMC45	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	28
	WNMC46	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	28
	WNMC47	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	28
	WNMC48	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	28
	WNMC49	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	28
Total			1,443

Table 15: Ultrasonic ARU survey effort (current survey).

Site ID	Habitat	Nights deployed
WNBD01	Drainage Line/River/Creek (major)	3
WNBD02	Hills/Ranges/Plateaux	3
WNBD03	Hummock grassland	3
WNBD04	Drainage Line/River/Creek (major)	3
WNBD05	Drainage Line/River/Creek (major)	3
WNTB01	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	3
WNTB02	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	3
WNTB03	Hummock grassland	3
WNTB04	Hummock grassland	3
WNTB05	Drainage Line/River/Creek (major)	3
WNTB06	Hills/Ranges/Plateaux	3
WNTB07	Drainage Line/River/Creek (major)	3
WNTB08	Hills/Ranges/Plateaux	3
Total		39

Table 16: Acoustic ARU survey effort (current survey).

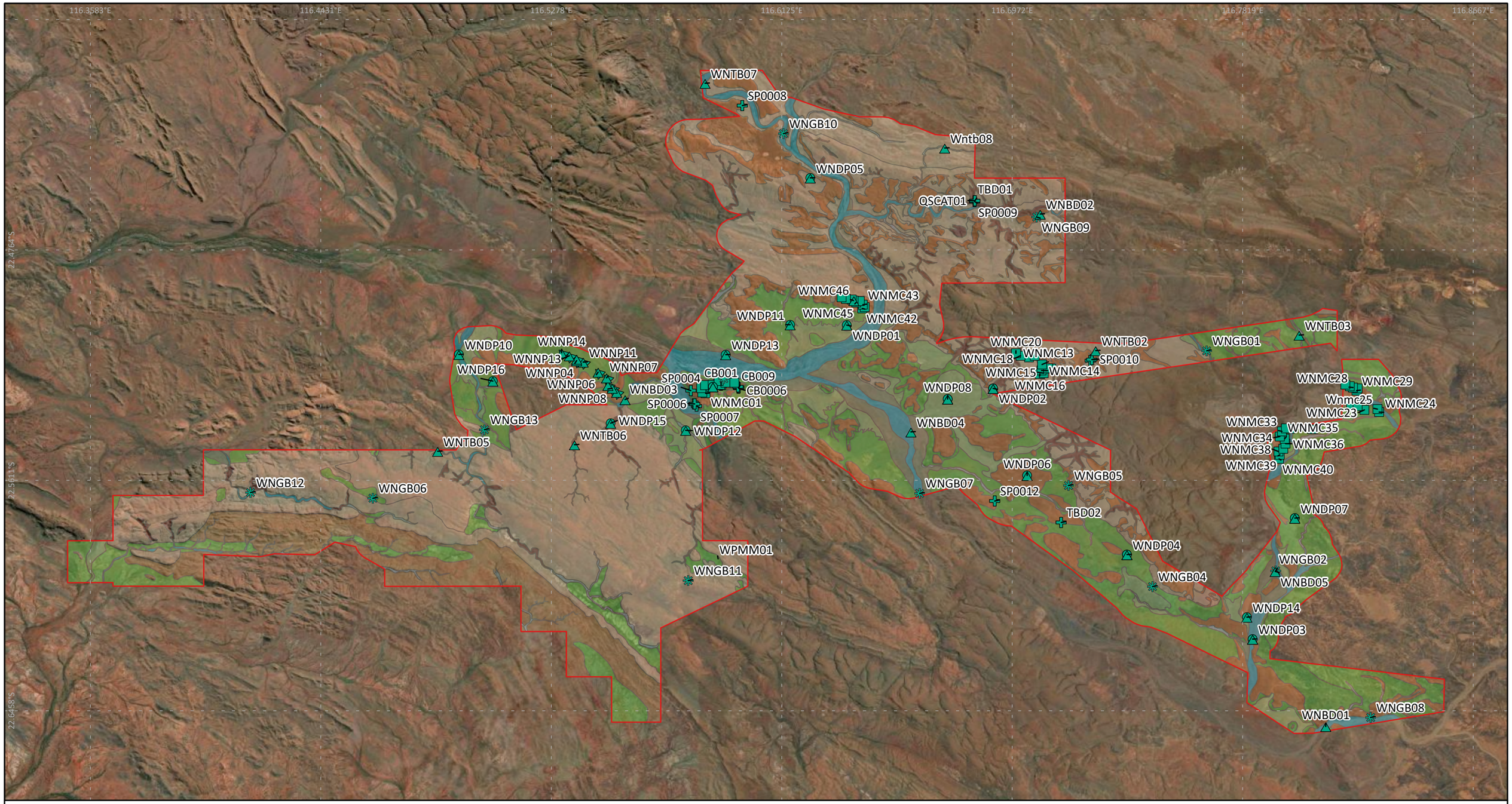
Site ID	Habitat	Nights deployed
WNNP06	Hummock grassland	6
WNNP07	Hummock grassland	6
WNNP08	Hummock grassland	6
WNNP09	Hummock grassland	6
WNNP10	Hummock grassland	6
WNNP11	Hummock grassland	6
WNNP12	Hummock grassland	6
WNNP13	Hummock grassland	6
WNNP14	Hummock grassland	6
Total		54

Table 17: Ghost bat lure survey effort (current survey).

Site ID	Habitat	Nights deployed
WNGB01	Hummock grassland	1
WNGB02	Drainage Line/River/Creek (major)	1
WNGB03	Hummock grassland	1
WNGB04	Hummock grassland	1
WNGB05	Hummock grassland	1
WNGB06	Hummock grassland	1
WNGB07	Drainage Line/River/Creek (major)	1
WNGB08	Drainage Line/River/Creek (major)	1
WNGB09	Hills/Ranges/Plateaux	1
WNGB10	Drainage Line/River/Creek (major)	1
WNGB11	Hills/Ranges/Plateaux	1
WNGB12	Drainage Line/River/Creek (major)	1
WNGB13	Drainage Line/River/Creek (major)	1
Total		13

Table 18: Targeted searches (current survey).

Site/Transect ID	Habitat type	Active search (mins)
Grey falcon searches (transect 1-6) - Targeted survey	Major drainage lines	2,190
Northern quoll and significant bat searches	Rocky habitats	2,400
Spotlighting - Phase 2	Main track between Neil's Lodge and Wyloo Caravan Camp	240
Total		4,830



Survey area

Sampling method

- Fauna: Cave Habitat Assessment
- Fauna: Motion Camera
- Fauna: Ghost Bat Lure
- Fauna: Trap Site
- Fauna: Sound Recorder (ultrasonic)
- Fauna: Sound Recorder (acoustic)

Habitat type

- Drainage Line/River/Creek (major)
- Drainage Line/River/Creek (minor)
- Gorges/Gullys
- Hills/Ranges/Plateaux
- Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)
- Lower slopes/hillslopes
- Plain (alluvial)
- Hummock Grassland
- Shrubland (open)

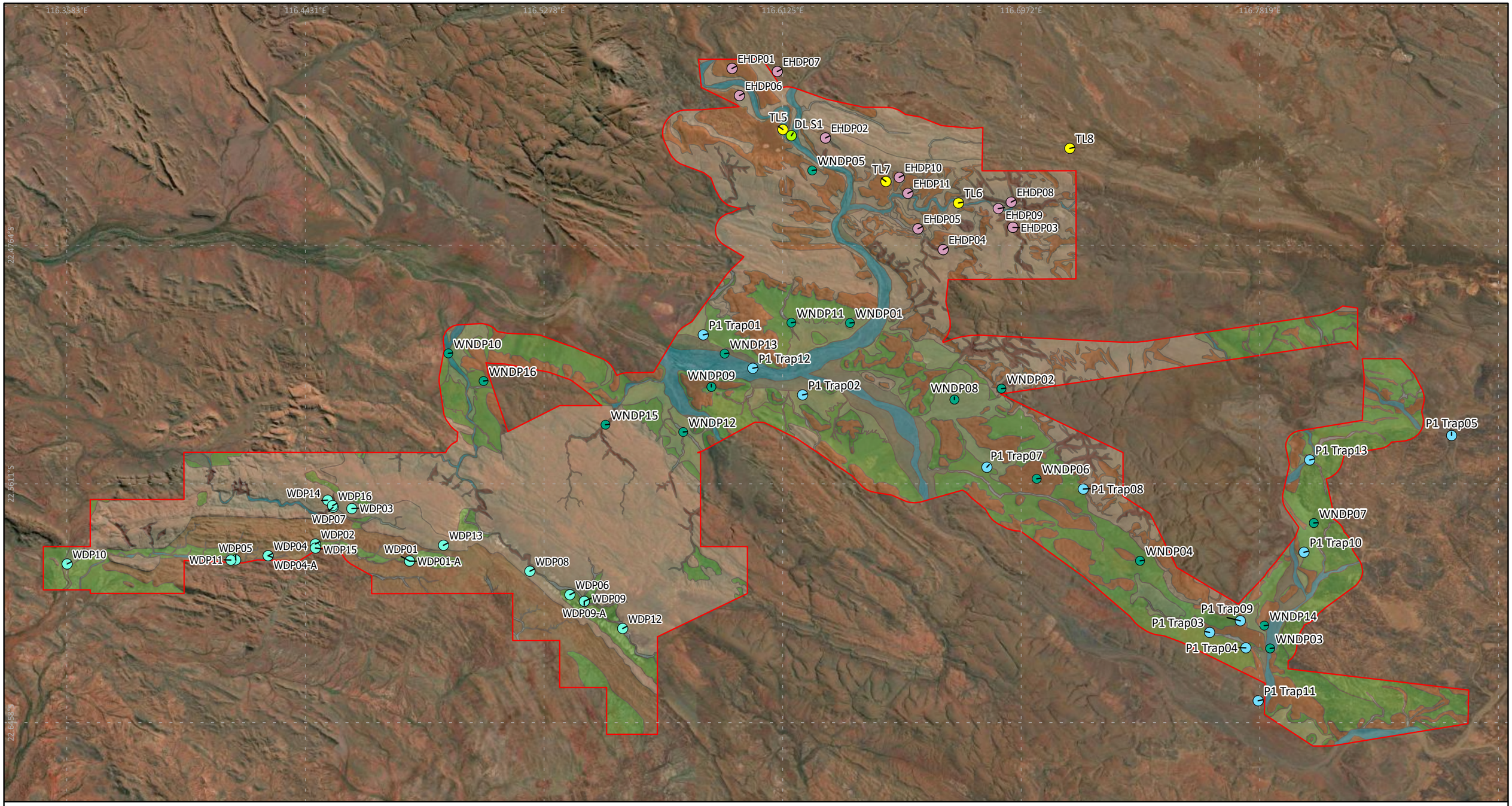
ecologia ENVIRONMENT

Project No.: 1995
Author: CE
Created Date: 21 May 2025
Coordinate System: GCS GDA 1994
Scale: 1:150,000 @A3

Map 10: Locations of current survey sites.

Earthstar Geographics

0 2 3 5 10 Kilometers



Survey area

Current survey

- Fauna: Trap Site

GHD (2020) - Western Hub

- Fauna: Trap Site

ecologia (2023b) Elevation-Hendrix

- Fauna: Trap Site

ecologia (2022c) - Wyloo

- Fauna: Trap Site

ecologia (2013) - Delphine

- Fauna: Trap Site

Biologic (2013)- The Edge

- Fauna: Trap Site

ecologia ENVIRONMENT

Project No.: 1995
Author: CE
Created Date: 22 May 2025
Coordinate System: GCS GDA 1994
Scale: 1:145,000 @A3

Map 12: Locations of systematic trapping sites (consolidated survey effort).

Earthstar Geographics

0 2 3 5 10 Kilometers

116.3583°E 116.4431°E 116.5278°E 116.6125°E 116.6972°E 116.7819°E

22.4764°S

22.5611°S

22.6458°S

Survey area

Current survey

- Fauna: Motion Camera

Stantec (2021)- Elevation-Hendrix-Boolgeeda

- Fauna: Motion Camera

ecologia (2022c) - Wyloo

- Fauna: Motion Camera
- Fauna: Cage Trap

ecologia (2023b) Elevation-Hendrix

- Fauna: Motion Camera
- Fauna: Cage Trap

Biologic (2013)- The Edge

- Fauna: Motion Camera

ecologia (2013) - Delphine

- Fauna: Motion Camera
- Fauna: Cage Trap

GHD (2020) - Western Hub

- Fauna: Motion Camera
- Fauna: Cage Trap

Ecoscape (2018)

- Fauna: Trap Site

Signficant Fauna Monitoring

- Fauna: Monitoring Site (Camera)

Habitat type

- Drainage Line/River/Creek (major)
- Drainage Line/River/Creek (minor)
- Gorges/Gullys
- Hills/Ranges/Plateaux
- Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)
- Lower slopes/hillslopes
- Plain (alluvial)
- Hummock Grassland
- Shrubland (open)

ecologia ENVIRONMENT

Project No.: 1995
Author: CE
Created Date: 21 May 2025
Coordinate System: GCS GDA 1994
Scale: 1:145,000 @A3

Earthstar Geographics

Map 12: Locations of targeted cages and camera traps (consolidated survey effort).

0 2 3 5 10 Kilometers

116.3583°E 116.4431°E 116.5278°E 116.6125°E 116.6972°E 116.7819°E

22.4764°S

22.5611°S

22.6458°S

Survey area

Current survey

- Fauna: Ghost Bat Lure
- Fauna: Sound Recorder (ultrasonic)

- Fauna: Sound Recorder (ultrasonic)

ecologia (2022c) - Wyloo

- Fauna: Sound Recorder (ultrasonic)

ecologia (2023b) Elevation-Hendrix

- Fauna: Sound Recorder

Ecoscape (2018)

- Fauna: Sound Recorder

Biologic (2013)- The Edge

- Fauna: Sound Recorder

ecologia (2013) - Delphine

- Fauna: Sound Recorder

GHD (2020) - Western Hub

- Fauna: Sound Recorder (ultrasonic)

Signficant Fauna Monitoring

- Fauna: Monitoring Site (Sound Recorder)

Habitat type

- Drainage Line/River/Creek (major)
- Drainage Line/River/Creek (minor)
- Gorges/Gullys
- Hills/Ranges/Plateaux
- Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)
- Lower slopes/hillslopes
- Plain (alluvial)
- Hummock Grassland
- Shrubland (open)

ecologia ENVIRONMENT

Project No.: 1995
Author: CE
Created Date: 21 May 2025
Coordinate System: GCS GDA 1994
Scale: 1:145,000 @A3

Map 13: Locations of ultrasonic Autonomous Recording Units (ARUs) and ghost bat lures (consolidated survey effort).

Earthstar Geographics

0 2 3 5 10 Kilometers

N

116.3583°E
116.4431°E
116.5278°E
116.6125°E
116.6972°E
116.7819°E
22.4764°S
22.5611°S
22.6458°S

Survey area

Current survey

Fauna: Sound Recorder (acoustic)

Stantec (2021)- Elevation-Hendrix-Boolgeeda

Fauna: Sound Recorder (acoustic)

ecologia (2022c) - Wyloo

Fauna: Sound Recorder (acoustic)

GHD (2020) - Western Hub

Fauna: Sound Recorder (acoustic)

Habitat type

- Drainage Line/River/Creek (major)
- Drainage Line/River/Creek (minor)
- Gorges/Gullys
- Hills/Ranges/Plateaux
- Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)
- Lower slopes/hillslopes
- Plain (alluvial)
- Hummock Grassland
- Shrubland (open)

ecologia ENVIRONMENT

Project No.: 1995
Author: CE
Created Date: 21 May 2025
Coordinate System: GCS GDA 1994
Scale: 1:145,000 @A3

Map 14: Locations of acoustic Autonomous Recording Units (ARUs) (consolidated survey effort).

Earthstar Geographics

0 2 3 5 10 Kilometers

N

116.3583°E 116.4431°E 116.5278°E 116.6125°E 116.6972°E 116.7819°E

22.4764°S

22.5611°S

22.6458°S

Survey area

Current survey

Grey falcon search transects

GHD (2020) - Western Hub

- Fauna: Active Search
- Fauna: Spotlighting

Significant Fauna Monitoring

- Grassland and aerial insectivorous birds
- Migratory Birds
- Waterbirds
- Pilbara Olive Python
- Pilbara Olive Python - Search Site
- Pilbara Olive Python eDNA

Habitat type

- Drainage Line/River/Creek (major)
- Drainage Line/River/Creek (minor)
- Gorges/Gullys
- Hills/Ranges/Plateaux
- Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)
- Lower slopes/hillslopes
- Plain (alluvial)
- Hummock Grassland
- Shrubland (open)

ecologia ENVIRONMENT

Project No.: 1995
Author: CE
Created Date: 21 May 2025
Coordinate System: GCS GDA 1994
Scale: 1:145,000 @A3

Map 15: Locations of significant fauna searches (consolidated effort).

Earthstar Geographics

0 2 3 5 10 Kilometers

4.5 DATA ANALYSIS

4.5.1 Estimated Species Richness

Species richness for the current detailed and targeted surveys was assessed by estimating species richness using asymptotic richness estimators and by extrapolating a rarefaction curve. Rarefaction curves are produced by repeatedly re-sampling the pool of individuals at random and plotting the average number of species represented by various levels of sampling effort. As sampling effort increases, the rate at which new species are recorded gradually reduces until the number of species observed reaches the estimate of true species richness. Six species richness estimators (Chao 1, Chao 2, ICE, Bootstrap, Jackknife 1 and Jackknife 2) were calculated in EstimateS v9.1 with the default settings (R. K. Colwell, 2013) to estimate species richness for the survey area. The rarefaction curve was extrapolated in EstimateS to estimate the number of species (S_{est}) that would be found in an augmented sample of three times the number of sampled sites, where S_{est} is the expected number of species given the reference sample, following R.K. Colwell et al. (2012). Analyses were conducted using sampling effort associated with the current survey and previous detailed surveys undertaken at Wyloo (*ecologia*, 2022c) and Elevation-Hendrix (*ecologia*, 2023b). Analysis was completed separately for avifauna and trapped animals (ground dwelling mammals, amphibians, and reptiles).

4.5.2 Non-metric MultiDimensional Scaling (NMDS)

Non-metric MultiDimensional Scaling (NMDS) ordination was used to assess similarity in species composition between sites and between the habitat types identified within the survey area. NMDS was conducted using square root transformed abundance data and the Bray-Curtis dissimilarity measure using the *metaMDS* function of the *vegan* package in R (Oksanen et al., 2017). The 95% confidence intervals of the group (habitat type) centroids were calculated and displayed on the plot as ellipses. A stress value for the ordination was calculated to determine if the 2-dimensional configuration of points is a good representation of the actual similarity between sites, where stress < 0.2 is considered acceptable.

4.5.3 Night Parrot Call Analysis

Raw data was provided to Dr Nick Leseberg (Adaptive NRM) for analysis using a combination of automated processes and manual review. Adaptive NRM received the raw acoustic data as '.wav' files. These were scanned using the software Kaleidoscope Pro v5.2.1, targeting the frequency range of 1500 – 3500 Hz, within which all known night parrot calls are distributed. Search parameters were optimised using a random selection of night parrot call examples.

Potential night parrot calls detected during the analysis were compared to a reference library of night parrot calls from Western Australia. This library consists of calls recorded at sites where night parrots have been confirmed using visual means and is therefore considered of high reliability. The library also comprises multiple examples of all known call types from Western Australia.

Night parrot analysis and associated commentary by Dr Leseberg is provided in Appendix G.

4.5.4 Bat Analysis

4.5.4.1 Ultrasonic recordings

The raw ultrasonic recordings provided were recorded in WAV format with Titley Scientific Anabat Chorus bat detectors (sampling rate 500 kHz, set to turn on automatically at sunset and off at sunrise), and Wildlife Acoustics SM4BAT-FS bat detectors (sampling rate 384 kHz). Data was sent to Dr Kyle Armstrong (Specialised Zoological) where it was processed and analysed to identify all

bat species present, with a focus on the two significant bat taxa potentially occurring in the survey area; the ghost bat (*Macroderma gigas*) and Pilbara leaf-nosed bat (*Rhinonicteris aurantia*).

A multi-step acoustic analysis procedure developed to process large full spectrum echolocation recording datasets from insectivorous bats was applied to the recordings made on the survey. Firstly, the WAV files were scanned for bat echolocation calls using several parameters sets in the software SCAN'R version 1.8.3 (Binary Acoustic Technology), which also provides measurements (SCAN'R parameters) from each putative bat pulse. The outputs were then used to determine if putative bat pulses measured in SCAN'R could be identified to species. This was done using a custom [R] language application that performed three tasks:

1. Undertook a Discriminant Function Analysis on training data from representative calls from the Pilbara.
2. From the measurements of each putative bat pulse from SCAN'R, calculated values for the first two discriminant functions that could separate the echolocation call types derived from the analysis of training data and plotted these resulting coordinates over data ellipses representing one standard deviation of the variation for the defined call types.
3. Facilitated an inspection in a spectrogram of multiple examples of each call type for each recording night by opening the original WAV files containing pulses of interest in ADOBE AUDITION version 23.1.

Species were identified based on information in the author's unpublished material and Churchill (2008). Nomenclature follows Jackson and Groves (2015).

4.5.4.2 Ghost bat lures

All videos were processed with an expeditious and robust analysis method. A custom Python (https://www.python.org/) script (Dr R. C. Morgans, Supersensory Technologies Pty Ltd unpublished) applied a background subtraction algorithm from the opencv framework (https://opencv.org/) to the recordings and constructed a concatenated short video containing only portions of the recording with moving objects above a certain size. These concatenated videos are viewed at <50% speed in the MPV MEDIA PLAYER (https://mpv.io/), which allows fine control of frame advancement. Objects of interest were located and re-examined in the original 4K recording using the embedded timestamp information.

Smaller species of bat can be seen often in the infrared videos. Without careful consideration, these species can sometimes be confused for the Ghost Bat when they fly near the speaker—a behaviour that might intuitively be expected only from the Ghost Bat. Ghost Bats can be distinguished in infrared and thermal video recordings from other bat species and insects based on the observation of any combination of the following morphological and behavioural features that provide an empirical basis for the identification:

- flight pattern (four distinct behaviours classified as: 'circling' of the post containing the speaker; 'hover' in front of the speaker; 'long glide' towards the speaker; and 'drop in' whereby they would sometimes approach at c. 2 m above the speaker and then drop vertically towards it);
- body size relative to other objects in the frame;
- large ear size;
- lack of a tail;
- bright eyeshine of the reflected infrared light from their large eyes (infrared recordings only, though not always visible); and
- corroboration with concurrently recorded diagnostic echolocation calls.

All bats observed in videos are examined by single manual frame advancement to check for diagnostic features. The relatively high resolution and video frame rate provides a reasonable level of image quality.

Bat call and ghost bat lure analysis and associated commentary by Dr Armstrong is provided in Appendix C.

4.6 TAXONOMY AND NOMENCLATURE

Nomenclature for birds, mammals, reptiles and amphibians within this report is as per the Western Australian Museum Checklist of the Vertebrates of Western Australia (November 2024). Taxonomic references and field guides used for fauna identification are listed in Table 19.

Table 19: References used for identification.

Fauna group	Reference
Mammals	Menkhorst and Knight (2011), S. Van Dyck, Gynther, and Baker (2013)
Bats	S. Churchill (2008), Menkhorst and Knight (2011)
Birds	Pizzey, Pizzey, and Knight (2013)
Reptiles	Cogger (2018), S. Wilson and Swan (2021)
Amphibians	Frog ID App (FrogID, 2023)
Fish	Allen, Midgley, and Allen (2002)

4.7 ANIMAL ETHICS

The current survey were conducted as per *ecologia*'s Animal Ethics Code of Practice and Animal Ethics Approvals (Table 20), which conform to Section 4 of the Australian Code of Practice for the Care and Use of Animals for Scientific Purposes (NHMRC, 2013).

4.8 STUDY TEAM AND LICENCES

The fauna assessment was planned, coordinated, executed, and reported by those summarised below in Table 20.

Table 20: Study team and licences.

Project staff				
Name	**Qualification**	**Experience**	**Role**	**Project role**
Shaun Grein	B. Sc. Biol.; Grad. Dip. Nat. Resources; MBA	>30 yrs	Managing Director/Senior Principal Scientist	Project management, reporting, QA
Tim McCabe	B.Sc. Env. Biol, Dip Proj Mngment, Cert III Vert Pest Mngment	>12 yrs	Principal Zoologist	Project management, field assessment, reporting, GIS
Claudia Elliott	B.Sc. Cons. Biol. & Zool.; MWildlifeHth	>5 yrs	Senior Zoologist	Field assessment, quoll spot pattern analysis, GIS, reporting
Sammantha Plant	B. Sc WildlifeBiol. EnvSc.; MWildlifeHth; Cert II ConsLandMngment.	>5 yrs.	Zoologist	Field assessment, GIS, reporting
Thomas Burley	B.Sc Cons.Biol	>5 yrs	Zoologist	Field assessment

Project staff				
Name	**Qualification**	**Experience**	**Role**	**Project role**
Lydia Ellwood	B.Sc Env. Mgmt. & Sust. & Cons. & WildlifeBiol.	<5 yrs	Zoologist	Field assessment
Ada Shackleton	B.Sc. Vet. Sci & Mar. Biol	<5 yrs	Zoologist	Field assessment

Licences		
Holder	Type	Number
Tim McCabe	Authorisation to Take or Disturb Threatened Species – Section 40	TFA 2324-0209
Tim McCabe	Fauna Taking (Biological Assessment) Licence – Regulation 27	BA27001023
Ecologia Environment	WAEC Ethics Approval	WAEC 23-07-46

4.9 LIMITATIONS AND CONSTRAINTS

An assessment of survey-specific issues and limitations associated with the current survey and consolidation are detailed in Table 21. Additional discussion regarding limitations of individual surveys included in this consolidation are not discussed here and can be found in the respective reports.

Table 21: Fauna survey limitations (current survey).

Aspect	Limitation?	Comment
Competency/experience of the consultant carrying out the survey.	Nil	The principal zoologist has more than 13 years of experience conducting terrestrial vertebrate fauna and avifauna surveys in the Pilbara bioregion of Western Australia. All other zoologists involved in the fauna survey have a minimum of two years' experience conducting fauna surveys.
Scope (what faunal groups were sampled and were some sampling methods not able to be employed because of constraints such as weather conditions).	Nil	The fauna survey focussed on collecting baseline vertebrate fauna data and significant fauna species that may have the potential to occur in the survey area. The scope was well defined. Fauna and their habitats were surveyed using standardised and well-established techniques. Relevant databases and precious surveys of the survey area were reviewed.
Proportion of fauna identified, recorded and/or collected.	Nil	A comprehensive desktop study adequately gathered background information on the study area and a detailed fauna survey collected baseline data on faunal assemblages and habitat types within the survey area. The targeted fauna surveys focussed on significant fauna species that may have the potential to occur in the survey area. All fauna taxa observed were identified.
Sources of information (previously available information as distinct from new data).	Nil	Database records, including significant fauna species, were available for the area and considered adequate in providing appropriate contextual information for the study.
The proportion of the task achieved and further work which might be needed.	Nil	Planned survey works were conducted and completed. No further work is required to complete the survey scope.

Aspect	Limitation?	Comment
Timing/weather/season/cycle.	Nil	The surveys were conducted during an appropriate time/season. Mild temperatures encountered during the phase one detailed fauna survey may have affected capture rates for small vertebrate fauna species especially reptiles. However, seasonal conditions during the phase two detailed surveys were conducive to high levels of reptile activity and this is not considered a significant limitation.
Disturbances which affected results of the survey (e.g. fire, flood, accidental human intervention).	Minor	Bushfires occurred across approximately 1/8 of the central portion of the survey area immediately prior to the current survey, with an additional 1/8 of the survey area burnt in 2023. These fires are likely to have affected local abundance and diversity of avian species and influenced capture rates for small vertebrate fauna species in these areas. However, as previous surveys included in the assessment were conducted prior to the burn event this is considered a minor limitation. No other significant disturbance events were recorded, and survey effort was not adversely affected by weather events, natural disasters or accidental human intervention.
Intensity (in retrospect was the intensity adequate).	Nil	The survey intensity is considered adequate, and all habitat types were surveyed systematically or opportunistically, with the majority of the species that were expected to occur recorded.
Completeness (e.g. was relevant area fully surveyed).	Moderate	Significant heritage access restrictions were encountered during the current surveys. Although these restrictions were mostly resolved during the subsequent surveys, some areas were unable to be surveyed by foot due to heritage exclusions (e.g. Duck Creek and other ethnographic sites in rocky habitats). Previous sampling has been undertaken in these areas; however, no targeted or detailed sampling has been undertaken in these areas within the past five years. Where possible, habitat and suitability for significant fauna was assessed via helicopter for these areas. Representative habitat was surveyed elsewhere during the detailed surveys; however, targeted surveys and cave assessments were not undertaken in these areas due to the culturally sensitive nature of these areas and corresponding LUC conditions.
Resources (e.g. degree of expertise available in animal identification to taxon level).	Nil	Resources were adequate to carry out the survey and survey participants were competent in the identification of species. No resource issues were encountered.
Remoteness and/or access problems.	Minor	Access was not granted to survey Duck Creek, or areas of rocky habitat west of Duck Creek/north of the Edge camp during the current survey. Although this represents a limitation of surveys undertaken within the past five years, historical survey effort has been undertaken in these areas and representative habitats were generally able to be accessed elsewhere in the survey area, therefore these access problems are considered a minor limitation in the context of the consolidated survey effort. A helicopter was utilised for the current survey and remoteness is not considered a limitation.
Availability of contextual (e.g. biogeographic) information on the region.	Nil	Sufficient contextual information was available on the Pilbara region and the survey area.
Efficacy of sampling methods (i.e. any groups not sampled by survey methods).	Nil	Sampling methods are considered adequate for detailed and targeted vertebrate fauna surveys. Although data analysis for the current survey indicates that additional survey effort may have yielded additional species, consolidation of results with previous detailed survey effort shows that the cumulative survey effort is considered adequate.

5 RESULTS AND DISCUSSION

5.1 FAUNA HABITAT

Fauna habitat assessments were undertaken to describe and map fauna habitat types. Habitats with the potential to support significant fauna species within the survey area were also identified. After assessing the fauna habitat types identified during previous surveys and ground-truthing existing habitat mapping, based on vegetation types, soil units, and landforms present, nine broad fauna habitat types were identified within the survey area (Table 22, Map 16):

- Plain (alluvial),
- Hills/Ranges/Plateaux,
- Gorge/Gully,
- Drainage Line/River/Creek (major),
- Drainage Line/River/Creek (minor),
- Lower Slopes/Hillslopes,
- Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways),
- Hummock Grassland and
- Shrubland (open)

Fauna habitat assessment sheets are provided in Appendix E.

Plain (alluvial) habitat within the survey area was unable to be systematically sampled during the current or previous surveys due to heritage access restrictions associated with Duck Creek and the poor condition of accessible areas outside these exclusion zones.

From a local perspective, habitat features that are disjunct and provide sources of shelter, food and mesic qualities required for restricted species may be considered important. The Hills/Ranges/Plateaux (36.62%) habitat type was the dominant feature of the survey area, encompassing ridges, mesas, cliffs, outcrops and breakaways which provide denning/roosting, foraging and dispersal habitat for significant fauna.

Table 22: Fauna habitats identified within the survey area and associated sampling effort (consolidated surveys).

Broad habitat type	Area (ha)	%	Sampling effort	Vegetation description	Fauna suitability	Representative photos
Plain (alluvial)	902.11	2.1	**Current survey:** None **Previous surveys:** 2 x Ultrasonic bat recording sites 1 x Motion camera site	Shrublands of mixed *Acacia* with *Cymbopogon ambiguus,* and *Poaceae* sp., *Triodia* sp. on loam/clay/sandy soils.	This habitat is comprised of tall mixed *Acacia* shrubs over soft grasses and spinifex hummocks on soft to firm alluvial soils sometimes with stones and pebbles. Mixed acacia shrublands also include a variety of flowering shrubs and herbs, and therefore a good food source for bird species, particularly after rainfall. Alluvial soils provide burrowing substrates for small mammals while leaf litter and woody debris is regularly found around the base of shrubs and trees creating niches for fauna to occupy. This habitat type is associated with the margins of Duck Creek and Boolgeeda Creek and was not systematically surveyed during the current or previous surveys due to heritage restrictions and/or poor habitat condition (e.g. heavy cattle grazing/trampling and extensive weed infestations) within accessible portions. This habitat type is unlikely to provide critical habitat for significant fauna; however, may provide foraging and dispersal habitat for these species.	
Hummock Grassland	10,345	23.5	**Current survey:** 3 x Systematic trapping sites 2 x Motion camera sites 5 x Ghost bat lures 18 x Ultrasonic bat recording sites 10 x Acoustic night parrot recording sites 4 x Cave habitat assessments **Previous surveys:** 11 x Systematic trapping sites 4 x Motion camera sites 15 x Ultrasonic bat recording sites 14 x Acoustic night parrot recording sites 9 x Habitat assessments 4 x Cave habitat assessments 1 x Significant avifauna survey site	This habitat type supports low open Eucalypt woodland over mid sparce mixed shrubland of *Acacia spp.*, *Grevillea spp.,* and *Hakea spp.* and open hummock grassland (*Triodia spp.*). Triodia hummocks were generally small due to fire; however, several isolation long unburnt patches were identified. Includes habitat previously mapped as Plain (stony/gibber) in *ecologia* (2022c).	Substrate was reddish brown to brown loamy sand and clay loam with ironstone, basalt or a mixture of both. Landscape varies from stony hills and rises to spinifex plains to stony gibber plains. Habitat was generally good however evidence of cattle trampling and grazing present. A total of 86 species were recorded in this habitat including 24 reptile species, 19 mammals and 43 birds (Appendix F). One introduced species (European cattle) was recorded within this habitat type during the current survey. Four significant fauna taxa were recorded within this habitat type during the current survey, including the lined soil crevice skink, western pebble-mound mouse, ghost bat and Pilbara leaf-nosed bat. Although these species were recorded within this habitat type, critical denning and roosting habitat for significant bat taxa does not occur within this habitat type and records are likely to represent foraging and dispersal activities rather than permanent occupancy for these species. No additional significant fauna taxa were recorded in this habitat type during previous surveys.	

Broad habitat type	Area (ha)	%	Sampling effort	Vegetation description	Fauna suitability	Representative photos
Shrubland (open)	2,251	5.1	**<u>Current survey:</u>** 2 x Systematic trapping sites 3 x Ultrasonic bat recording sites **<u>Previous surveys:</u>** 6 x Systematic trapping sites 4 x Ultrasonic bat recording sites 2 x Motion camera sites 3 x Habitat assessments	Habitat supports low open Eucalypt woodland over mid sparse shrubland of tall mixed Acacia shrubs and areas of snakewood (*Acacia xyphophylla*) over soft grasses and spinifex hummocks.	Open shrubland of Acacia and snakewood over stony, clay based soils. Areas of denser vegetation with layered leaf litter may provide microhabitats for ground dwelling taxa. Flowering shrubs provide food resources, nesting and perching opportunities for avifauna. A total of 57 species were recorded in this habitat during the current survey, including 17 reptile species, 11 mammals and 29 birds (Appendix F). The Pilbara leaf-nosed bat and lined soil-crevice skink were recorded in this habitat type during the current survey.	
Hills/Ranges/Plateaux	17,069	38.8	**<u>Current survey:</u>** 2 x Systematic trapping sites 1 x Motion camera site 2 x Ghost bat lures 6 x Ultrasonic bat recording sites 1 x Cave habitat assessment **<u>Previous surveys:</u>** 8 x Systematic trapping sites 24 x Motion camera sites 20 x Ultrasonic bat recording sites 1 x Acoustic night parrot recording sites 65 x Northern quoll cage traps 33 x Cave habitat assessments 1 x Olive python monitoring site 1 x Significant avifauna survey points 2 x Active searches 3 X Night parrot recording sites	Scattered Eucalypts over sparse shrubland of mixed *Acacia* spp. and *Salvia* sp. over open *Triodia* sp. hummock grassland.	The landscape consists of large ironstone and banded iron ranges with supporting hills, ranges and breakaways that have reddish brown loamy sand and sandy loam. Boulders and rocky crevices provide shelter for vertebrate fauna. The Hills/Ranges/Plateaux habitat type encompasses ridgelines boulders, crevices and caves which may provide shelter, denning, foraging and roosting habitat for species such as the northern quoll, Pilbara leaf-nosed bat, peregrine falcon and ghost bat. Substrates may be of a suitable size for the western pebble-mound mouse and the Pilbara olive python may utilise this habitat type during foraging and dispersal activities. A total of 46 vertebrate fauna species were recorded in this habitat type during the current survey, including 12 reptiles, 22 birds and 12 mammals (Appendix F). The house mouse and feral cat were previously recorded within this habitat type. Both the northern quoll and Pilbara leaf-nosed bat were recorded in this habitat type during the current and previous surveys (*ecologia*, 2022c, 2023b; Stantec, 2021). The ghost bat was also recorded in this habitat type during the current survey. Rocky substrates within this habitat type may be utilised by the western pebble-mound mouse.	

Broad habitat type	Area (ha)	%	Sampling effort	Vegetation description	Fauna suitability	Representative photos
Gorge/Gully	1,126	2.6	**<u>Current survey:</u>** 1 x Systematic trapping sites 4 x Motion camera sites 1 x Ultrasonic bat recording site 2 x Cave habitat assessments **<u>Previous surveys:</u>** 4 x Systematic trapping sites 58 x Motion camera sites 24 x Ultrasonic bat recording sites 72 x Northern quoll cage traps 14 x Cave habitat assessments 2 x Active searches 7 x Habitat assessments	Eucalyptus over a sparse shrubland with hummock grasses and spinifex.	Gorges and gullies are generally found in the Hills/Ranges/Plateaux habitat but also feature where drainage lines have cut through Lower Slopes/Hillslopes. Gorges and Gullies are characterised by steep sided rocky habitats with breakaways, caves, crevices, and cracks with a number of semi-permanent and permanent water sources present at the time of survey. Moist areas, woody debris along with dense shrubbery and leaf litter provide shelter and habitat for ground dwelling species. A total of 32 vertebrate fauna species were recorded in this habitat type during the current survey, comprising of seven reptiles, 12 birds, 11 mammals and two amphibian species (Appendix F). Generally, these areas are of high conservation value providing denning and roosting habitat for species such as the northern quoll, Pilbara olive python, ghost bat and Pilbara leaf-nosed bat. This habitat type encompasses permanent and semi-permanent water bodies that provide important habitat for numerous significant fauna species, including the northern quoll, Pilbara olive python, Pilbara leaf-nosed bat and ghost bat. The northern quoll and Pilbara leaf nosed bat were recorded in this habitat type during the current and previous surveys (*ecologia*, 2022c, 2023b; Stantec, 2021). The Gane's blind snake was also recorded within this habitat type during the current survey. Although not recorded during the current survey, the ghost bat, peregrine falcon and Pilbara olive python were previously recorded within this habitat type (Stantec, 2021).	
Lower Slopes/Hillslopes	2,898	6.6	**<u>Current survey:</u>** 6 x Ultrasonic bat recording sites **<u>Previous surveys</u>**: 3 x Systematic trapping sites 4 x Ultrasonic bat recording sites	This habitat supports scattered *Eucalyptus leucophloia* (snappy gum) over sparse shrubland of mixed *Acacia spp*. and *Senna spp.* over open spinifex hummock grassland.	Rolling rocky hills and lower slopes with a continuous layer of pebbles, stones and boulders on clay/loam soils supporting scattered *Eucalyptus leucophloia* and *A. bivenosa* over *Triodia* hummock grassland. This habitat type is a transitional area between the higher Hills/Ranges/Plateaux and the lower flatter Plains. Minor drainage lines intersect this habitat with leaf litter, boulders and crevices present in addition to some breakaways and caves. The lower slopes/hillslopes habitat type provide foraging and dispersal habitat for the Pilbara leaf-nosed bat, ghost bat and northern quoll; however, roosting and denning habitat (e.g. caves) is generally absent from this habitat type. Rocky substrates within this habitat type may be utilised by the western pebble-mound mouse. Two significant fauna taxa (northern quoll and Pilbara leaf-nosed bat) were previously recorded within this habitat type (*ecologia*, 2022c). No significant fauna were recorded in this habitat type during the current survey.	

Broad habitat type	Area (ha)	%	Sampling effort	Vegetation description	Fauna suitability	Representative photos
Rocky Escarpments (Ridges/Mesa/Cliffs/ Outcrops/Breakaways)	6,540	14.9	**Current survey:** 3 x Systematic trapping sites 41 x Motion camera sites 6 x Ultrasonic bat recording sites 15 x Cave habitat assessments **Previous surveys:** 4 x Systematic trapping sites 38 x Motion camera sites 16 x Ultrasonic bat recording sites 23 x Cave habitat assessments 3 x Active searches 4 x Northern quoll cage traps 1 x Habitat assessment	Mixed shrubland of *Acacia* sp., *Senna* sp., *Hakea* sp., *Eremophila, Ptilotus obovatus, Paspalidium clementii* and *Solanum lasiophyllum* over tussock grassland of *Triodia* sp.	Rocky features from small-scale rock face to large protruding rocks/boulders, usually associated with the tops or bases of ridgelines, stony hills and rises or major drainage lines. Ridgelines, cliff, breakaways, boulders, crevices and caves within this habitat type provide shelter, denning and roosting habitat for species such as the northern quoll, Pilbara leaf-nosed bat, peregrine falcon, Rothschild's rock wallaby, rock rat, monitor lizard and Woolley's pseudantechinus. Rocky Escarpments within the survey area support denning, foraging, dispersal habitat for the northern quoll, ghost bat and Pilbara leaf-nosed bat. Rocky substrates within this habitat type may be utilised by the western pebble-mound mouse. A total of 66 vertebrate fauna species were recorded in this habitat type during the current survey, comprising 22 reptiles, 30 birds and 14 mammals (Appendix F). The Pilbara leaf-nosed bat and northern quoll were recorded within this habitat type during the current and previous surveys (*ecologia*, 2022c, 2023b; Stantec, 2021).	
Drainage Line/River/Creek (major)	2,232	5.1	**Current survey:** 3 x Systematic trapping sites 1 x Motion camera site 6 x Ghost bat lures 9 x Ultrasonic bat recording sites **Previous surveys:** 4 x Systematic trapping sites 18 x Motion camera sites 30 x Ultrasonic bat recording sites 11 x Northern quoll cage traps 3 x Cave habitat assessment 4 x Significant avifauna survey points 1 x Pilbara olive python sampling point (eDNA) 4 x Active searches 7 x Habitat assessments 1 x Night parrot recording site 2 x Aquatic funnel traps	Open woodland of *Eucalyptus camaldulensis* over *Melaleuca argentea* and *Acacia coriacea subsp. pendens* over grassland of *Poaceae* sp.	Generally encompassing major drainage lines and associated tributaries, this habitat type feature deeply incised drainage channels and a higher density of vegetation than surrounding areas. Banks of major drainage lines generally support large, hollow bearing eucalypts which provide roosting and nesting opportunities for avifauna and arboreal mammals. Substrates of gravelly, sand or rocks on clay/loam soils provide quality burrowing substrates. This habitat type may be utilised as dispersal and foraging habitat by the northern quoll, grey falcon, Pilbara leaf-nosed bat, ghost bat and Pilbara olive python. A total of 67 vertebrate fauna species were recorded from this habitat type during the current survey, including 14 reptiles, 10 mammals and 43 species of bird (Appendix F). The Pilbara leaf-nosed bat was recorded within this habitat type during the current and previous surveys (*ecologia*, 2022c, 2023b; Stantec, 2021). A Pilbara olive python was recorded on a motion camera deployed in habitat adjacent to Duck Creek during previous surveys (Stantec, 2021).	

Broad habitat type	Area (ha)	%	Sampling effort	Vegetation description	Fauna suitability	Representative photos
Drainage Line/River/Creek (minor)	580	1.3	**Current survey:** 2 x Systematic trapping sites 2 x Ultrasonic bat recording sites **Previous surveys:** 5 x Systematic trapping sites 9 x Ultrasonic bat recording sites 1 x Olive python monitoring site	Scattered Eucalypts over shrublands of mixed *Acacia* with *Hakea lorea*, *Cymbopogon ambiguus* over grassland of *Poaceae* sp. on heavy loam/clay/rocky soils.	This habitat type features shallow incised drainage channels with a slightly higher density of vegetation than surrounding areas. Typically lacks the large eucalypts associated with major drainage lines. Substrates of gravelly, sand or rocks on clay/loam soils support scattered trees and shrubs. A total of 39 vertebrate fauna species were recorded from this habitat type during the current survey, including 11 reptiles, seven mammals and 21 species of bird (Appendix F). No significant fauna taxa were recorded in this habitat type during the current survey. The Pilbara leaf-nosed bat was recorded in this habitat type during previous surveys (*ecologia*, 2022c, 2023b; Stantec, 2021).	
Total	43,943	100				

116.3583°E
116.4431°E
116.5278°E
116.6125°E
116.6972°E
116.7819°E
116.8667°E
22.4764°S
22.5511°S
22.6458°S

Survey area

Habitat feature

- Roost/nest (Corvid nests)
- Permanent/temporary pool
- Cave ecologia (2022)
- Cave (Current survey)
- Cave ecologia (2023)
- Cave (GHD 2020)

Habitat type

- Drainage Line/River/Creek (major)
- Drainage Line/River/Creek (minor)
- Gorges/Gullys
- Hills/Ranges/Plateaux
- Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)
- Lower slopes/hillslopes
- Plain (alluvial)
- Hummock Grassland
- Shrubland (open)

ecologia ENVIRONMENT

Project No.: 1995
Author: CE
Created Date: 21 May 2025
Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Scale: 1:145,000 @A3

Map 16: Fauna habitat types and significant fauna microhabitat features identified within the survey area.

Earthstar Geographics

0 2 3 5 9 Kilometers

N

5.2 FAUNA ASSEMBLAGE

Of the 340 vertebrate fauna species identified by database searches as potentially occurring within the survey area, 157 (46.2%) were recorded during the current survey including 26 mammals (14 native non-volant species, three introduced species and nine bats), 55 reptiles, 74 birds and two amphibians. An additional 26 birds, seven mammals, 20 reptiles, two amphibians and five fish have previously been recorded within the survey area for a combined total of 217 species recorded. The combined fauna assemblage recorded within the survey area represents 63.8% of species potentially occurring based on the database assessment and literature review. Further discussion on survey adequacy is provided in Section 5.3.

A regional species list is provided in Appendix D and a site-by-species matrix for the current survey is provided in Appendix F.

5.2.1 Native mammals

A total of 23 native mammal taxa belonging to 10 families were recorded within the survey area during the current survey, comprising 14 species of ground dwelling mammals and nine bats (Appendix F). Ground dwelling mammal species recorded during the current survey included five carnivorous marsupials (Dasyuridae), five native rodents (Muridae), two macropods (Macropodidae), the dingo (Canidae), and the short-beaked echidna (Tachyglossidae). Two species of sheath-tailed bat (Emballonuridae), two species of free-tailed bat (Molossidae), three species of simple-nosed bat (Vespertilionidae), the ghost bat (Megadermatidae) and Pilbara leaf-nosed bat (Rhinonycteridae) were recorded during the current survey.

An additional six native mammal taxa (two carnivorous marsupials, one macropod, the Pilbara brushtail possum and two species of bat) have previously been recorded within the survey area (Appendix D). The combined native mammal assemblage recorded in the survey area (29 species), represents 93.5% of the native mammal assemblage identified as potentially occurring based on the database searches and literature review (Appendix D).

The northern quoll (*Dasyurus hallucatus* [EN]), western pebble-mound mouse (*Pseudomys chapmani* [P4]), ghost bat (*Macroderma gigas* [VU]) and Pilbara leaf-nosed bat (*Rhinonicteris aurantia* [VU]) were recorded during the current survey. No additional significant mammal taxa were recorded in the survey area during previous surveys. Significant mammals recorded in the survey area are discussed further in Section 5.5.

5.2.2 Avifauna

Seventy-four bird taxa from 34 families were recorded during the current survey (Appendix F). The family honeyeaters (Meliphagidae) were the most diverse family recorded during the surveys (nine species), followed by woodswallows, butcherbirds and currawongs (Artamidae) (six species) and pigeons and doves (Columbidae) (five species). A total of 995 individual birds were recorded during set time surveys during the current survey. The spinifex pigeon was most frequently recorded species during set-time surveys (96 records) followed by the grey-crowned babbler (60 records), rufous whistler (54 records) and crested bellbird (47 records).

An additional 26 avifauna taxa have previously been recorded within the survey area, for a cumulative total of 99 species recorded within the survey area (Appendix D). The combined avifauna assemblage recorded within the survey area represents 56.9% of avifauna taxa potentially occurring within 50 kilometres of the survey area based on database searches.

Although no significant avifauna taxa were recorded during the current survey, the peregrine falcon (*Falco peregrinus* [OS]), osprey (*Pandion cristatus* [MI]) and fork-tailed swift (*Apus pacificus* [MI]) have previously been recorded within the survey area (Appendix D). These species are discussed in further detail in Section 5.5.2.

5.2.3 Reptiles

Fifty-five reptile taxa were recorded during the current survey, representing nine families. Reptile species recorded during the current survey included 12 geckos (five Diplodactylidae and seven Gekkonidae), four legless lizards (Pygopodidae), 18 skinks (Scincidae), five dragons (Agamidae), five monitors (Varanidae), two pythons (Pythonidae), three blind snakes (Typhlopidae) and six venomous snakes (Elapidae). The most abundant species captured during systematic surveys included *Ctenotus saxatilis* (47 captures), *Ctenotus pantherinus* (35 captures), *Ctenotus grandis* (23 captures), *Lerista muelleri* (15 captures) and *Heteronotia binoei* (13 captures). All other reptile species were captured on 10 or less occasions.

An additional 20 reptile taxa, comprising four venomous snakes, two pythons, two monitor lizards, two legless lizards, four skinks and six geckos were recorded within the survey area during previous surveys. The combined reptile assemblage recorded within the survey area (75 species) represents 65.2% of species potentially occurring in the area based on database searches.

The Gane's blind snake (*Anilios ganei* [P1]) and the lined soil-crevice skink (*Notoscincus butleri* [P4]) were recorded during the current survey (Appendix F). Although not recorded during the current survey, the Pilbara olive python (*Liasis olivaceus barroni* [VU]) was recorded at three sites during targeted surveys undertaken by Stantec (2021). Significant reptiles recorded within the survey area are discussed in Section 5.5.2.

5.2.4 Amphibians

Two amphibian species were recorded during the current survey, comprising the gorge toadlet (132 captures) and little red tree frog (2 captures). Two additional frog species (sheep frog and Pilbara toadlet) have previously been recorded in the survey area (Appendix D). The combined amphibian assemblage recorded within the survey area comprises 100% of the species potentially occurring based on database searches.

No significant amphibians were recorded during the surveys, and no significant species are expected to occur within the survey area (Appendix D). Database searches and current modelled species distributions indicate that the introduced cane toad (*Rhinella marina*) does not currently occur within the survey area.

5.2.5 Fish

No fish were recorded during the detailed or targeted surveys; however, five species (western rainbowfish, Hyrtle's catfish, barred grunter, Fortescue grunter and spangled perch) have previously been recorded in the survey area (Appendix D). The assemblage recorded represents 71.4% of fish taxa identified from the desktop as potentially occurring within the survey area (Appendix D, Table 7).

Although the Fortescue grunter (*Leiopotherapon aheneus* [P4]) was not recorded during the current survey, this species was previously recorded in the survey area by *ecologia (2015a)* in the northern portion of Duck Creek. This species is discussed in further detail in Section 5.5.2.

5.2.6 Introduced Species

Three introduced mammal taxa were recorded during the current survey including European cattle, donkey and feral cats. Three additional introduced species (house mouse, laughing turtle dove and horse) have previously been recorded in the survey area; however, were not recorded during the current survey (Appendix D).

Dingoes were recorded through a combination of primary (motion cameras and sightings) and secondary evidence (track) during the current and previous surveys. As feral dogs and feral dog/dingo hybrids are very rare across mainland Australia, it is considered unlikely that the

animals recorded during the surveys represent feral dogs or hybrids (Cairns, Crowther, Nesbitt, & Letnic, 2021).

5.3 ESTIMATED SPECIES RICHNESS

Trapped vertebrates: mammals, reptiles, and amphibians

Using Chao2, ICE, Jackknife 1, Jackknife 2, Bootstrap, and Michaelis-Menten estimators the trapped vertebrate species richness of the survey area ranged from 90.24 to 104.64 species (Table 23). Observed species richness (S) recorded during systematic sampling undertaken during the current survey and previous detailed surveys undertaken at Wyloo (*ecologia*, 2022c) and Elevation-Hendrix (*ecologia*, 2023b) was 81, representing between 77.4% and 89.76% of the estimated species richness values. An extrapolated species accumulation curve showed accumulation of new species tending towards zero (asymptote) by 43 sites (Figure 2), indicating site-based survey effort is not likely to result in an increased number of observed trapped animal species at sampling sites. Additionally, 28 species were recorded opportunistically, for a total of 109 species recorded within the survey area, which exceeds estimated species richness values. Therefore, for the purposes of this survey, the consolidated vertebrate fauna trapping effort is considered adequate.

Table 23: Species richness estimates for trapped vertebrates (mammals, reptiles, and amphibians).

Data	
N (number of reference samples)	43
S (observed number of taxa within sites)	81
No. of singletons	10
No. of doubletons	15
No. species recorded opportunistically	28
Total species observed	109
Species richness estimator	*Estimated species richness* ±SD[1]
ICE	94.39
Chao2	92.13±6.18
Jackknife 1	99.56±4.7
Jackknife 2	104.64
Bootstrap	90.24
Michaelis-Menten Means	95.75

[1]Standard deviation is not calculated for some estimators.

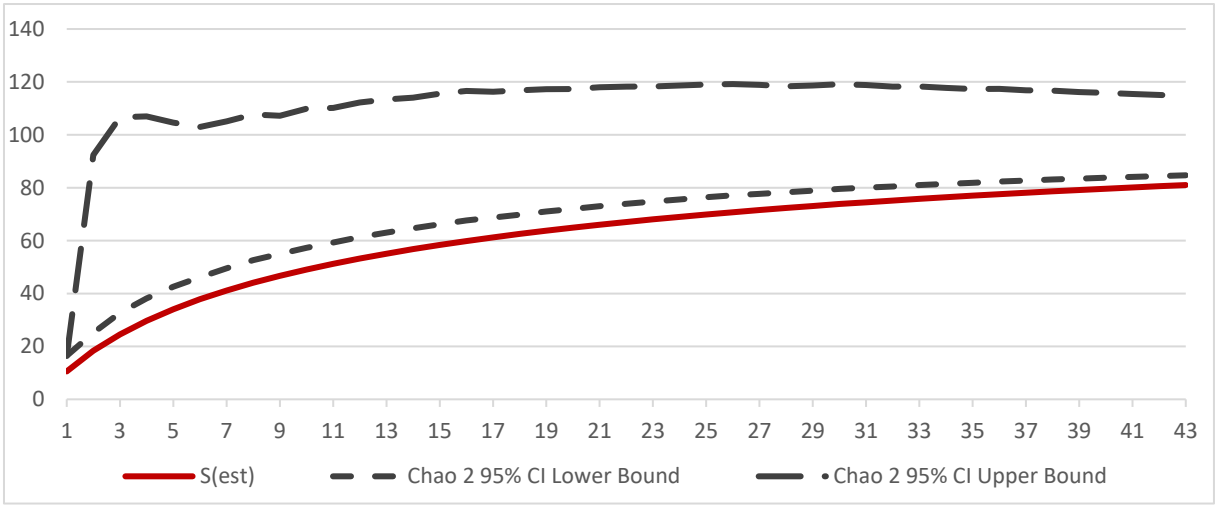


Figure 2: Extrapolated rarefaction curve of estimated terrestrial fauna species richness (S_{est}) after 16 sampling sites.

Avifauna

The estimated bird species richness of the survey area using the Chao2, ICE, jackknife 1, jackknife 2, bootstrap, and Michaelis-Menten estimators ranged from 72.03 to 84.58 species (Table 24). Observed species richness (S) recorded during systematic sampling undertaken during the current survey and previous detailed surveys undertaken at Wyloo (*ecologia*, 2022c) and Elevation-Hendrix (*ecologia*, 2023b) was 67, representing between 79.21% and 93.01% of the estimated species richness values. An extrapolated species accumulation curve showed accumulation of new species is tending towards zero (asymptote) by 43 sites (Figure 3) indicating site-based survey effort is not likely to result in an increased number of observed trapped animal species at sampling sites. An additional 25 species were recorded opportunistically, for a total of 92 species recorded within the survey area, exceeding estimated species richness values. Therefore, for the purposes of this survey, consolidated avifauna sampling effort is considered adequate.

Table 24: Species richness estimates for avifauna.

Data	
N (number of reference samples)	43
S (observed number of taxa within sites)	67
No. of singletons	6
No. of doubletons	5
No. species recorded opportunistically	25
Total species observed	92
Species richness estimator	*Estimated species richness*±SD[1]
ICE	74.53
Chao2	76.21±7.11
Jackknife 1	78.72±3.52
Jackknife 2	84.58
Bootstrap	72.51
Michaelis-Menten Means	72.03

[1]Standard deviation is not calculated for some estimators.

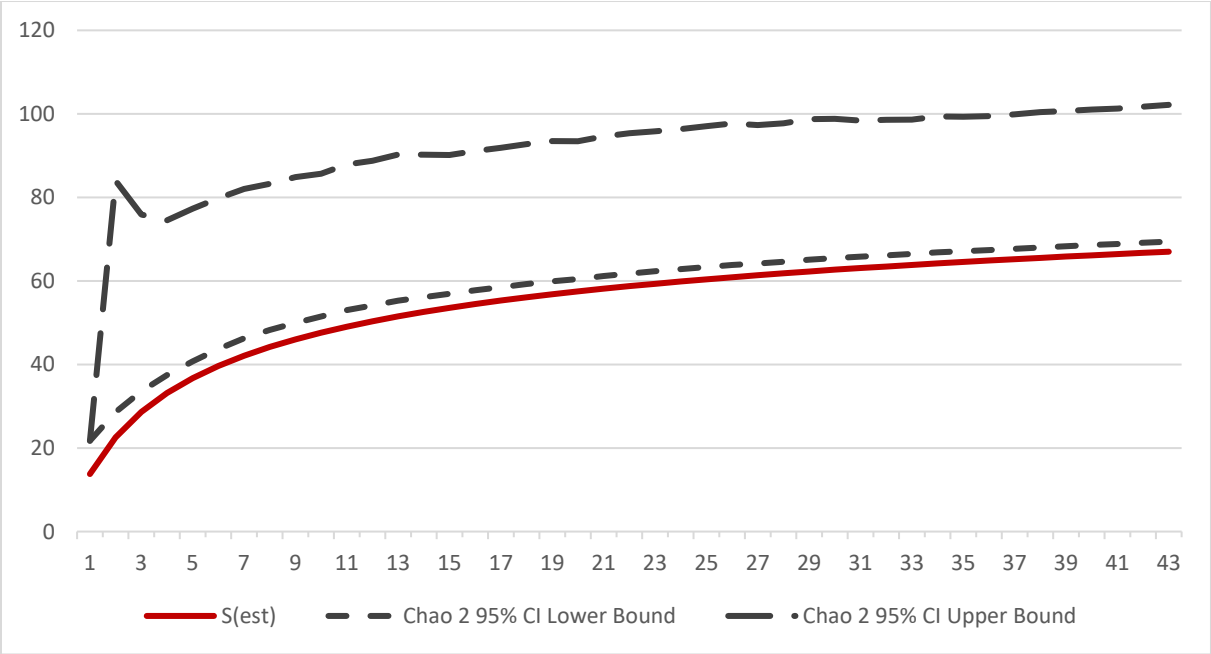


Figure 3: Extrapolated rarefaction curve of estimated avifauna species richness (S_{est}) after 16 sampling sites.

5.4 NON-METRIC MULTIDIMENSIONAL SCALING (NMDS)

Trapped vertebrates: mammals, reptiles, and amphibians

A stress value of 0.234 was calculated for the ordination of vertebrate trapping sites, indicating that the configuration of points is not an overly representation of the calculated similarity between the consolidated trapping sites. The NMDS ordination (Figure 4) suggests that broad similarities in the trapped vertebrate fauna assemblages exist between most fauna habitat types when considering the consolidated data sets. The NMDS indicates that noticeable differences in fauna assemblages were recorded within some Rocky Escarpment sites, which is likely to be attributed to the varying landforms (and associated microhabitats) encompassed within this habitat type. Shrubland (open) habitat sites appear to be somewhat differentiated from other habitat types sampled within the survey area. Drainage Line/River/Creek (major) habitat encompasses a broader faunal assemblage, including species that do not permanently reside within this habitat type, but instead utilise water resources or dispersal habitat within major drainage lines. Similarities in species composition also exist between Hills/Range/Plateaux, Lower Slopes and Hillslopes and Gorge/Gully habitat types. Overall, there appears to be more compositional differentiation between habitat types in trapped vertebrate fauna compared to the avifauna surveys (Figure 5).

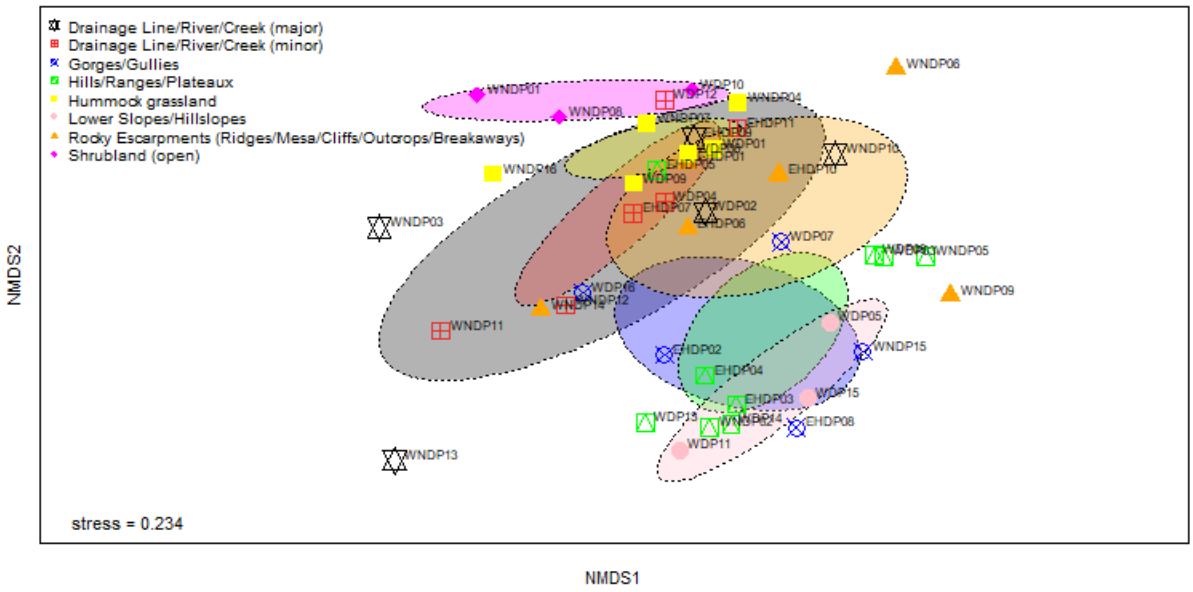


Figure 4: First two dimensions of NMDS ordination of survey sites based on Bray-Curtis dissimilarity (trapped vertebrates). Dotted lines indicate 95% CI of the group centroids.

Avifauna

A stress value of 0.207 was calculated for the ordination of avifauna at trapping sites, indicating that the configuration of points may be a poor representation of the calculated similarity between sites. The NMDS ordination (Figure 5) suggests similarities exist between all habitat types, with fewer similarities observed between the avifauna assemblages recorded in sites associated with rocky habitats (Gorge/Gully, Hills/Ranges/Plateaux and Rocky Escarpments). Overall, there appears to be more compositional differentiation between habitat types in trapped vertebrate fauna compared to the avifauna surveys. This is expected due to the highly mobile nature of avifauna taxa, allowing them to overfly and utilise foraging resources within a wide range of habitat types.

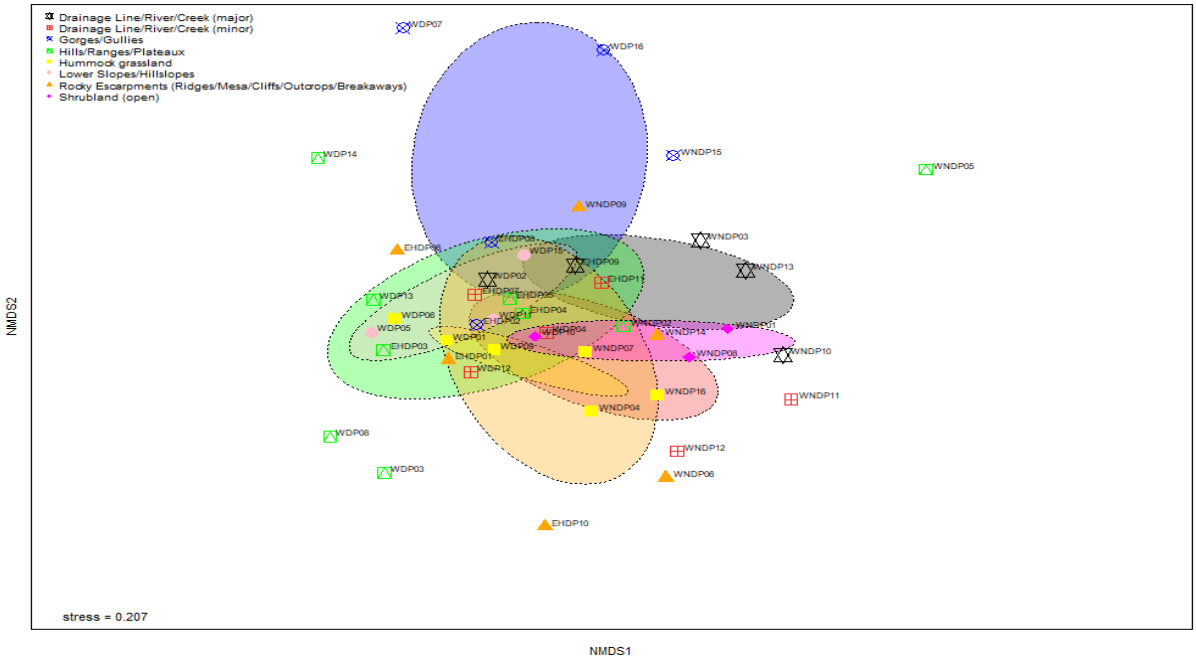


Figure 5: First two dimensions of NMDS ordination of survey sites based on Bray-Curtis dissimilarity (avifauna). Dotted lines indicate 95% CI of the group centroids.

5.5 SIGNIFICANT FAUNA

A post-survey likelihood of occurrence assessment was undertaken for significant fauna species with the potential to occur within the survey area, taking into consideration the field survey results, habitat types identified, and desktop survey (Appendix I). Further discussion surrounding significant species recorded within the survey area and species considered highly or moderately likely to occur within the survey area is provided in Section 5.5.2, Section 5.5.3 and Section 5.5.4 respectively.

Eleven significant species have been recorded in the survey area, including:

- Northern quoll (*Dasyurus hallucatus*) – Endangered EPBC Act and BC Act.
- Pilbara leaf-nosed bat (*Rhinonicteris aurantia* [Pilbara form]) – Vulnerable EPBC Act and BC Act.
- Ghost bat (*Macroderma gigas*) – Vulnerable EPBC Act and BC Act.
- Pilbara olive python (*Liasis olivaceus barroni*) - Vulnerable EPBC Act and BC Act.
- Fork-tailed swift (*Apus pacificus*) - Migratory EPBC Act and BC Act.
- Osprey (*Pandion cristatus*) - Migratory EPBC Act and BC Act.
- Peregrine falcon (*Falco peregrinus*) - Other Specially Protected Fauna BC Act.
- Gane's blind snake (*Anilios ganei*) – Priority 1.
- Lined soil-crevice skink (*Notoscincus butleri*) – Priority 3.
- Western pebble-mound mouse (*Pseudomys chapmani*) – Priority 4.
- Fortescue grunter (*Leiopotherapon aheneus*) – Priority 4.

One significant bird, the grey falcon (*Falco hypoleucos* [VU]), was assessed as highly likely to occur within the survey area based on the presence of suitable habitat and proximity of recent records. Two species (long-tailed dunnart (*Antechinomys longicaudata*) [P4] and Pilbara barking gecko (*Underwoodisaurus seorsus* [P2]) were allocated a moderate likelihood of occurrence based on presence of suitable habitat, abundance/distribution of records and distance of records from the survey area (Appendix I).

The likelihood of occurrence assessment assessed 14 significant avifauna taxa and one significant mammal as having a low likelihood of occurrence within the survey areas due to absence of suitable habitat, age of records, distance of records from the survey area or a combination of these factors (Appendix I). Additionally, the striated grasswren [sandplain] (*Amytornis striatus striatus*) was classified as not occurring within the survey area due to recently revised taxonomy that no longer recognises this species in the Pilbara (DBCA, 2025). Species considered unlikely to occur or classified as 'does not occur' will not be discussed further.

5.5.1 Matters of National Significance (MNES)

Six MNES species have been recorded in the survey area:

- Northern quoll (*Dasyurus hallucatus*) - Endangered EPBC and BC Act.
- Pilbara leaf-nosed bat (*Rhinonicteris aurantia*) - Vulnerable EPBC Act and BC Act.
- Ghost bat (*Macroderma gigas*) - Vulnerable EPBC Act and BC Act.
- Pilbara olive python (*Liasis olivaceus barroni*) - Vulnerable EPBC Act and BC Act.
- Fork-tailed swift (*Apus pacificus*) – Migratory EPBC Act and BC Act.
- Osprey (*Pandion cristatus*) - Migratory EPBC Act and BC Act.

Criteria and definitions used to assess critical habitat and important populations for MNES species recorded within the survey area are outlined in Table 25. Where habitat critical to the survival of a species is not defined, DEWHA (2013) considers habitat critical to the survival of a species to include areas that are necessary:

- for activities such as foraging, breeding, roosting or dispersal;

- for the long-term maintenance of the species;
- to maintain genetic diversity and long-term evolutionary development; or
- for the reintroduction of populations or recovery of the species.

DEWHA (2013) outlines important features of MNES populations necessary for a species' long-term survival and recovery, which may include:

- key source populations either for breeding or dispersal;
- populations necessary for maintaining genetic diversity; and/or
- populations near the limit of the species range.

Table 25: Definitions used to identify critical habitat for MNES taxa and important populations of these species within the survey area.

Species (*Scientific name*)	EPBC status	Definitions utilised for assessment of critical habitat and important populations
Northern quoll (*Dasyurus hallucatus*)	**Endangered**	Northern quoll populations considered important for the long-term survival of this species are outlined by the (Commonwealth of Australia, 2016) in the EPBC referral guidelines for the northern quoll. Populations important for the long-term survival of the northern quoll include: • high density populations, which occur in refuge-rich habitat critical to the survival of the species, including where cane toads are present. • populations occurring in habitat that is free of cane toads and unlikely to support cane toads upon arrival (i.e. granite habitats in WA, populations surrounded by desert and without permanent water). • populations which are subject to ongoing conservation or research actions i.e. populations being monitored by government agencies or universities or subject to reintroductions or translocation. The EPBC referral guidelines define a high-density population as one which is characterised by numerous camera triggers by multiple individuals at multiple sites and or traps (Commonwealth of Australia, 2016). A low-density population is defined as one which is characterised by infrequent captures of one or two individuals which are confined to one or two sites or where no individuals have been trapped but latrine evidence is present (Commonwealth of Australia, 2016). Critical habitat: The EPBC *referral guidelines for the northern quoll* define habitat critical to the survival of the species (Commonwealth of Australia, 2016). The below definitions of critical habitat are applied to any habitat within the distribution of the northern quoll which provide shelter for breeding, refuge from fire and/or predation and potential poisoning from interactions with cane toads. Critical habitat for the northern quoll includes: • offshore islands where the northern quoll is known to exist. • rocky habitats such as ranges, escarpments, mesas, gorges, breakaways, boulder fields, major drainage lines or treed creek lines. • structurally diverse woodland or forest areas containing large diameter trees, termite mounds or hollow logs. Dispersal and foraging habitat which are associated with or connects populations important for long-term survival of the species is also considered critical habitat for the northern quoll (Commonwealth of Australia, 2016).

Species (*Scientific name*)	EPBC status	Definitions utilised for assessment of critical habitat and important populations
Pilbara leaf-nosed bat: (*Rhinonicteris aurantia* [Pilbara form])	**Vulnerable**	Critical habitat: Roosting habitat for the Pilbara leaf-nosed bat can be categorised into one of the categories outlined below in accordance with definitions provided in (TSSC, 2016b): • Permanent diurnal roosts (Priority 1): occupied year-round and likely the focus for some part of the 9-month breeding cycle. Priority 1 roosts are considered critical habitat for the Pilbara leaf-nosed bat. • Non-permanent breeding roosts (Priority 2): evidence of usage during some part of the 9-month breeding cycle (July–March) but are not occupied year-round. Priority 2 roosts are considered critical habitat for the Pilbara leaf-nosed bat. • Transitory diurnal roosts (Priority 3): occupied for part of the year only, outside the breeding season (i.e. April–June), and which could facilitate long distance dispersal in the region. Priority 3 roosts are considered critical habitat for the Pilbara leaf-nosed bat. • Nocturnal refuge (Priority 4): occupied or entered at night for resting, feeding or other purposes, with perching not a requirement. Excludes overhangs. Priority 4 roosts are not considered critical habitat but are important for persistence in the local area. According to the Conservation Advice (TSSC, 2016b):(Threatened Species Scientific Committee, 2016b) for the Pilbara leaf-nosed bat, foraging habitats are categorised in accordance with the below criteria, where these habitats occur in the vicinity of roosting habitat: • Gorges with pools (Priority 1): watercourses through upland areas bounded by sheer rock walls for parts of their length, often containing pools that remain for weeks or months, sites of relatively large biomass production, sometimes containing caves; • Gullies (Priority 2): primary drainage with limited riparian development in upland rocky habitats, sometimes containing small pools that may last for weeks, with less biomass production than Priority 1 gorge habitat; • Rocky outcrop (Priority 3): areas of exposed rock at the top of rocky outcrop and mesa hills that contain caves and overhangs, and boulder piles in the granite terrains; • Major watercourses (Priority 4): riparian vegetation on flat land plus the main gravelly or sandy channel of the riverbed, sometimes containing pools that persist for weeks or months, and generally supporting higher productivity of biomass than the surrounding habitats; • Open grassland and woodland (Priority 5): dominated by Triodia, on lowland plains, colluvial slopes and hilltops. Pilbara leaf-nosed bats have been observed foraging in a variety of habitats including spinifex hummock grasslands covering low rolling hills and shallow gullies, black soil grasslands, open savannah woodland, tall open forest and monsoon rainforest (S. K. Churchill, Jolly, Hand, & Milne, 2008). The Pilbara leaf-nosed bat is commonly encountered over small pools of water in rocky gullies and gorges (DEWHA, 2021). Foraging areas may range up to 20 km away from a diurnal roost (Bat Call, 2016). Given the lack of understanding around which habitats are required to sustain a roosting colony, it is difficult to define critical foraging habitat of the PLNB (Threatened Species Scientific Committee, 2016b).

Species (*Scientific name*)	EPBC status	Definitions utilised for assessment of critical habitat and important populations
Ghost bat (*Macroderma gigas*)		Critical habitat: In the Pilbara critical roosting habitat for the ghost bat appears to be caves beneath bluffs of low rounded hills (TSSC, 2016a). Permanent roost sites are typically deep caves, rock crevices or old mine adits with a relatively stable temperature (23-28°C) and high humidity (50-100%) (TSSC, 2016a). Foraging habitat for the ghost bat is not clearly defined by the (TSSC, 2016a). Recent studies in the Pilbara indicate that the ghost bat may forage over large areas up to 12 km from their diurnal roost (Augusteyn, 2018) (Bat Call WA, 2021).
Pilbara olive python (*Liasis olivaceus barroni*)		Critical habitat: There is a lack of research on habitat use and life history for the Pilbara olive python and therefore critical habitat for the species is difficult to define. For the purposes of this assessment, critical habitat for the Pilbara olive python includes areas which may contain escarpments, gorges, preferably with rock crevices and outcrops near water holes, which attract prey species (TSSC, 2008). The species prefers deeps gorges and holes within ranges in the Pilbara and spends the cooler months sheltering in caves and rock crevices away from water sources (TSSC, 2008). Supporting habitat: In the absence of definitive data, foraging habitat for the species includes riparian and minor/ medium drainage line habitat, permanent pools and ephemeral waterbodies.
Grey falcon (*Falco hypoleucos*)		Critical habitat: Critical habitat for the grey falcon is not clearly defined within the conservation advice for the grey falcon (TSSC, 2020). For the purposes of this assessment, critical breeding habitat for the species encompasses major water courses with large trees containing old raptor and corvid nests which may be utilised by the species. As the grey falcon is also known to utilise nests in telecommunication towers, these structures may also represent critical breeding habitat for the species where suitable nests are identified. Supporting habitat: The species frequents timbered lowland plains, particularly acacia shrublands that are crossed by tree-lined water courses (TSSC, 2020). The species has been observed hunting in treeless areas and frequents tussock grassland and open woodland, especially in winter ((Olsen & Olsen, 1986); (Schoenjahn, 2018)).

5.5.2 Significant Fauna Recorded

5.5.2.1 Northern quoll (*Dasyurus hallucatus*) - Endangered EPBC and BC Act

Ecology and Distribution

The northern quoll's range once extended contiguously across the north of Australia but due to the spread of the cane toad is now restricted to six separate land units including the Pilbara (DoE, 2023a). The Pilbara is currently regarded as the stronghold population for the species as this region does not currently support populations of the cane toad (Woinarski, Burbidge, & Harrison, 2014). The preferred denning habitat for the northern quoll is rocky escarpments, but the species also utilises riverine habitat for dispersal (Woinarski et al., 2014). Rocky habitats with rock crevices and caves support higher densities of northern quoll (Steve Van Dyck & Strahan, 2008; Woinarski et al., 2014). Predominantly inhabiting dissected rocky escarpments, a male quoll can have a home range of more than 100 ha while a female occupies territories of up to 35 ha (Steve Van Dyck & Strahan, 2008).

While this species is predominantly nocturnal, it may be observed during the day particularly during the breeding season and on overcast days (Oakwood, 2008). Northern quolls are opportunistic omnivores, feeding primarily on small vertebrates (mammals, amphibians and reptiles), invertebrates and soft fruits (Oakwood, 2008). Breeding occurs once per year, with juveniles deposited in dens once they reach eight to nine weeks of age (Oakwood, 2008). Northern quolls are the smallest of the Australian quolls and are the largest mammal species in the world for males to undergo die-off events following the breeding season (Oakwood, 2008). Lifespan of females in the wild is typically less than three years, with most females only surviving a single breeding season (Oakwood, 2008).

Occurrence within the Survey Area

Current Survey

During the current survey, the northern quoll was recorded on 35 occasions, comprising one secondary sign (scat), two captures (one male, one female) and 42 motion camera visits (eight individuals). Northern quolls were recorded at 13 locations across three camera transects (WNQT01, WNQT02 and WNQT04) and a single opportunistic camera trapping site (Map 17). A total of 42 independent visits were recorded during the current survey, with spot pattern analysis identifying at least eight individuals. Six triggers did not capture sufficient detail to conclusively identify the quoll at an individual level and were unable to be utilised for spot pattern analysis. In addition to individual quolls captured on motion cameras, two northern quoll individuals (one female, one male) were trapped at systematic trapping site WNDP02 during the phase one detailed survey. Spot pattern profiles associated with trapped animals were compared to those captured on motion cameras; however, no matches were identified, and all animals are considered to represent new individuals.

Previous Surveys

Stantec (2021) recorded the northern quoll on 31 occasions, across 18 locations within the Elevation-Hendrix-Boolgeeda deposit during previous surveys. Records obtained by Stantec (2021) include 26 motion camera visits and five scat records. An additional 83 northern quoll records were recorded by *ecologia* (2023b) at Elevation-Hendrix, comprising 25 cage trap captures and 58 motion camera visits. Of the 25 cage trapped quolls, thirteen individuals (11 males, two females) were identified, with one individual was unable to be identified and 11 captures represented recaptures of previously trapped individuals. Northern quolls were

recorded across four camera trapping transects and three cage trapping transects in the southern half of the survey area.

A total of 421 northern quoll records were obtained during previous surveys within the Wyloo deposit by *ecologia* (2022c). Northern quoll records obtained include 22 captures, 383 motion camera trap visits and three secondary (scat) observations. At least 13 individual quolls (nine males, four females) were identified from trap captures, with some individuals recaptured on two or more occasions. Spot pattern analysis indicates that a total of seventeen distinct individuals were recorded across four camera transects, with three individuals captured via both cage and camera traps.

GHD (2020) recorded the northern quoll at seven locations within the survey area and Biologic (2013) recorded the northern quoll on three occasions at a single location. Spectrum Ecology (2022) recorded the northern quoll on 25 occasions across three monitoring camera traps.

Northern quoll records and critical habitat mapping are outlined in Map 17.

Critical Habitat, Supporting Habitat and Important Populations within the Survey Area

Based on the number of individuals identified and frequency of detections recorded during current and previous surveys, the survey area appears to support two high density, reproductive clusters of northern quoll individuals which are likely to represent one or more populations important for the long-term survival of the species. One cluster of records is located in the western half of the Wyloo deposit and the other spans across the Elevation-Hendrix-Boolgeeda deposit. Insufficient information is currently available to determine whether these clusters represent separate populations or whether a genetic linkage is present between these areas and it is therefore not feasible to comment on the local and regional significance of the population/s.

Rocky Escarpments (6,540 ha) and Gorge/Gully (1,126 ha) habitat within the survey area provide critical denning habitat for the northern quoll, as delineated in Map 17 (Table 26). Additionally, Hills/Range/Plateaux (2,367.05 ha) habitat in the western portion of the Wyloo deposit is considered to represent critical habitat for the species, due to the high concentration of northern quoll records in this area (Table 26).

Dispersal and foraging habitats associated with, or connecting, populations important for long-term survival of the northern quoll also represent critical habitat (Commonwealth of Australia, 2016). Therefore, Hill/Range/Plateaux, Lower Slopes and Hillslopes and Drainage Line/River/Creek (major) habitat linking the Wyloo and Elevation-Hendrix-Boolgeeda deposits may also represent critical foraging and dispersal habitat for the northern quoll (Table 26).

Table 26: Critical and supporting habitat for the northern quoll within the survey area.

Habitat type	Details	Area (ha)
Critical habitat		
Rocky Escarpments	Denning habitat	6,540
Gorge/Gully	Denning habitat	1,126
Hills/Range/Plateaux (western portion of Wyloo deposit)	Dispersal and foraging habitat	2,367
Total		**10,033**
Supporting habitat		
Drainage Line/River/Creek (major)	Dispersal and foraging habitat	2,232
Lower Slopes/Hillslopes	Dispersal and foraging habitat	2,898
Hills/Range/Plateaux	Dispersal and foraging habitat	14,702
Total		**19,832**

116.3583°E 116.4431°E 116.5278°E 116.6125°E 116.6972°E 116.7819°E 116.8667°E

22.4764°S

22.5611°S

22.6458°S

Survey area

Wyloo North (2025)
- Northern quoll

Elevation-Hendrix (2023)
- Northern quoll

Wyloo (2022)
- Northern quoll

DBCA database
- Northern quoll

Fortescue Plant and Animal Register
- Northern quoll

FMG database
- Northern quoll

Critical habitat
- Gorges/Gullys
- Hills/Ranges/Plateaux
- Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)

Dispersal and foraging habitat
- Drainage Line/River/Creek (major)
- Hills/Ranges/Plateaux
- Lower slopes/hillslopes

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Project No.: 1995
Author: SP
Created Date: 3 June 2025
Coordinate System: GCS GDA 1994
Scale: 1:150,000 @A3

Map 17: Northern quoll records, critical habitat and supporting habitat within the survey area.

Earthstar Geographics

0 2 3 5 10 Kilometers

N

5.5.2.2 Pilbara leaf-nosed bat (*Rhinonicteris aurantia*) – Vulnerable EPBC Act and BC Act

Ecology and Distribution

This small insectivorous bat occurs throughout the Pilbara and adjacent upper Gascoyne regions of Western Australia (Threatened Species Scientific Committee, 2016b). The species was listed under the EPBC Act as Vulnerable in April 2001 as it had undergone a substantial reduction in numbers, its geographic distribution is precarious for its survival (being limited to the Pilbara), the estimated total number of mature individuals is limited, and the number is likely to continue to decline.

The Pilbara leaf-nosed bat has very restrictive habitat requirements, including caves and disused mines with hot to very hot and humid roost sites with temperatures in the 28° to 32°C range and 96% to 100% relative humidity (Armstrong, 2001; S. Churchill, 2008). During the Pilbara dry, winter months, preceding the heavy summer rains, Pilbara leaf-nosed bat colonies are thought to contract to the deepest mines and caves that maintain microclimates suitable for roosting (Armstrong, 2001; Bullen & McKenzie, 2011; Steve Van Dyck & Strahan, 2008). During the hotter, wetter and more humid summer months, the species has a greater ability to disperse through the landscape. The Pilbara leaf-nosed bat has been observed foraging in a variety of habitats including *Triodia* hummock grasslands covering low rolling hills and shallow gullies, with scattered *Eucalyptus camaldulensis* along the creeks (DoE, 2023b). This species is most commonly encountered over small pools of water in rocky gullies and gorges (DoE, 2023b).

Occurrence within the Survey Area

Current Survey

During the current survey, the Pilbara leaf-nosed bat was recorded at seven sites across a total of 12 nights (Map 18) (Appendix C). The species was recorded at one site in the Drainage Line/River/Creek (major), Gorge/Gully, Hummock Grassland, Rocky Escarpments and Shrubland (open) habitat types and two sites within Hills/Range/Plateaux habitat type. Detection rates were low, with a total of 82 passes recorded across all sites, and all call times recorded were either well after sunset or well before sunrise. Call patterns recorded during the current survey do not indicate the presence of a nearby roost, with no low time calls (<1 hour civil twilight) recorded. The lowest-time calls recorded during the current survey were detected 64 prior to civil twilight (sunrise) at site WNDP14 (Map 18). Pilbara leaf-nosed bat call times recorded during the current survey are summarised in Appendix J.

Previous Surveys

The Pilbara leaf-nosed bat was recorded at 12 locations during targeted surveys undertaken by Stantec (2021), 10 locations in the Elevation-Hendrix deposits during surveys previously completed by *ecologia* (2023b) and 42 sites within the Wyloo deposit during previous surveys conducted by *ecologia* (2022c).

Low-time calls (<30 minutes after/before civil twilight) were recorded at two semi-permanent waterbodies (WBD02, WBD13) in August 2021 during a previous detailed survey undertaken by *ecologia* (2022c). In November 2021, an ARU situated adjacent to a semi-permanent waterbody (WBD20) recorded a large number of call sequences on two successive nights. Calls were recorded a few minutes after and before the end of civil twilight indicating that a diurnal roost site may be located relatively close to this location (Specialised Zoological, 2022). The relatively high number of echolocation sequences recorded at the semi-permanent pool, in conjunction with elevated activity levels shortly after dusk and immediately prior to dawn, were consistent with patterns typically recorded at sites located near water sources and are not necessarily indicative of a nearby roost site (Specialised Zoological, 2022). Subsequent targeted surveys did not record

any low time calls indicating that this area may be used for transitory visitation rather than permanent occupancy.

Thirty additional records of the Pilbara leaf-nosed bat were recorded at 18 sites within the survey area by GHD (2020). GHD (2020) recorded low-time Pilbara leaf-nosed bat calls on multiple consecutive nights at one location within the survey area (DS13) and two locations adjacent to the survey area (DS23 and DS34) during the dry season (July/August). Additional low-time calls were also recorded within 30 minutes of dusk at sites DS21 and DS32; however, low-time calls were not consistently detected at these sites.

Ecoscape Australia (2018) recorded the Pilbara leaf-nosed bat at seven locations during their first targeted survey, with four sites adjacent to Pinarra Creek recording calls within two hours of sunrise. The second targeted survey suggested that a series of diurnal and nocturnal roost caves occur along Pinarra Creek, adjacent to the current survey area. Based on the call patterns recorded at two sites (EPDE-Bat 2-15 and EPDE-Bat 2-19), Ecoscape Australia (2018) concluded that these caves may be utilised as a diurnal roost site by a small number of Pilbara leaf-nosed bats, with several other caves classified as nocturnal roost sites {Ecoscape Australia, 2018 #2028}. Although these sites are located outside the survey area, no Pilbara leaf-nosed bat calls were recorded on bat detectors deployed within Pinarra Creek during the current surveys.

No low-time calls (<1 hour civil twilight) were recorded during surveys undertaken by *ecologia* (2023b) or Stantec (2021) within the Elevation-Hendrix-Boolgeeda deposits.

Pilbara leaf-nosed bat records and critical habitat mapping are shown in Map 18. Pilbara leaf-nosed bat call times recorded during previous surveys are summarised in Appendix K.

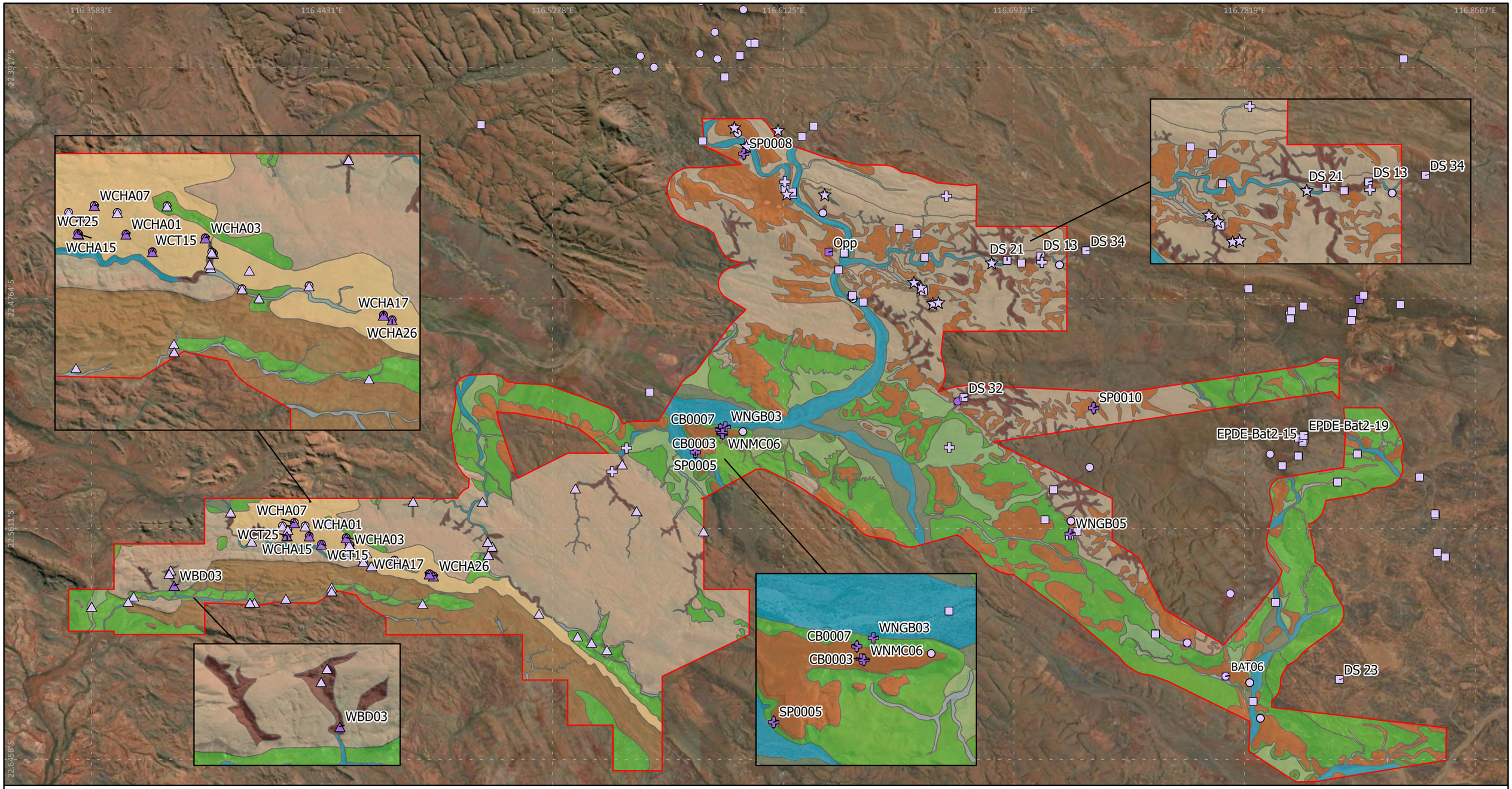
Critical Habitat and Supporting Habitat within the Survey Area

The regular detection of low-time calls recorded by GHD (2020) at three sites in and immediately adjacent to the survey area suggests that one or more diurnal Pilbara leaf-nosed bat roosts may be present in the local area. This finding is supported by calls recorded by Biologic (2013) who recorded a small number of low-time calls (<1 hour of sunset) in the eastern portion of the survey area; however, low-time calls were not recorded on multiple consecutive nights during the surveys undertaken between 2021 and 2024. Although target areas for a potential roost were identified by both GHD (2020) and Biologic (2013), current and previous surveys (*ecologia*, 2023b; Stantec, 2021) failed to record low-time calls in this portion of the survey area and it is possible that the potential roost site is transitory or has subsequently been abandoned. If conditions change in the future and the Western Pilbara experiences a period of sustained rainfall, it is possible that the bats utilising this area in the past may return.

Rocky Escarpment (6,540 ha) and Gorge/Gully (1,126 ha) habitat within the survey area represent critical roosting habitat for the Pilbara leaf-nosed bat (Table 27). Based on the regular detection rates and distribution of Pilbara leaf-nosed bat records across current and previous surveys, all habitat types within the survey area are likely to provide priority foraging habitat for the Pilbara leaf-nosed bat. Rocky habitats within the survey area represent either Priority 1 and 2 (Gorge/Gully) or Priority 3 (Hills/Range/Plateaux and Rocky Escarpments) foraging habitats for the Pilbara leaf-nosed bat (Table 27). Drainage Line/River/Creek (major/minor) provide Priority 4 foraging habitats and Priority 5 habitats (Hummock Grassland, Lower Slopes/Hillslopes, Plain (alluvial) and Shrubland (open)) may also be utilised by the Pilbara leaf-nosed bat while foraging (Table 27). All habitat types may be utilised by the species during dispersal (Table 27).

Table 27: Critical and supporting habitats utilised by the Pilbara leaf-nosed bat.

Habitat type	Details	Area (ha)
Critical habitat		
Rocky Escarpments	Roosting, dispersal and Priority 3 foraging habitat	6,540
Gorge/Gully	Roosting, dispersal and Priority 1/Priority 2 foraging habitat	1,126
Total		**7,666**
Supporting habitat		
Hills/Range/Plateaux	Dispersal and foraging habitat - Priority 3	17,069
Lower Slopes/Hillslopes	Dispersal and foraging habitat- Priority 3	2,898
Drainage Line/River/Creek (major)	Dispersal and foraging habitat - Priority 4	2,232
Drainage Line/River/Creek (minor)	Dispersal and foraging habitat - Priority 4	580
Hummock Grassland	Dispersal and foraging habitat - Priority 5	10,345
Plain (alluvial)	Dispersal and foraging habitat - Priority 5	902
Shrubland (open)	Dispersal and foraging habitat - Priority 5	2,251
Total		**36,277**



Survey area

Wyloo North (2025)
- Ghost bat
- Pilbara leaf-nosed bat
- Ghost bat (secondary evidence)

Elevation-Hendrix (2023)
- Pilbara leaf-nosed bat

Wyloo (2022)
- Pilbara leaf-nosed bat
- Ghost bat

Elevation- Hendrix-Boolgeeda (2022)
- Ghost bat

Fortescue database
- Pilbara leaf-nosed bat
- Ghost bat

DBCA database
- Ghost bat
- Pilbara leaf-nosed bat

Critical habitat
- Gorges/Gullys - Priority 1/2
- Hills/Ranges/Plateaux- Priority 3
- Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways) - Priority 3

Foraging and dispersal habitat
- Drainage Line/River/Creek (major) - Priority 4
- Drainage Line/River/Creek (minor) - Priority 4
- Hills/Ranges/Plateaux - Priority 3
- Lower slopes/hillslopes - Priority 5
- Plain (alluvial) - Priority 5
- Hummock Grassland - Priority 5
- Shrubland (open) - Priority 5

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Project No.: 1995
Author: SP
Created Date: 04 June 2025
Coordinate System: GCS GDA 1994
Scale: 1:150,000 @A3

Map 18: Pilbara leaf-nosed bat and ghost bat records, critical habitat and supporting habitat within the survey area.

Earthstar Geographics

0 2 3 5 10 Kilometers

5.5.2.3 Ghost bat (*Macroderma gigas*) - Vulnerable EPBC Act and BC Act

Ecology and Distribution

The ghost bat is the largest microchiropteran bat in Australia, is strictly carnivorous and captures its prey mainly on the ground before returning to an established feeding site to devour its catch (Steve Van Dyck & Strahan, 2008). The diet of this species includes amphibians, reptiles, birds, small terrestrial mammals, insects and other bats (Steve Van Dyck & Strahan, 2008). Unlike other microchiropterans, the ghost bat does not continuously call when in flight and instead uses its eyes and ears to scan for prey (Steve Van Dyck & Strahan, 2008). Females reach reproductive maturity between two and three years of age (Hoyle, Pople, & Toop, 2001).

The ghost bat was historically distributed across much of Australia but now has a fragmented although widespread distribution restricted to northern Australia (Threatened Species Scientific Committee, 2016a). Following European settlement, the distribution of this species contracted northward with arid zone populations undergoing the greatest contractions (Threatened Species Scientific Committee, 2016a). Ghost bat populations are highly structured and are considered to be genetically distinct at both local and regional scales (Threatened Species Scientific Committee, 2016a).

Occurrence within the Survey Area

The ghost bat has been recorded through primary observations on four occasions (two roost sightings and two acoustic lure records), ARU recordings on 10 occasions and secondary evidence (middens) on eight locations.

Current survey

During phase one of the detailed survey, the ghost bat was recorded at two acoustic lure sites (WNGB03 and WNGB05) (Table 28, Map 18, Appendix J). Ghost bats were recorded roosting in cave CB0003 (adjacent to site WNGB003) and ghost bat middens were recorded in five caves (SP0010, SP0008, SP0005, CB0007 and WNMC06) within the survey area during the current targeted surveys (Table 28, Map 18).

Table 28: Ghost bat records from current survey.

Site ID	Notes
CB0003	Ghost bats recorded roosting in rear of cave.
SP0005	Ghost bat scat
SP0008	Ghost bat scat and feeding debris
SP0010	Ghost bat scat and feeding debris
CB0007	Multiple ghost bat middens present
WNMC06	Midden
WNGB03	Ghost bat lure video recording
WNGB05	Ghost bat lure call recording

Previous surveys

Ghost bat echolocation and social calls were recorded by *ecologia* (2022c) on three consecutive evenings in 2021 at site WBD03, adjacent to a semi-permanent pool (Map 18). A single echolocation sequence was recorded within 60 minutes of sunset, with all other calls recorded well after sunset/before sunrise. Although call times and activity levels recorded do not indicate the presence of a diurnal roost adjacent to site WBD03, repeated visitations to this site over three successive nights suggests regular usage of Gorge/Gully habitat within the survey area by this species. Ghost bat echolocation and social calls were recorded at eight cave entrances within

the Wyloo deposit during the 2022 targeted surveys across thirteen nights (57 audio files), with calls consistently recorded at cave WCHA17 (entrances A and B) on four evenings (23 audio files) (Map 18, Table 29).

Stantec (2021) recorded the ghost bat at four locations in 2021, through a combination of echolocation recordings (one site), opportunistic sightings (one individual) and scat (three sites) (Table 29). A ghost bat midden was opportunistically recorded by GHD (2020) within a cave adjacent to Duck Creek (Table 29), with an additional three middens and nine potential roost caves recorded by GHD in the vicinity of the survey area.

Ghost bat records and habitat mapping are shown in Map 18. Ghost bat records from previous surveys are shown in Appendix K.

Table 29: Ghost bat records from previous surveys.

Site ID	Notes
Wyloo (ecologia, 2022c)	
WCHA01	Two ghost bat calls recorded at cave entrance on a single night.
WCHA03	Single ghost bat call recorded at cave entrance on first night and 15 calls recorded on second night.
WCHA07	Two ghost bat calls recorded at cave entrance on a single night.
WCHA15	Three ghost bat calls recorded at cave entrance on a single night.
WCHA17	Ghost bat call sequences recorded at both cave entrances over four nights. Eighteen sequences recorded on one night, with 1-2 sequences recorded all other nights. Calls recorded all through night, including within 1 hour of sunrise.
WCHA26	Two ghost bat calls recorded at cave entrance on a single night.
WCT15	Single ghost bat call recorded at cave entrance on a single night.
WCT25	Eight ghost bat calls recorded at cave entrance on a single night.
WBD03	Social and echolocation calls recorded at a water body on three evenings.
Elevation-Hendrix-Boolgeeda (Stantec, 2021)	
Opportunistic	Midden
Opportunistic	Midden
Opportunistic	Ghost bat recorded roosting in cave.
BAT06	Echolocation calls recorded on three nights. Midden also recorded at this site.
Western Hub (GHD, 2020)	
Opportunistic	Midden in shallow cave.

Critical Habitat and Supporting Habitat within the Survey Area

Gorge/Gully (1,126 ha) and Rocky Escarpment (6,540 ha) habitats within the survey area encompass geologies suitable to support the presence of diurnal ghost bat roosts, representing critical habitat for the species (Map 18, Table 30). The records obtained to date indicate that at least three caves (CB0003, WCHA17 and one opportunistic site recorded by (Stantec, 2021)) within the survey area provide diurnal roosting habitat for the species, with an additional 16 caves representing nocturnal shelter and potential roosting habitat based on the presence of middens and/or echolocation call recordings at cave entrances.

Four middens and two primary sightings (one on a ghost bat lure and two individuals in cave CB0003) have been recorded adjacent to Duck Creek during the current survey, with an additional four middens identified within five kilometres of Duck Creek by GHD (2020). The concentration of ghost bat records in this area indicates that rocky habitats surrounding Duck Creek may represent important ghost bat roosting habitat; however, suitable caves for the species have also been recorded elsewhere in the survey area.

Based on the abundance and distribution of records obtained during current and previous surveys, the ghost bat is likely to forage and disperse across the majority of the survey area, with

the Drainage Line/River/Creek (major) habitat type (2,232 ha) providing critical foraging and dispersal habitat for the species. Similarly, Hills/Range/Plateaux habitat (1,508 ha) in the western portion of the Wyloo deposit represents critical foraging and dispersal habitat for the ghost bat due to the high concentration of records detected in this region.

Table 30: Critical and supporting habitat for the ghost bat.

Habitat type	Details	Area (ha)
Critical habitat		
Rocky Escarpments	Roosting, dispersal and foraging habitat	6,540
Gorge/Gully	Roosting, dispersal and foraging habitat	1,126
Drainage Line/River/Creek (major)	Dispersal and foraging habitat	2,232
Hills/Range/Plateaux (western portion of Wyloo deposit)	Dispersal and foraging habitat	1,508
Total		**11,406**
Supporting habitat		
Hills/Range/Plateaux	Dispersal and foraging habitat	15,561
Lower Slopes/Hillslopes	Dispersal and foraging habitat	2,898
Drainage Line/River/Creek (minor)	Dispersal and foraging habitat	580
Hummock Grassland	Dispersal and foraging habitat	10,345
Plain (alluvial)	Dispersal and foraging habitat	902
Shrubland (open)	Dispersal and foraging habitat	2,251
Total		**32,537**

5.5.2.4 Pilbara olive python (*Liasis olivaceus barroni*) - Vulnerable EPBC Act and BC Act

Ecology and Distribution

The Pilbara subspecies of the olive python only occurs in the ranges of the Pilbara region of Western Australia. It inhabits watercourses and areas of permanent water in rocky gorges and gullies (Pearson, 2003). This subspecies is an adept swimmer, often hunting in water, feeding on a variety of vertebrates such as rock wallabies, fruit bats, ducks and pigeons. Individuals spend the cooler winter months sheltering in caves and rock crevices. In the warmer months the pythons can move widely, usually in close proximity to water and rock outcrops (DEWHA, 2008). Radiotelemetry of individuals has found that they occupy a distinct home range, with males travelling long distances (up to 4 km) to locate and mate with females (Pearson, 2003).

Population size estimates are difficult due to the olive python's cryptic nature and lack of reliable trapping or census techniques (DEWHA, 2008). The main threats to this subspecies come from predation by feral cats and foxes, particularly of juveniles, competition with foxes for food, and destruction of habitat (Pearson, 2003).

Occurrence within the Survey Area

Current survey

No Pilbara olive pythons were records during the current survey.

Previous surveys

Although the Pilbara olive python was not recorded during the current survey, Stantec (2021) recorded the species on five occasions across three locations within the Rocky Escarpment, Lower Slopes/Hillslopes and Drainage Line/River/Creek (major) habitat types.

Pilbara olive python records and critical habitat mapping is provided in Map 19.

Critical Habitat and Supporting Habitat within the Survey Area

Gorge/Gully (1,126 ha) and Rocky Escarpment (6,540 ha) habitat types within the survey area represent critical habitat for the Pilbara olive python due to the presence of rock crevices and outcrops near water holes (Table 31). Similarly, Drainage Line/River/Creek (major) (2,232 ha) habitat within the survey area provides critical dispersal and foraging habitat for the species, due to the presence of permanent and semi-permanent pools within this habitat type (Table 31). The Pilbara olive python has a highly transitory nature and may disperse and forage across all habitat types.

Table 31: Critical and supporting habitat for the olive python.

Habitat type	Details	Area (ha)
Critical habitat		
Rocky Escarpments	Dispersal and foraging habitat	6,540
Gorge/Gully	Breeding, dispersal and foraging habitat	1,126
Drainage Line/River/Creek (major)	Dispersal and foraging habitat	2,232
Total		**9,898**
Supporting habitat		
Hills/Range/Plateaux	Dispersal and foraging habitat	17,069
Lower Slopes/Hillslopes	Dispersal and foraging habitat	2,898
Drainage Line/River/Creek (minor)	Dispersal and foraging habitat	580
Hummock Grassland	Dispersal and foraging habitat	10,345
Plain (alluvial)	Dispersal and foraging habitat	902
Shrubland (open)	Dispersal and foraging habitat	2,251
Total		**34,045**

116.3583°E 116.4431°E 116.5278°E 116.6125°E 116.6972°E 116.7819°E 116.8667°E

22.3917°S

22.4764°S

22.5611°S

22.6458°S

Survey area

DBCA database

- Pilbara olive python

Fortescue database

- Pilbara olive python

Fortescue Plant and Animal Register

- Pilbara olive-python

Critical habitat

- Drainage Line/River/Creek (major)
- Gorges/Gullys
- Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)

Foraging and dispersal habitat

- Drainage Line/River/Creek (minor
- Hills/Ranges/Plateaux
- Lower slopes/hillslopes
- Plain (alluvial)
- Hummock Grassland
- Shrubland (open)

ecologia ENVIRONMENT

Project No.: 1995
Author: SP
Created Date: 4 June 2025
Coordinate System: GCS GDA 1994
Scale: 1:150,000 @A3

Map 19: Pilbara olive-python records and critical habitat within the study area.

Earthstar Geographics

0 2 3 5 10 Kilometers

N

5.5.2.5 Fork-tailed swift (*Apus pacificus*) – Migratory EPBC Act and BC Act

Ecology and Distribution

The fork-tailed swift is a migratory, almost exclusively aerial species that, in its non-breeding area in Australia, is independent of terrestrial habitats. The fork-tailed swift migrates to Australia from its breeding areas in Siberia in October and returns by the end of April (Higgins, 1999). They forage along the edge of low-pressure systems which help lift insect prey and assist in flight.

Occurrence within the Survey Area

Although not recorded during the current survey, this species was recorded overflying the Wyloo deposit during previous surveys conducted by (*ecologia*, 2022c). According to database searches, the fork-tailed swift has previously been recorded three occasions within 50 kilometres of the survey area; however, has not previously been recorded within the survey area.

Fork-tailed swift records are shown in Map 20.

Habitat within the Survey Area

This species is an aerial specialist which does not utilise terrestrial habitats and this record represents intermittent visitation through the airspace above the survey area rather than an indication of permanent occupancy. Critical habitat for this species does not occur within the survey area.

5.5.2.6 Osprey (*Pandion cristatus*) – Migratory EPBC Act and BC Act

Ecology and Distribution

The osprey is a large (50-60 cm), highly visible and water-dependent bird of prey with a world-wide distribution (Henny, 1986; Wink, Sauer-Guerth, & Witt, 2004). It occurs around most of the Australian coastline, inhabiting coastal areas and favouring mangroves, rivers and estuaries, inshore seas as well as coastal islands (Simpson & Day, 2004). The species is uncommon to rare or absent from closely settled parts of south-eastern Australia and does not occur in Victoria or Tasmania.

The osprey feeds mostly on fish, but also on sea snakes, seabirds, turtles, amphibians and large lizards as well as invertebrates such as crustaceans, sea snails and beetles (Henny, 1986; Johnstone & Storr, 1998). Breeding takes place from autumn to spring, eggs being laid in April in the north and as late as October in the south of Australia. Osprey nests are large and usually placed at the tops of trees, prominent headlands or communication towers (Henny, 1986; Simpson & Day, 2004). Some nests are re-used for decades (Morcombe, 2010).

Occurrence within the Survey Area

This species was not recorded during the current survey; however, was previously recorded in the survey area by *ecologia* (2015a).

Osprey records are shown in Map 20.

Habitat within the Survey Area

The osprey is a Migratory species which is highly dependent on water and is typically associated with coastal areas. The sighting recorded by *ecologia (2015a)* was associated with the northern section of Duck Creek and utilisation of habitat within the survey area is likely to represent vagrant

visitation to inland waterbodies, rather than permanent occupancy. Critical habitat for this species does not occur within the survey area.

5.5.2.7 Peregrine falcon (*Falco peregrinus*) – Other Specially Protected Fauna BC Act

Ecology and Distribution

This species is widespread in Australia but requires specific nesting sites. It does not build a nest but requires cliffs, rocky outcrops, or large tree hollows (Johnstone & Storr, 1998). Suitable breeding habitat has the potential to occur in the survey area in the form of tree hollows and breakaways; however, due to its widespread movements, the species may also overfly all habitats of the survey area intermittently. Peregrine falcons feed almost entirely on birds, especially ducks, parrots, and pigeons.

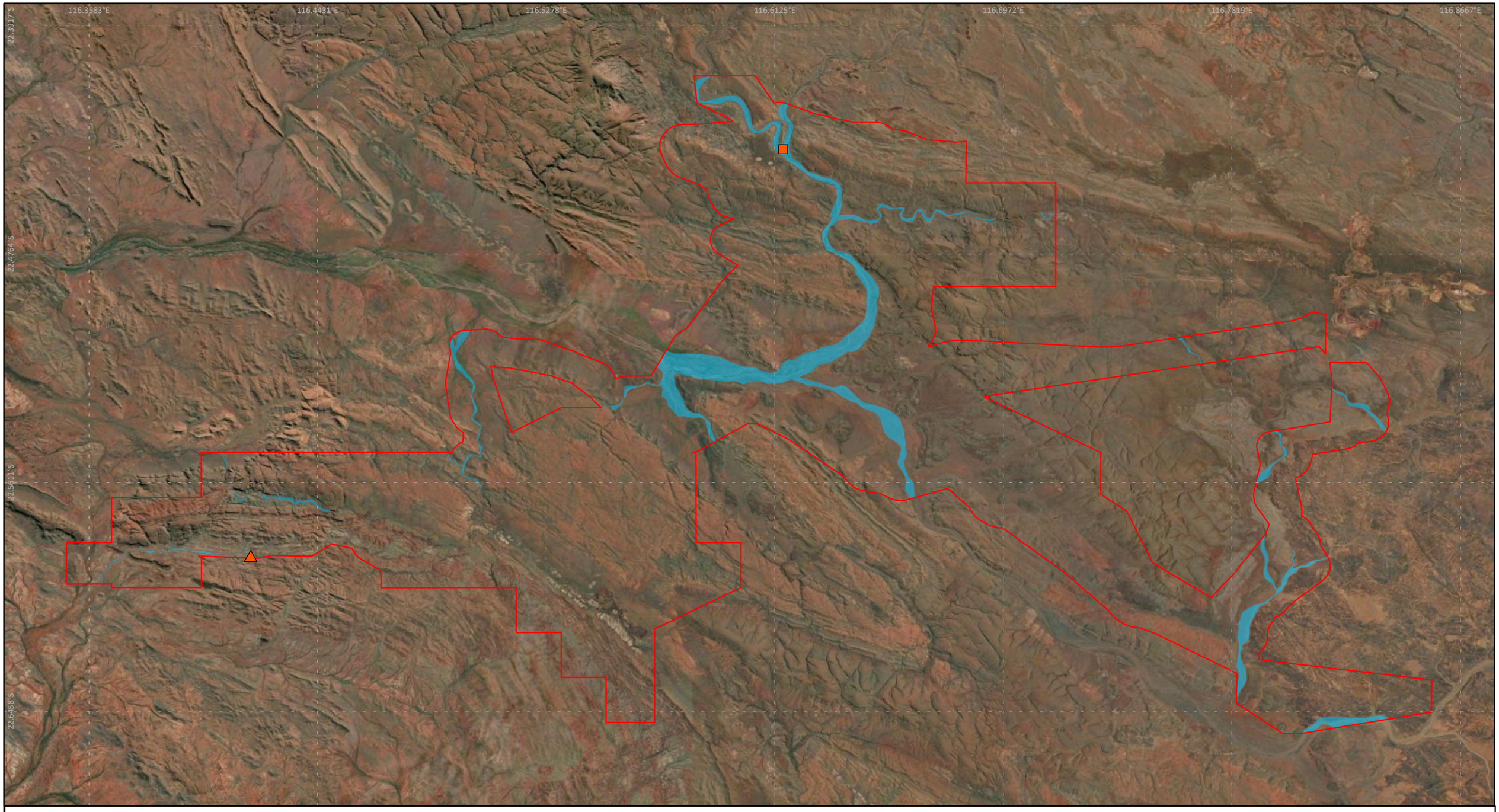
Occurrence within the Survey Area

Although the peregrine falcon was not recorded during the current survey, the species was previously recorded within the survey area by *ecologia* (2023b) and Stantec (2021). Two individuals were recorded by Stantec (2021) nesting at one location in rocky habitat, with a large accumulation of whitewash recorded on the gorge walls.

Peregrine falcon records are shown in Map 21.

Habitat within the Survey Area

Rocky Escarpment habitat within the survey area supports large cliffs and overhangs suitable for breeding and roosting activities. The species was previously recorded nesting in this habitat type by Stantec (2021), and Rocky Escarpments within the survey area encompass suitable breeding habitat for the species. The species has the potential to utilise all habitat types while foraging or transiting.



Survey area

Wyloo (2022)

Fork-tailed swift

Fortescue database

Osprey

Habitat

Drainage Line/River/Creek (major)

ecologia ENVIRONMENT

Project No.: 1995
Author: SP
Created Date: 4 June 2025
Coordinate System: GCS GDA 1994
Scale: 1:150,000 @A3

Map 20: Migratory bird records and habitat within the survey area.

Earthstar Geographics

0 2 3 5 10 Kilometers

116.3683°E 116.4431°E 116.5278°E 116.6125°E 116.6972°E 116.7819°E 116.8667°E

22.3917°S

22.4764°S

22.5611°S

22.6458°S

Survey area

Fortescue database

Peregrine falcon

DBCA database

Peregrine falcon

Habitat

Drainage Line/River/Creek (major)

Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)

ecologia ENVIRONMENT

Project No.: 1995
Author: SP
Created Date: 4 June 2025
Coordinate System: GCS WGS 1984
Scale: 1:150,000 @A3

Map 21: Peregrine falcon records and suitable habitat within the survey area.

Earthstar Geographics

0 2 3 5 10 Kilometers

N

5.5.2.8 Gane's blind snake (*Anilios ganei*) – Priority 1

Ecology and Distribution

Very little is known about this elusive blind snake due to its fossorial lifestyle. Blind snakes are exclusively insectivorous, and like other members of their genus, *Anlios ganei* is believed to burrow into social insect colonies to feed on termites and ants, as well as their eggs and pupae (Wilson and Swan 2021). The species has been found within the Pilbara region between Newman and Pannawonica (Wilson and Swan 2021). It has been suggested that they prefer to live in subterranean habitats near moist gullies and gorges (Wilson and Swan 2021), although there are records from sandy soil vegetated with spinifex and mulga woodland.

Occurrence within the Survey Area

The Gane's blind snake was recorded on one occasion during the current survey (WNDP15) within the Gorge/Gully habitat type. This species was not recorded during previous surveys at the Elevation-Hendrix-Boolgeeda or Wyloo deposits (*ecologia*, 2022c, 2023b; Stantec, 2021); however, has previously been recorded in the vicinity of the survey area (GHD, 2020).

Gane's blind snake records are shown in Map 22.

Habitat within the Survey Area

Hills/Ranges/Plateaux, Hummock Grassland, Gorge/Gully and Drainage Line/River/Creek (major) habitat types within the survey area may encompass suitable habitat for the Gane's blind snake. Suitable habitat for the Gane's blind snake is not restricted within the survey area and the known distribution of the species extends well beyond the confines of the survey area.

5.5.2.9 Lined soil-crevice skink (*Notoscincus butleri*) – Priority 4

Ecology and Distribution

Found in habitat typically dominated by spinifex near creeks and river margins (Wilson and Swan 2021) this species was once thought to be restricted to near coastal Pilbara in the vicinity of Dampier. Recent records of this species have expanded its distribution from Karratha south to the survey area.

Occurrence within the Survey Area

The lined soil-crevice skink was recorded at two sites during the current survey (WNDP08 and WNDP16) within the Hummock Grassland habitat type. The lined soil-crevice skink was also recorded on six occasions across two sites during previous surveys at Elevation-Hendrix (*ecologia*, 2023b) and three occasions from two sites during previous surveys at Wyloo (*ecologia*, 2022c).

Lined soil-crevice skink records are shown in Map 22.

Habitat within the Survey Area

Hummock Grassland, Hills/Ranges/Breakaways and Drainage Line/River/Creek (minor) habitat types within the survey area provide suitable habitat for the lined soil-crevice skink. This species has been recorded throughout the Hamersley Ranges and is not considered to be restricted to the survey area.

5.5.2.10 Western pebble-mound mouse (*Pseudomys chapmani*) – Priority 4

Ecology and Distribution

The western pebble-mound mouse constructs distinctive mounds of pebbles around their burrows (S. D. Anstee, Roberts, & O'Shea, 1997). The species has a fragmented distribution in the Pilbara, but is known to have a preference for hilly and/or rocky landscapes (S. Anstee & Armstrong, 2001; Ford & Johnson, 2007). When first described, it was considered that the range and abundance of this species had decreased dramatically. Since that time, it has been recorded on numerous occasions and is considered common and widespread in the bioregion.

Occurrence within the Survey Area

Active mounds belonging to the western pebble-mound mouse were recorded on three occasions within the Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways) habitat type during the current survey. One additional inactive mound was recorded during previous surveys at Elevation-Hendrix (*ecologia*, 2023b) and six mounds (four inactive, two active) were recorded during previous surveys at Wyloo (*ecologia*, 2022c). One additional western pebble-mound mouse mound was recorded in the Hummock Grassland habitat type by Biologic (2013) during their Western Hub surveys.

Western pebble-mound mouse records are shown in Map 22.

Habitat within the Survey Area

Pebbles of a suitable size for mound construction are found within the Rocky Escarpments, Hills/Range/Plateaux and Hummock Grassland habitat types. This species is considered locally widespread and suitable habitat extends well beyond the survey area.

5.5.2.11 Fortescue grunter (*Leiopotherapon aheneus*) – Priority 4

Ecology and Distribution

The Fortescue grunter belongs to the Terapontidae family of fish, and is endemic to the Pilbara region of Western Australia (Allen et al., 2002). The species is found in slow to fast flowing streams and pools (Allen et al., 2002), and shows a preference for unstable sections of the catchment such as ephemeral pools (Beesley, 2006). The species is only found in the Fortescue, Robe and Ashburton rivers (Beesley, 2006).

Occurrence within the Survey Area

Although the Fortesue grunter was not recorded during the current or previous surveys, the species was recorded by *ecologia* (2015a) in the northern section of Duck Creek. There are 17 additional records of the Fortescue grunter located within 50 kilometres of the survey area.

Fortescue grunter records are shown in Map 22.

Habitat within the Survey Area

Drainage Line/River/Creek (major) habitat associated with Duck Creek and Boolgeeda Creek provide suitable habitat for the Fortescue grunter during periods of seasonal inundation.

116.3583°E 116.4431°E 116.5278°E 116.6125°E 116.6972°E 116.7819°E 116.8667°E

22.3917°S 22.4764°S 22.5611°S 22.6458°S

Survey area

Wyloo North (2025)
- Gane's blind snake
- Lined soil-crevice skink
- Western pebble-mound mouse

Elevation-Hendrix (2023)
- Lined soil-crevice skink
- Western pebble-mound mouse

Wyloo (2022)
- Lined soil-crevice skink
- Western pebble-mound mouse

Fortescue database
- Fortescue grunter
- Lined soil-crevice skink
- Western pebble-mound mouse
- Gane's blind snake

DBCA database
- Fortescue grunter
- Lined soil-crevice skink
- Western pebble-mound mouse
- Gane's blind snake

Habitat type
- Drainage Line/River/Creek (major)
- Drainage Line/River/Creek (minor)
- Gorges/Gullys
- Hills/Ranges/Plateaux
- Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)
- Lower slopes/hillslopes
- Plain (alluvial)
- Hummock Grassland
- Shrubland (open)

ecologia ENVIRONMENT

Project No.: 1995
Author: SP
Created Date: 03 June 2025
Coordinate System: GCS GDA 1994
Scale: 1:150,000 @A3

Map 22: Priority fauna recorded in the survey area.

Earthstar Geographics

0 2 3 5 10 Kilometers

N

5.5.3 Significant Fauna with a High Likelihood of Occurrence

5.5.3.1 Grey falcon (*Falco hypoleucos*) – Vulnerable EPBC Act and BC Act

Ecology and Distribution

The grey falcon (*Falco hypoleucos*) is a stocky, elusive species endemic to mainland Australia and is the rarest of the Australian members of the *Falco* genus (Marchant & Higgins, 1993); (Schoenjahn, 2011b). The total population size is accepted to be <1,000 mature individuals (Schoenjahn, 2011a) and as a result, this species was listed as Vulnerable under the EPBC Act in September 2019. The grey falcon is also listed as Vulnerable under the BC Act.

The grey falcon is a medium-sized raptor, with average body mass for males around 390 grams and for females around 560 grams (Schoenjahn, 2011b). A sleek, grey plumaged falcon with a swift, direct flight pattern, patrolling low over groundcover below treetop level with shallow wing beats and brief glides (Morcombe, 2022). Soars with wings held close to level with dark tipped primaries slightly spread to give a blunt wingtip (Morcombe, 2022).

Grey falcons of all ages feed almost exclusively on birds including doves, pigeons, parrots, cockatoos and finches (Schoenjahn, Pavey, & Walter, 2020). Grey falcons hunt predominantly in open country, often over treeless grassland, which is also a key feeding habitat of prey species (Schoenjahn, 2013) and are well known for hunting over natural and artificial water sources (Schoenjahn, 2018).

The grey falcon is distributed sparsely over parts of Australia's arid and semi-arid zone with climate characteristics appearing to play a crucial role in the species' distribution (Schoenjahn et al., 2020). This species occurs in low densities across inland Australia and is considered to comprise a single, monotypic population (Marchant & Higgins, 1993). The species frequents timbered lowland plains, particularly acacia shrublands that are crossed by tree-lined water courses (Garnett, Szabo, & Dutson, 2011); (Ehmann & Watson, 2008); (Schoenjahn, 2013). The species has been observed hunting in treeless areas and frequents tussock grassland and open woodland, especially in winter (Schoenjahn, 2018); (Olsen & Olsen, 1986).

Grey falcons do not build their own nests and use old stick-nests of other birds, mainly corvids and other raptors in trees or on artificial structures such as telecommunication towers and powerline poles (Schoenjahn et al., 2020); (Johnstone & Storr, 1998). Nesting usually occurs high in the tallest trees in the area usually along watercourses or river pool (Morcombe, 2022) particularly in *Eucalyptus camaldulensis* and *Eucalyptus coolabah* (Threatened Species Scientific Committee, 2020). Breeding takes place between June and November with a clutch size of 2-4, a nestling number of 1-4 and a nestling period of >38 days (Schoenjahn, 2013).

Potential Occurrence within the Survey Area

DBCA database searches indicate that the grey falcon has been recorded on three occasions in the vicinity of the survey area, with the closest record located nearly 15 kilometres north of the survey area. The species was recorded north of the survey area on three occasions during detailed and targeted surveys undertaken by GHD within the Western Hub (GHD, 2020), with at least two birds recorded utilising habitat within Serpentine Creek.

Corvid nests were identified at seven locations within major drainage lines during targeted searches; however, no evidence of nest utilisation by grey falcons was recorded during the current survey. Although the species was not recorded in Drainage Line/River/Creek (major) habitat elsewhere in the survey area, targeted searches for the species within Duck Creek were unable to be conducted due to heritage exclusion restrictions and the potential presence of this species within this portion of the survey area cannot be ruled out. Drainage Line/River/Creek

(major) habitat within the survey area represents potential breeding and foraging habitat for this species.

5.5.4 Significant Fauna with a Moderate Likelihood of Occurrence

5.5.4.1 Long-tailed dunnart (*Antechinomys longicaudata*) – Priority 4

Ecology and Distribution

The long-tailed dunnart is a small, carnivorous marsupial, with a brush-tipped tail that is more than twice its head-body length (Burbidge, McKenzie, & Fuller, 2008). The species feeds on arthropods including beetles, ants, spiders, cockroaches, centipedes, grasshoppers and larvae. It has a long tail with a muscular base that allows it to be held in a variety of positions and probably acts as a balancer. This, along with striated foot-pads and behavioural observations made in captivity indicate that this species is well adapted to climbing (Burbidge et al., 2008). Breeding occurs in spring and summer, and juveniles disperse in March/April (Burbidge et al., 2008).

Long-tailed dunnarts are mostly found in rocky country in the western arid zone and occasionally in open country with a gravel/stony mantle (Burbidge et al., 2008). Although rarely encountered, in Western Australia they occur in the Pilbara, Murchison, north-eastern Goldfields, Ashburton and Gibson Desert regions (Burbidge et al., 2008).

Potential Occurrence within the Survey Area

Database searches identified seven records of the long-tailed dunnart, with the closest record located nearly 20 kilometres east of the survey area. Although the long-tailed dunnart was not recorded during the current or previous surveys, the species is considered moderately likely to occur within rocky habitats (Rocky Escarpments, Hills/Ranges/Plateaux and Gorge/Gully) within the survey area due to the proximity and recency of records and highly cryptic nature of the species.

5.5.4.2 Pilbara barking gecko (*Underwoodisaurus seorsus*) – Priority 2

Ecology and Distribution

The Pilbara barking gecko has only been recorded on ridge tops and in rocky gorges of the Hamersley Range and is currently known from four locations (Doughty & Oliver, 2011; S. Wilson & Swan, 2010, DEC 2013). Little is known of the Pilbara barking geckos ecology, but it is presumably similar to other *Underwoodisaurus* and *Nephrurus* species, which are nocturnal ground dwellers that feed mostly on insects and smaller geckos (S. Wilson & Swan, 2010).

Potential Occurrence within the Survey Area

According to DBCA database searches, the Pilbara barking gecko has been recorded on a single occasion in 2019, with the record located approximately 32 kilometres north of the survey area. Although this species was not recorded within the survey area during current or previous surveys, it is known to occur within the Hamersley range and is highly cryptic. If present, this species may utilise Rocky Escarpment, Gorge/Gully and Hills/Range/Plateaux habitat within the survey area.

6 CONCLUSIONS

The key conclusions from the current terrestrial vertebrate fauna assessment as follows:

- Nine fauna habitat types occur within the survey area: Plain (alluvial), Hills/Ranges/Plateaux, Gorge/Gully, Drainage Line/River/Creek (major), Drainage Line/River/Creek (minor), Lower Slopes/Hillslopes, Hummock Grassland, Shrubland (open) and Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways).
- One hundred and fifty-seven vertebrate fauna taxa were recorded during the current survey, comprising 26 mammals (14 native non-volant species, three introduced species and nine bats), 55 reptiles, 74 birds and two amphibians. An additional 60 species (26 birds, seven mammals, 20 reptiles, two amphibians and five fish) were recorded during previous surveys, for a combined total of 217 species recorded within the survey area. The cumulative assemblage recorded represents 63.8% of the total species assemblage potentially occurring within the survey area based on database searches.
- Species accumulation curves indicate that additional survey effort is unlikely to have resulted in a more diverse fauna assemblage recorded for both trapped vertebrate fauna and avifauna when considering consolidated sampling effort.
- Eleven vertebrate species of significance have been recorded within the survey area: northern quoll (EN), ghost bat (VU), Pilbara leaf-nosed bat (VU), Pilbara olive python (VU), fork-tailed swift (MI), osprey (MI), peregrine falcon (OS), Gane's blind snake (P1), lined soil-crevice skink (P4), western pebble-mound mouse (P4) and Fortescue grunter (P4).
- Rocky Escarpments and Gorge/Gully habitat within the survey area represent critical denning and roosting habitat for the northern quoll, Pilbara olive python, ghost bat and Pilbara leaf-nosed bat. Hills/Range/Plateaux habitat in the western portion of the Wyloo deposit represents critical foraging and dispersal habitat for the northern quoll and ghost bat, with habitat elsewhere in the survey area providing foraging and dispersal habitat for the Pilbara leaf-nosed bat and Pilbara olive python. These rocky habitats also provide suitable habitat for the Gane's blind snake, western pebble-mound mouse, lined soil-crevice skink, peregrine falcon and western pebble-mound mouse.
- Drainage Line/River/Creeks (major) provide dispersal and foraging habitat for the northern quoll, Pilbara leaf-nosed bat, ghost bat and Pilbara olive python. Drainage Line/River/Creeks (major) also represent suitable habitat for the Fortescue grunter, peregrine falcon, lined soil-crevice skink, Gane's blind snake.
- The grey falcon is considered highly likely to occur within the survey area based on proximity of records and presence of potential habitat. Drainage Line/River/Creek (major) habitat within the survey area represents potential breeding, foraging and dispersal habitat for this species.
- Two mammals (long-tailed dunnart [P4] and Pilbara barking gecko [P2]) are considered moderately likely to occur within the survey area. Rocky Escarpments, Hills/Ranges/Plateaux and Gorge/Gully habitat types within the survey area represent potential breeding, foraging and dispersal habitat for these species.

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8 APPENDICES

Appendix A Definitions.

SIGNIFICANT FAUNA

According to the *EPA Factor Guideline: Terrestrial* Fauna (EPA, 2016) animal taxa (or records) may be considered significant for a number of reasons including, but not restricted to, the following:

- A taxon listed as 'Threatened' under the *Biodiversity Conservation Act 2016* (WA) or the *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth);
- A taxon on the Department of Biodiversity, Conservation and Attractions (DBCA) Priority Fauna List;
- Species with restricted distributions;
- Degree of historical impact from threatening processes;
- Providing an important function required to maintain the ecological integrity of a significant ecosystem.

Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) (Cwlth)

At a Commonwealth level, Threatened species are protected under the EPBC Act, which lists species in accordance with the criteria of the International Union for Conservation of Nature (International Union for Conservation of Nature, 2014), that is, 'Critically Endangered', 'Endangered', 'Vulnerable', 'Conservation Dependant', 'Extinct', or 'Extinct in the Wild' (see http://www.environment.gov.au/cgi-bin/sprat/public/publicthreatenedlist.pl?wanted=flora and http://www.environment.gov.au/cgi-bin/sprat/public/publicthreatenedlist.pl?wanted=fauna).

Biodiversity Conservation Act 2016 (Western Australia)

At a State level, Threatened species are protected under the BC Act. These are taxa which have been adequately surveyed and are deemed to be either rare, in danger of extinction, or otherwise in need of special protection in the wild and are gazetted as Threatened (Declared Rare) Flora. Threatened species are further categorised by the Department of Biodiversity, Conservation and Attractions (DBCA) according to their level of threat using the International Union for Conservation of Nature (IUCN) red list criteria ((International Union for Conservation of Nature, 2014) (see https://www.dpaw.wa.gov.au/plants-and-animals/threatened-species-and-communities for definitions).

Priority Fauna (DBCA)

The DBCA maintains a list of Priority species, which are considered poorly known, uncommon or under threat but for which there is insufficient justification to be listed as Threatened, based on known distribution and population sizes. Priority species are assigned to one of four categories, described below. DBCA listed Priority species do not have any statutory protection (see https://www.dpaw.wa.gov.au/plants-and-animals/threatened-species-and-communities/threatened-plants for definitions.)

Appendix B Fauna database search results.

Birdata Species List

Emu
Dromaius novaehollandiae
10 (1.66%)

Black Swan
Cygnus atratus
14 (2.32%)

Hardhead
Aythya australis
8 (1.32%)

Pacific Black Duck
Anas superciliosa
27 (4.47%)

Grey Teal
Anas gracilis
23 (3.81%)

Australian Wood Duck
Chenonetta jubata
1 (0.17%)

Stubble Quail
Coturnix pectoralis
3 (0.50%)

Brown Quail
Synoicus ypsilophorus
13 (2.15%)

Australasian Grebe
Tachybaptus novaehollandiae
12 (1.99%)

Hoary-headed Grebe
Poliocephalus poliocephalus
1 (0.17%)

Rock Dove
Columba livia
1 (0.17%)

Spinifex Pigeon
Geophaps plumifera
123 (20.36%)

Common Bronzewing
Phaps chalcoptera
15 (2.48%)

Flock Bronzewing
Phaps histrionica
2 (0.33%)

Crested Pigeon
Ocyphaps lophotes
154 (25.50%)

Diamond Dove
Geopelia cuneata
140 (23.18%)

Peaceful Dove
Geopelia placida
79 (13.08%)

Pheasant Coucal
Centropus phasianinus
7 (1.16%)

Horsfield's Bronze-Cuckoo
Chalcites basalis
32 (5.30%)

Black-eared Cuckoo
Chalcites osculans
4 (0.66%)

Pallid Cuckoo
Heteroscenes pallidus
47 (7.78%)

Australian Bustard
Ardeotis australis
22 (3.64%)

Tawny Frogmouth
Podargus strigoides
5 (0.83%)

Spotted Nightjar
Eurostopodus argus
8 (1.32%)

Australian Owlet-nightjar
Aegotheles cristatus
12 (1.99%)

Purple Swamphen
Porphyrio porphyrio
4 (0.66%)

Eurasian Coot
Fulica atra
5 (0.83%)

Bush Stone-curlew
Burhinus grallarius
6 (0.99%)

Pied Stilt
Himantopus leucocephalus
1 (0.17%)

Oriental Plover
Charadrius veredus
1 (0.17%)

Black-fronted Dotterel
Elseyornis melanops
49 (8.11%)

Red-kneed Dotterel
Erythrogonys cinctus
2 (0.33%)

Sharp-tailed Sandpiper
Calidris acuminata
1 (0.17%)

Common Sandpiper
Actitis hypoleucos
5 (0.83%)

Common Greenshank
Tringa nebularia
1 (0.17%)

Little Button-quail
Turnix velox
37 (6.13%)

Australian Pelican
Pelecanus conspicillatus
18 (2.98%)

Nankeen Night-Heron
Nycticorax caledonicus
5 (0.83%)

White-necked Heron
Ardea pacifica
45 (7.45%)

Great Egret
Ardea alba
21 (3.48%)

Plumed Egret
Ardea plumifera
2 (0.33%)

White-faced Heron
Egretta novaehollandiae
41 (6.79%)

Little Egret
Egretta garzetta
2 (0.33%)

Straw-necked Ibis
Threskiornis spinicollis
29 (4.80%)

Little Pied Cormorant
Microcarbo melanoleucos
29 (4.80%)

Great Cormorant
Phalacrocorax carbo
2 (0.33%)

Little Black Cormorant
Phalacrocorax sulcirostris
14 (2.32%)

Great Pied Cormorant
Phalacrocorax varius
2 (0.33%)

Australasian Darter
Anhinga novaehollandiae
17 (2.81%)

Black-shouldered Kite
Elanus axillaris
21 (3.48%)

Black-breasted Buzzard
Hamirostra melanosternon
7 (1.16%)

Square-tailed Kite
Lophoictinia isura
1 (0.17%)

Wedge-tailed Eagle
Aquila audax
36 (5.96%)

Little Eagle
Hieraaetus morphnoides
11 (1.82%)

Swamp Harrier
Circus approximans
5 (0.83%)

Spotted Harrier
Circus assimilis
36 (5.96%)

Brown Goshawk
Accipiter fasciatus
10 (1.66%)

Collared Sparrowhawk
Accipiter cirrocephalus
6 (0.99%)

Whistling Kite
Haliastur sphenurus
135 (22.35%)

Black Kite
Milvus migrans
37 (6.13%)

Barn Owl
Tyto alba
6 (0.99%)

Southern Boobook
Ninox boobook
14 (2.32%)

Rainbow Bee-eater
Merops ornatus
120 (19.87%)

Sacred Kingfisher
Todiramphus sanctus
37 (6.13%)

Red-backed Kingfisher
Todiramphus pyrrhopygius
36 (5.96%)

Blue-winged Kookaburra
Dacelo leachii
73 (12.09%)

Nankeen Kestrel
Falco cenchroides
90 (14.90%)

Australian Hobby
Falco longipennis
14 (2.32%)

Brown Falcon
Falco berigora
96 (15.89%)

Peregrine Falcon
Falco peregrinus
4 (0.66%)

Cockatiel
Nymphicus hollandicus
82 (13.58%)

Red-tailed Black-Cockatoo
Calyptorhynchus banksii
1 (0.17%)

Galah
Eolophus roseicapilla
155 (25.66%)

Little Corella
Cacatua sanguinea
141 (23.34%)

Australian Ringneck
Barnardius zonarius
105 (17.38%)

Budgerigar
Melopsittacus undulatus
147 (24.34%)

Western Bowerbird
Chlamydera guttata
21 (3.48%)

Black-tailed Treecreeper
Climacteris melanurus
15 (2.48%)

Variegated Fairy-wren
Malurus lamberti
96 (15.89%)

Splendid Fairy-wren
Malurus splendens
1 (0.17%)

White-winged Fairy-wren
Malurus leucopterus
74 (12.25%)

Rufous-crowned Emu-wren
Stipiturus ruficeps
3 (0.50%)

Striated Grasswren
Amytornis striatus
5 (0.83%)

Black Honeyeater
Sugomel nigrum
4 (0.66%)

Brown Honeyeater
Lichmera indistincta
58 (9.60%)

Pied Honeyeater
Certhionyx variegatus
6 (0.99%)

Crimson Chat
Epthianura tricolor
41 (6.79%)

Spiny-cheeked Honeyeater
Acanthagenys rufogularis
59 (9.77%)

Singing Honeyeater
Gavicalis virescens
112 (18.54%)

Grey-headed Honeyeater
Ptilotula keartlandi
36 (5.96%)

Grey-fronted Honeyeater
Ptilotula plumula
3 (0.50%)

White-plumed Honeyeater
Ptilotula penicillata
160 (26.49%)

Yellow-throated Miner
Manorina flavigula
105 (17.38%)

Red-browed Pardalote
Pardalotus rubricatus
32 (5.30%)

Striated Pardalote
Pardalotus striatus
38 (6.29%)

Western Gerygone
Gerygone fusca
22 (3.64%)

Weebill
Smicrornis brevirostris
96 (15.89%)

Redthroat
Pyrrholaemus brunneus
9 (1.49%)

Slaty-backed Thornbill
Acanthiza robustirostris
3 (0.50%)

Chestnut-rumped Thornbill
Acanthiza uropygialis
21 (3.48%)

Grey-crowned Babbler
Pomatostomus temporalis
110 (18.21%)

White-browed Babbler
Pomatostomus superciliosus
2 (0.33%)

Varied Sittella
Daphoenositta chrysoptera
4 (0.66%)

Black-faced Cuckoo-shrike
Coracina novaehollandiae
140 (23.18%)

White-winged Triller
Lalage tricolor
52 (8.61%)

Chestnut-breasted Quail-thrush
Cinclosoma castaneothorax
8 (1.32%)

Rufous Whistler
Pachycephala rufiventris
146 (24.17%)

Grey Shrike-thrush
Colluricincla harmonica
61 (10.10%)

Crested Bellbird
Oreoica gutturalis
77 (12.75%)

Chiming Wedgebill
Psophodes occidentalis
5 (0.83%)

Australian Magpie
Gymnorhina tibicen
53 (8.77%)

Pied Butcherbird
Cracticus nigrogularis
105 (17.38%)

Grey Butcherbird
Cracticus torquatus
8 (1.32%)

Masked Woodswallow
Artamus personatus
23 (3.81%)

Black-faced Woodswallow
Artamus cinereus
110 (18.21%)

Little Woodswallow
Artamus minor
17 (2.81%)

Willie Wagtail
Rhipidura leucophrys
242 (40.07%)

Grey Fantail
Rhipidura albiscapa
3 (0.50%)

Torresian Crow
Corvus orru
78 (12.91%)

Little Crow
Corvus bennetti
29 (4.80%)

Magpie-lark
Grallina cyanoleuca
168 (27.81%)

Red-capped Robin
Petroica goodenovii
9 (1.49%)

Hooded Robin
Melanodryas cucullata
41 (6.79%)

Mistletoebird
Dicaeum hirundinaceum
14 (2.32%)

Painted Finch
Emblema pictum
108 (17.88%)

Star Finch
Neochmia ruficauda
21 (3.48%)

Zebra Finch
Taeniopygia castanotis
289 (47.85%)

Australasian Pipit
Anthus novaeseelandiae
39 (6.46%)

Horsfield's Bushlark
Mirafra javanica
36 (5.96%)

Brown Songlark
Cincloramphus cruralis
20 (3.31%)

Rufous Songlark
Cincloramphus mathewsi
54 (8.94%)

Spinifexbird
Poodytes carteri
47 (7.78%)

Australian Reed-Warbler
Acrocephalus australis
31 (5.13%)

White-backed Swallow
Cheramoeca leucosterna
1 (0.17%)

Fairy Martin
Petrochelidon ariel
14 (2.32%)

Tree Martin
Petrochelidon nigricans
36 (5.96%)

Welcome Swallow
Hirundo neoxena
5 (0.83%)

Crow & Raven spp
42 (6.95%)

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: 31-Jul-2024

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:	None
Listed Threatened Species:	13
Listed Migratory Species:	10

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:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	15
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:	None
Regional Forest Agreements:	None
Nationally Important Wetlands:	None
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 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
BIRD		
Aphelocephala leucopsis Southern Whiteface [529]	Vulnerable	Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Erythrotriorchis radiatus Red Goshawk [942]	Endangered	Species or species habitat may occur within area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat known to occur within area
Pezoporus occidentalis Night Parrot [59350]	Endangered	Species or species habitat may occur within area
Polytelis alexandrae Princess Parrot, Alexandra's Parrot [758]	Vulnerable	Species or species habitat may occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area
MAMMAL		

Scientific Name	Threatened Category	Presence Text
Dasyurus hallucatus		
Northern Quoll, Digul [Gogo-Yimidir], Wijingadda [Dambimangari], Wiminji [Martu] [331]	Endangered	Species or species habitat known to occur within area
Macroderma gigas		
Ghost Bat [174]	Vulnerable	Breeding known to occur within area
Rhinonicteris aurantia (Pilbara form)		
Pilbara Leaf-nosed Bat [82790]	Vulnerable	Roosting known to occur within area
PLANT		
Thryptomene wittweri		
Mountain Thryptomene [16645]	Vulnerable	Species or species habitat may occur within area
REPTILE		
Liasis olivaceus barroni		
Pilbara Olive Python [66699]	Vulnerable	Species or species habitat likely to occur within area

Listed Migratory Species [Resource Information]

Scientific Name	Threatened Category	Presence Text
Migratory Marine Birds		
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Hirundo rustica		
Barn Swallow [662]		Species or species habitat may occur within area
Motacilla cinerea		
Grey Wagtail [642]		Species or species habitat may occur within area
Motacilla flava		
Yellow Wagtail [644]		Species or species habitat may occur within area
Migratory Wetlands Species		
Actitis hypoleucos		
Common Sandpiper [59309]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Calidris acuminata Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Species or species habitat may occur within area
Glareola maldivarum Oriental Pratincole [840]		Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species		[Resource Information]
Scientific Name	Threatened Category	Presence Text
Bird		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area
Bubulcus ibis as Ardea ibis Cattle Egret [66521]		Species or species habitat may occur within area overfly marine area
Calidris acuminata Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area overfly marine area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area overfly marine area
Chalcites osculans as Chrysococcyx osculans Black-eared Cuckoo [83425]		Species or species habitat known to occur within area overfly marine area
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Species or species habitat may occur within area overfly marine area
Glareola maldivarum Oriental Pratincole [840]		Species or species habitat may occur within area overfly marine area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Hirundo rustica Barn Swallow [662]		Species or species habitat may occur within area overfly marine area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area overfly marine area

Scientific Name	Threatened Category	Presence Text
Motacilla flava		
Yellow Wagtail [644]		Species or species habitat may occur within area overfly marine area
Rostratula australis as Rostratula benghalensis (sensu lato)		
Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area overfly marine area

Extra Information

EPBC Act Referrals			[Resource Information]
Title of referral	Reference	Referral Outcome	Assessment Status
Controlled action			
Eliwana Iron Ore Mine Project, Pilbara region, WA	2017/8024	Controlled Action	Post-Approval
Eliwana Railway Project, Pilbara region, WA	2017/8025	Controlled Action	Post-Approval
Extension to Brockman Syncline Iron Ore Operations	2019/8518	Controlled Action	Assessment Approach
Proposed West Pilbara Iron Ore Project	2009/4706	Controlled Action	Post-Approval
Not controlled action			
Brockman Syncline 4 Iron Ore Project	2005/2289	Not Controlled Action	Completed
Eliwana Iron Ore Mine	2020/8749	Not Controlled Action	Completed
Improving rabbit biocontrol: releasing another strain of RHDV, sthrn two thirds of Australia	2015/7522	Not Controlled Action	Completed
Not controlled action (particular manner)			
Buckland Iron Ore Mining Project, Pilbara region, WA	2013/6867	Not Controlled Action (Particular Manner)	Post-Approval
Iron Ore Mining Operation of Bungaroo deposit in Robe River Valley, Pilbara	2006/2771	Not Controlled Action (Particular Manner)	Post-Approval

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 are 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

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

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

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
- 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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ALA records

Class	Order	Family	Genus	Species Name	Vernacular Name	Number of records
Actinopterygii	Perciformes	Terapontidae	Leiopotherapon	Leiopotherapon aheneus	Fortescue Grunter	17
Actinopterygii	Perciformes	Terapontidae	Amniataba	Amniataba percoides	Barred Grunter	9
Actinopterygii	Perciformes	Gobiidae	Glossogobius	Glossogobius giuris	Tank Goby	8
Actinopterygii	Perciformes	Terapontidae	Leiopotherapon	Leiopotherapon unicolor	Spangled Perch	6
Actinopterygii	Atheriniformes	Melanotaeniidae	Melanotaenia	Melanotaenia australis	Western Rainbowfish	6
Actinopterygii	Siluriformes	Ariidae	Neoarius	Neoarius graeffei	Blue Catfish	5
Actinopterygii	Synbranchiformes	Synbranchidae	Ophisternon	Ophisternon candidum	Blind Cave Eel	5
Actinopterygii	Mugiliformes	Mugilidae	Liza	Liza subviridis	Greenback Mullet	2
Actinopterygii	Elopiformes	Megalopidae	Megalops	Megalops cyprinoides	Oxeye Herring	1
Actinopterygii	Clupeiformes	Clupeidae	Nematalosa	Nematalosa erebi	Bony Breams	1
Actinopterygii	Siluriformes	Ariidae	Neoarius	Neoarius midgleyi	Silver Cobbler	1
Actinopterygii	Tetraodontiformes	Tetraodontidae	Chelonodon	Chelonodon patoca	Milkspot Toadfish	1
Actinopterygii	Tetraodontiformes	Monacanthidae	Anacanthus	Anacanthus barbatus	Bearded Leatherjacket	1
Actinopterygii	Scorpaeniformes	Scorpaenidae	Scorpaena	Scorpaena sumptuosa	Western Red Scorpionfish	1
Actinopterygii	Perciformes	Scatophagidae	Selenotoca	Selenotoca multifasciata	Striped Scat	1
Actinopterygii	Perciformes	Carangidae	Caranx	Caranx papuensis	Brassy Trevally	1
Actinopterygii	Perciformes	Lutjanidae	Lutjanus	Lutjanus argentimaculatus	Mangrove Jack	1
Actinopterygii	Siluriformes	Plotosidae	Neosilurus	Neosilurus hyrtlii	Hyrtl's Catfish	1
Actinopterygii	Mugiliformes	Mugilidae	Mugil	Mugil cephalus	Sea Mullet	1
Actinopterygii	Perciformes	Eleotridae	Hypseleotris	Hypseleotris compressa	Empire Gudgeon	1
Amphibia	Anura	Pelodryadidae	Litoria	Litoria rubella	Little Red Tree Frog	104
Amphibia	Anura	Pelodryadidae	Cyclorana	Cyclorana maini	Main's Frog	47
Amphibia	Anura	Myobatrachidae	Uperoleia	Uperoleia saxatilis	Pilbara Toadlet	32
Amphibia	Anura	Myobatrachidae	Pseudophryne	Pseudophryne douglasi	Douglas's Toadlet	25
Amphibia	Anura	Limnodynastidae	Neobatrachus	Neobatrachus aquilonius	Northern Burrowing Frog	10
Amphibia	Anura	Limnodynastidae	Platyplectrum	Platyplectrum spenceri	Spencer's Burrowing Frog	8
Amphibia	Anura	Limnodynastidae	Notaden	Notaden nichollsi	Desert Spadefoot	8
Amphibia	Anura	Limnodynastidae	Neobatrachus	Neobatrachus sutor	Shoemaker Frog	3
Amphibia	Anura	Limnodynastidae	Neobatrachus	Neobatrachus sudellae	Sudell's Frog	1
Amphibia	Anura	Pelodryadidae	Cyclorana	Cyclorana occidentalis		1
Amphibia	Anura	Bufonidae	Rhinella	Rhinella marina	Cane Toad	1
Amphibia	Anura	Limnodynastidae	Neobatrachus	Neobatrachus fulvus	Tawny Frog	1
Amphibia	Anura	Pelodryadidae	Litoria	Litoria rothii	Northern Laughing Tree Frog	1
Amphibia	Anura	Myobatrachidae	Uperoleia	Uperoleia russelli	Russell's Toadlet	1
Reptilia	Squamata	Agamidae	Ctenophorus	Ctenophorus caudicinctus	Ring-tailed Dragon	200
Reptilia	Squamata	Gekkonidae	Heteronotia	Heteronotia binoei	Bynoe's Gecko	101
Reptilia	Squamata	Agamidae	Ctenophorus	Ctenophorus isolepis	Central Military Dragon	94
Reptilia	Squamata	Diplodactylidae	Lucasium	Lucasium woodwardi		85
Reptilia	Squamata	Diplodactylidae	Diplodactylus	Diplodactylus bilybara	Western Fat-tailed Gecko	79
Reptilia	Squamata	Scincidae	Ctenotus	Ctenotus saxatilis	Stony-soil Ctenotus	74
Reptilia	Squamata	Gekkonidae	Gehyra	Gehyra variegata	Tree Dtella	72
Reptilia	Squamata	Scincidae	Lerista	Lerista muelleri	Wood Mulch-slider	71
Reptilia	Squamata	Scincidae	Cyclodomorphus	Cyclodomorphus melanops	Spinifex Slender Blue-tongue	66
Reptilia	Squamata	Gekkonidae	Gehyra	Gehyra punctata	Spotted Dtella	65
Reptilia	Squamata	Scincidae	Ctenotus	Ctenotus pantherinus	Leopard Ctenotus	64
Reptilia	Squamata	Scincidae	Ctenotus	Ctenotus pallasotus	Western Pilbara Lined Ctenotus	63
Reptilia	Squamata	Scincidae	Menetia	Menetia greyii	Grey's Menetia	59
Reptilia	Squamata	Scincidae	Menetia	Menetia surda	Western Dwarf Skink	55
Reptilia	Squamata	Scincidae	Ctenotus	Ctenotus helenae	Clay-soil Ctenotus	55
Reptilia	Squamata	Agamidae	Gowidon	Gowidon longirostris	Long-nosed Dragon	48
Reptilia	Squamata	Typhlopidae	Anilios	Anilios grypus	Long-beaked Blind Snake	48
Reptilia	Squamata	Elapidae	Acanthophis	Acanthophis wellsi	Pilbara Death Adder	46
Reptilia	Squamata	Typhlopidae	Anilios	Anilios ammodytes	Sand-diving Blind Snake	45
Reptilia	Squamata	Gekkonidae	Gehyra	Gehyra micra	Small Pilbara Spotted Rock Gehyra	42
Reptilia	Squamata	Scincidae	Lerista	Lerista bipes	Two-toed Lerista	42
Reptilia	Squamata	Diplodactylidae	Strophurus	Strophurus elderi	Jewelled Gecko	40
Reptilia	Squamata	Scincidae	Morethia	Morethia ruficauda	Lined Firetail Skink	39
Reptilia	Squamata	Gekkonidae	Gehyra	Gehyra crypta	Western Cryptic Gehyra	38
Reptilia	Squamata	Scincidae	Lerista	Lerista clara	Sharp-blazed Three-toed Slider	37
Reptilia	Squamata	Scincidae	Ctenotus	Ctenotus schomburgkii	Schomburgk's Ctenotus	35
Reptilia	Squamata	Diplodactylidae	Diplodactylus	Diplodactylus savagei	Southern Pilbara Beak-faced Gecko	34
Reptilia	Squamata	Scincidae	Carlia	Carlia munda	Shaded-litter Rainbow-skink	33
Reptilia	Squamata	Agamidae	Ctenophorus	Ctenophorus nuchalis	Central Netted Dragon	32
Reptilia	Squamata	Scincidae	Lerista	Lerista flammicauda	Pilbara Flame-tailed Slider	32
Reptilia	Squamata	Scincidae	Ctenotus	Ctenotus grandis	Grand Ctenotus	30
Reptilia	Squamata	Varanidae	Varanus	Varanus acanthurus	Ridge-tailed Monitor	28
Reptilia	Squamata	Gekkonidae	Gehyra	Gehyra pilbara	Pilbara Dtella	27
Reptilia	Squamata	Diplodactylidae	Rhynchoedura	Rhynchoedura ornata	Western Beaked Gecko	27
Reptilia	Squamata	Agamidae	Ctenophorus	Ctenophorus reticulatus	Western Netted Dragon	27
Reptilia	Squamata	Scincidae	Ctenotus	Ctenotus hanloni	Nimble Ctenotus	26
Reptilia	Squamata	Diplodactylidae	Oedura	Oedura fimbria		26
Reptilia	Squamata	Gekkonidae	Gehyra	Gehyra finipunctata		25
Reptilia	Squamata	Scincidae	Notoscincus	Notoscincus butleri	Lined Soil-crevice Skink	25
Reptilia	Squamata	Scincidae	Ctenotus	Ctenotus rubicundus	Ruddy Ctenotus	25
Reptilia	Squamata	Pygopodidae	Lialis	Lialis burtonis	Burton's Snake-lizard	24
Reptilia	Squamata	Pygopodidae	Delma	Delma nasuta	Sharp-snouted Delma	24

Reptilia	Squamata	Scincidae	Lerista	Lerista rolfei	Rolfe's Slider	24
Reptilia	Squamata	Agamidae	Pogona	Pogona minor	Dwarf Bearded Dragon	23
Reptilia	Squamata	Varanidae	Varanus	Varanus panoptes	Yellow-spotted Monitor	22
Reptilia	Squamata	Carphodactylidae	Nephrurus	Nephrurus cinctus		21
Reptilia	Squamata	Diplodactylidae	Lucasium	Lucasium wombeyi	Pilbara Ground Gecko	20
Reptilia	Squamata	Scincidae	Eremiascincus	Eremiascincus isolepis	Northern Bar-lipped Skink	20
Reptilia	Squamata	Varanidae	Varanus	Varanus brevicauda	Short-tailed Pygmy Monitor	19
Reptilia	Squamata	Scincidae	Eremiascincus	Eremiascincus pallidus	Western Narrow-banded Skink	18
Reptilia	Squamata	Agamidae	Diporiphora	Diporiphora valens	Pilbara Two-line Dragon	17
Reptilia	Squamata	Agamidae	Ctenophorus	Ctenophorus femoralis	Long-tailed Sand-dragon	17
Reptilia	Squamata	Varanidae	Varanus	Varanus tristis	Black-headed Monitor	17
Reptilia	Squamata	Scincidae	Notoscincus	Notoscincus ornatus	Ornate Soil-crevice Skink	16
Reptilia	Squamata	Scincidae	Lerista	Lerista verhmens	Powerful Lerista	16
Reptilia	Squamata	Pythonidae	Liasis	Liasis olivaceus	Olive Python	15
Reptilia	Squamata	Pygopodidae	Delma	Delma pax	Peace Delma	15
Reptilia	Squamata	Gekkonidae	Heteronotia	Heteronotia spelea	Desert Cave Gecko	14
Reptilia	Squamata	Pythonidae	Antaresia	Antaresia perthensis	Pygmy Python	14
Reptilia	Squamata	Elapidae	Furina	Furina ornata	Moon Snake	13
Reptilia	Squamata	Pythonidae	Antaresia	Antaresia childreni	Children's Python	13
Reptilia	Squamata	Varanidae	Varanus	Varanus gouldii	Gould's Goanna	13
Reptilia	Squamata	Elapidae	Pseudechis	Pseudechis australis	Mulga Snake	13
Reptilia	Squamata	Varanidae	Varanus	Varanus eremius	Pygmy Desert Monitor	12
Reptilia	Squamata	Pygopodidae	Delma	Delma tincta	Excitable Delma	12
Reptilia	Squamata	Diplodactylidae	Crenadactylus	Crenadactylus pilbarensis	Pilbara Clawless Gecko	11
Reptilia	Squamata	Elapidae	Pseudonaja	Pseudonaja modesta	Ringed Brown Snake	11
Reptilia	Squamata	Scincidae	Ctenotus	Ctenotus rutilans	Rusty-shouldered Ctenotus	11
Reptilia	Squamata	Elapidae	Brachyurophis	Brachyurophis approximans	North-western Shovel-nosed Snake	11
Reptilia	Squamata	Scincidae	Lerista	Lerista macropisthopus	Unpatterned Robust Slider	11
Reptilia	Squamata	Diplodactylidae	Strophurus	Strophurus wellingtonae	Western Shield Spiny-tailed Gecko	11
Reptilia	Squamata	Scincidae	Egernia	Egernia formosa	Goldfields Crevice-skink	10
Reptilia	Squamata	Pygopodidae	Delma	Delma elegans	Pilbara Delma	10
Reptilia	Squamata	Pythonidae	Aspidites	Aspidites melanocephalus	Black-headed Python	10
Reptilia	Squamata	Carphodactylidae	Nephrurus	Nephrurus levis	Three-lined Knob-tail	9
Reptilia	Squamata	Scincidae	Egernia	Egernia cygnitos	Western Pilbara Spiny-tailed Skink	9
Reptilia	Squamata	Scincidae	Ctenotus	Ctenotus robustus	Robust Ctenotus	9
Reptilia	Squamata	Elapidae	Suta	Suta gaikhorstorum	Pilbara Hooded Snake	9
Reptilia	Squamata	Scincidae	Cryptoblepharus	Cryptoblepharus buchananii	Buchananâ€™s Snake-eyed Skink	9
Reptilia	Squamata	Varanidae	Varanus	Varanus bushi		8
Reptilia	Squamata	Scincidae	Ctenotus	Ctenotus uber	Spotted Ctenotus	8
Reptilia	Squamata	Typhlopidae	Anilios	Anilios hamatus	Pale-headed Blind Snake	8
Reptilia	Squamata	Scincidae	Cryptoblepharus	Cryptoblepharus ustulatus	Russet Snake-eyed Skink	8
Reptilia	Squamata	Gekkonidae	Gehyra	Gehyra media	Medium Pilbara Spotted Rock Gehyra	7
Reptilia	Squamata	Elapidae	Demansia	Demansia rufescens	Rufous Whipsnake	7
Reptilia	Squamata	Varanidae	Varanus	Varanus giganteus	Perentie	7
Reptilia	Squamata	Elapidae	Suta	Suta fasciata	Rosen's Snake	7
Reptilia	Squamata	Typhlopidae	Anilios	Anilios pilbarensis	Pilbara Blind Snake	7
Reptilia	Squamata	Varanidae	Varanus	Varanus caudolineatus	Stripe-tailed Monitor	6
Reptilia	Squamata	Elapidae	Demansia	Demansia reticulata	Yellow-faced Whipsnake	6
Reptilia	Squamata	Scincidae	Lerista	Lerista petersoni	Pale Broad-blazed Slider	6
Reptilia	Squamata	Typhlopidae	Anilios	Anilios ganei	Gane's Blind Snake	6
Reptilia	Squamata	Agamidae	Tympanocryptis	Tympanocryptis diabolicus	Hammersley Pebble-mimic Dragon	6
Reptilia	Squamata	Diplodactylidae	Diplodactylus	Diplodactylus galaxias	Northern Pilbara Beak-faced Gecko	5
Reptilia	Squamata	Scincidae	Cyclodomorphus	Cyclodomorphus branchialis	Gilled Slender Blue-tongue	5
Reptilia	Squamata	Scincidae	Eremiascincus	Eremiascincus richardsonii	Broad-banded Sand-swimmer	5
Reptilia	Squamata	Varanidae	Varanus	Varanus pilbarensis	Pilbara Rock Monitor	5
Reptilia	Squamata	Varanidae	Varanus	Varanus hamersleyensis	Southern Pilbara Rock Goanna	5
Reptilia	Squamata	Elapidae	Simoselaps	Simoselaps bertholdi	Jan's Banded Snake	5
Reptilia	Squamata	Scincidae	Tiliqua	Tiliqua multifasciata	Centralian Blue-tongue	5
Reptilia	Squamata	Elapidae	Pseudonaja	Pseudonaja mengdeni	Western Brown Snake	5
Reptilia	Squamata	Scincidae	Eremiascincus	Eremiascincus rubiginosus	Rusty Skink	4
Reptilia	Squamata	Scincidae	Lerista	Lerista jacksoni		4
Reptilia	Squamata	Scincidae	Proablepharus	Proablepharus reginae	Spinifex Snake-eyed Skink	4
Reptilia	Squamata	Elapidae	Simoselaps	Simoselaps anomalus	Desert Banded Snake	4
Reptilia	Squamata	Pygopodidae	Pygopus	Pygopus nigriceps	Western Hooded Scaly-foot	4
Reptilia	Squamata	Diplodactylidae	Diplodactylus	Diplodactylus mitchelli	Pilbara Stone Gecko	4
Reptilia	Squamata	Scincidae	Ctenotus	Ctenotus rufescens	Rufous Finesnout Ctenotus	3
Reptilia	Squamata	Agamidae	Diporiphora	Diporiphora amphiboluroides	Mulga Dragon	3
Reptilia	Squamata	Scincidae	Ctenotus	Ctenotus iapetus	North West Cape Ctenotus	3
Reptilia	Squamata	Scincidae	Carlia	Carlia triacantha	Desert Rainbow-skink	3
Reptilia	Squamata	Gekkonidae	Gehyra	Gehyra purpurascens	Purplish Dtella	3
Reptilia	Squamata	Scincidae	Ctenotus	Ctenotus serventyi	North-western Sandy-loam Ctenotus	2
Reptilia	Squamata	Scincidae	Ctenotus	Ctenotus severus	Stern Ctenotus	2
Reptilia	Squamata	Scincidae	Ctenotus	Ctenotus maryani	Maryan's Ctenotus	2
Reptilia	Squamata	Scincidae	Egernia	Egernia pilbarensis	Pilbara Crevice-skink	2
Reptilia	Squamata	Scincidae	Lerista	Lerista chalybura	Pilbara Blue-tailed Slider	2
Reptilia	Squamata	Elapidae	Suta	Suta punctata	Little Spotted Snake	2
Reptilia	Squamata	Elapidae	Vermicella	Vermicella snelli		2
Reptilia	Squamata	Scincidae	Tiliqua	Tiliqua scincoides	Eastern Blue-tongue	2
Reptilia	Testudines	Chelidae	Chelodina	Chelodina (Chelodina) steindachneri	Steindachner's Turtle	2

Reptilia	Testudines	Cheloniidae	Chelonia	Chelonia mydas	Green Turtle	1
Reptilia	Squamata	Scincidae	Ctenotus	Ctenotus superciliaris	Sharp-browed Ctenotus	1
Reptilia	Squamata	Agamidae	Moloch	Moloch horridus	Thorny Devil	1
Reptilia	Squamata	Scincidae	Ctenotus	Ctenotus mimetes	Checker-sided Ctenotus	1
Reptilia	Squamata	Carphodactylidae	Nephrurus	Nephrurus wheeleri	Banded Knob-tail	1
Reptilia	Squamata	Scincidae	Ctenotus	Ctenotus duricola	Pilbara Ctenotus	1
Reptilia	Squamata	Diplodactylidae	Strophurus	Strophurus ciliaris	Northern Spiny-tailed Gecko	1
Reptilia	Squamata	Diplodactylidae	Strophurus	Strophurus strophurus	Western Spiny-tailed Gecko	1
Reptilia	Squamata	Diplodactylidae	Diplodactylus	Diplodactylus laevis	Desert Fat-tailed Gecko	1
Reptilia	Squamata	Agamidae	Ctenophorus	Ctenophorus rubens	Reddening Sand-dragon	1
Reptilia	Squamata	Scincidae	Ctenotus	Ctenotus nigrilineatus	Pin-striped Finesnout Ctenotus	1
Reptilia	Squamata	Diplodactylidae	Diplodactylus	Diplodactylus conspicillatus	Fat-tailed Diplodactylus	1
Reptilia	Squamata	Scincidae	Ctenotus	Ctenotus inornatus	Bar-shouldered Ctenotus	1
Reptilia	Squamata	Agamidae	Ctenophorus	Ctenophorus scutulatus	Lozenge-marked Dragon	1
Reptilia	Squamata	Gekkonidae	Hemidactylus	Hemidactylus frenatus	House Gecko	1
Mammalia	Dasyuromorphia	Dasyuridae	Ningaui	Ningaui timealeyi	Pilbara Ningaui	192
Mammalia	Rodentia	Muridae	Pseudomys	Pseudomys hermannsburgensis	Sandy Inland Mouse	165
Mammalia	Dasyuromorphia	Dasyuridae	Sminthopsis	Sminthopsis macroura	Stripe-faced Dunnart	77
Mammalia	Chiroptera	Emballonuridae	Taphozous	Taphozous georgianus	Common Sheathtail-bat	59
Mammalia	Dasyuromorphia	Dasyuridae	Dasykaluta	Dasykaluta rosamondae	Little Red Antechinus	43
Mammalia	Rodentia	Muridae	Mus	Mus musculus	House Mouse	42
Mammalia	Rodentia	Muridae	Zyzomys	Zyzomys argurus	Common Rock-rat	38
Mammalia	Diprotodontia	Macropodidae	Osphranter	Osphranter robustus	Common Wallaroo	36
Mammalia	Rodentia	Muridae	Leggadina	Leggadina lakedownensis	Lakeland Downs Mouse	29
Mammalia	Rodentia	Muridae	Pseudomys	Pseudomys desertor	Desert Mouse	25
Mammalia	Rodentia	Muridae	Pseudomys	Pseudomys chapmani	Pebble-mound Mouse	23
Mammalia	Chiroptera	Vespertilionidae	Vespadelus	Vespadelus finlaysoni	Finlayson's Cave Bat	19
Mammalia	Chiroptera	Molossidae	Chaerephon	Chaerephon jobensis	Northern Mastiff Bat	18
Mammalia	Chiroptera	Vespertilionidae	Chalinolobus	Chalinolobus gouldii	Gould's Wattled Bat	17
Mammalia	Dasyuromorphia	Dasyuridae	Dasyurus	Dasyurus hallucatus	Digul	16
Mammalia	Dasyuromorphia	Dasyuridae	Pseudantechinus	Pseudantechinus woolleyae	Woolley's Pseudantechinus	13
Mammalia	Rodentia	Muridae	Notomys	Notomys alexis	Spinifex Hopping-mouse	12
Mammalia	Chiroptera	Vespertilionidae	Scotorepens	Scotorepens greyii	Little Broad-nosed Bat	11
Mammalia	Diprotodontia	Macropodidae	Osphranter	Osphranter rufus	Red Kangaroo	11
Mammalia	Chiroptera	Pteropodidae	Pteropus	Pteropus alecto	Black Flying-fox	10
Mammalia	Carnivora	Canidae	Canis	Canis familiaris	Common Dog	10
Mammalia	Rodentia	Muridae	Pseudomys	Pseudomys delicatulus	Delicate Mouse	9
Mammalia	Diprotodontia	Macropodidae	Petrogale	Petrogale rothschildi	Rothschild's Rock-wallaby	9
Mammalia	Dasyuromorphia	Dasyuridae	Sminthopsis	Sminthopsis youngsoni	Lesser Hairy-footed Dunnart	8
Mammalia	Carnivora	Felidae	Felis	Felis catus	Cat	8
Mammalia	Chiroptera	Molossidae	Ozimops	Ozimops lumsdenae	Northern Free-tailed Bat	8
Mammalia	Chiroptera	Vespertilionidae	Nyctophilus	Nyctophilus daedalus	Pallid Long-eared Bat	6
Mammalia	Chiroptera	Megadermatidae	Macroderma	Macroderma gigas	Ghost Bat	5
Mammalia	Chiroptera	Emballonuridae	Taphozous	Taphozous hilli	Hill's Sheathtail-bat	4
Mammalia	Diprotodontia	Phalangeridae	Trichosurus	Trichosurus vulpecula	Common Brushtail Possum	4
Mammalia	Chiroptera	Rhinonycteridae	Rhinonicteris	Rhinonicteris aurantia	Orange Leaf-nosed Bat	3
Mammalia	Monotremata	Tachyglossidae	Tachyglossus	Tachyglossus aculeatus	Short-beaked Echidna	2
Mammalia	Carnivora	Canidae	Vulpes	Vulpes vulpes	Fox	2
Mammalia	Artiodactyla	Bovidae	Bos	Bos (Bos) taurus	European Cattle	2
Mammalia	Diprotodontia	Potoroidae	Potorous	Potorous tridactylus	Long-nosed Potoroo	2
Mammalia	Chiroptera	Emballonuridae	Saccolaimus	Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	1
Mammalia	Cetacea	Delphinidae	Pseudorca	Pseudorca crassidens	False Killer Whale	1
Mammalia	Diprotodontia	Macropodidae	Macropus	Macropus fuliginosus	Western Grey Kangaroo	1
Aves	Passeriformes	Estrildidae	Taeniopygia	Taeniopygia guttata	Zebra Finch	919
Aves	Passeriformes	Rhipiduridae	Rhipidura	Rhipidura (Sauloprocta) leucophrys	Willie Wagtail	875
Aves	Passeriformes	Monarchidae	Grallina	Grallina cyanoleuca	Magpie-lark	768
Aves	Passeriformes	Meliphagidae	Ptilotula	Ptilotula penicillata	White-plumed Honeyeater	723
Aves	Psittaciformes	Cacatuidae	Cacatua	Cacatua (Licmetis) sanguinea	Little Corella	712
Aves	Passeriformes	Campephagidae	Coracina	Coracina (Coracina) novaehollandiae	Black-faced Cuckoo-shrike	660
Aves	Passeriformes	Meliphagidae	Manorina	Manorina (Myzantha) flavigula	Yellow-throated Miner	656
Aves	Columbiformes	Columbidae	Ocyphaps	Ocyphaps lophotes	Crested Pigeon	640
Aves	Psittaciformes	Cacatuidae	Eolophus	Eolophus roseicapilla	Galah	614
Aves	Accipitriformes	Accipitridae	Haliastur	Haliastur sphenurus	Whistling Kite	594
Aves	Passeriformes	Pachycephalidae	Pachycephala	Pachycephala (Alisterornis) rufiventris	Rufous Whistler	504
Aves	Columbiformes	Columbidae	Geopelia	Geopelia cuneata	Diamond Dove	483
Aves	Passeriformes	Acanthizidae	Smicrornis	Smicrornis brevirostris	Weebill	479
Aves	Psittaciformes	Psittacidae	Melopsittacus	Melopsittacus undulatus	Budgerigar	455
Aves	Columbiformes	Columbidae	Geophaps	Geophaps (Lophophaps) plumifera	Spinifex Pigeon	451
Aves	Psittaciformes	Psittacidae	Barnardius	Barnardius zonarius	Australian Ringneck	447
Aves	Coraciiformes	Meropidae	Merops	Merops (Merops) ornatus	Rainbow Bee-eater	435
Aves	Passeriformes	Artamidae	Artamus	Artamus (Angroyan) cinereus	Black-faced Woodswallow	414
Aves	Passeriformes	Artamidae	Cracticus	Cracticus nigrogularis	Pied Butcherbird	411
Aves	Passeriformes	Corvidae	Corvus	Corvus orru	Torresian Crow	407
Aves	Passeriformes	Meliphagidae	Gavicalis	Gavicalis virescens	Singing Honeyeater	405
Aves	Passeriformes	Pomatostomidae	Pomatostomus	Pomatostomus (Pomatostomus) temporalis	Grey-crowned Babbler	388
Aves	Passeriformes	Estrildidae	Emblema	Emblema pictum	Painted Finch	369
Aves	Passeriformes	Pachycephalidae	Colluricincla	Colluricincla (Colluricincla) harmonica	Grey Shrike-thrush	336
Aves	Passeriformes	Meliphagidae	Acanthagenys	Acanthagenys rufogularis	Spiny-cheeked Honeyeater	334
Aves	Passeriformes	Meliphagidae	Ptilotula	Ptilotula keartlandi	Grey-headed Honeyeater	308

Aves	Coraciiformes	Alcedinidae	Dacelo	Dacelo (Dacelo) leachii	Blue-winged Kookaburra	298
Aves	Passeriformes	Meliphagidae	Lichmera	Lichmera (Lichmera) indistincta	Brown Honeyeater	285
Aves	Passeriformes	Artamidae	Gymnorhina	Gymnorhina tibicen	Australian Magpie	273
Aves	Falconiformes	Falconidae	Falco	Falco (Tinnunculus) cenchroides	Nankeen Kestrel	270
Aves	Accipitriformes	Accipitridae	Milvus	Milvus migrans	Black Kite	266
Aves	Anseriformes	Anatidae	Anas	Anas (Anas) superciliosa	Pacific Black Duck	265
Aves	Charadriiformes	Charadriidae	Elseyornis	Elseyornis melanops	Black-fronted Dotterel	263
Aves	Falconiformes	Falconidae	Falco	Falco (Ieracidea) berigora	Brown Falcon	262
Aves	Passeriformes	Oreoicidae	Oreoica	Oreoica gutturalis	Crested Bellbird	261
Aves	Psittaciformes	Cacatuidae	Nymphicus	Nymphicus hollandicus	Cockatiel	260
Aves	Passeriformes	Hirundinidae	Petrochelidon	Petrochelidon (Hylochelidon) nigricans	Tree Martin	234
Aves	Passeriformes	Maluridae	Malurus	Malurus (Leggeornis) assimilis	Purple-backed Fairy-wren	227
Aves	Columbiformes	Columbidae	Geopelia	Geopelia placida	Peaceful Dove	210
Aves	Anseriformes	Anatidae	Anas	Anas gracilis	Grey Teal	210
Aves	Coraciiformes	Alcedinidae	Todiramphus	Todiramphus (Todiramphus) sanctus	Sacred Kingfisher	207
Aves	Passeriformes	Locustellidae	Poodytes	Poodytes carteri	Spinifexbird	200
Aves	Passeriformes	Acrocephalidae	Acrocephalus	Acrocephalus (Acrocephalus) australis	Australian Reed Warbler	199
Aves	Ciconiiformes	Ardeidae	Ardea	Ardea pacifica	White-necked Heron	199
Aves	Passeriformes	Maluridae	Malurus	Malurus (Musciparus) leucopterus	White-winged Fairy-wren	195
Aves	Passeriformes	Artamidae	Artamus	Artamus (Angroyan) minor	Little Woodswallow	194
Aves	Podicipediformes	Podicipedidae	Tachybaptus	Tachybaptus novaehollandiae	Australasian Grebe	194
Aves	Passeriformes	Locustellidae	Cincloramphus	Cincloramphus (Maclennania) mathewsi	Rufous Songlark	191
Aves	Passeriformes	Ptilonorhynchidae	Chlamydera	Chlamydera guttata	Western Bowerbird	188
Aves	Passeriformes	Dicaeidae	Dicaeum	Dicaeum (Dicaeum) hirundinaceum	Mistletoebird	188
Aves	Passeriformes	Acanthizidae	Gerygone	Gerygone fusca	Western Gerygone	182
Aves	Passeriformes	Maluridae	Malurus	Malurus (Leggeornis) lamberti	Variegated Fairy-wren	180
Aves	Accipitriformes	Accipitridae	Aquila	Aquila (Uroaetus) audax	Wedge-tailed Eagle	165
Aves	Cuculiformes	Cuculidae	Heteroscenes	Heteroscenes pallidus	Pallid Cuckoo	161
Aves	Passeriformes	Petroicidae	Melanodryas	Melanodryas (Melanodryas) cucullata	Hooded Robin	160
Aves	Passeriformes	Pardalotidae	Pardalotus	Pardalotus (Pardalotinus) rubricatus	Red-browed Pardalote	159
Aves	Ciconiiformes	Ardeidae	Egretta	Egretta novaehollandiae	White-faced Heron	152
Aves	Passeriformes	Hirundinidae	Petrochelidon	Petrochelidon (Petrochelidon) ariel	Fairy Martin	149
Aves	Ciconiiformes	Threskiornithidae	Threskiornis	Threskiornis spinicollis	Straw-necked Ibis	144
Aves	Columbiformes	Columbidae	Phaps	Phaps (Phaps) chalcoptera	Common Bronzewing	136
Aves	Passeriformes	Motacillidae	Anthus	Anthus (Anthus) novaeseelandiae	Australian Pipit	135
Aves	Passeriformes	Pardalotidae	Pardalotus	Pardalotus (Pardalotinus) striatus	Striated Pardalote	133
Aves	Passeriformes	Meliphagidae	Epthianura	Epthianura (Parepthianura) tricolor	Crimson Chat	128
Aves	Anseriformes	Anatidae	Aythya	Aythya (Nyroca) australis	Hardhead	128
Aves	Gruiformes	Rallidae	Fulica	Fulica atra	Eurasian Coot	127
Aves	Coraciiformes	Alcedinidae	Todiramphus	Todiramphus (Cyanalcyon) pyrrhopygius	Red-backed Kingfisher	126
Aves	Passeriformes	Maluridae	Amytornis	Amytornis (Magnamytis) whitei		113
Aves	Turniciformes	Turnicidae	Turnix	Turnix (Alphaturnia) velox	Little Button-quail	105
Aves	Passeriformes	Acanthizidae	Acanthiza	Acanthiza (Geobasileus) uropygialis	Chestnut-rumped Thornbill	97
Aves	Pelecaniformes	Phalacrocoracidae	Microcarbo	Microcarbo melanoleucos	Little Pied Cormorant	91
Aves	Passeriformes	Corvidae	Corvus	Corvus bennetti	Little Crow	91
Aves	Accipitriformes	Accipitridae	Circus	Circus assimilis	Spotted Harrier	89
Aves	Pelecaniformes	Phalacrocoracidae	Phalacrocorax	Phalacrocorax (Phalacrocorax) sulcirostris	Little Black Cormorant	89
Aves	Ciconiiformes	Ardeidae	Ardea	Ardea alba	Great Egret	88
Aves	Pelecaniformes	Anhingidae	Anhinga	Anhinga novaehollandiae	Australasian Darter	88
Aves	Gruiformes	Otididae	Ardeotis	Ardeotis australis	Australian Bustard	87
Aves	Struthioniformes	Casuariidae	Dromaius	Dromaius novaehollandiae	Emu	83
Aves	Passeriformes	Campephagidae	Lalage	Lalage (Lalage) tricolor	White-winged Triller	80
Aves	Passeriformes	Artamidae	Cracticus	Cracticus torquatus	Grey Butcherbird	73
Aves	Pelecaniformes	Pelecanidae	Pelecanus	Pelecanus conspicillatus	Australian Pelican	70
Aves	Passeriformes	Estrildidae	Neochmia	Neochmia (Neochmia) ruficauda	Star Finch	69
Aves	Apodiformes	Aegothelidae	Aegotheles	Aegotheles (Aegotheles) cristatus	Australian Owlet-nightjar	69
Aves	Accipitriformes	Accipitridae	Accipiter	Accipiter (Leucospiza) fasciatus	Brown Goshawk	62
Aves	Passeriformes	Artamidae	Artamus	Artamus (Campbellornis) personatus	Masked Woodswallow	60
Aves	Accipitriformes	Accipitridae	Elanus	Elanus axillaris	Black-shouldered Kite	60
Aves	Charadriiformes	Recurvirostridae	Himantopus	Himantopus himantopus	Black-winged Stilt	55
Aves	Ciconiiformes	Threskiornithidae	Threskiornis	Threskiornis moluccus	Australian White Ibis	55
Aves	Accipitriformes	Accipitridae	Hieraaetus	Hieraaetus (Hieraaetus) morphnoides	Little Eagle	53
Aves	Anseriformes	Anatidae	Chenonetta	Chenonetta jubata	Australian Wood Duck	52
Aves	Caprimulgiformes	Caprimulgidae	Eurostopodus	Eurostopodus (Eurostopodus) argus	Spotted Nightjar	51
Aves	Charadriiformes	Burhinidae	Burhinus	Burhinus (Burhinus) grallarius	Bush Stone-curlew	51
Aves	Gruiformes	Rallidae	Porphyrio	Porphyrio (Porphyrio) porphyrio	Purple Swamphen	50
Aves	Falconiformes	Falconidae	Falco	Falco (Falco) longipennis	Australian Hobby	49
Aves	Passeriformes	Alaudidae	Mirafra	Mirafra (Mirafra) javanica	Horsfield's Bushlark	49
Aves	Accipitriformes	Accipitridae	Accipiter	Accipiter (Paraspizias) cirrocephalus	Collared Sparrowhawk	47
Aves	Passeriformes	Petroicidae	Petroica	Petroica (Petroica) goodenovii	Red-capped Robin	47
Aves	Strigiformes	Strigidae	Ninox	Ninox (Ninox) novaeseelandiae	Southern Boobook	47
Aves	Passeriformes	Meliphagidae	Melithreptus	Melithreptus (Eidopsarus) gularis	Black-chinned Honeyeater	46
Aves	Passeriformes	Acanthizidae	Pyrrholaemus	Pyrrholaemus brunneus	Redthroat	46
Aves	Anseriformes	Anatidae	Cygnus	Cygnus atratus	Black Swan	46
Aves	Passeriformes	Climacteridae	Climacteris	Climacteris (Climacteris) melanurus	Black-tailed Treecreeper	45
Aves	Ciconiiformes	Ardeidae	Nycticorax	Nycticorax caledonicus	Nankeen Night-heron	45
Aves	Strigiformes	Strigidae	Ninox	Ninox (Hieracoglaux) connivens	Barking Owl	44
Aves	Cuculiformes	Cuculidae	Chalcites	Chalcites basalis	Horsfield's Bronze-cuckoo	44
Aves	Galliformes	Phasianidae	Synoicus	Synoicus ypsilophora	Brown Quail	42

Aves	Charadriiformes	Scolopacidae	Tringa	Tringa (Rhyacophilus) glareola	Wood Sandpiper	39
Aves	Passeriformes	Locustellidae	Cincloramphus	Cincloramphus (Cincloramphus) cruralis	Brown Songlark	36
Aves	Passeriformes	Maluridae	Stipiturus	Stipiturus ruficeps	Rufous-crowned Emu-wren	35
Aves	Podicipediformes	Podicipedidae	Poliocephalus	Poliocephalus poliocephalus	Hoary-headed Grebe	34
Aves	Cuculiformes	Cuculidae	Centropus	Centropus phasianinus	Pheasant Coucal	33
Aves	Charadriiformes	Scolopacidae	Actitis	Actitis hypoleucos	Common Sandpiper	32
Aves	Passeriformes	Acanthizidae	Acanthiza	Acanthiza (Milligania) robustirostris	Slaty-backed Thornbill	32
Aves	Passeriformes	Meliphagidae	Sugomel	Sugomel niger	Black Honeyeater	30
Aves	Accipitriformes	Accipitridae	Hamirostra	Hamirostra melanosternon	Black-breasted Buzzard	27
Aves	Anseriformes	Anatidae	Malacorhynchus	Malacorhynchus membranaceus	Pink-eared Duck	25
Aves	Gruiformes	Rallidae	Zapornia	Zapornia tabuensis	Spotless Crake	24
Aves	Passeriformes	Cinclosomatidae	Cinclosoma	Cinclosoma (Samuela) castaneothorax	Chestnut-breasted Quail-thrush	24
Aves	Caprimulgiformes	Podargidae	Podargus	Podargus strigoides	Tawny Frogmouth	24
Aves	Gruiformes	Rallidae	Tribonyx	Tribonyx ventralis	Black-tailed Native-hen	23
Aves	Strigiformes	Strigidae	Ninox	Ninox (Ninox) boobook	Southern Boobook	22
Aves	Passeriformes	Pomatostomidae	Pomatostomus	Pomatostomus (Morganornis) superciliosus	White-browed Babbler	20
Aves	Passeriformes	Psophodidae	Psophodes	Psophodes (Sphenostoma) occidentalis	Chiming Wedgebill	20
Aves	Passeriformes	Meliphagidae	Conopophila	Conopophila (Lacustroica) whitei	Grey Honeyeater	19
Aves	Passeriformes	Maluridae	Amytornis	Amytornis (Magnamytis) striatus	Striated Grasswren	18
Aves	Passeriformes	Rhipiduridae	Rhipidura	Rhipidura (Rhipidura) albiscapa	Grey Fantail	18
Aves	Anseriformes	Anatidae	Dendrocygna	Dendrocygna eytoni	Plumed Whistling-duck	16
Aves	Passeriformes	Cinclosomatidae	Cinclosoma	Cinclosoma (Samuela) marginatum	Western Quail-thrush	15
Aves	Gruiformes	Rallidae	Hypotaenidia	Hypotaenidia philippensis	Buff-banded Rail	15
Aves	Ciconiiformes	Ardeidae	Egretta	Egretta garzetta	Little Egret	15
Aves	Passeriformes	Hirundinidae	Hirundo	Hirundo (Hirundo) neoxena	Welcome Swallow	15
Aves	Cuculiformes	Cuculidae	Chalcites	Chalcites osculans	Black-eared Cuckoo	15
Aves	Galliformes	Phasianidae	Coturnix	Coturnix ypsilophora		14
Aves	Passeriformes	Neosittidae	Daphoenositta	Daphoenositta (Neositta) chrysoptera	Varied Sittella	14
Aves	Falconiformes	Falconidae	Falco	Falco (Hierofalco) peregrinus	Peregrine Falcon	13
Aves	Psittaciformes	Psittacidae	Neopsephotus	Neopsephotus bourkii	Bourke's Parrot	13
Aves	Passeriformes	Acanthizidae	Acanthiza	Acanthiza (Acanthiza) apicalis	Red-rumped Tit	12
Aves	Passeriformes	Meliphagidae	Certhionyx	Certhionyx (Certhionyx) variegatus	Pied Honeyeater	12
Aves	Passeriformes	Campephagidae	Coracina	Coracina (Pteropodocys) maxima	Ground Cuckoo-shrike	12
Aves	Passeriformes	Meliphagidae	Purnella	Purnella albifrons	White-fronted Honeyeater	11
Aves	Charadriiformes	Charadriidae	Erythrogonys	Erythrogonys cinctus	Red-kneed Dotterel	11
Aves	Strigiformes	Tytonidae	Tyto	Tyto javanica	Eastern Barn Owl	11
Aves	Passeriformes	Acanthizidae	Acanthiza	Acanthiza (Geobasileus) chrysorrhoa	Yellow-rumped Thornbill	9
Aves	Gruiformes	Rallidae	Porzana	Porzana (Porzana) fluminea	Australian Spotted Crake	9
Aves	Accipitriformes	Accipitridae	Circus	Circus approximans	Swamp Harrier	9
Aves	Ciconiiformes	Threskiornithidae	Platalea	Platalea (Platibis) flavipes	Yellow-billed Spoonbill	8
Aves	Charadriiformes	Laridae	Chlidonias	Chlidonias (Pelodes) hybrida	Whiskered Tern	8
Aves	Accipitriformes	Accipitridae	Lophoictinia	Lophoictinia isura	Square-tailed Kite	8
Aves	Passeriformes	Artamidae	Artamus	Artamus (Artamus) leucorynchus	White-breasted Woodswallow	8
Aves	Columbiformes	Columbidae	Phaps	Phaps (Histriophaps) histrionica	Flock Bronzewing	7
Aves	Ciconiiformes	Threskiornithidae	Plegadis	Plegadis falcinellus	Glossy Ibis	7
Aves	Passeriformes	Maluridae	Malurus	Malurus (Malurus) splendens	Splendid Fairy-wren	7
Aves	Passeriformes	Hirundinidae	Cheramoeca	Cheramoeca leucosterna	White-backed Swallow	6
Aves	Apodiformes	Apodidae	Apus	Apus (Apus) pacificus	Fork-tailed Swift	6
Aves	Charadriiformes	Scolopacidae	Calidris	Calidris (Erolia) acuminata	Sharp-tailed Sandpiper	6
Aves	Pelecaniformes	Phalacrocoracidae	Phalacrocorax	Phalacrocorax (Phalacrocorax) varius	Pied Cormorant	5
Aves	Psittaciformes	Psittacidae	Psephotellus	Psephotellus varius	Mulga Parrot	5
Aves	Passeriformes	Acanthizidae	Aphelocephala	Aphelocephala leucopsis	Southern Whiteface	5
Aves	Accipitriformes	Accipitridae	Haliaeetus	Haliaeetus (Pontoaetus) leucogaster	White-bellied Sea-eagle	5
Aves	Charadriiformes	Laridae	Sternula	Sternula albifrons	Little Tern	4
Aves	Galliformes	Phasianidae	Coturnix	Coturnix (Coturnix) pectoralis	Stubble Quail	4
Aves	Charadriiformes	Laridae	Chroicocephalus	Chroicocephalus novaehollandiae	Silver Gull	4
Aves	Charadriiformes	Charadriidae	Vanellus	Vanellus (Lobivanellus) tricolor	Banded Lapwing	4
Aves	Accipitriformes	Accipitridae	Pandion	Pandion haliaetus	Osprey	3
Aves	Falconiformes	Falconidae	Falco	Falco (Hierofalco) hypoleucos	Grey Falcon	3
Aves	Charadriiformes	Scolopacidae	Tringa	Tringa (Rhyacophilus) stagnatilis	Marsh Sandpiper	3
Aves	Columbiformes	Columbidae	Columba	Columba (Columba) livia	Rock Dove	3
Aves	Passeriformes	Acanthizidae	Aphelocephala	Aphelocephala nigricincta	Banded Whiteface	3
Aves	Charadriiformes	Scolopacidae	Calidris	Calidris (Ereunetes) subminuta	Long-toed Stint	3
Aves	Charadriiformes	Glareolidae	Glareola	Glareola (Glareola) maldivarum	Oriental Pratincole	2
Aves	Charadriiformes	Glareolidae	Stiltia	Stiltia isabella	Australian Pratincole	2
Aves	Charadriiformes	Scolopacidae	Calidris	Calidris (Ereunetes) ruficollis	Red-necked Stint	2
Aves	Passeriformes	Rhipiduridae	Rhipidura	Rhipidura (Rhipidura) fuliginosa	New Zealand Fantail	2
Aves	Accipitriformes	Accipitridae	Elanus	Elanus scriptus	Letter-winged Kite	2
Aves	Passeriformes	Acanthizidae	Calamanthus	Calamanthus campestris	Rufous Fieldwren	2
Aves	Passeriformes	Acanthizidae	Gerygone	Gerygone tenebrosa	Dusky Gerygone	2
Aves	Psittaciformes	Psittacidae	Neophema	Neophema (Neonanodes) elegans	Elegant Parrot	2
Aves	Charadriiformes	Charadriidae	Charadrius	Charadrius (Eupoda) veredus	Oriental Plover	2
Aves	Passeriformes	Locustellidae	Poodytes	Poodytes gramineus	Little Grassbird	2
Aves	Ciconiiformes	Ardeidae	Egretta	Egretta sacra	Eastern Reef Egret	2
Aves	Columbiformes	Columbidae	Geopelia	Geopelia humeralis	Bar-shouldered Dove	2
Aves	Ciconiiformes	Ardeidae	Ixobrychus	Ixobrychus flavicollis	Black Bittern	2
Aves	Gruiformes	Gruidae	Grus	Grus rubicunda	Brolga	1
Aves	Passeriformes	Meliphagidae	Epthianura	Epthianura (Aurepthianura) aurifrons	Orange Chat	1
Aves	Columbiformes	Columbidae	Spilopelia	Spilopelia senegalensis	Laughing Turtle-dove	1

Aves	Charadriiformes	Scolopacidae	Numenius	Numenius (Phaeopus) phaeopus	Whimbrel	1
Aves	Ciconiiformes	Threskiornithidae	Platalea	Platalea (Platalea) regia	Royal Spoonbill	1
Aves	Pelecaniformes	Phalacrocoracidae	Phalacrocorax	Phalacrocorax (Phalacrocorax) carbo	Great Cormorant	1
Aves	Psittaciformes	Cacatuidae	Cacatua	Cacatua (Cacatua) galerita	Sulphur-crested Cockatoo	1
Aves	Passeriformes	Pachycephalidae	Pachycephala	Pachycephala (Pachycephala) pectoralis	Golden Whistler	1
Aves	Passeriformes	Meliphagidae	Ptilotula	Ptilotula plumula	Grey-fronted Honeyeater	1
Aves	Cuculiformes	Cuculidae	Cacomantis	Cacomantis (Vidgenia) flabelliformis	Fan-tailed Cuckoo	1
Aves	Charadriiformes	Charadriidae	Pluvialis	Pluvialis fulva	Pacific Golden Plover	1
Aves	Anseriformes	Anatidae	Oxyura	Oxyura australis	Blue-billed Duck	1
Aves	Turniciformes	Turnicidae	Turnix	Turnix (Austroturnix) varius	Painted Button-quail	1
Aves	Anseriformes	Anatidae	Dendrocygna	Dendrocygna arcuata	Wandering Whistling-duck	1
Aves	Psittaciformes	Cacatuidae	Calyptorhynchus	Calyptorhynchus (Calyptorhynchus) banksii	Red-tailed Black Cockatoo	1
Aves	Ciconiiformes	Ardeidae	Ardea	Ardea intermedia	Intermediate Egret	1
Aves	Anseriformes	Anseranatidae	Anseranas	Anseranas semipalmata	Magpie Goose	1
Aves	Charadriiformes	Charadriidae	Charadrius	Charadrius (Charadrius) ruficapillus	Red-capped Plover	1
Aves	Passeriformes	Pachycephalidae	Pachycephala	Pachycephala (Alisterornis) lanioides	White-breasted Whistler	1
Aves	Falconiformes	Falconidae	Falco	Falco (Hierofalco) subniger	Black Falcon	1
Aves	Charadriiformes	Laridae	Hydroprogne	Hydroprogne caspia	Caspian Tern	1
Aves	Anseriformes	Anatidae	Anas	Anas (Nettion) castanea	Chestnut Teal	1
Aves	Charadriiformes	Scolopacidae	Calidris	Calidris (Erolia) ferruginea	Curlew Sandpiper	1
Aves	Accipitriformes	Accipitridae	Haliastur	Haliastur indus	Brahminy Kite	1
Aves	Charadriiformes	Scolopacidae	Gallinago	Gallinago (Gallinago) megala	Swinhoe's Snipe	1

Appendix C Bat echolocation call analysis (current survey).

Specialised Zoological

Identification of bat species from Wyloo, Western Australia

Prepared for **Ecologia Environment Pty Ltd**

Version **13 December 2024**

SZ project reference **SZ748**

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This report should be included as an appendix in any larger submission to Government, and cited as:

Specialised Zoological (2024). Identification of bat species from Wyloo, Western Australia. Unpublished report by Specialised Zoological for Ecologia Environment Pty Ltd, 13 December 2024, project reference SZ748.

Version history

Date	Version	Note
2024-11-18	2024-11-18	Final version
2024-12-13	2024-12-13	Revised version with August 2024 results

1.0 Summary

1.1 Scope and data

Bat identifications from acoustic and video recordings are provided from the Wyloo project area in the Pilbara region of Western Australia. The datasets reported on here are from three surveys, and comprise a total of 31 bat detector (only) sites with 105 recording nights, and 15 nights at 13 acoustic lure sites (infra-red video + bat detector; total 90,447 WAV format sound files from 120 bat detector nights, including those from acoustic lure sites; **Table 1**).

Particular attention was given to the detection of two bat species of conservation significance: Ghost Bat *Macroderma gigas* (Megadermatidae) and Pilbara Diamond-faced Bat *Rhinonicteris aurantia* (Rhinonycteridae; =Pilbara Leaf-nosed Bat).

Two methods were used on the field survey:

1. Ultrasonic recordings with bat detectors to provide species identifications from echolocation calls;
2. Acoustic lure (portable speaker broadcasting Ghost Bat social calls; **Figure 1**) with detections and identification of the Ghost Bat from both infrared video and ultrasonic recordings; this is a targeted survey method to detect the species away from roost sites (Ruykys et al. 2023, 2024).

Both the Ghost Bat and Pilbara Diamond-faced Bat were detected (**Tables 2** and **3**; **Figure 2**). Seven other species of bat were also detected (**Tables 4** – **6**; **Figure 3**).

1.2 Ghost Bat

The Ghost Bat was detected at two acoustic lure sites: WNGB03 and WNGB05 (**Table 2**).

One individual was observed circling the speaker from 19:26:37 to 19:27:41 at site WNGB03 (**Figure 4**). No echolocation calls were present in the bat detector recordings during this period.

Ghost Bat echolocation calls of the species were detected at site WNGB05 in two sound files on the night of 2024-05-23 at 04:46:39 and 04:46:52 (after the spotlight batteries had diminished, but when the speaker was still broadcasting). The species was not observed in the infrared videos earlier in the night.

1.3 Pilbara Diamond-faced Bat

The Pilbara Diamond-faced Bat was detected at a total of seven sites (**Table 3**). One of these sites was an acoustic lure site. I have observed this species approaching a Ghost Bat social call broadcast on previous occasions.

The detection rate was relatively low (total 12 recording nights; and a total of 82 call sequences). Detections were well after sunset and well before sunrise. None of the times of detection were suggestive of diurnal roosting at or near where the detector was placed.

2.0 Methods

2.1 Ultrasonic recordings

The ultrasonic recordings provided were recorded in WAV format with Titley Scientific Anabat Chorus bat detectors (sampling rate 500 kHz, set to turn on automatically at sunset and off at sunrise), and Wildlife Acoustics SM4BAT-FS bat detectors (sampling rate 384 kHz).

A multi-step acoustic analysis procedure developed to process large full spectrum echolocation recording datasets from insectivorous bats (Armstrong et al. 2021a,b) was applied to the recordings made on the survey. Firstly, the WAV files were scanned for bat echolocation calls using several parameter sets in the software SCAN'R version 1.8.3 (Binary Acoustic Technology), which also provides measurements (SCAN'R parameters) from each putative bat pulse. The outputs were then used to determine if putative bat pulses measured in SCAN'R could be identified to species. This was done using a custom [R] language application that performed three tasks:

1. undertook a Discriminant Function Analysis on training data from representative calls from Pilbara bat species;

2. from the measurements of each putative bat pulse from SCAN'R, calculated values for the first two Discriminant Functions that could separate the echolocation call types derived from the analysis of training data, and plotted these resulting coordinates over data ellipses representing one standard deviation of the variation for the defined call types; and

3. facilitated an inspection in a spectrogram of multiple examples of each call type for each recording night by opening the original WAV files containing pulses of interest in ADOBE AUDITION version 23.1.

Species were identified based on information in the author's unpublished material and Churchill (2008). Nomenclature follows Jackson and Groves (2015). Identifications were supported by distribution information in a curated source of distribution records maintained by the Australasian Bat Society, Inc. (https://www.ausbats.org.au/batmap.html) (Milne et al. 2023). Custom [R] language scripts were used to summarise the analysis outcomes.

2.2 Acoustic lure sites with infrared video recordings

An acoustic lure system was set at 13 sites. This method is based on recent demonstrations of its utility by Hanrahan et al. (2023) and Ruykys et al. (2023), and is broadly consistent with guidelines on the approach released in the Northern Territory (Ruykys et al. 2024). The system comprised a portable speaker (generic brand from Amazon), an Anabat Chorus bat detector, two infrared-capable camera traps (Jaycar model QC8051), and two 'long range infrared spotlights' (Jaycar model QC3654).

The portable speakers were loaded with a micro-SD card containing a sequence of sound files comprising 'squabble' calls; *sensu* Hanrahan et al. 2023; see **Appendix 1**) of the Ghost Bat. Sound files consisted of a 2-minute period with various examples of squabble calls, followed by a 2-minute period of silence. The speakers played sound files on a memory card

sequentially upon startup, for the entire night. The speaker volume was maximised. The distance at which Ghost Bats can hear the signals at night is unknown but assumed to be at least 100 m.

The camera trap was set to record sequential 3-minute black and white video files at high resolution (4K 3840 x 2160) continuously upon start up. Recordings were started after covering the camera lens so that the unit switched from colour to night (black and white) mode. The settings were adjusted so that built-in infrared LEDs were non-functional, and infrared light was instead provided by the long-range infrared spotlight, which was powered by 10 AA batteries that lasted c. 5 hours. Each camera trap contained a blank 256 GB Sandisk SD card, which had the capacity to save the recording from a full night.

The Chorus bat detector was placed on the central star picket underneath the portable speaker to maximise the chance of detection via echolocation calls if a Ghost Bat approached the speaker. Detection of echolocation calls provides a way to independently validate any detection made from the video recordings (**Appendix 1**).

Figure 1. Representation of the acoustic lure system deployment. There are two camera traps for redundancy and corroboration of images of bats, and a bat detector for validation of an identification made from videos based on echolocation calls only.

All videos were processed with an expeditious and robust analysis method. A custom Python (https://www.python.org/) script (Dr R.C. Morgans, Supersensory Technologies Pty Ltd unpublished) applied a background subtraction algorithm from the *opencv* framework (https://opencv.org/) to the recordings and constructed a concatenated short video containing only portions of the recording with moving objects above a certain size. These concatenated videos were watched at <50% speed in the MPV MEDIA PLAYER (https://mpv.io/), which allowed fine control of frame advancement. Objects of interest were located and re-examined in the original 4K recording using the embedded timestamp information.

Smaller species of bat can be seen often in the infrared videos. Without careful consideration, these species can sometimes be confused for the Ghost Bat when they fly near the speaker—a behaviour that might intuitively be expected only from the Ghost Bat. Ghost Bats can be distinguished in infrared and thermal video recordings from other bat species and insects based on the observation of any combination of the following morphological and behavioural features that provide an empirical basis for the identification:

- flight pattern (four distinct behaviours classified as: ‘circling’ of the post containing the speaker; ‘hover’ in front of the speaker; ‘long glide’ towards the speaker; and ‘drop in’ whereby they would sometimes approach at c. 2 m above the speaker and then drop vertically towards it);
- body size relative to other objects in the frame;
- large ear size;
- lack of a tail;
- bright eyeshine of the reflected infrared light from their large eyes (infrared recordings only, though not always visible); and
- corroboration with concurrently-recorded diagnostic echolocation calls (**Appendix 1**).

All bats observed in videos are examined by single manual frame advancement to check for diagnostic features. The relatively high resolution and video frame rate provides a reasonable level of image quality.

3.0 Limitations

The identifications presented in this report have been made within the following context:

1. The identifications made herein were based on the ultrasonic sound and video recordings made and provided by a 'third party' (the client named on the front of this report).
2. In the case of the present report, some of the recording equipment was set up and supplied by Specialised Zoological (acoustic lure setups). The equipment was operated by the third party during the survey.
3. Other than the general location of the study area, Specialised Zoological has not been provided with detailed information of the survey area, has not made a visit to observe the habitats available for bats, nor have we visited the specific project areas on a previous occasion. Please see the main report for geographic coordinates of recording sites.
4. Specialised Zoological has had no input into the overall design and timing of this bat survey, recording site placement, nor the degree of recording site replication.
5. This version of the document supersedes any previous version. Previous drafts are not authorised by us for submission to the regulator or the public domain.
6. Please see **Appendix 1** for more information about the application of the acoustic lure.

4.0 References

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Table 1. Summary of datasets analysed (blue highlight separates survey periods; number of nights in total is reported for bat detector recording sites only, plus a total is given in parentheses for all bat detector sites that includes those from acoustic lure sites; Mg—detections of *M. gigas*; Ra—detections of *R. aurantia*).

Survey	Site type	Sites	Total sites	Nights	WAVs	Mg	Ra
April 2024	Bat detector	WNBD01 – 03	3	9	2,325	.	WNBD02, WNBD03
April 2024	Bat detector	WNDP01 – 05, 07, 08, 10	8	26	15,042	.	.
April 2024	Acoustic lure video	WNGB01 – 04	4	6	.	WNGB03	.
April 2024	Acoustic lure bat detector	WNGB01 – 04	4	6	6,580	.	.
May 2024	Bat detector	WNTB01 – 08	8	24	3,207	.	WNTB08
May 2024	Acoustic lure video	WNGB05 – 13	9	9	.	.	.
May 2024	Acoustic lure bat detector	WNGB05 – 13	9	9	41,477	WNGB05	WNGB10
August 2024	Bat detector	WNDP02 – 04, 07 – 09, 11 – 16	12	46	21,816	.	WNDP08, WNDP14, WNDP15
Totals			**44**	**105 (120)**	**90,447**	**2 sites**	**7 sites**

Table 2. Summary and outcomes from analyses of the acoustic lure recordings (bat detector and two infrared camera traps per site).

Acoustic lure sites and bat detector units	Night	Detections of *M. gigas*
April 2024		
WNGB01-636473	22/04/2024	no video or echolocation
WNGB01-636473	23/04/2024	no video or echolocation
WNGB02-636474	22/04/2024	no video or echolocation
WNGB02-SM4-04	22/04/2024	no video or echolocation
WNGB03-644436	23/04/2024	detected on video from 19:26:37 to 19:27:41.
WNGB04-SM4-05	24/04/2024	no video or echolocation
May 2024		
WNGB05-SM4-03	23/05/2024	echolocation only; WNGB05-SM4-03_20240524_044639.wav; WNGB05-SM4-03_20240524_044652.wav
WNGB06-SM4-04	23/05/2024	no video or echolocation
WNGB07-SM4-02	24/05/2024	no video or echolocation
WNGB08-SM4-02	25/05/2024	no video or echolocation
WNGB09-SM4-05	25/05/2024	no video or echolocation
WNGB10-SM4-05	26/05/2024	no video or echolocation
WNGB11-SM4-02	26/05/2024	no video or echolocation
WNGB12-SM4-04	27/05/2024	no video or echolocation
WNGB13-SM4-06	27/05/2024	no video or echolocation

Table 3. Summary of detections of the Pilbara Diamond-faced Bat from all sites (blue highlight aids inspection by separating sites and survey periods; orange for an acoustic lure site).

Site	Serial	Night of	Passes	Sunset	Dusk	Dawn	Sunrise	Time first detection	Time last detection	Time since sunset	Time until sunrise
WNBD02	SM401	22/04/2024	42	22/04/2024 17:52	22/04/2024 18:15	23/04/2024 6:01	23/04/2024 6:23	19:24:47	1:32:37	1H 32M 3S	4H 51M 13S
WNBD02	SM401	23/04/2024	12	23/04/2024 17:52	23/04/2024 18:14	24/04/2024 6:01	24/04/2024 6:24	19:19:13	2:23:45	1H 27M 12S	4H 0M 26S
WNBD02	SM401	24/04/2024	13	24/04/2024 17:51	24/04/2024 18:13	25/04/2024 6:01	25/04/2024 6:24	19:51:21	3:11:41	2H 0M 31S	3H 12M 52S
WNBD03	SM406	24/04/2024	1	24/04/2024 17:51	24/04/2024 18:13	25/04/2024 6:01	25/04/2024 6:24	20:24:53	20:24:53	2H 33M 35S	9H 59M 40S
WNGB10	SM405	26/05/2024	1	26/05/2024 17:36	26/05/2024 18:00	27/05/2024 6:13	27/05/2024 6:37	19:23:25	19:23:25	1H 46M 40S	11H 14M 12S
WNTB08	644439	25/05/2024	1	25/05/2024 17:36	25/05/2024 18:00	26/05/2024 6:13	26/05/2024 6:37	23:38:53	23:38:53	6H 1M 56S	6H 58M 19S
WNDP08	SM403	16/08/2024	1	16/08/2024 17:59	16/08/2024 18:22	17/08/2024 6:14	17/08/2024 6:37	1:44:42	1:44:42	7H 45M 25S	4H 52M 58S
WNDP14	SM402	13/08/2024	2	13/08/2024 17:58	13/08/2024 18:21	14/08/2024 6:16	14/08/2024 6:39	23:56:14	0:24:12	5H 58M 3S	6H 15M 41S
WNDP14	SM402	14/08/2024	1	14/08/2024 17:58	14/08/2024 18:21	15/08/2024 6:16	15/08/2024 6:39	19:03:01	19:03:01	1H 4M 28S	11H 36M 9S
WNDP14	SM402	15/08/2024	3	15/08/2024 17:58	15/08/2024 18:21	16/08/2024 6:15	16/08/2024 6:38	23:03:56	4:55:19	5H 5M 1S	1H 43M 6S
WNDP14	SM402	16/08/2024	4	16/08/2024 17:59	16/08/2024 18:22	17/08/2024 6:14	17/08/2024 6:37	1:03:55	3:36:19	7H 4M 38S	3H 1M 21S
WNDP15	644440	17/08/2024	1	17/08/2024 17:59	17/08/2024 18:22	18/08/2024 6:13	18/08/2024 6:36	20:16:23	20:16:23	2H 16M 45S	10H 20M 31S

Table 4. Species identified in the present survey from all sites combined.

MEGADERMATIDAE	
Ghost Bat	*Macroderma gigas*
RHINONYCTERIDAE	
Pilbara Diamond-faced Bat (Pilbara Leaf-nosed Bat)	*Rhinonicteris aurantia*
EMBALLONURIDAE	
Yellow-bellied Sheath-tailed Bat	*Saccolaimus flaviventris*
Common Sheath-tailed Bat	*Taphozous georgianus*
VESPERTILIONIDAE	
Gould's Wattled Bat	*Chalinolobus gouldii*
Little Broad-nosed Bat	*Scotorepens greyii*
Finlayson's Cave Bat	*Vespadelus finlaysoni*
MOLOSSIDAE	
Greater Northern Free-tailed Bat	*Chaerephon jobensis*
Northern Free-tailed Bat	*Ozimops lumsdenae*

Table 5. Summary of all species of bat identified at the bat detector recording sites (see *Table 4* for full species names; continued next page).

Site	Unit	First night	Last night	No. nights	*C. gouldii*	*C. jobensis*	*M. gigas*	*O. lumsdenae*	*S. flaviventris*	*S. greyii*	*T. georgianus*	*V. finlaysoni*
April 2024												
WNBD01	SM4-07	22/04/2024	24/04/2024	3	X	X	.	X	X	X	X	X
WNBD02	SM4-01	22/04/2024	24/04/2024	3	X	X	.	X	.	.	X	X
WNBD03	SM4-06	22/04/2024	24/04/2024	3	X	X	.	X	X	X	X	X
WNDP01	644439	22/04/2024	24/04/2024	3	X	X	.	X	X	X	X	X
WNDP02	SM4-01	19/04/2024	21/04/2024	3	.	X	.	.	.	.	X	X
WNDP03	SM4-05	20/04/2024	23/04/2024	4	X	.	.	X	X	X	X	X
WNDP04	SM4-07	19/04/2024	21/04/2024	3	X	.	.	.	.	.	X	X
WNDP05	SM4-06	19/04/2024	21/04/2024	3	.	.	.	.	.	X	X	X
WNDP07	SM4-03	20/04/2024	23/04/2024	4	X	.	.	X	.	X	X	X
WNDP08	644440	22/04/2024	24/04/2024	3	X	X	.	.	.	.	X	X
WNDP10	636488	22/04/2024	24/04/2024	3	X	.	.	.	.	X	X	X
May 2024												
WNTB01	SM4-04	21/05/2024	23/05/2024	3	X	X	.	.	.	X	X	X
WNTB02	SM4-07	21/05/2024	23/05/2024	3	X	.	.	.	.	.	X	X
WNTB03	SM4-05	21/05/2024	23/05/2024	3	X	X	.	.	.	.	X	X
WNTB04	SM4-01	21/05/2024	23/05/2024	3	X	.	.	.	.	X	X	X
WNTB05	644436	23/05/2024	25/05/2024	3	X	.	.	.	.	X	X	X
WNTB06	644440	23/05/2024	25/05/2024	3	X	.	.	X	.	X	X	X
WNTB07	636488	23/05/2024	25/05/2024	3	X	X	.	.	.	X	.	X
WNTB08	644439	23/05/2024	25/05/2024	3	X	X	.	.	.	.	X	X

Site	Unit	First night	Last night	No. nights	*C. gouldii*	*C. jobensis*	*M. gigas*	*O. lumsdenae*	*S. flaviventris*	*S. greyii*	*T. georgianus*	*V. finlaysoni*
August 2024												
WNDP02	SM4-07	14/8/2024	18/8/2024	5	X	.	.	X	.	.	X	X
WNDP03	SM4-04	13/8/2024	16/8/2024	4	X	X	.	X	X	X	X	X
WNDP04	SM4-08	13/8/2024	16/8/2024	4	X	.	.	X	.	X	X	X
WNDP07	SM4-01	13/8/2024	16/8/2024	4	.	X	.	.	.	.	X	X
WNDP08	SM4-03	14/8/2024	17/8/2024	4	X	X	.	.	X	X	X	X
WNDP09	644439	16/8/2024	18/8/2024	3	X	X	.	.	.	X	X	X
WNDP11	SM4-05	15/8/2024	18/8/2024	4	X	X	.	X	.	X	X	X
WNDP12	SM4-06	14/8/2024	17/8/2024	4	X	.	.	.	.	X	X	X
WNDP13	636488	15/8/2024	18/8/2024	4	X	X	.	.	.	X	X	X
WNDP14	SM4-02	13/8/2024	17/8/2024	5	X	X	.	.	.	X	X	X
WNDP15	644440	16/8/2024	18/8/2024	3	X	X	.	X	.	X	X	X
WNDP16	644436	16/8/2024	22/8/2024	7	.	.	.	X	.	X	.	X

Table 6. Summary of all species on bat detector recordings at the acoustic lure sites (see *Table 4* for full species names).

Site	Unit	First night	Last night	No. nights	*C. gouldii*	*C. jobensis*	*M. gigas*	*O. lumsdenae*	*S. flaviventris*	*S. greyii*	*T. georgianus*	*V. finlaysoni*
April 2024												
WNGB01	636473	22/04/2024	23/04/2024	2	.	X	.	X	.	X	.	.
WNGB02	636474	22/04/2024	23/04/2024	2	X	.	.	.	X	X	.	X
WNGB03	644436	23/04/2024	.	1	X	.	.	.	.	X	.	X
WNGB04	SM4-05	24/04/2024	.	1	.	.	.	.	.	.	X	X
May 2024												
WNGB05	SM4-03	23/05/2024	.	1	.	.	X	.	.	.	X	X
WNGB06	SM4-06	23/05/2024	.	1	X	.	.	.	.	.	.	X
WNGB07	SM4-02	24/05/2024	.	1	.	X	.	.	.	X	X	.
WNGB08	SM4-02	25/05/2024	.	1	X	.	.	X	.	.	X	.
WNGB09	SM4-05	25/05/2024	.	1	.	X	.	.	X	.	X	X
WNGB10	636488	26/05/2024	.	1	X	X	.	.	.	X	X	X
WNGB11	SM4-02	26/05/2024	.	1	X	.	.	.	.	.	X	X
WNGB12	SM4-04	27/05/2024	.	1	.	.	.	.	.	.	.	X
WNGB13	SM4-06	27/05/2024	.	1	X	.	.	.	.	X	.	X

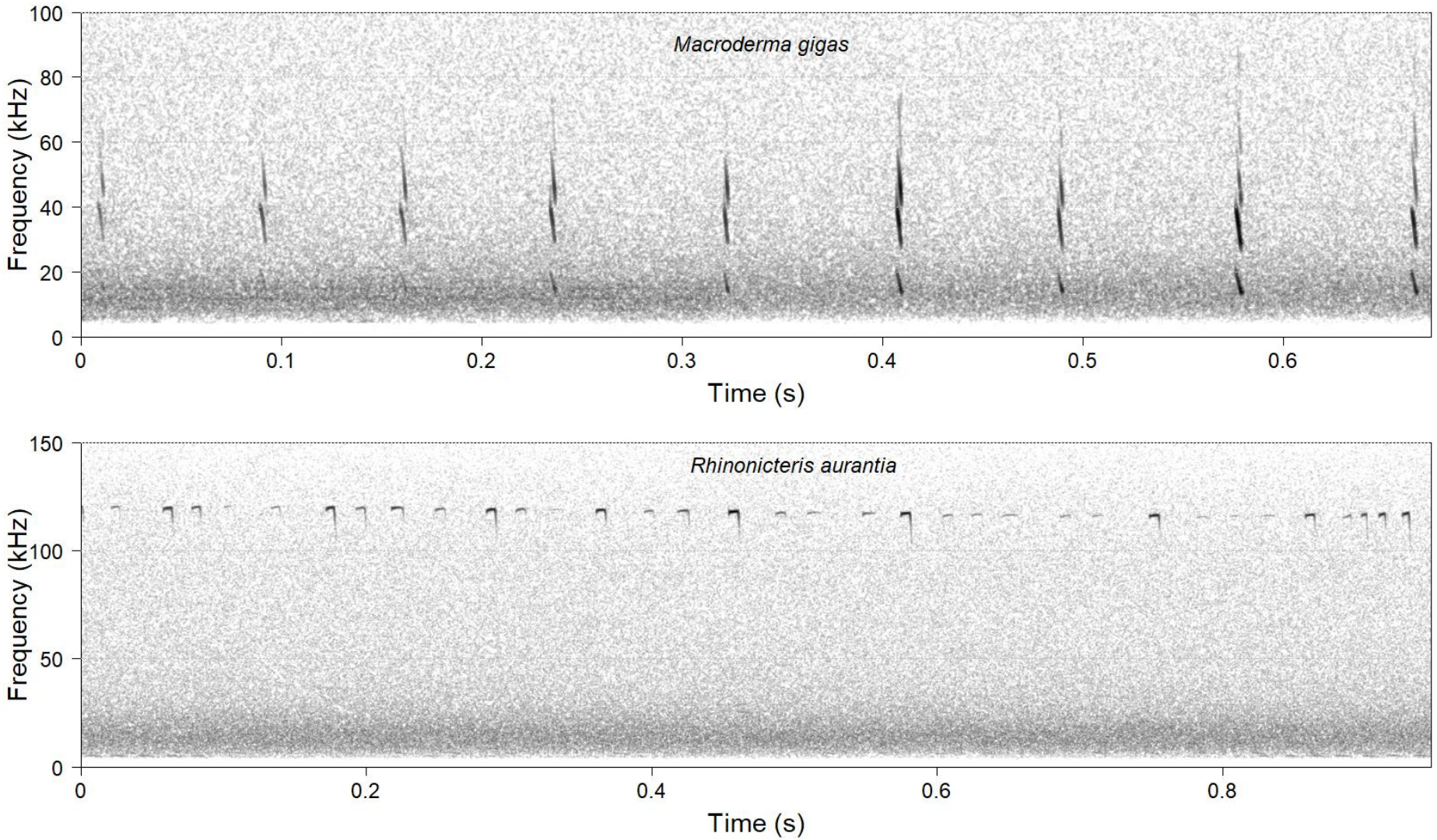

Figure 2. Representative echolocation call sequence portions from the Ghost Bat (**top**) and Pilbara Diamond-faced Bat (**bottom**).

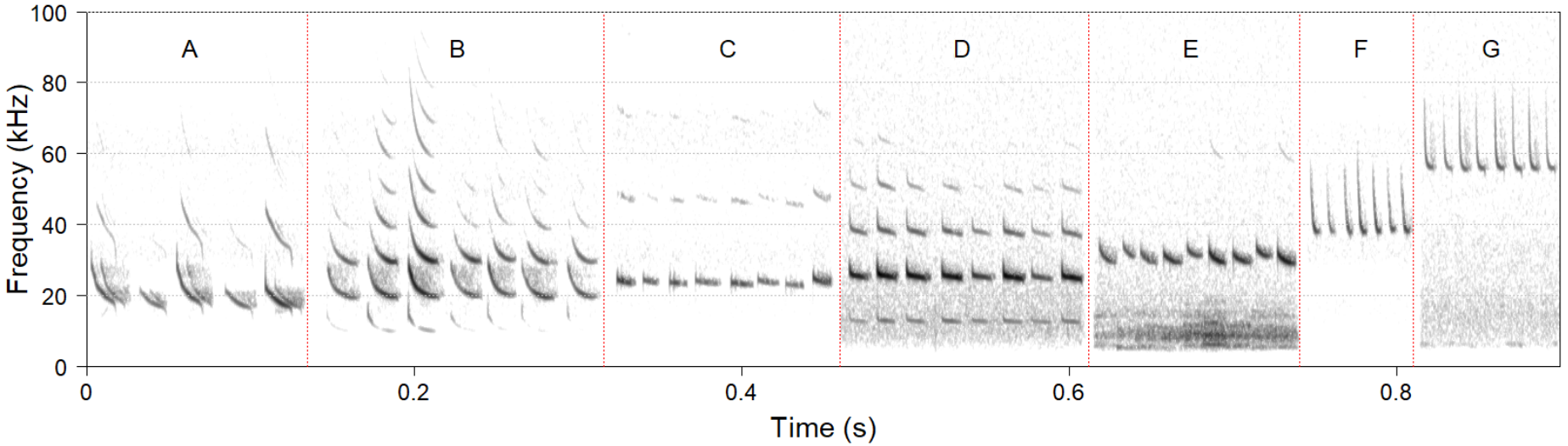

Figure 3. Representative echolocation call sequence portions from the species identified (**A**: *Chaerephon jobensis*; **B**: *Saccolaimus flaviventris*; **C**: *Ozimops lumsdenae*; **D**: *Taphozous georgianus*; **E**: *Chalinolobus gouldii*; **F**: *Scotorepens greyii*; **G**: *Vespadelus finlaysoni*; time between pulses has been compressed).

Figure 4. Screenshot of the individual Ghost Bat circling the speaker at site WNGB03.

Appendix 1. Use of acoustic lures

Specialised Zoological provided the equipment for the acoustic lure surveys, and provided advice on how set and use it. The equipment and procedure are broadly consistent with recently released guidelines in the Northern Territory for the use of acoustic lures for Ghost Bat detection (Ruykys et al. 2024). In the Introduction to these guidelines, the authors state that "…*it is expected that further application across the species' distribution will improve its generality and functionality.*"; (see also section 2.8). Given my own experience with the use of this method on several projects, and some practical considerations, I have provided advice in the present survey that I consider to be important improvements. These include:

1. The use of a bat detector directly under the portable speaker to detect the echolocation calls of a Ghost Bat that approaches and might briefly circle the post with this equipment. I address the five cautions articulated in the third 'author's tip' in section 2.6 of the guidelines:

   i. **"ghost bats do not consistently use echolocation when in flight"** Indeed Ghost Bats are thought not to echolocate continuously while in flight, but they are more likely to echolocate when approaching an object of their attention. In my own experience (not yet in the public domain; n = >20; exact number not given to preserve project anonymity), 74% of approaches could be validated unambiguously by the concurrent detection of an echolocation sequence on a bat detector placed under the speaker. For the remaining 26% of sites, it is possible that echolocation calls were not detected because of a combination of the low amplitude of the calls and the direction of flight relative to the zone of sound reception of the microphone; and 'equipment issues' can also prevent the detection of echolocation calls..

   ii. **"the acoustic lure may mask any echolocation pulses from ghost bats"** This is not the case. No echolocation calls are part of the broadcast sequence used. Further, echolocation pulses are of a different frequency range than the various social calls, and overlapping of broadcast social calls and the echolocation calls of an approaching bat <u>does not</u> prevent them from being distinguished, either buy casual observation in a spectrogram, or the semi-automated analysis method used by Specialised Zoological.

   iii. **"no ghost bats were detected acoustically during the study by Ruykys et al. (2023), despite ghost bats routinely flying with 1 m of bat detectors"** In that study, bat detectors were not placed in an ideal position (see underlined segments) for recording echolocation calls, and consequently the usefulness of bat detectors is under-emphasised in the guidelines:

   "*To determine whether the echolocation calls of lured ghost bats could be passively detected, a bat detector (Anabat Swift, Titley Scientific, Queensland, Australia) was <u>deployed on the reference tree</u> at each survey site for both the control and active treatment. Detectors were deployed at chest height, with the ultrasonic omnidirectional microphone <u>placed on the far side of the tree, away from the speaker</u>.*

The microphone was angled at 45° down from vertical." (Ruykys et al. 2023; my underlining)

iv. **"expertise is required to identify bats – particularly ghost bats – via their echolocation call"** Specialised Zoological has a long track record of being able to identify these calls reliably, using an efficient semi-automated method, and being able to distinguish them from signals of similar shape produced by other cave-roosting bat species.

v. **"the analysis of acoustic recordings will add significant analysis time to a project"** The analysis of bat detector recordings from acoustic lure sites using Specialised Zoological's semi-automated method is efficient, requiring relatively little time for analysis, and certainly far less than a full manual inspection of the dataset. Most importantly, a validation of observations from videos from an independent, unambiguous identification based on diagnostic echolocation calls is extremely valuable. While some visitations of Ghost Bats might be very clearly of this species in the videos, there can be uncertainty with others. Echolocation call detection provides adequate validation.

In addition, there is comment in the guidelines about the difficulty of recognising juvenile Ghost Bats in videos, and consequently a recommendation to avoid using the technique when juveniles are likely to be present (section 2.3.1; p. 15). This is unnecessary because juveniles can also be recognised by echolocation calls and behaviour in the same way as adults.

2. Much detail is given in the guidelines about the density of sampling and the probability of detection—especially for a 'first stage' survey (see section 2). But it should be noted that probability of detection is likely to be different in other landscapes, given the number of nearby roosts, and the colony size in those roosts. In addition, the effective broadcast range of the acoustic lure is relatively limited, and has not yet been properly estimated (or standardised), though a diameter of 200 metres seems reasonable. The size of this stimulus zone might be too small for some situations, especially where different habitats and landscape features might need to be investigated to address specific requirements. Thus, increased sampling density consistent with the notion of the 'second stage' survey might be required for questions such as '*Which habitats do Ghost Bats use in this study area?*' or '*Do Ghost Bats visit this feature?*' The notion of the appropriate sampling density for different regions and study objectives is deserving of more discussion. This is acknowledged in section 2.8 of the guidelines.

3. Further empirical observations will provide a better understanding of the potential impact of the technique on the Ghost Bat, which will either support or diminish concern for the various ethical considerations mentioned throughout the guidelines. In my own experience in one comprehensive study, visitations typically involved either a single pass of the speaker, or else presence of a few seconds only, and typically not more than about one minute. Key to understanding impacts is knowing how many individuals might be detected (this information cannot be determined), the total visitation time, number of visitations per night, associated behaviours, and whether a roost site is likely to be nearby (relevant for the time when broadcasts are started). At present, I have

recommended that broadcasts continue for longer than is recommended in the guidelines because the aim is to maximise the chance of detection in relatively large, complex geological terrains. In my experience, the time of first detection of a Ghost Bat can be anytime throughout the night, though certainly most detections are within the first 2 – 3 hours after sunset.

4. The equipment described and illustrated in the guidelines comprises a single video camera. I recommend two 4K video cameras placed at right angles so that a second view of any approaching bat is available for situations where an identification is ambiguous. It also provides redundancy in case of equipment set-up issues, given the high cost of remote field surveys. I also recommend speakers that play from a micro-SD card rather than Bluetooth. The equipment set-up used on the present survey has been used successfully elsewhere, though it has several constraints, and the system will likely keep evolving with experience, feedback and the availability of newer technology.

5. In the guidelines there is an emphasis on the manual review of video streams and how this should be undertaken. The semi-automated analysis conducted by Specialised Zoological represents a significant improvement over manual reviews, and is undertaken with a different set of considerations designed to maximise robustness. Most of the information in section 2.6 on page 20 is not relevant to the present study.

6. I consider that effort for the discovery of diurnal roost sites is still the primary consideration for environmental impact assessments, but that the acoustic lure method is useful for confirming presence both near roosts and away from them, and for characterising the use of a study area for foraging.

7. Specialised Zoological has had minimal input into the sampling design and level of sampling intensity in this study.

This study used squabble calls provided by Dr Nicola Hanrahan with permission. I have confirmed with her that no registration number is required for this project because it began before the guidelines were released.

Appendix D Regional fauna records (detailed fauna surveys only).

Letter	Survey
A	Elevation-Hendrix Terrestrial Vertebrate Fauna Assessment (*ecologia*, 2023b)
B	Cobra Terrestrial Vertebrate Fauna Assessment (ecologia, 2023a)
C	Wyloo Terrestrial Vertebrate Fauna Assessment (*ecologia*, 2022c)
D	J6 Terrestrial Vertebrate Fauna Assessment (ecologia, 2022b)
E	Western Hub Fauna Surveys GHD 2020 (GHD, 2020)
F	Consolidated Vertebrate Fauna Survey (Ecoscape Australia, 2018)
G	Eliwana and Flying Fish Terrestrial Vertebrate Fauna Assessment (ecologia, 2015)
H	Mt Farquhar Terrestrial Vertebrate Fauna Assessment (ecologia, 2012)
I	Delphine Terrestrial Vertebrate Fauna Assessment (ecologia, 2013)
J	Beasley River Limonites Baseline Fauna Survey (Biota, 2009)
K	The Edge Terrestrial Vertebrate Fauna Survey (Biologic, 2013)
L	Fauna Habitats and Fauna Assemblage of the Brockman Syncline 4 Project, near Tom Price (Biota, 2005)

Scientific name	Common name	Conservation status		Database searches					Literature												Current survey
		WA status	EPBC Act	Atlas of Living	Birdlife	DBCA fauna	Fortescue PAR	PMST	A	B	C	D	E	F	G	H	I	J	K	L	
Mammals																					
TACHYGLOSSIDAE																					
Tachyglossus aculeatus	Echidna			x								x	x					x	x		x
DASYURIDAE																					
Antechinomys longicaudata	Long-tailed dunnart	P4	-			x	x							x							
Dasykaluta rosamondae	Little red kaluta			x							x	x	x	x	x		x		x	x	x
Dasyurus hallucatus	Northern quoll	EN	EN	x		x	x	x	x		x	x	x	x	x*		x		x		x
Ningaui timealeyi	Pilbara ningaui			x					x	x	x	x	x	x	x	x	x	x	x	x	x
Planigale sp.	Planigale								x	x	x	x	x	x	x	x	x	x	x		
Planigale kendricki	Orange-headed Pilbara planigale																				x
Pseudantechinus woolleyae	Woolley's pseudantechinus								x	x	x	x	x	x	x	x	x		x		x
Sminthopsis macroura	Stripe-faced dunnart										x			x			x	x	x		
PHALANGERIDAE																					
Trichosurus vulpecula	Brushtail possum			x					x	x				x							
MACROPODIDAE																					
Osphranter robustus erubescens	Euro								x	x	x	x	x	x	x	x	x	x	x	x	
Osphranter rufus	Red kangaroo			x					x			x	x	x	x		x		x	x	x
Petrogale rothschildi	Rothchild's rock wallaby								x	x	x	x	x	x		x	x				x
MURIDAE																					
Leggadina lakedownensis	Northern short-tailed mouse	P4	-			x	x							x				x			
Mus musculus	House mouse			x					x	x	x		x	x	x	x		x		x	
Pseudomys chapmani	Western pebble-mound mouse	P4	-	x		x	x		x	x	x	x	x	x	x		x		x	x	x
Pseudomys pilbarensis	Pilbara delicate mouse										x	x		x	x						x
Pseudomys desertor	Desert mouse								x	x	x	x		x		x	x			x	x
Pseudomys hermannsburgensis	Sandy inland mouse			x					x	x	x	x		x	x		x	x	x	x	x
Zyzomys argurus	Common rock rat			x					x	x	x	x	x	x		x	x	x	x	x	x
RHINONYCTERIDAE																					
Rhinonicteris aurantia (Pilbara pop'n)	Pilbara leaf-nosed bat	VU	VU			x	x	x	x	x	x	x	x	x	x	x	x	x	x		x
MEGADERMATIDAE																					
Macroderma gigas	Ghost bat	VU	VU	x		x	x	x			x		x	x	x						x
EMBALLONURIDAE																					
Saccolaimus flaviventris	Yellow-belly sheath-tail bat			x					x	x	x	x	x	x	x	x	x		x		x
Taphozous georgianus	Common sheath-tail bat			x					x	x	x	x	x	x	x	x	x	x	x	x	x
Taphozous hilli	Hill's sheathtail-bat			x																	
MOLOSSIDAE																					
Chaerephon jobensis	Greater northern free-tail bat			x					x	x	x	x	x	x	x	x	x		x		x
Ozimops lumsdenae	Northern free-tail bat			x					x	x	x	x	x	x	x	x	x		x	x	x
Austronomus australis	White-striped free-tailed bat												x	x		x	x	x		x	
VESPERTILIOIDAE																					
Chalinolobus gouldii	Gould's wattle bat			x					x	x	x	x	x	x	x	x	x	x	x	x	x
Nyctophilus geoffroyi	Lesser long-eared bat										x		x	x	x				x	?	
Nyctophilus sp.	Unidentified long-eared bat								x												
Scotorepens greyii	Little broad-nosed bat								x	x	x	x	x	x	x	x	x	x	x	x	x
Vespadelus finlaysoni	Finlayson's cave bat			x					x	x	x	x	x	x	x	x	x	x	x	x	x

Scientific name	Common name	Conservation status		Database searches					Literature												Current survey
		WA status	EPBC Act	Atlas of Living	Birdlife	DBCA fauna	Fortescue PAR	PMST	A	B	C	D	E	F	G	H	I	J	K	L	
Mammals																					
CANIDAE																					
Canis familiaris	Dingo/Dog			x					x	x	x	x	x	x	x	x	x			x	x
FELIDAE																					
Felis catus	Cat								x	x	x	x	x	x	x	x	x		x	x	x
EQUIDAE																					
Equus africanus asinus	Donkey											x	x	x	x					x	x
Equus ferus caballus	Horse												x				x		x	x	
BOVIDAE																					
Bos primigenius taurus	European cattle			x					x		x	x	x	x	x	x	x		x		x
Total				20	0	6	6	3	25	21	27	26	28	33	24	20	26	15	24	20	26
Birds																					
Casuariidae																					
Dromaius novaehollandiae	Emu			x	x						x		x	x			x			x	
Anatidae																					
Cygnus atratus	Black swan			x	x														x		
Chenonetta jubata	Australian wood duck			x	x								x						x		
Anas superciliosa	Pacific black duck			x	x				x	x			x	x			x		x	x	
Anas gracilis	Grey teal			x	x									x						x	
Aythya australis	Hardhead			x	x																
Phasianidae																					
Synoicus ypsilophora	Brown quail			x	x					x				x	x		x				
Coturnix pectoralis	Stubble quail			x	x									x							
Podargidae																					
Podargus strigoides	Tawny frogmouth			x	x					x	x		x	x	x		x		x	x	x
Caprimulgidae																					
Eurostopodus argus	Spotted nightjar			x	x				x		x	x	x	x	x	x	x	x	x	x	x
Aegothelidae																					
Aegotheles cristatus	Australian owlet-nightjar			x	x				x	x	x	x	x	x	x		x		x		x
Apodidae																					
Apus pacificus	Fork-tailed swift	MI	MI			x	x	x			x	x		x							
Otididae																					
Ardeotis australis	Australian bustard			x	x				x			x		x	x		x		x	x	
Cuculidae																					
Centropus phasianinus	Pheasant coucal			x	x									x			x				
Chalcites basalis	Horsfield's bronze-cuckoo			x	x					x	x	x	x	x	x		x	x		x	x
Chalcites osculans	Black-eared cuckoo			x	x			x													
Heteroscenes pallidus	Pallid cuckoo			x	x				x	x	x	x	x	x	x	x	x		x	x	x
Columbidae																					

Scientific name	Common name	Conservation status		Database searches					Literature											Current survey
		WA status	EPBC Act	Atlas of Living	Birdlife	DBCA fauna	Fortescue PAR	PMST	A	B	C	D	E	F	G	H	I	J	K	L	
Mammals																					
**Spilopelia senegalensis*	Laughing turtle-dove																x				
**Columba livia*	Rock dove				x																
Phaps chalcoptera	Common bronzewing			x	x				x	x	x	x	x	x	x	x	x		x	x	x
Phaps histrionica	Flock bronzewing			x	x																
Ocyphaps lophotes	Crested pigeon			x	x				x	x	x	x	x	x	x	x	x	x	x	x	x
Geophaps plumifera	Spinifex pigeon			x	x				x	x	x	x	x	x	x	x	x	x	x	x	x
Geopelia cuneata	Diamond dove			x	x				x	x	x	x	x	x	x	x	x	x	x	x	x
Geopelia striata	Peaceful dove			x	x				x	x			x	x			x				x
Rallidae																					
Tribonyx ventralis	Black-tailed native-hen			x																	
Fulica atra	Eurasian coot			x	x														x		
Porphyrio melanotus	Purple swamphen			x	x																
Zapornia tabuensis	Spotless crake			x																	
Podicipedidae																					
Tachybaptus novaehollandiae	Australian grebe			x	x									x			x		x		
Poliocephalus poliocephalus	Hoary-headed grebe				x																
Turnicidae																					
Turnix varius	Painted button-quail			x																	
Turnix velox	Little button-quail			x	x				x	x	x	x	x	x	x	x	x	x	x	x	
Burhinidae																					
Burhinus grallarius	Bush-stone curlew			x	x				x				x	x	x		x		x	x	x
Recurvirostridae																					
Himantopus himantopus	Black-winged stilt			x																	
Himantopus leucocephalus	Pied stilt				x																
Charadriidae																					
Elseyornis cintus	Red-kneed dotterel				x																
Elseyornis melanops	Black-fronted dotterel			x	x								x				x		x	x	
Charadrius veredus	Oriental plover	MI	MI	x	x	x	x	x													
Rostratulidae																					
Rostratula australis	Australian painted snipe	EN	EN					x													
Scolopacidae																					
Calidris acuminata	Sharp-tailed sandpiper	MI	VU & MI	x	x			x													
Calidris ferruginea	Curlew sandpiper	CR	CR & MI					x													
Calidris ruficollis	Red-necked stint			x																	
Calidris melanotos	Pectoral sandpiper	MI	MI					x													
Actitis hypoleucos	Common sandpiper	MI	MI	x	x	x		x													

Scientific name	Common name	Conservation status		Database searches					Literature												Current survey
		WA status	EPBC Act	Atlas of Living	Birdlife	DBCA fauna	Fortescue PAR	PMST	A	B	C	D	E	F	G	H	I	J	K	L	
Mammals																					
Tringa nebularia	Common greenshank				x																
Glareolidae																					
Glareola maldivarum	Oriental pratincole	MI	MI					x													
Anhingidae																					
Anhinga novaehollandiae	Australasian darter			x	x								x				x		x		
Phalacrocoracidae																					
Microcarbo melanoleucos	Little pied cormorant			x	x				x				x				x		x		
Phalacrocorax varius	Pied cormorant			x	x																
Phalacrocorax carbo	Great cormorant				x																
Phalacrocorax sulcirostris	Little black cormorant			x	x																
Threskiornithidae																					
Threskiornis molucca	Australian white ibis																		x		
Threskiornis spinicollis	Straw-necked ibis			x	x								x				x				
Platalea flavipes	Yellow-billed spoonbill																		x		
Ardeidae																					
Nycticorax caledonicus	Nankeen night heron			x	x												x				
Bubulcus coromandus	Cattle egret							x													
Ardea pacifica	White-necked heron			x	x				x				x	x			x	x	x	x	
Ardea alba	Great egret			x	x												x		x		
Ardea plumifera	Plumed egret				x																
Egretta novaehollandiae	White-faced heron			x	x				x				x	x			x			x	
Egretta garzetta	Little egret			x	x																
Pelecanidae																					
Pelecanus conspicillatus	Australian pelican			x	x				x				x				x		x		
Pandionidae																					
Pandion haliaetus	Osprey	MI	MI	x		x	x														
Accipitridae																					
Elanus axillaris	Black-shouldered kite			x	x									x	x				x		
Lophoictinia isura	Square-tailed kite			x					x								x		x		
Hamirostra melanosternon	Black-breasted buzzard			x	x								x								
Hieraaetus morphnoides	Little eagle			x	x								x	x	x	x	x		x	x	
Aquila audax	Wedge-tailed eagle			x	x				x	x	x	x	x	x	x		x	x	x	x	x
Erythrotriorchis radiatus	Red goshawk	VU	EN					x													
Tachyspiza fasciatus	Brown goshawk			x	x				x	x	x	x	x	x	x	x	x		x	x	
Tachyspiza cirrocephalus	Collared sparrowhawk			x					x	x	x	x		x			x		x		x
Circus approximans	Swamp harrier			x	x									x							
Circus assimilis	Spotted harrier			x	x						x	x	x	x	x	x	x		x	x	
Milvus migrans	Black kite			x	x								x	x		x	x		x		
Haliastur sphenurus	Whistling kite			x	x				x		x		x	x	x		x		x	x	x

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Mammals																					
Tytonidae																					
Tyto javanica	Barn owl			x	x									x					x	x	
Strigidae																					
Ninox connivens	Barking owl			x									x				x				
Ninox boobook	Southern boobook			x	x				x		x		x	x	x	x	x	x	x		x
Alcedinidae																					
Dacelo leachii	Blue-winged kookaburra			x	x				x	x		x	x	x	x		x	x	x	x	x
Todiramphus sanctus	Sacred kingfisher			x	x				x	x	x	x	x	x	x		x		x		
Todiramphus pyrrhopygius	Red-backed kingfisher			x	x				x	x	x	x	x	x	x	x	x	x	x	x	x
Meropidae																					
Merops ornatus	Rainbow bee-eater			x	x				x	x	x	x	x	x	x	x	x	x	x	x	x
Falconidae																					
Falco cenchroides	Nankeen kestrel			x	x				x		x	x	x	x	x	x	x	x	x	x	x
Falco longipennis	Australian hobby			x	x				x		x	x		x	x		x		x	x	
Falco berigora	Brown falcon			x	x				x	x	x	x	x	x	x	x	x	x	x	x	x
Falco hypoleucos	Grey falcon	VU	VU			x		x					x				x				
Falco subniger	Black falcon			x																	
Falco peregrinus	Peregrine falcon	OS	-	x	x	x	x		x	x		x		x		x					
Cacatuidae																					
Nymphicus hollandicus	Cockatiel			x	x				x		x	x	x	x	x	x	x		x	x	x
Calyptorhynchus banksii	Red-tailed black cockatoo			x	x																
Eolophus roseicapilla	Galah			x	x				x	x	x	x	x	x	x	x	x	x	x	x	x
Cacatua sanguinea	Little corella			x	x				x	x	x	x	x	x	x	x	x		x	x	x
Psittaculidae																					
Polytelis alexandrae	Princess parrot	P4	VU					x													
Psephotellus varius	Mulga parrot			x																	
Barnardius zonarius	Australian ringneck			x	x				x	x	x	x	x	x	x	x	x		x	x	x
Pezoporus occidentalis	Night parrot	CR	EN					x													
Neopsephotus bourkii	Bourke's parrot			x							x	x									
Neophema elegans	Elegant parrot			x										x							
Melopsittacus undulatus	Budgerigar			x	x				x	x	x	x	x	x	x	x	x	x	x	x	x
Ptilonorhynchidae																					
Chlamydera guttata	Western bowerbird			x	x				x	x	x	x	x	x	x	x	x		x	x	x
Climacteridae																					
Climacteris melanurus	Black-tailed treecreeper			x	x								x	x		x	x			x	x
Maluridae																					
Malurus assimilis	Purple-backed fairywren			x					x	x	x	x	x	x	x	x	x	x	x	x	x
Malurus splendens	Splendid fairywren			x	x																
Malurus leucopterus	White-winged fairywren			x	x				x	x	x	x	x	x	x	x	x		x	x	x

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Mammals																					
Stipiturus ruficeps	Rufous crowned emuwren								x											x	x
Amytornis whitei	Pilbara grasswren			x	x	x			x	x	x	x		x	x		x		x	x	x
Meliphagidae																					
Epthianura tricolor	Crimson chat			x	x								x	x	x	x	x		x	x	x
Lacustroica whitei	Grey honeyeater			x										x							
Certhionyx variegatus	Pied honeyeater			x	x								x	x	x		x				x
Sugomel niger	Black honeyeater			x	x									x	x	x	x				
Lichmera indistincta	Brown honeyeater			x	x				x	x	x	x	x	x	x	x	x	x		x	x
Melithreptus gularis	Black-chinned honeyeater			x								x	x	x	x	x	x		x	x	x
Purnella albifrons	White-fronted honeyeater			x						x	x	x		x	x		x			x	
Gavicalis virescens	Singing honeyeater			x	x				x	x	x	x	x	x	x	x	x	x	x	x	x
Ptilotula keartlandi	Grey-headed honeyeater			x	x				x	x	x	x	x	x	x	x	x	x	x	x	x
Ptilotula plumula	Grey-fronted honeyeater				x						x										
Ptilotula penicillata	White-plumed honeyeater			x	x				x	x	x	x	x	x	x	x	x		x	x	x
Acanthagenys rufogularis	Spiny-cheeked honeyeater			x	x				x		x	x	x	x	x		x	x	x	x	x
Manorina flavigula	Yellow-throated miner			x	x				x	x	x	x	x	x	x	x	x	x	x	x	x
Pardalotidae																					
Pardalotus rubricatus	Red-browed pardalote			x	x				x	x	x	x	x	x	x	x	x	x	x	x	x
Pardalotus striatus	Striated pardalote			x	x				x	x	x	x	x	x	x	x	x	x	x	x	x
Acanthizidae																					
Smicrornis brevirostris	Weebill			x	x				x	x	x	x	x	x	x	x	x	x	x	x	x
Pyrrholaemus brunneus	Redthroat				x																x
Gerygone fusca	Western gerygone			x	x						x	x	x	x	x		x	x	x	x	x
Gerygone tenebrosa	Dusky gerygone			x																	
Acanthiza apicalis	Inland thornbill			x										x						x	
Acanthiza uropygialis	Chestnut-rumped thornbill			x	x					x		x		x	x			x		x	x
Acanthiza chrysorrhea	Yellow-rumped thornbill			x															x		
Acanthiza robustirostris	Slaty-backed thornbill			x	x						x			x							
Aphelocephala leucopsis	Southern whiteface	P4	VU					x													
Pyrrholaemus brunneus	Redthroat			x																	
Pomatostomidae																					
Pomatostomus temporalis	Grey-crowned babbler			x	x				x	x	x	x	x	x	x	x	x	x	x	x	x
Pomatostomus superciliosus	White-browed babbler			x	x															x	
Psophodidae																					
Psophodes occidentalis	Chiming wedgebill			x	x						x										x
Cinclosomatidae																					
Cinclosoma marginatum	Western quail-thrush			x	x															x	

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Mammals																					
Artamidae																					
Artamus personatus	Masked woodswallow			x	x						x			x	x	x	x				x
Artamus cinereus	Black-faced woodswallow			x	x				x	x	x	x	x	x	x	x	x		x	x	x
Artamus minor	Little woodswallow			x	x				x	x	x	x	x	x	x	x	x	x		x	x
Gymnorhina tibicen	Australian magpie			x	x				x	x	x	x	x	x	x		x	x	x	x	x
Cracticus torquatus	Grey butcherbird			x	x				x		x			x	x		x		x	x	x
Cracticus nigrogularis	Pied butcherbird			x	x				x	x	x	x	x	x	x	x	x	x	x	x	x
Campephagidae																					
Coracina maxima	Ground cuckoo-shrike			x								x		x			x	x		x	x
Coracina novaehollandiae	Black-faced cuckoo-shrike			x	x				x	x	x	x	x	x	x	x	x	x	x	x	x
Lalage tricolor	White-winged triller			x	x						x		x	x	x	x	x			x	x
Neosittidae																					
Daphoenositta chrysoptera	Varied sittella			x	x																
Oreoicidae																					
Oreoica gutturalis	Crested bellbird			x	x				x	x	x	x	x	x	x	x	x	x	x	x	x
Pachycephalidae																					
Pachycephala rufiventris	Rufous whistler			x	x				x	x	x	x	x	x	x	x	x	x	x	x	x
Colluricincla harmonica	Grey shrike-thrush			x	x				x	x	x	x	x	x	x	x	x	x		x	x
Rhipiduridae																					
Rhipidura leucophrys	Willie wagtail			x	x				x	x	x	x	x	x	x	x	x	x	x	x	x
Rhipidura albiscapa	Grey fantail			x						x			x				x				x
Monarchidae																					
Grallina cyanoleuca	Magpie-lark			x	x				x	x	x	x	x	x	x		x	x	x	x	x
Corvidae																					
Corvus orru	Torresian crow			x	x				x	x	x	x	x	x	x	x	x	x	x	x	x
Corvus bennetti	Little crow			x	x									x							
Petroicidae																					
Melanodryas cucullata	Hooded robin			x	x				x	x	x	x	x	x	x	x	x	x		x	x
Petroica goodenovii	Red-capped robin			x	x							x		x			x	x		x	

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Mammals																					
Alaudidae																					
Mirafra javanica	Horesfield's bushlark			x	x									x			x				
Hirundinidae																					
Cheramoeca leucosterna	White-backed swallow			x	x							x		x							
Hirundo rustica	Barn swallow	MI	MI					x													
Hirundo neoxena	Welcome swallow			x	x								x								
Petrochelidon ariel	Fairy martin			x	x						x		x	x	x			x		x	x
Petrochelidon nigricans	Tree martin			x	x					x	x		x	x			x			x	x
Acrocephalidae																					
Acrocephalus australis	Australian reed warbler			x	x												x				
Locustellidae																					
Poodytes carteri	Spinifexbird			x	x				x	x	x	x	x	x	x	x	x	x	x	x	x
Cincloramphus cruralis	Brown songlark			x	x									x	x		x			x	
Cincloramphus mathewsi	Rufous songlark			x	x						x	x		x	x	x	x		x	x	x
Dicaeidae																					
Dicaeum hirundinaceum	Mistletoebird			x	x				x	x		x	x	x	x	x	x			x	x
Estrildidae																					
Bathilda ruficauda	Star finch			x	x														x		
Emblema pictum	Painted finch			x	x				x	x	x	x		x	x	x	x	x		x	x
Taeniopygia castanotis	Australian zebra finch			x	x				x	x	x	x	x	x	x	x	x	x	x	x	x
Motacillidae																					
Motacilla flava	Yellow wagtail	MI	MI					x													
Motacilla cinerea	Grey wagtail	MI	MI		x			x													
Anthus australis	Australian pipit			x	x								x	x						x	x
Total				147	133	7	4	18	67	59	70	67	83	102	76	56	100	45	78	83	74
Reptiles																					
CHELONIIDAE																					

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Mammals																					
Chelonia mydas	Green turtle			x																	
CARPHODACTYLIDAE																					
Nephrurus cinctus	Banded knob-tailed gecko			x					x	x		x	x	x	x	x	x		x	x	
Underwoodisaurus seorsus	Pilbara barking gecko	P2				x								x		x					
DIPLODACTYLIDAE																					
Crenadactylus pilbarensis	Clawless gecko										x		x	x							
Diplodactylus bilybara (conspicillatus)	Fat-tailed gecko			x							x			x	x		x		x	x	
Diplodactylus galaxias	Northern Pilbara beak-faced gecko											x									
Diplodactylus laevis	Desert fat-tailed gecko											x									x
Diplodactylus savagei	Pilbara beak-faced gecko			x					x	x	x	x	x	x	x		x	x		x	x
Lucasium woodwardi (stenodactylum)	Sand-plain gecko			x							x		x	x	x		x	x	x	x	x
Lucasium wombeyi	Pilbara ground gecko			x							x			x	x		x	x		x	
Oedura fimbria (marmorata)	Marbled velvet gecko			x							x		x	x	x	x	x	x	x		x
Rhynchoedura ornata	Western beaked gecko			x										x			x			x	
Strophurus ciliaris	Northern spiny-tailed gecko			x																	
Strophurus elderi	Jewelled gecko			x					x	x	x		x	x			x			x	x
Strophurus wellingtonae	Western-shield spiny-tailed gecko			x										x			x			x	
GEKKONIDAE																					
Gehyra crypta	Cryptic gehyra			x					x		x		x								x
Gehyra finipunctata (punctulata)	Small-spotted midwest rock gehyra			x							x										x
Gehyra micra	Little gehyra			x					x	x	x		x								
Gehyra montium	Centralian gehyra										x										x
Gehyra pilbara	Pilbara gehyra			x									x	x		x	x		x		
Gehyra punctata	Spotted rock gehyra			x					x	x	x	x	x	x	x	x	x	x	x	x	x
Gehyra purpurascens	Purple arid gehyra																		x		x
Gehyra variegata	Tree gehyra			x					x		x	x	x	x	x	x	x	x	x	x	
Heteronotia binoei	Bynoe's gecko			x					x	x	x	x	x	x	x	x	x	x	x	x	x
Heteronotia spelea	Desert cave gecko			x					x	x	x	x	x	x			x	x	x		x
PYGOPODIDAE																					
Delma butleri	Spinifex delma										x	x									

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Mammals																					
Delma elegans	Elegant delma			x					x		x		x	x							x
Delma nasuta	Sharp-snout delma			x					x	x	x	x	x	x	x	x	x		x	x	x
Delma pax	Peace delma			x					x		x	x	x	x	x	x	x			x	x
Delma tincta	Black-necked delma			x										x	x					x	
Lialis burtonis	Burton's legless lizard			x					x	x	x	x	x	x	x	x	x			x	x
Pygopus nigriceps	Hooded scaly-foot			x							x	x		x	x		x			x	
AGAMIDAE																					
Ctenophorus caudicinctus	Ring-tailed dragon			x					x	x	x	x	x	x	x	x	x	x	x	x	x
Ctenophorus isolepis	Central military dragon			x							x	x	x	x	x			x	x	x	x
Ctenophorus nuchalis	Central netted dragon			x									x						x		x
Ctenophorus reticulatus	Western netted dragon			x									x								
Ctenophorus scutulatus	Lozenge-marked dragon			x																	
Diporiphora amphiboluroides	Mulga dragon													x							
Diporiphora valens	Southern Pilbara tree dragon			x										x						x	
Gowidon longirostris	Long-nosed dragon			x					x	x	x	x	x	x	x	x	x	x	x	x	x
Pogona minor	Dwarf bearded dragon													x			x		x	x	x
Tympanocryptis cephalus	Pebble dragon			x										x							
SCINCIDAE																					
Carlia munda	Striped rainbow skink			x					x	x	x	x	x	x	x	x	x	x	x	x	x
Carlia triacantha	Desert rainbow skink													x				x			
Cryptoblepharus buchananii	Buchanan's skink			x									x	x						x	
Cryptoblepharus ustulatus	Russet snake-eyed skink			x								x	x		x	x	x	x	x	x	x
Ctenotus grandis	Grand ctenotus								x	x	x	x	x	x	x	x	x	x	x	x	x
Ctenotus hanloni	Hanlon's skink			x																	
Ctenotus helenae (inornatus)	Helen's skink			x					x		x	x	x	x	x	x	x	x	x	x	x
Ctenotus iapetus	North west cape ctenotus			x																	
Ctenotus leonhardii	Leonhard's ctenotus													x							
Ctenotus mimetes	Checker-sided ctenotus			x																	
Ctenotus pallasotus (duricola)	Pilbara striped ctenotus			x					x			x	x	x	x		x			x	x
Ctenotus pantherinus	Leopard skink			x					x	x	x	x	x	x	x	x	x	x	x	x	x
Ctenotus robustus	Robust striped skink			x										x			x				
Ctenotus rubicundus	Rufous skink			x					x	x	x	x	x	x	x	x	x	x			x
Ctenotus rutilans	Rusty-shouldered ctenotus			x										x	x			x		x	

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Mammals																					
Ctenotus saxatilis	Rock ctenotus			x					x	x	x	x	x		x	x	x	x	x	x	x
Ctenotus schomburgkii	Wedge-snout ctenotus			x						x		x		x		x	x			x	x
Ctenotus severus				x																	
Ctenotus superciliaris	Sharp-browed ctenotus													x							
Ctenotus uber	Spotted ctenotus			x										x							
Cyclodomorphus melanops	Slender blue-tongue			x					x	x		x	x	x	x		x	x	x	x	x
Egernia cygnitos	Western pilbara spiny-tail			x									x	x	x		x				
Egernia formosa	Goldfields crevice skink			x					x	x	x	x	x	x	x	x	x	x	x	x	x
Eremiascincus richardsonii	Broad-banded sand- swimmer			x										x	x		x				
Eremiascincus isolepis	Bar-lipped sand-swimmer			x															x		
Eremiascincus pallidus	Western sand-swimmer													x					x		
Eremiascincus rubiginosus	Rusty skink			x																	
Lerista bipes	North-western sand-swimmer			x																	
Lerista clara	Sharp-blazed three-toed slider			x																	
Lerista flammicauda	Pilbara flame-tailed slider			x					x	x	x		x	x		x			x		x
Lerista jacksoni	Jackson's slider			x															x		
Lerista macropisthopis	Big slider												x						x		x
Lerista muelleri	Mueller's three-toed slider			x					x	x	x	x	x	x	x					x	x
Lerista rolfei	Rolfe's slider			x																	
Lerista verhmens	Powerful lerista			x										x							
Menetia greyii	Common dwarf skink			x					x	x	x	x	x	x	x				x	x	x
Menetia surda	Western dwarf skink			x										x	x		x		x	x	
Morethia ruficauda	Lined firetail skink			x					x	x	x	x	x	x		x	x	x	x	x	x
Notoscincus butleri	Lined soil-crevice skink	P4		x		x	x		x	x	x	x	x	x	x		x			x	x
Notoscincus ornatus	Ornate snake-eyed skink			x							x			x	x		x		x		
Proablepharus reginae	Spinifex snake-eyed skink													x	x						
Tiliqua multifasciata	Central blue-tongue			x							x	x	x	x	x	x	x		x	x	x
VARANIDAE																					
Varanus acanthurus	Spiny-tailed monitor			x					x	x	x	x	x	x	x	x	x	x	x	x	x
Varanus brevicauda	Short-tailed pygmy monitor										x		x	x	x		x		x	x	
Varanus bushi	Pilbara pygmy monitor			x									x	x	x				x		

Scientific name	Common name	Conservation status		Database searches					Literature												Current survey
		WA status	EPBC Act	Atlas of Living	Birdlife	DBCA fauna	Fortescue PAR	PMST	A	B	C	D	E	F	G	H	I	J	K	L	
Mammals																					
Varanus caudolineatus	Striped-tailed monitor													x				x			
Varanus eremius	Pygmy desert monitor										x			x	x		x		x	x	
Varanus giganteus	Perentie			x					x	x	x	x	x	x			x		x	x	x
Varanus hamersleyensis	Hamersley rock monitor			x					x	x	x	x	x	x	x	x	x		x	x	x
Varanus panoptes	Yellow-spotted monitor			x					x		x	x	x	x	x		x			x	x
Varanus tristis	Black-headed monitor			x						x	x		x	x	x	x	x	x		x	x
TYPHLOPIDAE																					
Anilios ammodytes	Sand-diving blind snake			x									x	x	x		x		x		x
Anilios ganei	Ganes blind snake	P1		x		x	x			x			x	x							x
Anilios grypus	Northern beaked blind snake			x							x	x	x	x	x					x	x
Anilios hamatus	Pale-headed blind snake			x																	
Anilios pilbarensis	Pilbara blind snake			x										x						x	
PYTHONIDAE																					
Antaresia perthensis	Pygmy python			x					x		x			x	x		x		x		x
Antaresia childreni (Antaresia stimsoni)	Children's python			x							x	x	x	x	x		x	x	x		x
Aspidites melanocephalus	Black-headed python			x							x			x			x		x		
Liasis olivaceus barroni	Pilbara olive python	VU	VU	x		x	x	x						x	x			x			
ELAPIDAE																					
Acanthophis wellsi	Pilbara death adder										x		x	x	x	x					x
Brachyurophis approximans	Shovel-nosed snake			x					x		x			x	x					x	
Demansia reticulata	Reticulated whipsnake			x					x	x	x		x	x	x	x	x		x	x	x
Demansia rufescens	Rufous whipsnake			x					x	x	x	x		x	x	x			x		x
Furina ornata	Orange-napped snake			x							x	x	x	x	x	x	x	x	x	x	
Pseudechis australis	Mulga snake			x					x	x	x	x	x	x	x	x	x		x	x	x
Pseudonaja mengdeni	Gwardar/Western brown snake										x	x	x	x	x		x		x	x	x
Pseudonaja modesta	Ringed brown snake			x					x		x		x	x	x	x	x		x		x
Simoselaps anomalus	Desert banded snake			x																	
Suta fasciata	Rosen's snake			x					x			x	x	x	x		x		x		
Suta gaikhorstorum (Parasuta monarchus)	Pilbara hooded snake			x							x	x	x	x	x	x	x		x	x	
Suta punctata	Little spotted snake													x	x						
Vermicella snelli	Pilbara bandy bandy			x															x		
Total				93	0	4	3	1	40	32	58	45	60	86	60	34	58	29	53	54	55

Scientific name	Common name	Conservation status		Database searches					Literature												Current survey
		WA status	EPBC Act	Atlas of Living	Birdlife	DBCA fauna	Fortescue PAR	PMST	A	B	C	D	E	F	G	H	I	J	K	L	
Mammals																					
Amphibians																					
PELODRYADIDAE																					
Cyclorana maini	Sheep frog			x					x	x	x	x		x			x			x	
Litoria larisonans	Little red tree frog			x						x	x	x	x	x	x		x	x	x	x	x
MYOBATRACHIDAE																					
Pseudophryne douglasi	Gorge toadlet			x						x											x
Uperoleia saxatilis	Pilbara toadlet			x									x	x	x		x		x		
Total				4	0	0	0	0	1	3	2	2	2	3	2	0	3	1	2	2	2
Fish																					
CLUPEIDAE																					
Nematalosa erebi	Bony bream																x				
GOBIIDAE																					
Glossogobius giuris	Tank goby			x																	
MELANOTAENIIDAE																					
Melanotaenia australis	Western rainbowfish										x					x	x				
PLOTOSIDAE																					
Neosilurus hyrtlii	Hyrtl's catfish																x		x		
TERAPONTIDAE																					
Amniataba percoides	Barred grunter			x													x		x		
Leiopotherapon aheneus	Fortescue grunter	P4	-			x	x										x				
Leiopotherapon unicolor	Spangled perch			x							x			x	x	x	x				
Total				3	0	1	1	0	0	0	2	0	0	1	1	2	6	0	2	0	0

Appendix E Fauna habitat assessments and cave habitat assessments (current survey).

WNDP01

Date	18/04/2024		
Site type	Systematic trapping site		
Coordinate	50k -22.5039, 116.6364		
Habitat type	Shrubland (Open)		
Habitat type (other)	NA		
Habitat description	Acacia shrubland		
Habitat condition	Very Good		
Suitability for significant species	NA		
Evidence of significant species	No		
Disturbance	Roads in proximity, cattle		
Time since fire	No evidence		
Leaf litter cover	< 10		
Woody debris	10 – 40		
Rocky crevices/caves	NA		
Large trees	No		
Tree hollows	No		
Landform	Floodplain	**Landform (other)**	NA
Slope	Negligible	**Aspect**	NA
Soil colour	Light brown	**Soil texture**	Loamy sand
Bare soil	10 – 30	**Drainage**	NA
Rock type	Ironstone	**Rock size**	Pebbles (2-64 mm)
Rock abundance	30 – 70		
Upper stratum	NA		
Middle stratum	Shrubland		
Lower stratum	Scattered hummock grassland		

WNDP02

Date	17/04/2024		
Site type	Systematic trapping site		
Coordinate	50k -22.5273, 116.6902		
Habitat type	Hills/Ranges/Plateaux		
Habitat type (other)	NA		
Habitat description	Rocky hill with open eucalypt woodland over open acacia shrubland over mid-dense spinifex grassland		
Habitat condition	Very Good		
Suitability for significant species	Northern quoll, Pilbara leaf-nosed bat, ghost bat		
Evidence of significant species	Yes		
Disturbance	Nearby recent fire		
Time since fire	> 5 yrs		
Leaf litter cover	< 10		
Woody debris	< 10		
Rocky crevices/caves	30 – 70		
Large trees	No		
Tree hollows	Yes		
Landform	Hill	**Landform (other)**	NA
Slope	Moderate	**Aspect**	Southwest
Soil colour	Reddish brown	**Soil texture**	Loamy sand
Bare soil	< 10	**Drainage**	Drainage line
Rock type	Banded ironstone	**Rock size**	Mixed
Rock abundance	30 – 70		
Upper stratum	Open woodland		
Middle stratum	Open shrubland		
Lower stratum	Mid-dense hummock grassland		

WNDP03

Date	19/04/2024
Site type	Systematic trapping sote
Coordinate	50k -22.6195, 116.7855
Habitat type	Drainage Line/River/Creek (major)
Habitat type (other)	NA
Habitat description	Major creekline, large Eucalypts over Acacia shrubland over open hummock grassland and buffel grass.
Habitat condition	Good
Suitability for significant species	Northern quoll- potential transit, ghost bat, grey falcon
Evidence of significant species	No
Disturbance	Cattle grazed understory, with infestation of buffel grass
Time since fire	> 5 yrs
Leaf litter cover	10 – 40
Woody debris	10 – 40
Rocky crevices/caves	NA
Large trees	Yes
Tree hollows	Yes
Landform	Creek
Landform (other)	NA
Slope	Negligible
Aspect	NA
Soil colour	Reddish brown
Soil texture	Sandy clay
Bare soil	< 10
Drainage	Major creek (5-30 m)
Rock type	Ironstone
Rock size	Cobbles (64-256 mm)
Rock abundance	10 – 30
Upper stratum	Tall woodland
Middle stratum	Open shrubland
Lower stratum	Very open tussock grassland / herbland

WNDP04

Date	19/04/2024
Site type	Systematic trapping site
Coordinate	50k -22.5884, 116.7393
Habitat type	Hummock Grassland
Habitat type (other)	NA
Habitat description	Very sparse, low Acacia and eucalypt trees over open acacia shrubland over mid-dense spinifex grassland
Habitat condition	Good
Suitability for significant species	Grey falcon
Evidence of significant species	No
Disturbance	Cattle observed nearby
Time since fire	> 5 yrs
Leaf litter cover	< 10
Woody debris	< 10
Rocky crevices/caves	NA
Large trees	No
Tree hollows	No
Landform	Plain
Landform (other)	NA
Slope	Negligible
Aspect	NA
Soil colour	Reddish brown
Soil texture	Loamy sand
Bare soil	< 10
Drainage	NA
Rock type	Ironstone
Rock size	Pebbles (2-64 mm)
Rock abundance	10 – 30
Upper stratum	Scattered low trees
Middle stratum	Open shrubland
Lower stratum	Mid-dense hummock grassland

WNDP05

Date	17/04/2024		
Site type	Systematic trapping site		
Coordinate	50k -22.4499, 116.6229		
Habitat type	Hills/Ranges/Plateaux		
Habitat type (other)	NA		
Habitat description	Rocky hill with scattered Eucalypt trees over scattered Acacia shrubs over mid-dense spinifex grassland		
Habitat condition	Very Good		
Suitability for significant species	Northern quoll, Pilbara leaf-nosed bat, ghost bat		
Evidence of significant species	No		
Disturbance	Road adjacent		
Time since fire	> 5 yrs		
Leaf litter cover	< 10		
Woody debris	< 10		
Rocky crevices/caves	10 – 30		
Large trees	No		
Tree hollows	No		
Landform	Hill	**Landform (other)**	NA
Slope	Moderate	**Aspect**	Northeast
Soil colour	Reddish brown	**Soil texture**	Sandy loam
Bare soil	< 10	**Drainage**	Drainage line
Rock type	Mixed	**Rock size**	Mixed
Rock abundance	30 – 70		
Upper stratum	Scattered trees		
Middle stratum	Scattered shrubs		
Lower stratum	Mid-dense hummock grassland		

WNDP06

Date	18/04/2024		
Site type	Systematic trapping site		
Coordinate	50k -22.5593, 116.7026		
Habitat type	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)		
Habitat type (other)	NA		
Habitat description	Mesa top, with stony substrates. Acacia spp. mixed shrubland over spinifex grassland		
Habitat condition	Excellent		
Suitability for significant species	NA		
Evidence of significant species	No		
Disturbance	NA		
Time since fire	> 5 yrs		
Leaf litter cover	< 10		
Woody debris	< 10		
Rocky crevices/caves	NA		
Large trees	No		
Tree hollows	No		
Landform	Mesa	**Landform (other)**	NA
Slope	Negligible	**Aspect**	NA
Soil colour	Brown	**Soil texture**	Loam
Bare soil	< 10	**Drainage**	NA
Rock type	Ironstone	**Rock size**	Mixed
Rock abundance	> 70		
Upper stratum	Scattered trees		
Middle stratum	Shrubland		
Lower stratum	Open hummock grassland		

WNDP07

Date	19/04/2024
Site type	Systematic trapping site
Coordinate	50k -22.575, 116.8011
Habitat type	Hummock Grassland
Habitat type (other)	NA
Habitat description	Scattered low Acacia trees over open Acacia shrubland over open epactia grassland
Habitat condition	Good
Suitability for significant species	Grey falcon
Evidence of significant species	No
Disturbance	Some cattle tracks and grazing evidence
Time since fire	> 5 yrs
Leaf litter cover	< 10
Woody debris	< 10
Rocky crevices/caves	NA
Large trees	No
Tree hollows	No
Landform	Plain
Landform (other)	NA
Slope	Negligible
Aspect	NA
Soil colour	Brown
Soil texture	Loamy sand
Bare soil	< 10
Drainage	NA
Rock type	Mixed
Rock size	Pebbles (2-64 mm)
Rock abundance	30 – 70
Upper stratum	Scattered low trees
Middle stratum	Open shrubland
Lower stratum	Open hummock grassland

WNDP08

Date	21/04/2024		
Site type	Systematic trapping site		
Coordinate	50k -22.5312, 116.6735		
Habitat type	Shrubland (open)		
Habitat type (other)	NA		
Habitat description	Occasional scattered low Eucalyptus trees, amongst low open Acacia shrubland over open hummock grassland on stony plain, occasional drainage line.		
Habitat condition	Excellent		
Suitability for significant species	Grey falcon, ghost bat, Pilbara leaf-nosed bat		
Evidence of significant species	No		
Disturbance	NA		
Time since fire	> 5 yrs		
Leaf litter cover	< 10		
Woody debris	< 10		
Rocky crevices/caves	NA		
Large trees	No		
Tree hollows	No		
Landform	Undulating plain	**Landform (other)**	NA
Slope	Negligible	**Aspect**	NA
Soil colour	Reddish brown	**Soil texture**	Sandy loam
Bare soil	< 10	**Drainage**	Drainage line
Rock type	Ironstone	**Rock size**	Pebbles (2-64 mm)
Rock abundance	> 70		
Upper stratum	Scattered low trees		
Middle stratum	Low shrubland		
Lower stratum	Open hummock grassland		

WNDP09

Date	21/04/2024		
Site type	Systematic trapping site		
Coordinate	50k -22.5266, 116.5872		
Habitat type	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)		
Habitat type (other)	NA		
Habitat description	Valley between mesas with large and medium sized boulders and hammock grasslands.		
Habitat condition	Very Good		
Suitability for significant species	Northern quoll, grey falcon, ghost bat, Pilbara leaf-nosed bat		
Evidence of significant species	Yes		
Disturbance	Disused mine road		
Time since fire	> 5 yrs		
Leaf litter cover	< 10		
Woody debris	< 10		
Rocky crevices/caves	10 – 30		
Large trees	Yes		
Tree hollows	Yes		
Landform	Mesa	**Landform (other)**	NA
Slope	Moderate	**Aspect**	South
Soil colour	Reddish brown	**Soil texture**	Sandy loam
Bare soil	< 10	**Drainage**	NA
Rock type	Ironstone	**Rock size**	Mixed
Rock abundance	> 70		
Upper stratum	Scattered tall trees		
Middle stratum	Scattered shrubs		
Lower stratum	Hummock grassland		

WNDP10

Date	21/04/2024		
Site type	Systematic trapping site		
Coordinate	50k -22.5147, 116.4938		
Habitat type	Drainage Line/River/Creek (major)		
Habitat type (other)	NA		
Habitat description	Open Eucalypt and Acacia woodland over tall, open acacia shrubland over dense buffel grassland		
Habitat condition	Degraded		
Suitability for significant species	NA		
Evidence of significant species	No		
Disturbance	Catttle tracks, cattle and donkey scat and dense buffel grass		
Time since fire	No evidence		
Leaf litter cover	10 – 40		
Woody debris	< 10		
Rocky crevices/caves	NA		
Large trees	Yes		
Tree hollows	No		
Landform	Plain	**Landform (other)**	NA
Slope	Negligible	**Aspect**	NA
Soil colour	Reddish brown	**Soil texture**	Sandy clay
Bare soil	< 10	**Drainage**	NA
Rock type	NA	**Rock size**	NA
Rock abundance	NA		
Upper stratum	Open woodland		
Middle stratum	Tall open scrub		
Lower stratum	Tussock grass land / sedgeland / herbland		

WNDP11

Date	21/08/2024		
Site type	Systematic trapping site		
Coordinate	50k -22.5039, 116.6155		
Habitat type	Drainage Line/River/Creek (minor)		
Habitat type (other)	NA		
Habitat description	Minor drainage Acacia shrubland over buffel grass		
Habitat condition	Good		
Suitability for significant species	NA		
Evidence of significant species	No		
Disturbance	Cattle, buffel		
Time since fire	2 – 5 yrs		
Leaf litter cover	10 – 40		
Woody debris	< 10		
Rocky crevices/caves	NA		
Large trees	No		
Tree hollows	No		
Landform	Creek	**Landform (other)**	NA
Slope	Negligible	**Aspect**	NA
Soil colour	Reddish brown	**Soil texture**	Sand
Bare soil	30 – 70	**Drainage**	Minor creek (< 5 m)
Rock type	NA	**Rock size**	NA
Rock abundance	NA		
Upper stratum	NA		
Middle stratum	Shrubland		
Lower stratum	Open tussock grassland / sedgeland / herbland		

WNDP12

Date	14/08/2024		
Site type	Systematic trapping site		
Coordinate	50k -22.5426, 116.5772		
Habitat type	Drainage Line/River/Creek (minor)		
Habitat type (other)	NA		
Habitat description	Minor drainage with scattered Eucalypts over Acacia shrubland over Triodia and buffel grass		
Habitat condition	Good		
Suitability for significant species	NA		
Evidence of significant species	No		
Disturbance	Cattle, buffel		
Time since fire	No evidence		
Leaf litter cover	< 10		
Woody debris	< 10		
Rocky crevices/caves	NA		
Large trees	No		
Tree hollows	No		
Landform	Creek	**Landform (other)**	NA
Slope	Negligible	**Aspect**	NA
Soil colour	Reddish brown	**Soil texture**	Sandy loam
Bare soil	30 – 70	**Drainage**	Minor creek (< 5 m)
Rock type	Mixed	**Rock size**	Mixed
Rock abundance	< 10		
Upper stratum	Scattered trees		
Middle stratum	Tall shrubland		
Lower stratum	Open tussock grassland / sedgeland / herbland		

WNDP13

Date	21/08/2024		
Site type	Systematic trapping site		
Coordinate	50k -22.5149, 116.5919		
Habitat type	Drainage Line/River/Creek (major)		
Habitat type (other)	NA		
Habitat description	Eucalypts over Acacia and other shrubs with buffel understorey		
Habitat condition	Good		
Suitability for significant species	NA		
Evidence of significant species	No		
Disturbance	Cattle		
Time since fire	No evidence		
Leaf litter cover	10 – 40		
Woody debris	10 – 40		
Rocky crevices/caves	NA		
Large trees	Yes		
Tree hollows	Yes		
Landform	Plain	**Landform (other)**	NA
Slope	Negligible	**Aspect**	NA
Soil colour	Reddish brown	**Soil texture**	Loamy sand
Bare soil	< 10	**Drainage**	NA
Rock type	NA	**Rock size**	NA
Rock abundance	NA		
Upper stratum	Scattered trees		
Middle stratum	Open shrubland		
Lower stratum	Open tussock grassland / sedgeland / herbland		

WNDP14

Date	16/08/2024		
Site type	Systematic trapping site		
Coordinate	50k -22.6113, 116.7835		
Habitat type	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrop/Breakaways)		
Habitat type (other)	NA		
Habitat description	Rocky hills with Triodia understorey, mixed Acacia shrubland and open Eucalypt hills		
Habitat condition	Good		
Suitability for significant species	Northern quoll		
Evidence of significant species	No		
Disturbance	Roads <500		
Time since fire	< 1 yr		
Leaf litter cover	< 10		
Woody debris	< 10		
Rocky crevices/caves	10 – 30		
Large trees	No		
Tree hollows	No		
Landform	Hill	**Landform (other)**	NA
Slope	Steep	**Aspect**	Southeast
Soil colour	Reddish brown	**Soil texture**	Clay loam
Bare soil	< 10	**Drainage**	NA
Rock type	Ironstone	**Rock size**	Mixed
Rock abundance	> 70		
Upper stratum	Low open woodland		
Middle stratum	Low open shrubland		
Lower stratum	Open hummock grassland		

WNDP15

Date	21/08/2024		
Site type	Systematic trapping site		
Coordinate	50k -22.5401, 116.5496		
Habitat type	Gorges/Gullies		
Habitat type (other)	NA		
Habitat description	Gorge/gully with creekline, Melaleuca over shrubs with tussock grasses		
Habitat condition	Excellent		
Suitability for significant species	NA		
Evidence of significant species	No		
Disturbance	NA		
Time since fire	No evidence		
Leaf litter cover	> 40 with layering		
Woody debris	10 – 40		
Rocky crevices/caves	10 – 30		
Large trees	Yes		
Tree hollows	No		
Landform	Gully	**Landform (other)**	NA
Slope	Negligible	**Aspect**	NA
Soil colour	Light brown	**Soil texture**	Sand
Bare soil	10 – 30	**Drainage**	Major creek (5-30 m)
Rock type	Mixed	**Rock size**	Mixed
Rock abundance	30 – 70		
Upper stratum	Open woodland		
Middle stratum	Shrubland		
Lower stratum	Open tussock grassland / sedgeland / herbland		

WNDP16

Date	21/08/2024		
Site type	Systematic trapping site		
Coordinate	50k -22.5245, 116.5063		
Habitat type	Hummock grassland		
Habitat type (other)	NA		
Habitat description	Stony plain with shrubland over Triodia grassland		
Habitat condition	Very Good		
Suitability for significant species	NA		
Evidence of significant species	No		
Disturbance	Cattle		
Time since fire	No evidence		
Leaf litter cover	< 10		
Woody debris	10 – 40		
Rocky crevices/caves	NA		
Large trees	No		
Tree hollows	No		
Landform	Plain	**Landform (other)**	NA
Slope	Negligible	**Aspect**	NA
Soil colour	Reddish brown	**Soil texture**	Sandy loam
Bare soil	< 10	**Drainage**	Minor creek (< 5 m)
Rock type	Ironstone	**Rock size**	Mixed
Rock abundance	> 70		
Upper stratum	NA		
Middle stratum	Open shrubland		
Lower stratum	Hummock grassland		

WNNP06

Date	28/05/2024		
Site type	Night parrot detector		
Coordinate	50k -22.5213, 116.545		
Habitat type	Hummock grassland		
Habitat type (other)	NA		
Habitat description	Long unburnt spinifex within landscape of heavily burnt habitat. In the vicinity of duck creek.		
Habitat condition	Good		
Suitability for significant species	Potential night parrot roosting		
Evidence of significant species	No		
Disturbance	NA		
Time since fire	No evidence		
Leaf litter cover	< 10		
Woody debris	< 10		
Rocky crevices/caves	NA		
Large trees	No		
Tree hollows	No		
Landform	Undulating plain	**Landform (other)**	NA
Slope	Negligible	**Aspect**	NA
Soil colour	Reddish brown	**Soil texture**	Sandy loam
Bare soil	< 10	**Drainage**	NA
Rock type	Ironstone	**Rock size**	Cobbles (64-256 mm)
Rock abundance	> 70		
Upper stratum	NA		
Middle stratum	Open shrubland		
Lower stratum	Hummock grassland		

WNNP07

Date	28/05/2024		
Site type	Night parrot detector		
Coordinate	50k -22.5234, 116.548		
Habitat type	Hummock grassland		
Habitat type (other)	NA		
Habitat description	Long unburnt spinifex within landscape of heavily burnt habitat. In the vicinity of duck creek.		
Habitat condition	Good		
Suitability for significant species	Potential night parrot roosting		
Evidence of significant species	No		
Disturbance	NA		
Time since fire	No evidence		
Leaf litter cover	< 10		
Woody debris	< 10		
Rocky crevices/caves	NA		
Large trees	No		
Tree hollows	No		
Landform	Undulating plain	**Landform (other)**	NA
Slope	Negligible	**Aspect**	NA
Soil colour	Reddish brown	**Soil texture**	Sandy loam
Bare soil	< 10	**Drainage**	NA
Rock type	Ironstone	**Rock size**	Cobbles (64-256 mm)
Rock abundance	> 70		
Upper stratum	NA		
Middle stratum	Open shrubland		
Lower stratum	Hummock grassland		

WNNP09

Date	28/05/2024
Site type	Night parrot detector
Coordinate	50k -22.5262, 116.5486
Habitat type	Hummock grassland
Habitat type (other)	NA
Habitat description	Long unburnt spinifex within landscape of heavily burnt habitat. In the vicinity of duck creek.
Habitat condition	Good
Suitability for significant species	Potential night parrot roosting
Evidence of significant species	No
Disturbance	NA
Time since fire	No evidence
Leaf litter cover	< 10
Woody debris	< 10
Rocky crevices/caves	NA
Large trees	No
Tree hollows	No
Landform	Undulating plain
Landform (other)	NA
Slope	Negligible
Aspect	NA
Soil colour	Reddish brown
Soil texture	Clay loam
Bare soil	10 – 30
Drainage	Drainage line
Rock type	Ironstone
Rock size	Cobbles (64-256 mm)
Rock abundance	30 – 70
Upper stratum	NA
Middle stratum	Open shrubland
Lower stratum	Hummock grassland

WNNP08

Date	28/05/2024
Site type	Night parrot detector
Coordinate	50k -22.5272, 116.5502
Habitat type	Hummock grassland
Habitat type (other)	NA
Habitat description	Long unburnt spinifex within landscape of heavily burnt habitat. In the vicinity of duck creek.
Habitat condition	Good
Suitability for significant species	Potential night parrot roosting
Evidence of significant species	No
Disturbance	NA
Time since fire	> 5 yrs
Leaf litter cover	< 10
Woody debris	< 10
Rocky crevices/caves	NA
Large trees	No
Tree hollows	No
Landform	Undulating plain
Landform (other)	NA
Slope	Negligible
Aspect	NA
Soil colour	Reddish brown
Soil texture	Sandy loam
Bare soil	< 10
Drainage	NA
Rock type	Ironstone
Rock size	Pebbles (2-64 mm)
Rock abundance	> 70
Upper stratum	Scattered low trees
Middle stratum	Open shrubland
Lower stratum	Hummock grassland

WNNP10

Date	28/05/2024
Site type	Night parrot detector
Coordinate	50k -22.5286, 116.5517
Habitat type	Hummock grassland
Habitat type (other)	NA
Habitat description	Long unburnt spinifex within landscape of heavily burnt habitat. In the vicinity of duck creek.
Habitat condition	Good
Suitability for significant species	Potential night parrot roosting
Evidence of significant species	No
Disturbance	NA
Time since fire	> 5 yrs
Leaf litter cover	< 10
Woody debris	< 10
Rocky crevices/caves	NA
Large trees	No
Tree hollows	No
Landform	Undulating plain
Landform (other)	NA
Slope	Negligible
Aspect	NA
Soil colour	Reddish brown
Soil texture	Sandy loam
Bare soil	< 10
Drainage	NA
Rock type	Ironstone
Rock size	Cobbles (64-256 mm)
Rock abundance	> 70
Upper stratum	Scattered low trees
Middle stratum	Open shrubland
Lower stratum	Hummock grassland

WNNP11

Date	17/08/2024		
Site type	Night parrot recorder		
Coordinate	50k -22.5176, 116.5394		
Habitat type	Hummock Grassland		
Habitat type (other)	NA		
Habitat description	Old growth Triodia hummock grassland plain supporting scattered open Eucalypt woodland		
Habitat condition	Good		
Suitability for significant species	Potential night parrot roosting		
Evidence of significant species	No		
Disturbance	Roads <500		
Time since fire	> 5 yrs		
Leaf litter cover	< 10		
Woody debris	10 – 40		
Rocky crevices/caves	NA		
Large trees	No		
Tree hollows	No		
Landform	Plain	**Landform (other)**	NA
Slope	Gentle	**Aspect**	Northeast
Soil colour	Red	**Soil texture**	Clay loam
Bare soil	< 10	**Drainage**	NA
Rock type	Ironstone	**Rock size**	Mixed
Rock abundance	> 70		
Upper stratum	Scattered low trees		
Middle stratum	Tall open scrub		
Lower stratum	Hummock grassland		

WNNP12

Date	17/08/2024		
Site type	Night parrot recorder		
Coordinate	50k -22.5164, 116.537		
Habitat type	Hummock Grassland		
Habitat type (other)	NA		
Habitat description	Old growth Triodia hummock grassland plain supporting scattered open Eucalypt woodland		
Habitat condition	Good		
Suitability for significant species	Potential night parrot roosting		
Evidence of significant species	No		
Disturbance	Roads <500		
Time since fire	> 5 yrs		
Leaf litter cover	< 10		
Woody debris	10 – 40		
Rocky crevices/caves	NA		
Large trees	No		
Tree hollows	No		
Landform	Plain	**Landform (other)**	NA
Slope	Gentle	**Aspect**	Northeast
Soil colour	Red	**Soil texture**	Clay loam
Bare soil	< 10	**Drainage**	NA
Rock type	Ironstone	**Rock size**	Mixed
Rock abundance	> 70		
Upper stratum	Scattered low trees		
Middle stratum	Tall open scrub		
Lower stratum	Hummock grassland		

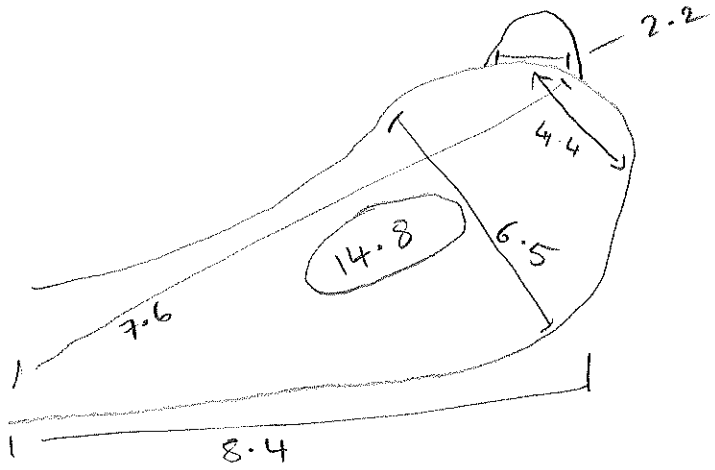
WNNP13

Date	17/08/2024		
Site type	Night parrot recorder		
Coordinate	50k -22.5152, 116.5344		
Habitat type	Hummock Grassland		
Habitat type (other)	NA		
Habitat description	Old growth Triodia hummock grassland plain supporting scattered open Eucalypt woodland		
Habitat condition	Good		
Suitability for significant species	Potential night parrot roosting		
Evidence of significant species	No		
Disturbance	Roads <500		
Time since fire	> 5 yrs		
Leaf litter cover	< 10		
Woody debris	10 – 40		
Rocky crevices/caves	NA		
Large trees	No		
Tree hollows	No		
Landform	Plain	**Landform (other)**	NA
Slope	Gentle	**Aspect**	Northwest
Soil colour	Red	**Soil texture**	Clay loam
Bare soil	NA	**Drainage**	NA
Rock type	Ironstone	**Rock size**	Mixed
Rock abundance	> 70		
Upper stratum	Scattered low trees		
Middle stratum	Tall open scrub		
Lower stratum	Hummock grassland		

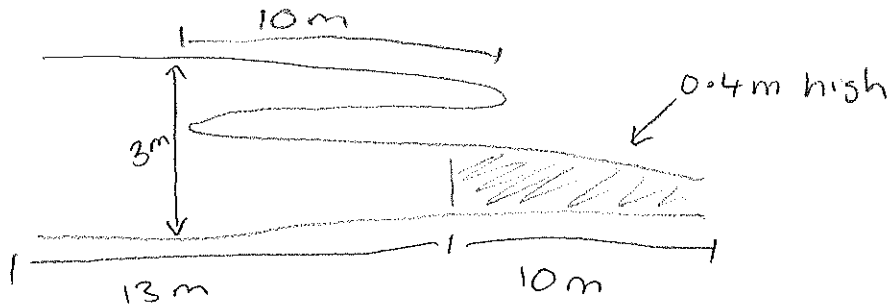
WNNP14

Date	17/08/2024
Site type	Night parrot recorder
Coordinate	50k -22.5142, 116.5315
Habitat type	Hummock Grassland
Habitat type (other)	NA
Habitat description	Old growth Triodia hummock grassland plain supporting scattered open Eucalypt woodland
Habitat condition	Good
Suitability for significant species	Potential night parrot roosting
Evidence of significant species	No
Disturbance	Roads <500
Time since fire	> 5 yrs
Leaf litter cover	< 10
Woody debris	10 – 40
Rocky crevices/caves	NA
Large trees	No
Tree hollows	No
Landform	Plain
Landform (other)	NA
Slope	Gentle
Aspect	Northwest
Soil colour	Red
Soil texture	Clay loam
Bare soil	< 10
Drainage	NA
Rock type	Ironstone
Rock size	Mixed
Rock abundance	> 70
Upper stratum	Scattered low trees
Middle stratum	Tall open shrubland
Lower stratum	Hummock grassland

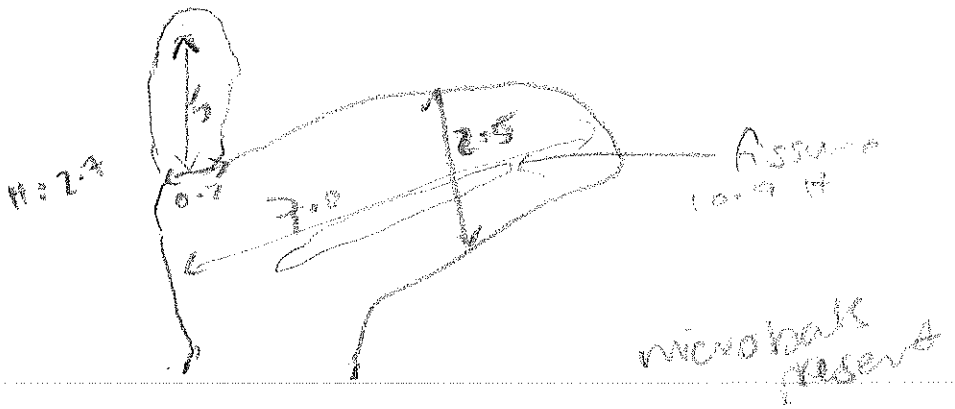
Cave ID: TBD02	Date: 27/5/24
Assessed Ghost bat usage:	Coordinates:
Nil	-22.576631, 116.715178
Entrance safe or unsafe to approach:	Basic Geology:
Safe	Woongara Rhyolite
Entrance type and dims – WxH (m):	Entrance Orientation:
3.3 x 3.2	S
Cave Grouping:	Insulation from surface above:
Cluster on ridge	~70m
Cave Type:	Internal domed chamber:
Pot. nocturnal shelter	Yes
Rear passages that may have roosts:	Internal temp. and relative humidity:
No	Ambient
Local foraging opportunities:	Current distance to disturbance:
Slim, heavily burnt cliffs + gorges	~5m - Fire / burnt
Cave Floorplan and Photo	TR 10:56



Cave ID: TBD 1	**Date:** 26.5.24
Assessed Ghost bat usage: No evidence	**Coordinates:** -22.458329, 116.683462
Entrance safe or unsafe to approach: Safe	**Basic Geology:** Marra Mumba
Entrance type and dims – WxH (m): 3.6 x 2.6	**Entrance Orientation:** NW
Cave Grouping: 2 potential nocturnal shelters among overhangs	**Insulation from surface above:** ~5m
Cave Type: Pot nocturnal shelter	**Internal domed chamber:** No
Rear passages that may have roosts: Yes	**Internal temp. and relative humidity:** Ambient
Local foraging opportunities: Gorge	**Current distance to disturbance:** Fire = 10m Drill pad/road = 50m
Cave Floorplan and Photo	TB 11:36

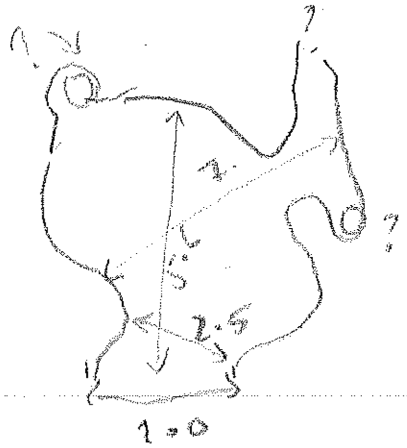


Cave ID: SP012	Date: 27/5/24
Assessed Ghost bat usage:	Coordinates:
Nil	
Entrance safe or unsafe to approach:	Basic Geology:
safe	Boolgeeda Iron Formation
Entrance type and dims – WxH (m):	Entrance Orientation:
1.5 y 2.01	SE
Cave Grouping:	Insulation from surface above:
Cluster on ridge.	~ 6m
Cave Type:	Internal domed chamber:
Rat - Not Shelter	No, fissure.
Rear passages that may have roosts:	Internal temp. and relative humidity:
Unlikely.	Ambient
Local foraging opportunities:	Current distance to disturbance:
Grazing plains.	~10 km
Cave Floorplan and Photo	SP Phone 11:41

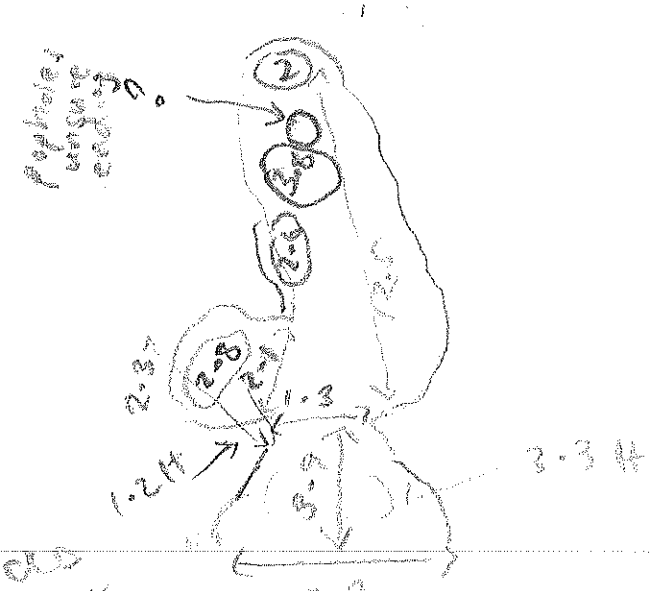


Cave ID: SP0013	**Date:** 27/5/24
Assessed Ghost bat usage: Nil	**Coordinates:**
Entrance safe or unsafe to approach: Safe	**Basic Geology:** Robe pisolite
Entrance type and dims – WxH (m): 2.0 x 1.9	**Entrance Orientation:** SE
Cave Grouping: Cluster on ridge	**Insulation from surface above:** ~5m
Cave Type: Pot, nocturnal or diurnal	**Internal domed chamber:** Nil - pop holes
Rear passages that may have roosts: Potential	**Internal temp. and relative humidity:** ambient
Local foraging opportunities: drainage,	**Current distance to disturbance:** ~Roads
Cave Floorplan and Photo	SP Phone 13:30

Microbats present

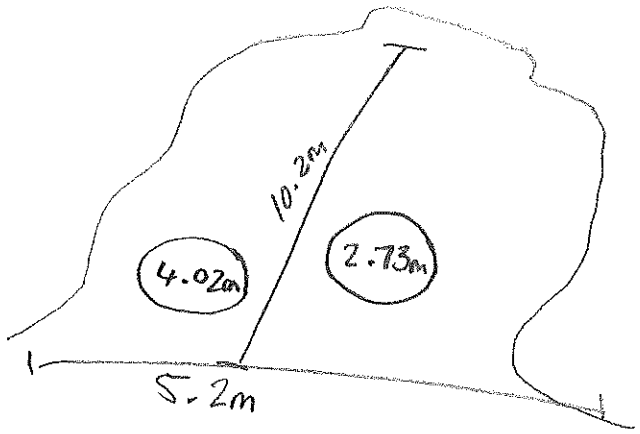


Cave ID: SP 0014	Date: 26/5/24
Assessed Ghost bat usage: N.L	Coordinates:
Entrance safe or unsafe to approach: Safe	Basic Geology: Robe pisolite
Entrance type and dims – WxH (m): 2.2 x 2.2	Entrance Orientation: E
Cave Grouping: Cluster ridge	Insulation from surface above: ~5m
Cave Type: Pot. roc shelter	Internal domed chamber: Yes - many
Rear passages that may have roosts: unlikely.	Internal temp. and relative humidity: ambient
Local foraging opportunities: Drainage	Current distance to disturbance: ~500m (road)
Cave Floorplan and Photo	SP1.hem 13:38

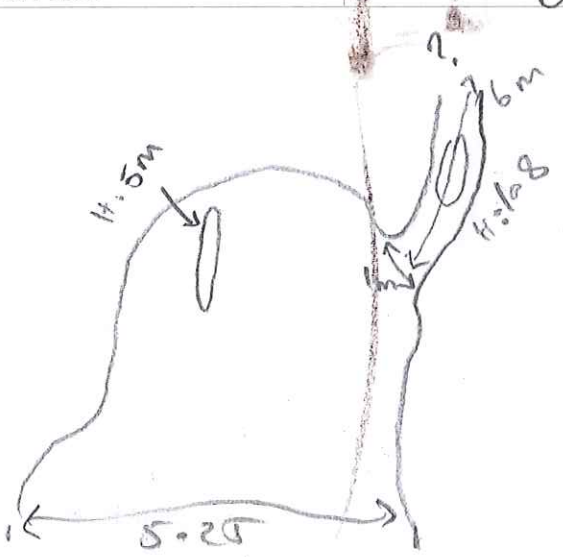


microbats present

Cave ID: CB004	Date: 20/5/24
Assessed Ghost bat usage: ~~GHA~~ No visible middens	Coordinates:
Entrance safe or unsafe to approach: Safe	Basic Geology: Robe Pisolite
Entrance type and dims – WxH (m): 5.2m × 3.8m	Entrance Orientation: E
Cave Grouping: Cluster	Insulation from surface above: ~12m
Cave Type: Nocturnal Shelter	Internal domed chamber: Yes, 2x small
Rear passages that may have roosts: No	Internal temp. and relative humidity: Ambient
Local foraging opportunities: Drainage Line	Current distance to disturbance: ~500m
Cave Floorplan and Photo	CB13:21

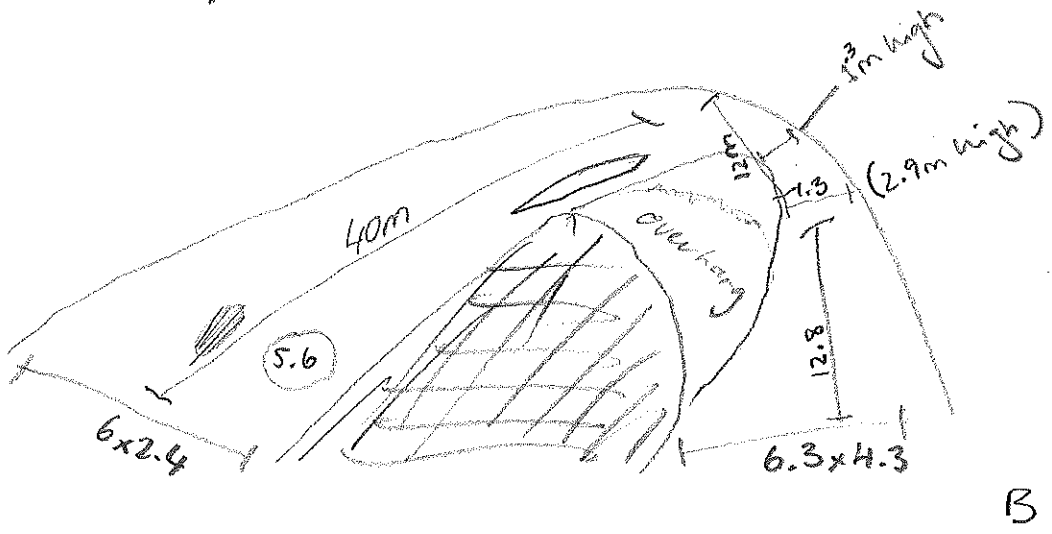


Cave ID: CB005	Date: 20/5/24
Assessed Ghost bat usage:	Coordinates:
Potential GB	
Entrance safe or unsafe to approach:	Basic Geology:
Safe	Robe Pisolite
Entrance type and dims – WxH (m):	Entrance Orientation:
5.25 x 1.02	SW
Cave Grouping:	Insulation from surface above:
Cluster	~15m
Cave Type:	Internal domed chamber:
Nocturnal shelter.	cracks + back dome.
Rear passages that may have roosts:	Internal temp. and relative humidity:
N/A	Ambient, mild temp.
Local foraging opportunities:	Current distance to disturbance:
Hillslopes, plains	~500m.
Cave Floorplan and Photo	CB 13:45



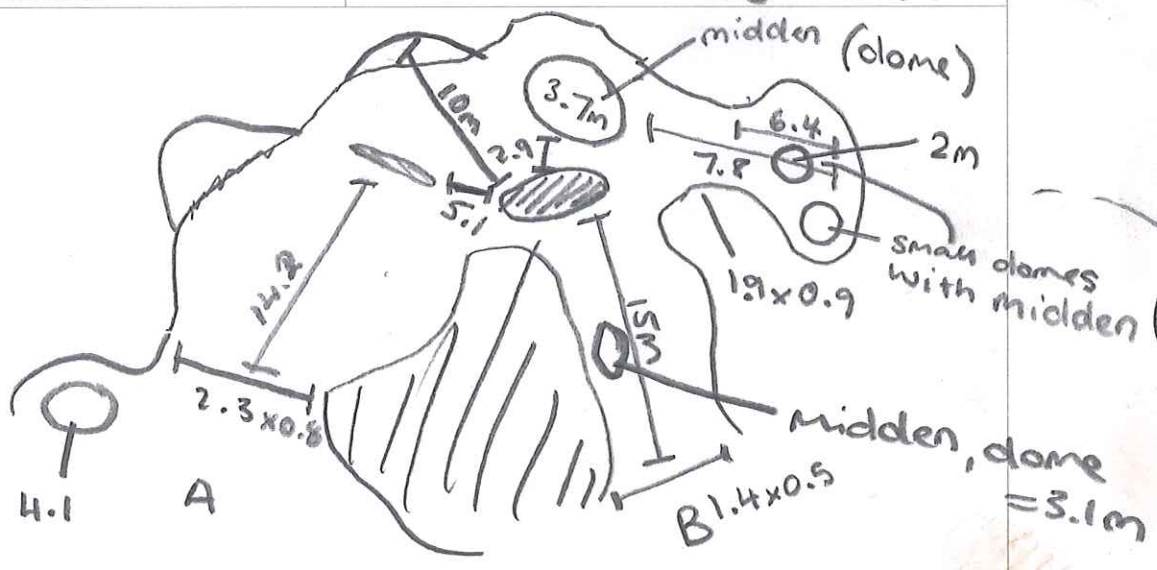
Cave ID: CB009	**Date:** 20/5/24
Assessed Ghost bat usage: None observed	**Coordinates:**
Entrance safe or unsafe to approach: Safe	**Basic Geology:** Robe Pisolite
Entrance type and dims – WxH (m): 6 x 2.4	**Entrance Orientation:** E
Cave Grouping: Cluster	**Insulation from surface above:** ~7m
Cave Type: Nocturnal shelter, potential roosting pop-hole / back	**Internal domed chamber:** Yes, small ones
Rear passages that may have roosts: Pop holes + cracks/ crevaces	**Internal temp. and relative humidity:** Warmer towards back, ambient elsewhere
Local foraging opportunities: Drainage Line	**Current distance to disturbance:** ~500m
Cave Floorplan and Photo	A = 14:30 (B = 14:28

• Microbats present



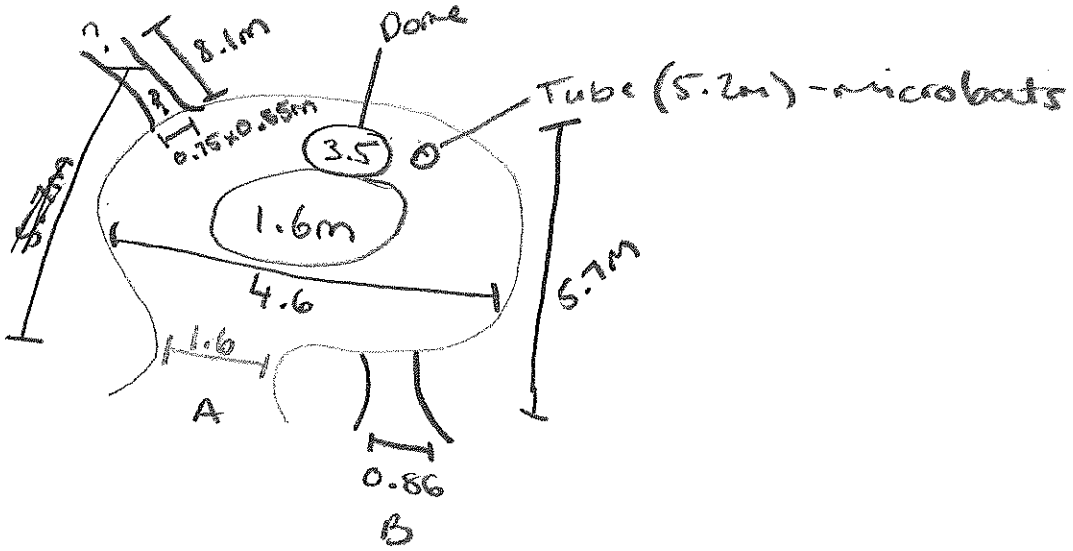
Details on SP tablet

Cave ID: CB007	Date: 27/5/24
Assessed Ghost bat usage:	Coordinates:
Yes, multiple middens	
Entrance safe or unsafe to approach:	Basic Geology:
Safe	Robe Pisolite
Entrance type and dims – WxH (m):	Entrance Orientation:
A – 2.3 x 0.8 B – 1.4 x 0.5	E
Cave Grouping:	Insulation from surface above:
Cluster of good caves	12-13m
Cave Type:	Internal domed chamber:
Nocturnal Shelter	Yes, Multiple
Rear passages that may have roosts:	Internal temp. and relative humidity:
Unlikely	Warm at rear + humid
Local foraging opportunities:	Current distance to disturbance:
Drainage Line	~500m
Cave Floorplan and Photo	



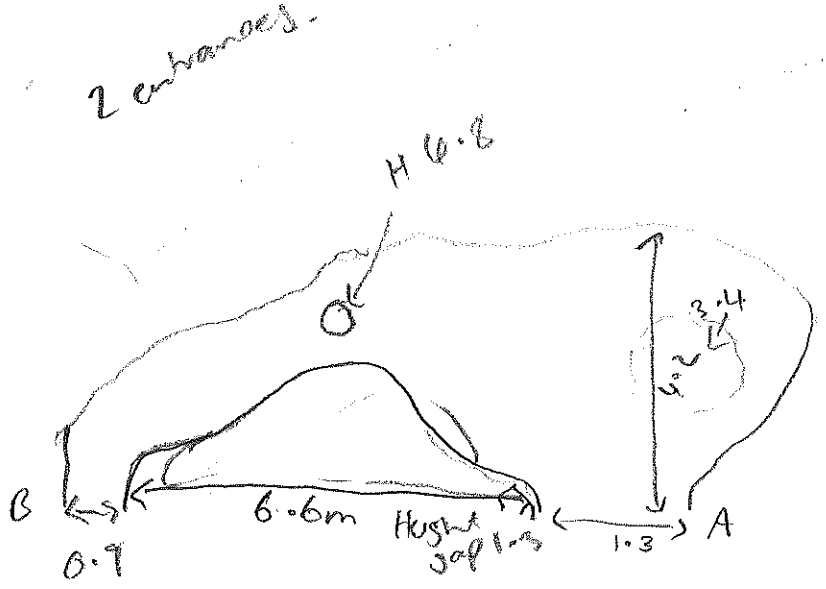
Single Cave on southern edge ~~of the~~ of Robe Pisolite Cluster

Cave ID: CB006	**Date:** 27/5/24
Assessed Ghost bat usage:	**Coordinates:**
Nil	
Entrance safe or unsafe to approach:	**Basic Geology:**
Safe	Robe Pisolite
Entrance type and dims – WxH (m):	**Entrance Orientation:**
1.6m x 0.75m – A 0.86 x 0.77m – B	East
Cave Grouping:	**Insulation from surface above:**
Cluster	~10m
Cave Type:	**Internal domed chamber:**
Potential Roost	Yes (3.5m)
Rear passages that may have roosts:	**Internal temp. and relative humidity:**
Yes, possible	Warm + Humid
Local foraging opportunities:	**Current distance to disturbance:**
Drainage line	~500m
Cave Floorplan and Photo	CB-13:38

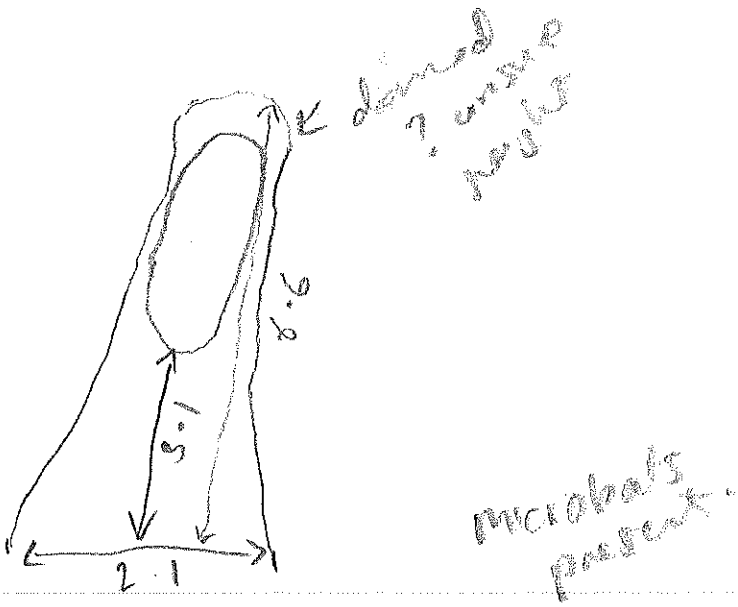


Cave ID: SP0003	Date: 20/5/24
Assessed Ghost bat usage: Nil	Coordinates:
Entrance safe or unsafe to approach: Safe	Basic Geology: Robe Pisolite
Entrance type and dims – WxH (m): A: (1.3 x 5.2) B: (0.7 x 4.6)	Entrance Orientation: SW
Cave Grouping: Cluster	Insulation from surface above: ~15m
Cave Type: Potential diurnal shelter	Internal domed chamber:
Rear passages that may have roosts: n/a	Internal temp. and relative humidity: Ambient, moderately humid
Local foraging opportunities: Hillslopes, plains	Current distance to disturbance: ~500m

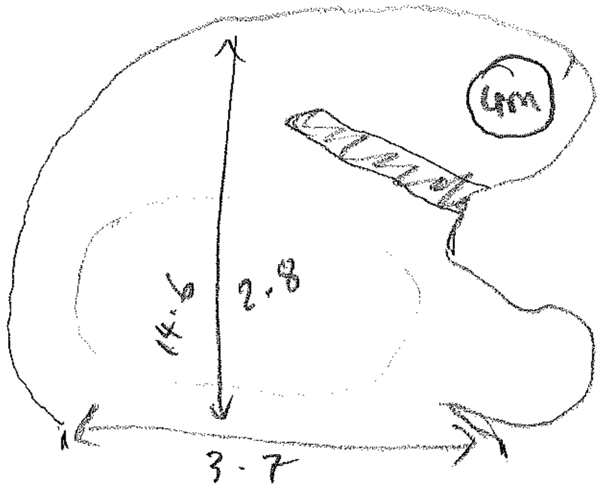
Cave Floorplan and Photo



Cave ID: SP0004	Date: 24/5/24
Assessed Ghost bat usage:	Coordinates:
Potential GB	
Entrance safe or unsafe to approach:	Basic Geology:
Safe	Robe Pisolite
Entrance type and dims – WxH (m):	Entrance Orientation:
2.1 x 0.7	West
Cave Grouping:	Insulation from surface above:
Cluster on ridgeline.	~10 m
Cave Type:	Internal domed chamber:
Potential GB + PD LB. diurnal.	
Rear passages that may have roosts:	Internal temp. and relative humidity:
Potential	humid.
Local foraging opportunities:	Current distance to disturbance:
plains hillslopes	~500m drill pads roads.
Cave Floorplan and Photo	



Cave ID: SP005	Date: 24/5/24
Assessed Ghost bat usage: GB scat	Coordinates:
Entrance safe or unsafe to approach: safe.	Basic Geology: Robe Pisolite
Entrance type and dims – WxH (m): 3.7 x 1.6	Entrance Orientation: West
Cave Grouping: Cluster on ridgeline	Insulation from surface above: ~13m
Cave Type: Diurnal / Nocturnal shelter	Internal domed chamber: Yes, multiple
Rear passages that may have roosts: Yes.	Internal temp. and relative humidity: humid + ambient.
Local foraging opportunities: hillslopes, plains, bats.	Current distance to disturbance: Roads, drillpads >500m.
Cave Floorplan and Photo	SP phone 14:30

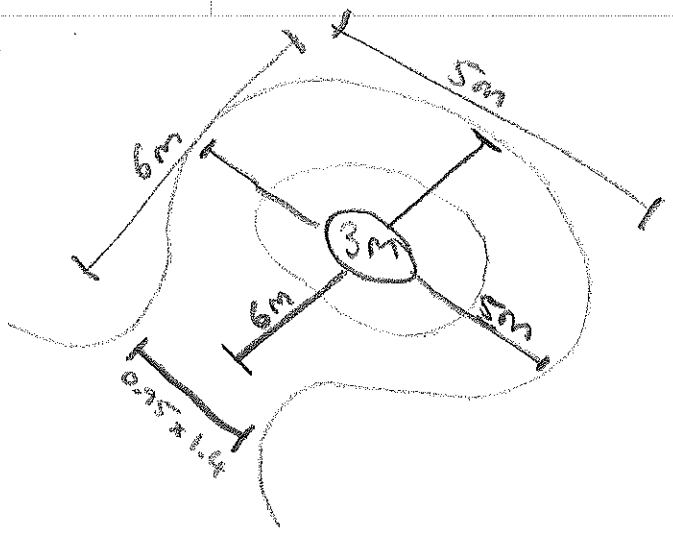


Microbats present

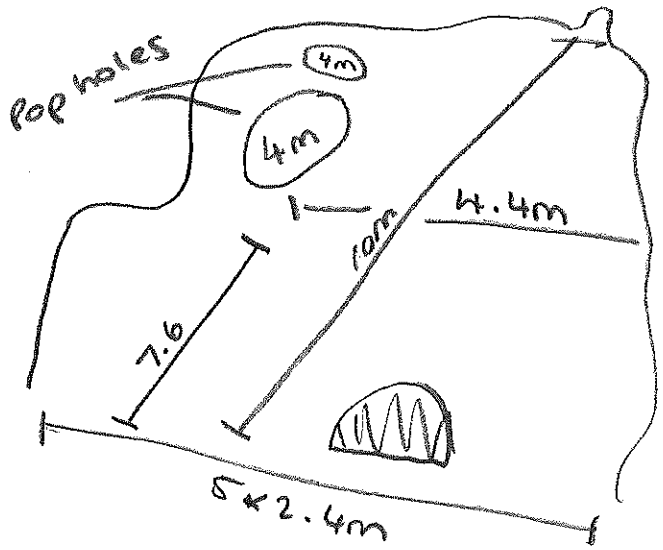
Cave ID: SP006	Date: 24/5/24
Assessed Ghost bat usage: NO	Coordinates:
Entrance safe or unsafe to approach: Safe	Basic Geology: Robe Pisolite
Entrance type and dims – WxH (m): 1.4 x 0.95	Entrance Orientation: S
Cave Grouping: Few caves on ridgeline	Insulation from surface above: ~10m
Cave Type: Potential nocturnal shelter	Internal domed chamber: Yes
Rear passages that may have roosts: Unlikely	Internal temp. and relative humidity: Ambient
Local foraging opportunities: Yes, creekline	Current distance to disturbance: >500m

Cave Floorplan and Photo

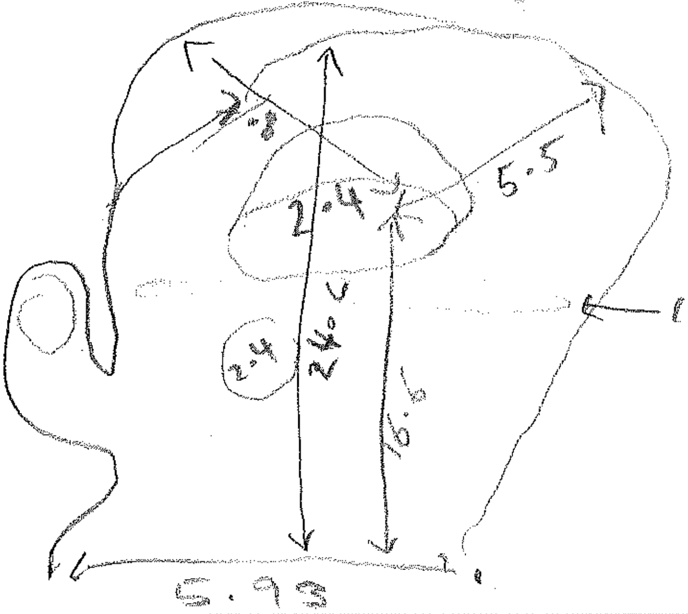
- Small pop holes
- Light



Cave ID: SP007	Date: 24/5/24
Assessed Ghost bat usage:	Coordinates:
No	
Entrance safe or unsafe to approach:	Basic Geology:
Safe	Robe Pisolite
Entrance type and dims – WxH (m):	Entrance Orientation:
5 x 2.4	S
Cave Grouping:	Insulation from surface above:
Small group	~10m
Cave Type:	Internal domed chamber:
Nocturnal shelter	Yes, low
Rear passages that may have roosts:	Internal temp. and relative humidity:
Unlikely.	Ambient, warmer at rear
Local foraging opportunities:	Current distance to disturbance:
Drainage Line	>500m
Cave Floorplan and Photo	SP: 1500



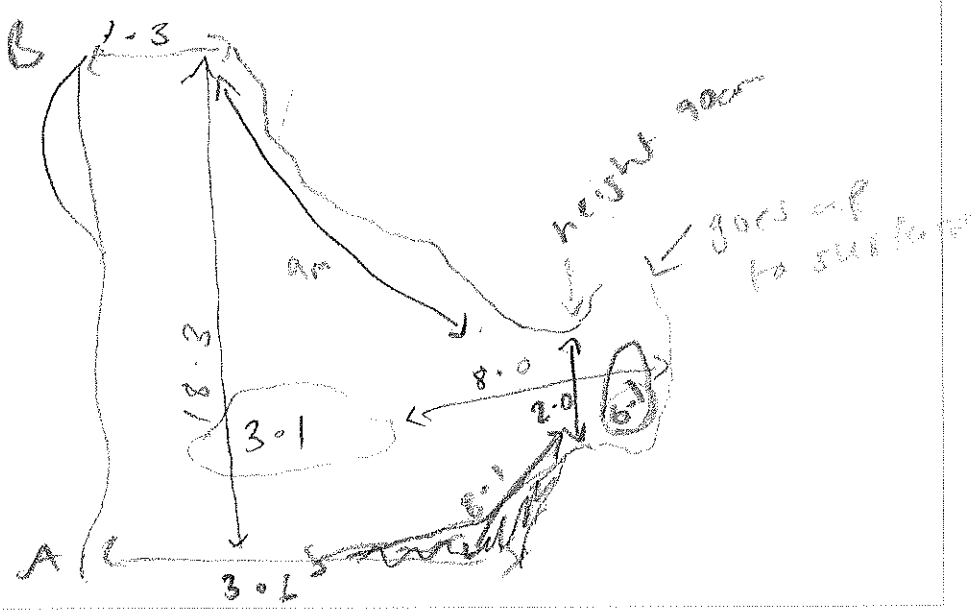
Cave ID: SP0008	Date: 25/5/24
Assessed Ghost bat usage: GB scat + Feeding debris	Coordinates:
Entrance safe or unsafe to approach: safe	Basic Geology: Wittenoom Formation.
Entrance type and dims – WxH (m): 5.93 x 1.6	Entrance Orientation: SE
Cave Grouping: Cluster on ridgeline	Insulation from surface above: 4m
Cave Type: Nocturnal shelter	Internal domed chamber: Yes, multiple chambers
Rear passages that may have roosts: Unlikely.	Internal temp. and relative humidity: humid + ambient
Local foraging opportunities: Creek, hillslopes + plains	Current distance to disturbance: ~500m roads + drill pads
Cave Floorplan and Photo	SP Phone 13:20



bee-eater carcass.

microbat present

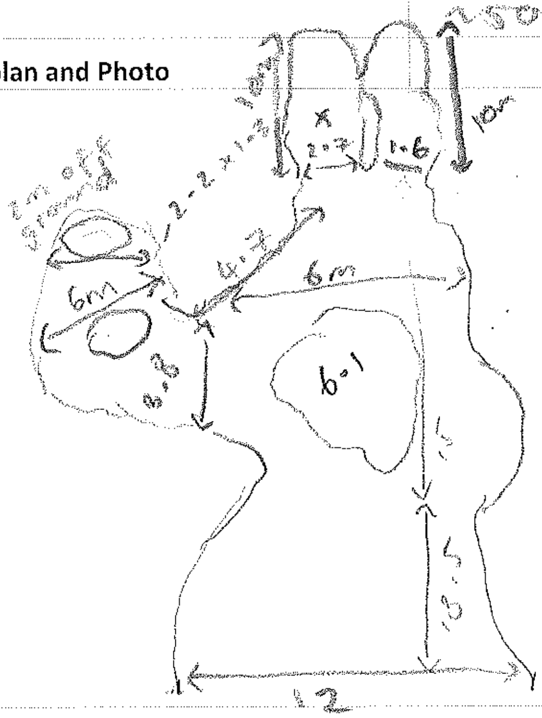
Cave ID: SP0009	**Date:** 26/5/24
Assessed Ghost bat usage: Potential GB nocturnal shelter	**Coordinates:**
Entrance safe or unsafe to approach: safe.	**Basic Geology:** Marra Mumba Iron
Entrance type and dims – WxH (m): A. 3.6 x 3.2 B. 1.3 x 3.2	**Entrance Orientation:** SE + NW
Cave Grouping: Cluster in gorge	**Insulation from surface above:** ~5m
Cave Type: Potential nocturnal shelter	**Internal domed chamber:** Yes
Rear passages that may have roosts: Unlikely	**Internal temp. and relative humidity:** Cool, ambient
Local foraging opportunities: Hillslopes, plains, gorge.	**Current distance to disturbance:** Fire ~10m Roads ~500m.
Cave Floorplan and Photo	11:20 SP Phone (A).



Cave ID: SP0010	Date: 25/5/24
Assessed Ghost bat usage: GB scat + feed debris	Coordinates:
Entrance safe or unsafe to approach: safe	Basic Geology: Brockman Iron Formation.
Entrance type and dims – WxH (m): 12 x 4	Entrance Orientation: NE
Cave Grouping: Gorge w/ caves.	Insulation from surface above: ~4 m
Cave Type: Nocturnal shelter	Internal domed chamber: yes
Rear passages that may have roosts: Unlikely.	Internal temp. and relative humidity: Ambient, back humid.
Local foraging opportunities: hillslopes.	Current distance to disturbance: ~10 m fire; ~500 m drillpads + roads

Cave Floorplan and Photo

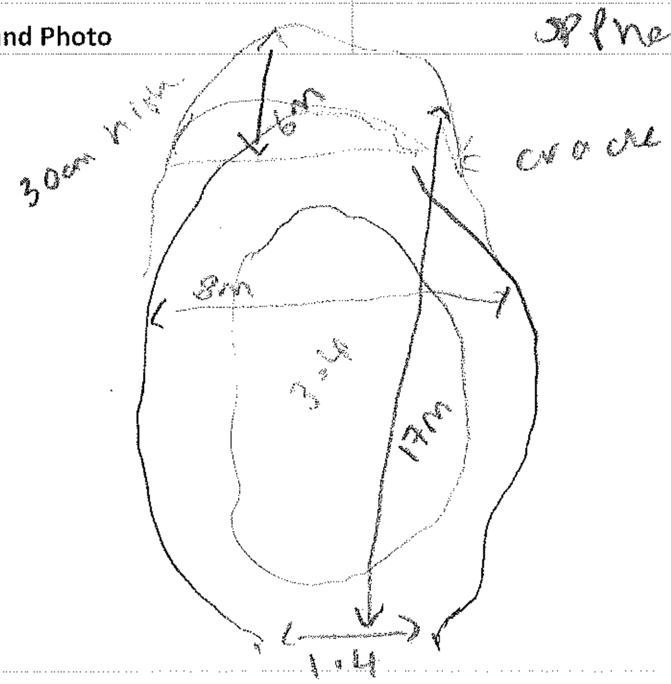
SP Phone 14:54



x = GB debris

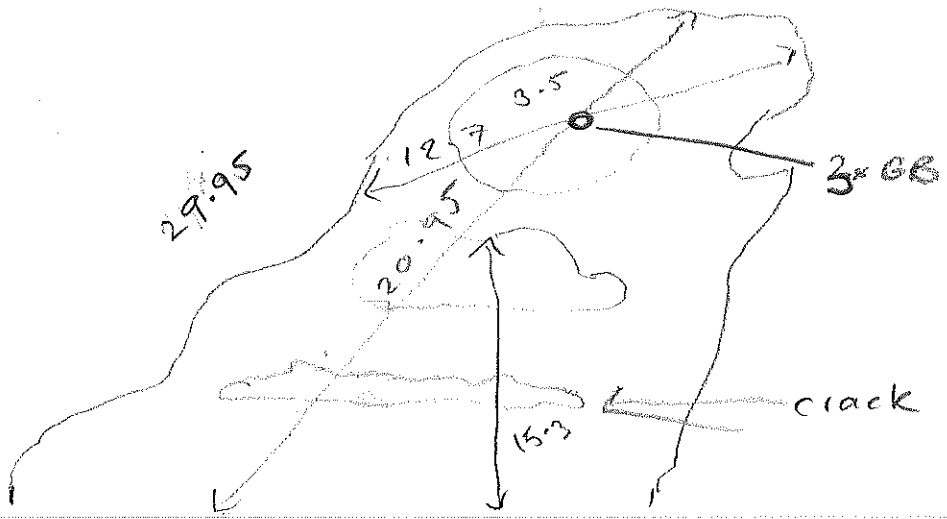
pal = nightjar kill.

Cave ID: SP0011	**Date:** 24/5/24
Assessed Ghost bat usage: Nil	**Coordinates:**
Entrance safe or unsafe to approach: safe	**Basic Geology:** Brockman Iron Formation.
Entrance type and dims – WxH (m): 1.4 x 0.8	**Entrance Orientation:** NW
Cave Grouping: Others in gorge	**Insulation from surface above:** ~6m
Cave Type: Pot. Nocturnal roost	**Internal domed chamber:** yes
Rear passages that may have roosts: Unlikely.	**Internal temp. and relative humidity:** Ambient
Local foraging opportunities: hillslopes, drainage	**Current distance to disturbance:** ~10m fire ~500m roads + drill pads.
Cave Floorplan and Photo	SP next 15:09.



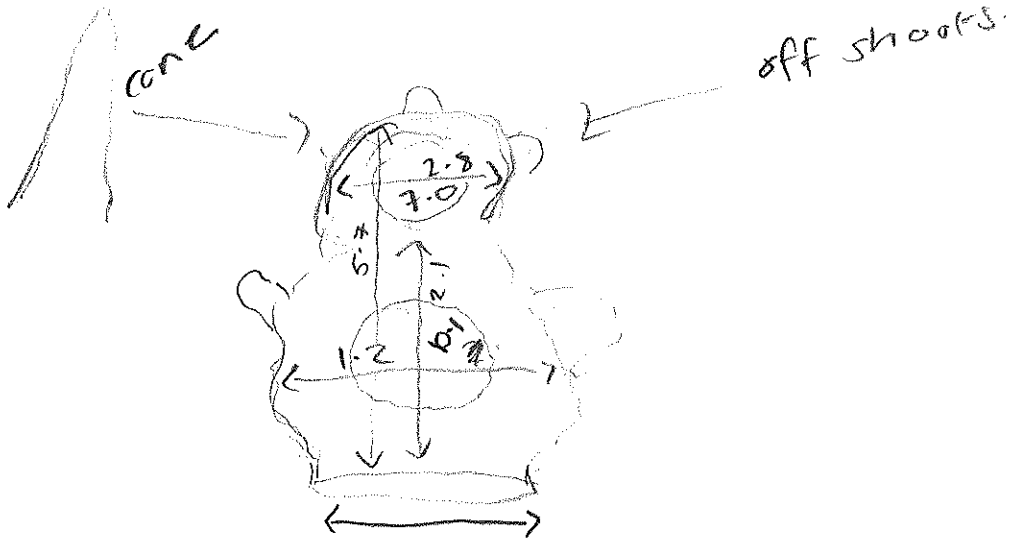
Cave ID: CB003	Date: 20/5/24
Assessed Ghost bat usage:	Coordinates:
Yes, three bats present in rear of cave	
Entrance safe or unsafe to approach:	Basic Geology:
Safe	Robe Pisolite
Entrance type and dims – WxH (m):	Entrance Orientation:
Wide 3.5 x 1.5	SE
Cave Grouping:	Insulation from surface above:
Cluster	~12 m
Cave Type:	Internal domed chamber:
Diurnal Roost - GB	Yes, several
Rear passages that may have roosts:	Internal temp. and relative humidity:
No, only pop holes + domed, no PlnB roosting opportunities	32° 22%
Local foraging opportunities:	Current distance to disturbance:
Hillslopes, plains	~500m
Cave Floorplan and Photo	13.03 SP

•numerous pop holes in cave ceiling

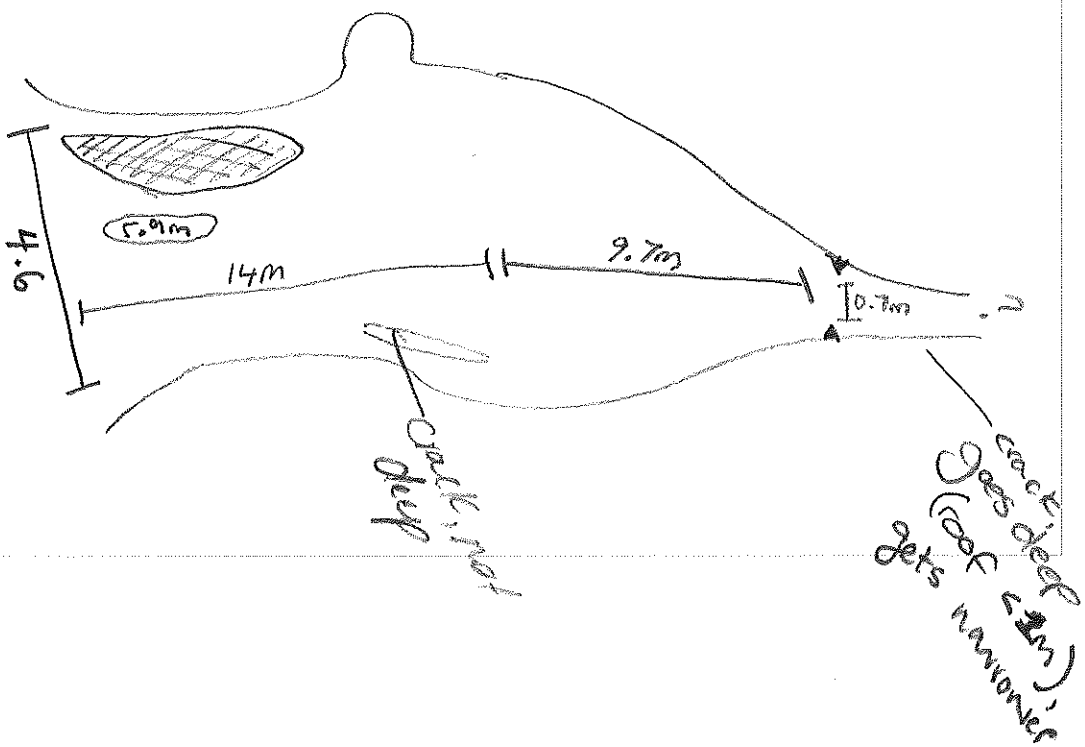


SP12:31

Cave ID: WNMC ICB002	Date: 20/5/24
Assessed Ghost bat usage: Nil	Coordinates:
Entrance safe or unsafe to approach: safe	Basic Geology: Robe Pisolite
Entrance type and dims – WxH (m): 0.70 x 2	Entrance Orientation: NW
Cave Grouping: Cluster, ridgeline w/ caves.	Insulation from surface above: ~10m
Cave Type: Potential GB	Internal domed chamber: Yes
Rear passages that may have roosts: shallow off shoots	Internal temp. and relative humidity: Warm + humid
Local foraging opportunities: Hillslope Microbats present	Current distance to disturbance: >500m
Cave Floorplan and Photo	SP12:31



Cave ID: CB001 / WNMC06	**Date:** 20/5/24
Assessed Ghost bat usage:	**Coordinates:**
Yes, midden	
Entrance safe or unsafe to approach:	**Basic Geology:**
Safe	Robe Pisolite
Entrance type and dims – WxH (m):	**Entrance Orientation:**
4.6 x 4.98m	NW
Cave Grouping:	**Insulation from surface above:**
Cluster	Mid-ridge (insulated)
Cave Type:	**Internal domed chamber:**
Diurnal roost? Nocturnal shelter	One at front (small + exposed), more deeper
Rear passages that may have roosts:	**Internal temp. and relative humidity:**
Yes	~~30~~ 32°C, 30%
Local foraging opportunities:	**Current distance to disturbance:**
Drainage lines	~500m
Cave Floorplan and Photo	



Appendix F Site by species matrix.

Scientific name	Common name	Systematic trapping site															Motion camera	ARU	Ghost bat lure	Incidental
		Shrubland (open)		Hills/ Ranges/ Plateaux		Drainage Line/River/Creek (major)			Drainage Line/River/Creek (major)		Hummock Grassland			Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)			Gorges/ Gullies				
		WND P01	WND P08	WNDP 02	WNDP 05	WNDP 13	WND P3	WND P10	WNDP12	WNDP11	WND P04	WND P07	WND P16	WNDP06	WNDP09	WNDP14	WNDP15				
AMPHIBIANS																					
Hylidae																					
Litoria rubella	Little red tree frog																2				
Myobatrachidae																					
Pseudophryne douglasi	Gorge toadlet																132				
BIRDS																					
Acanthizidae																					
Smicrornis brevirostris	Weebill											1									
Pyrrholaemus brunneus	Redthroat		4*																		1
Gerygone fusca	Western gerygone								1	1		1	1								1
Acanthiza uropygialis	Chestnut-rumped thornbill		x				3														1
Accipitridae																					
Aquila audax	Wedge-tailed eagle																	1			2
Haliastur sphenurus	Whistling kite	1																			2
Tachyspiza cirrocephalus	Collared sparrowhawk									1											
Aegothelidae																					
Aegotheles cristatus	Owlet-nightjar																1				2
Alcedinidae																					
Dacelo leachii	Blue-winged kookaburra						2									2					1
Todiramphus pyrrhopygius	Red-backed kingfisher					1	4		1				1								2
Artamidae																					
Artamus cinereus	Black-faced woodswallow									2	4	3									
Artamus minor	Little woodswallow				x										1						1
Artamus personatus	Masked woodswallow																				1
Cracticus nigrogularis	Pied butcherbird		3		x	2	2	3	3	1	4	5	3	4	3	3		1			
Cracticus torquatus	Grey butcherbird														1						
Gymnorhina tibicen	Australian magpie							1										1			4
Burhinidae																					
Burhinus grallarius	Bush-stone curlew																	1			5
Cacatuidae																					
Cacatua sanguinea	Little corella	9	x			19	2			2		2				2					
Eolophus roseicapilla	Galah		x	4		4	1		13				9	6		5					
Nymphicus hollandicus	Cockatiel					3															9
Campephagidae																					
Coracina maxima	Ground cuckoo-shrike																				1
Coracina novaehollandiae	Black-faced cuckoo-shrike	1	1	1		2	7			1		1			5	1	3				
Lalage tricolor	White-winged triller		1			1	3						1								1
Caprimulgidae																					
Eurostopodus argus	Spotted nightjar																				2
Climacteridae																					

Scientific name	Common name	Systematic trapping site															Motion camera	ARU	Ghost bat lure	Incidental
		Shrubland (open)		Hills/ Ranges/ Plateaux		Drainage Line/River/Creek (major)			Drainage Line/River/Creek (major)		Hummock Grassland			Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)			Gorges/ Gullies				
		WND P01	WND P08	WNDP 02	WNDP 05	WNDP 13	WND P3	WND P10	WNDP12	WNDP11	WND P04	WND P07	WND P16	WNDP06	WNDP09	WNDP14	WNDP15				
Climacteris melanurus	Black-tailed treecreeper					5	4													
Columbidae																				
Geopelia cuneata	Diamond dove		1	1		1	7					2				3				1
Geopelia striata placida	Peaceful dove									1										
Geophaps plumifera	Spinifex pigeon	43	20								17	16					2			
Ocyphaps lophotes	Crested pigeon		1	1		1			6	1	2	6	1			2				
Phaps chalcoptera	Common bronzewing	2	1					1									1			1
Corvidae																				
Corvus orru	Torresian crow		8	7	3*	3	6	1	2	1	1	12		2				38		
Corvus spp.																				x
Cuculidae																				
Chalcites basalis	Horsfield's bronze-cuckoo					1			1		3	3	2							
Heteroscenes pallidus	Pallid cuckoo		2	1							2	1	1							
Dicaeidae																				
Dicaeum hirundinaceum	Mistletoebird					1														1
Estrildidae																				
Emblema pictum	Painted finch						4				2	7			3					1
Taeniopygia castanotis	Australian zebra finch						2				2									3
Falconidae																				
Falco berigora	Brown falcon					1														
Falco cenchroides	Nankeen kestrel			1																
Hirundinidae																				
Petrochelidon ariel	Fairy martin																			2
Petrochelidon nigricans	Tree martin					2														3
Locustellidae																				
Poodytes carteri	Spinifexbird	2		1					1		7	9	6	1	3	2				
Cincloramphus mathewsi	Rufous songlark						2						2							
Maluridae																				
Amytornis whitei	Pilbara grasswren			3																
Malurus assimilis	Purple-backed fairywren		7*									13	5	3	3	2				
Malurus leucopterus	White-winged fairywren	1	14						5			8	4			2				
Stipiturus ruficeps	Rufous-crowned emu-wren										9									
Meliphagidae																				
Acanthagenys rufogularis	Spiny-cheeked honeyeater												4							
Certhionyx variegatus	Pied honeyeater			1																
Epthianura tricolor	Crimson chat																			2
Gavicalis virescens	Singing honeyeater	1	4					1	7		1	7	7	2		1				
Lichmera indistincta	Brown honeyeater		3				5		4				7			2	9			
Manorina flavigula	Yellow-throated miner	5	x			19						2				3				

Scientific name	Common name	Systematic trapping site															Motion camera	ARU	Ghost bat lure	Incidental
		Shrubland (open)		Hills/ Ranges/ Plateaux		Drainage Line/River/Creek (major)			Drainage Line/River/Creek (major)		Hummock Grassland			Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)			Gorges/ Gullies				
		WND P01	WND P08	WNDP 02	WNDP 05	WNDP 13	WND P3	WND P10	WNDP12	WNDP11	WND P04	WND P07	WND P16	WNDP06	WNDP09	WNDP14	WNDP15				
Melithreptus gularis	Black-chinned honeyeater					2															4
Ptilotula keartlandi	Grey-headed honeyeater			14							1	7									1
Ptilotula penicillata	White-plumed honeyeater					9	24									4					
Meropidae																					
Merops ornatus	Rainbow bee-eater	2		1		7	3	7		4			1		2	1					1
Monarchidae																					
Grallina cyanoleuca	Magpie-lark			1		2	6										1	1			1
Motacillidae																					
Anthus australis	Australian pipit																				1
Oreoicidae																					
Oreoica gutturalis	Crested bellbird	1	13*	11		3			2	5	4	4	2	1		1					
Otididae																					
Ardeotis australis	Australian bustard																				x
Pachycephalidae																					
Pachycephala rufiventris	Rufous whistler	1	12*	5		2	9	4	3	3	1	2	7			3	2				
Colluricincla harmonica	Grey shrike-thrush		1	4	1	2	12	3			7	4	2		4		3	3			1
Pardalotidae																					
Pardalotus rubricatus	Red-browed pardalote						1														
Pardalotus striatus	Striated pardalote				x	6	3						2		1		1				1
Petroicidae																					
Melanodryas cucullata	Hooded robin		1									3	2								3
Podargidae																					
Podargus strigoides	Tawny frogmouth																				2
Pomatostomidae																					
Pomatostomus temporalis	Grey-crowned babbler	3	11			5	18	2*		13						8					
Psittaculidae																					
Barnardius zonarius	Australian ringneck						10			2	2										
Melopsittacus undulatus	Budgerigar	3		5				1			3										
Psophodidae																					
Psophodes occidentalis	Chiming wedgebill		x																		
Ptilonorhynchidae																					
Chlamydera guttata	Western bowerbird						1														
Rhipiduridae																					
Rhipidura leucophrys	Willie wagtail		1	2		2	5					2			2	1	4	2			
Rhipidura albiscapa	Grey fantail																				1
Strigidae																					
Ninox boobook	Southern boobook																	1			
MAMMALS																					
Bovidae																					
Bos primigenius taurus	Domestic cattle																	2			2*
Canidae																					

Scientific name	Common name	Systematic trapping site															Motion camera	ARU	Ghost bat lure	Incidental
		Shrubland (open)		Hills/ Ranges/ Plateaux		Drainage Line/River/Creek (major)			Drainage Line/River/Creek (major)		Hummock Grassland			Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)			Gorges/ Gullies				
		WND P01	WND P08	WNDP 02	WNDP 05	WNDP 13	WND P3	WND P10	WNDP12	WNDP11	WND P04	WND P07	WND P16	WNDP06	WNDP09	WNDP14	WNDP15				
Canis familiaris	Dingo																	8			1 *
Dasyuridae																					
Dasykaluta rosamondae	Little red kaluta										3	1									
Dasyurus hallucatus	Northern quoll			2														3 2			1
Ningaui timealeyi	Pilbara ningaui										10	3	1								
Planigale kendricki	Orange-headed Pilbara planigale		1								5										
Pseudantechinus woolleyae	Woolley's pseudantechinus																	8			
Emballonuridae																					
Taphozous georgianus	Common sheath-tail bat	x	x	x	x	x	x	x	x	x	x	x			x	x	x	1	x	x	
Saccolaimus flaviventris	Yellow-belly sheath-tail bat	x					x												x	x	
Equuidae																					
Equus africanus asinus	Donkey																				1
Felidae																					
Felis catus	Cat																	9			2
Macropodidae																					
Osphranter rufus	Red kangaroo																	1 1			1
Petrogale rothschildi	Rothchild's rock wallaby																	1 1			1
Megadermatidae																					
Macroderma gigas	Ghost bat																			x	
Molossidae																					
Chaerephon jobensis	Greater northern free-tailed bat	x	x	x		x	x			x		x			x	x	x		x	x	
Ozimops lumsdenae	Northern free-tail-bat	x		x			x			x	x	x	x				x		x	x	
Muridae																					
Pseudomys chapmani	Western pebble-mound mouse																				3
Pseudomys desertor	Desert mouse											7									
Pseudomys hermannsburgensis	Sandy inland mouse		1																		
Pseudomys pilbarensis	Western delicate mouse										1										
Zyzomys argurus	Common rock rat			1	1										5			2 1			
Rhinonycteridae																					
Rhinonycteridae aurantia	Pilbara leaf-nosed bat		x													x			x	x	
Tachyglossidae																					
Tachyglossus aculeatus	Echidna																	2			
Vespertilionidae																					
Vespadelus finlaysoni	Inland cave bat	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x		x	x	
Chalinolobus gouldii	Gould's wattle bat	x	x	x		x	x	x	x	x	x	x			x	x	x		x	x	

Scientific name	Common name	Systematic trapping site															Motion camera	ARU	Ghost bat lure	Incidental
		Shrubland (open)		Hills/ Ranges/ Plateaux		Drainage Line/River/Creek (major)			Drainage Line/River/Creek (major)		Hummock Grassland			Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)			Gorges/ Gullies				
		WND P01	WND P08	WNDP 02	WNDP 05	WNDP 13	WND P3	WND P10	WNDP12	WNDP11	WND P04	WND P07	WND P16	WNDP06	WNDP09	WNDP14	WNDP15				
Scotorepens greyii	Little broad-nosed bat	x	x		x	x	x	x	x	x	x	x	x		x	x	x		x	x	
Reptiles																					
Agamidae																					
Ctenophorus caudicinctus	Ring-tailed dragon	1																			1
Ctenophorus isolepis	Central military dragon	2	1																		3
Ctenophorus nuchalis	Central netted dragon																				1
Gowidon longirostris	Long-nosed dragon							1													2
Pogona minor	Dwarf bearded dragon		1																		1
Diplodactylidae																					
Diplodactylus laevis	Desert fat-tailed gecko	1	3			1							2								
Diplodactylus savagei	Pilbara beak-faced gecko								1							1					
Lucasium woodwardi (stenodactylum)	Sand-plain gecko					1			1												
Oedura fimbria (marmorata)	Marbled velvet gecko			1																	
Strophurus elderi	Jewelled gecko								1						1						
Elapidae																					
Acanthophis wellsi	Pilbara death adder																				1
Demansia reticulata	Reticulated whipsnake		1								1										
Demansia rufescens	Rufous whipsnake						1														
Pseudechis australis	Mulga snake												1								
Pseudonaja mengdeni	Gwardar/ Western brown snake													1							
Pseudonaja modesta	Ringed brown snake									1											
Gekkonidae																					
Gehyra crypta	Cryptic gehyra					1			2	1						1	1				
Gehyra finipunctata (punctulata)	Small-spotted Midwest rock gehyra															1	1				
Gehyra montium	Centralian gehyra					1															
Gehyra punctata	Spotted rock gehyra			2																	
Gehyra purpurascens	Purple arid gehyra					2															
Heteronotia binoei	Bynoe's gecko				1				1		3	4		4							
Heteronotia spelea	Desert cave gecko			1																	
Pygopodidae																					
Delma elegans	Elegant delma			1																	
Delma nasuta	Sharp-snout delma			1							1					1					
Delma pax	Peace delma		2					1				1					2				
Lialis burtonis	Burton's legless lizard								1												
Pythonidae																					
Antaresia perthensis	Pygmy python			1																	
Antaresia childreni (Antaresia stimsoni)	Children's python																				1

Scientific name	Common name	Systematic trapping site															Motion camera	ARU	Ghost bat lure	Incidental
		Shrubland (open)		Hills/ Ranges/ Plateaux		Drainage Line/River/Creek (major)			Drainage Line/River/Creek (major)		Hummock Grassland			Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)			Gorges/ Gullies				
		WND P01	WND P08	WNDP 02	WNDP 05	WNDP 13	WND P3	WND P10	WNDP12	WNDP11	WND P04	WND P07	WND P16	WNDP06	WNDP09	WNDP14	WNDP15				
Scincidae																					
Carlia munda	Striped rainbow skink							2			1	2				1					
Cryptoblepharus ustulatus	Russet snake-eyed skink																				1
Ctenotus grandis	Grand ctenotus		12						2		1	2	6								
Ctenotus helenae (inornatus)	Helen's skink		3									2									
Ctenotus pallasotus (duricola)	Pilbara striped ctenotus										1										
Ctenotus pantherinus	Leopard skink	1	8	1				2	3		7	7	6								
Ctenotus rubicundus	Rufous skink			2																	
Ctenotus saxatilis	Rock ctenotus		1	15	6			2			6	2		1	6		8				
Ctenotus schomburgkii	Wedge-snout ctenotus																				1
Cyclodomorphus melanops	Slender blue-tongue											1		2							
Egernia formosa	Goldfields crevice skink																6				
Lerista flammicauda	Pilbara flame-tailed slider		1																		
Lerista macropisthopus	Unpatterned robust slider		3																		
Lerista muelleri	Mueller's three-toed Slider		1				4		3	3		1	2			1					
Menetia greyii	Common dwarf skink	1	2							1	1	4				1					
Morethia ruficauda	Lined firetail skink										2				2		1				
Notoscincus butleri	Lined soil-crevice skink		1										1								
Tiliqua multifasciata	Central blue-tongue										1			1							
Typhlopidae																					
Anilios ammodytes	Sand-diving blind snake						1						1								
Anilios ganei	Ganes blind snake																1				
Anilios grypus	Northern beaked blind snake																				1
Varanidae																					
Varanus acanthurus	Spiny-tailed monitor			1	1												1				
Varanus giganteus	Perentie																	2			
Varanus hamersleyensis	Hamersley rock monitor																	6			1
Varanus panoptes	Yellow-spotted monitor		1															4			1
Varanus tristis	Black-headed monitor		1	1			1														

Appendix G Night parrot call analysis.

Results of acoustic surveys conducted for Night Parrot (*Pezoporus occidentalis*)

Wyloo

May and August 2024

Report to:

Ecologia

Prepared by:

Nick Leseberg

Adaptive NRM

6th February 2025

1. Summary

In May and August 2024, autonomous recording units (ARUs) were deployed to survey for Night Parrots (*Pezoporus occidentalis*) at nine sites in the Wyloo project area, located in the Hamersley sub-region of Western Australia's Pilbara bioregion. Resulting acoustic data was analysed using signal parameters optimised for detecting Night Parrot calls. No Night Parrots were detected.

2. Night Parrot distribution and ecology

Analysis of historical records suggest Night Parrots were formerly found throughout arid central Australia, before undergoing a significant decline and range contraction during the late-19th and early-20th centuries (Leseberg *et al.* 2021). The species is now known from a small area in western Queensland, and the central and northern inland of Western Australia (Leseberg *et al*. 2021, Lindsay *et al*. 2024). There are several historical reports of Night Parrot from the Hamersley sub-region, although there are no high veracity reports from near the project area – the nearest verified contemporary record is from 280 km east of the project area, at Fortescue Marsh (Leseberg *et al*. 2021). As Night Parrots are known from the wider Pilbara bioregion though, it is possible that if suitable habitat exists in the project area, Night Parrots could occur there.

Night Parrots in western Queensland, and central and northern Western Australia, establish long-term stable roost sites in long unburnt *Triodia* (Jackett *et al.* 2017, Murphy *et al.* 2017b, Ngururrpa Rangers *et al*. 2024), and may occupy these sites for extended periods of up to several years (S. Murphy, N. Leseberg unpubl. data). These long-term stable roost sites support both roosting and breeding. Although the total extent of *Triodia* at these sites does not appear critical, the size distribution of hummocks is important. The sites where Night Parrots occur all contain at least some patches of large, long unburnt *Triodia* hummocks, and are in open areas with few, if any, trees or shrubs (Jackett *et al.* 2017, Murphy *et al.* 2017b, Ngururrpa Rangers *et al*. 2024).

Unpublished DNA analyses of faecal samples show that Night Parrots in western Queensland eat a relatively broad array of food plants including grasses (e.g. *Triodia longiceps*, *Uranthoecium truncatum*, *Brachyachne ciliaris*, *Astrebla lappacea*, *Dactyloctenium radulans*) and forbs (e.g. *Trianthema triquetra*) (S. Murphy, N. Leseberg, unpubl. data). Tracking studies

show that while foraging at night, Night Parrots access these resources by visiting floristically diverse run-on zones in the landscape, which can be large (e.g. floodplains) or small (e.g. gilgai formations) (Murphy *et al.* 2017b). Like roosting areas, these foraging areas are typically very open, with few, if any, trees or shrubs (Murphy *et al.* 2017b). The birds are known to visit foraging areas and drinking sites up to 10 km from their roosting sites (Murphy *et al.* 2017b). The proximity of such areas to suitable roosting habitat is likely to be an important factor determining the ability of a landscape to support Night Parrots.

3. Survey methodology

Research in western Queensland has shown that Night Parrots have predictable year-round calling periods at dusk and dawn (Murphy *et al.* 2017a, Leseberg *et al.* 2019). This ensures that if Night Parrots are roosting at a particular site, the likelihood of detecting them using ARUs is very high, provided the ARU is placed for a minimum of four nights in calm weather, and set to record during the peak calling periods. During breeding, and following large rain events, calling is more frequent, extends throughout the night, and the likelihood of detection is increased (Murphy *et al.* 2017a). Preliminary results from research in central Western Australia suggest patterns of behaviour in that region are similar (Jackett *et al.* 2017, Ngururrpa Rangers *et al*. 2024).

Night Parrots are also known to call during the night at feeding and drinking sites (Ngururrpa Rangers *et al*. 2024). Anecdotal evidence suggests they may call when moving between these sites (N. Leseberg, N. Jackett, S. Murphy unpubl. data). However, the detection of birds away from roosting sites is likely to be a chance event given the large area over which birds range at night (Murphy *et al.* 2017b).

Night Parrots are known to drink, and modelling suggests they may be reliant on free-standing water (or succulent food containing >55% water) during hot weather (Kearney *et al.* 2016). Birds have been detected in the Great Sandy Desert by focusing survey effort at water sources (Lindsay *et al*. 2024). It is likely this technique will be most effective during periods of water scarcity, when survey effort can focus on just a few possible locations.

The likelihood of detection is also influenced by the type of ARU being used. In calm conditions, a Song Meter 4 (Wildlife Acoustics, MA, USA), the ARU type used for these

surveys, is known to be capable of reliably detecting 95% of Night Parrot calls out to a range of around 205 m (Leseberg *et al.* 2022).

4. Survey effort

Ecologia conducted sampling for the Night Parrot at nine sites in the project area (Table 1). All surveys used Song Meter 4 ARUs. The recommended recording period for Night Parrot surveys is from 25 minutes after sunset until 25 minutes before sunrise (DBCA 2024). This allows ARUs to detect any Night Parrots which may be roosting in the vicinity, and any Night Parrots that may be moving through the survey area during the night. The five ARUs deployed in May recorded for two hours either side of sunset and sunrise. These ARUs would have captured any calling Night Parrots that were roosting in the immediate vicinity of the ARUs, but not any Night Parrots moving through the sampling area at night. The four ARUs deployed in August recorded from one hour before sunset until one hour after sunrise, and would have detected any calling Night Parrots that were roosting in the immediate vicinity of the ARU, and any Night Parrots moving through the sampling area at night. Recording conditions were good for the duration of both surveys, with little wind.

Table 1. Bioacoustic recordings analysed from the May and August 2024 survey periods.

Machine ID	Recording start date (PM)	Recording end date (AM)	Total recording nights
SM4-B1	22-May-24	28-May-24	6 *
SM4-B2	22-May-24	28-May-24	6 *
SM4-B3	22-May-24	28-May-24	6 *
SM4-B4	22-May-24	28-May-24	6 *
SM4-B5	22-May-24	28-May-24	6 *
SM4-B1	17-Aug-24	23-Aug-24	6
SM4-B2	17-Aug-24	23-Aug-24	6
SM4-B3	17-Aug-24	23-Aug-24	6
SM4-B5	17-Aug-24	23-Aug-24	6
		Total	54

5. Data analysis

ANRM received the raw acoustic data as '.wav' files. These were scanned using the software Kaleidoscope Pro v5.6.6, targeting the frequency range of 1500 – 3500 Hz, within which all known Night Parrot calls are distributed (Leseberg *et al.* 2019). Search parameters were optimised using a random selection of 250 Night Parrot call examples manually detected from both Great Sandy Desert and East Murchison datasets, of which 205 (82.0%) were automatically detected. Calls not detected were typically extremely faint. The probability of non-detection of a true-positive call was 18.0%; two true-positive calls was 3.2%; three true-positive calls was 0.6%; etc. Of the data tested, the median number of consecutive (spaced at < 5 minutes apart) calls in a sequence when Night Parrots were recorded was 5 (1–34, $n = 29$). The probability of at least one call being detected within a sequence of median length, assuming there was variation in the location of the source of the call, was > 99.9%.

Any detections outside of the 25-minute post-sunset to 25-minute pre-sunrise period were filtered out. Remaining detections were then compared to a reference library comprising several thousand Night Parrot calls from Western Australia. This library consists of calls recorded at sites where Night Parrots have been confirmed using visual means and is therefore considered of high reliability. The library also comprises multiple examples of all known call types from Western Australia (Leseberg *et al.* 2019).

6. Survey results

A total of 29,823 Kaleidoscope detections were manually assessed for Night Parrot vocalisations. No calls attributable to Night Parrots were detected during the analysis. No other species of conservation significance were detected.

7. Conclusion

It is unlikely long-term stable Night Parrot roosts exist within approximately 200 m of the nine sites sampled during this survey, at the time of sampling. Additionally, it is unlikely that Night Parrots were foraging in proximity to the four sites sampled during August at the time of sampling.

It is important to reinforce that these results pertain specifically to that area immediately surrounding these survey points, and only for the period during which the survey was

conducted. The results of these surveys do not enable robust conclusions about the presence or absence of Night Parrots in the wider landscape.

8. References

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Appendix H Current terrestrial fauna sampling site locations.

Site	Habitat type	Sample type	Latitude	Longitude	Open date	Close date
Cave habitat assessment						
CB0002	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	Fauna: Cave Habitat Assessment	-22.5251	116.5916	20/05/2024	N/A
CB0003	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	Fauna: Cave Habitat Assessment	-22.526	116.5899	20/05/2024	N/A
CB0004	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	Fauna: Cave Habitat Assessment	-22.5253	116.5898	20/05/2024	N/A
CB0005	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	Fauna: Cave Habitat Assessment	-22.5252	116.5896	20/05/2024	N/A
CB0006	Hummock grassland	Fauna: Cave Habitat Assessment	-22.5272	116.5966	27/05/2024	N/A
CB0007	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	Fauna: Cave Habitat Assessment	-22.5246	116.5894	27/05/2024	N/A
CB001	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	Fauna: Cave Habitat Assessment	-22.5261	116.5902	20/05/2024	N/A
CB009	Hummock grassland	Fauna: Cave Habitat Assessment	-22.5271	116.5966	20/05/2024	N/A
Qscat01	Gorge/Gully	Fauna: Cave Habitat Assessment	-22.4583	116.6834	21/04/2024	N/A
SP0003	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	Fauna: Cave Habitat Assessment	-22.5255	116.5899	20/05/2024	N/A
SP0004	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	Fauna: Cave Habitat Assessment	-22.5281	116.5791	24/05/2024	N/A
SP0005	Hummock grassland	Fauna: Cave Habitat Assessment	-22.533	116.5802	24/05/2024	N/A
SP0006	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	Fauna: Cave Habitat Assessment	-22.533	116.5805	24/05/2024	N/A
SP0007	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	Fauna: Cave Habitat Assessment	-22.5338	116.5812	24/05/2024	N/A
SP0008	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	Fauna: Cave Habitat Assessment	-22.4233	116.598	25/05/2024	N/A
SP0009	Gorge/Gully	Fauna: Cave Habitat Assessment	-22.4586	116.6834	26/05/2024	N/A
SP0010	Hills/Ranges/Plateaux	Fauna: Cave Habitat Assessment	-22.5167	116.7265	25/05/2024	N/A
SP0011	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	Fauna: Cave Habitat Assessment	-22.5171	116.7259	24/05/2024	N/A
SP0012	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	Fauna: Cave Habitat Assessment	-22.5687	116.6908	27/05/2024	N/A
SP0013	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	Fauna: Cave Habitat Assessment	-22.5267	116.5964	27/05/2024	N/A
SP0014	Hummock grassland	Fauna: Cave Habitat Assessment	-22.527	116.5967	26/05/2024	N/A
TBD01	Gorge/Gully	Fauna: Cave Habitat Assessment	-22.4583	116.6835	26/05/2024	N/A
TBD02	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	Fauna: Cave Habitat Assessment	-22.5766	116.7152	27/05/2024	N/A
Ghost bat lures						
WNGB01	Hummock grassland	Fauna: Ghost Bat Lure	-22.5135	116.7687	22/04/2024	23/04/2024
WNGB02	Drainage Line/River/Creek (major)	Fauna: Ghost Bat Lure	-22.5944	116.7941	22/04/2024	23/04/2024
WNGB03	Hummock grassland	Fauna: Ghost Bat Lure	-22.5237	116.5912	23/04/2024	24/04/2024

Site		Habitat type	Sample type	Latitude	Longitude	Open date	Close date
WNGB04		Hummock grassland	Fauna: Ghost Bat Lure	-22.6002	116.7488	24/05/2024	25/04/2024
WNGB05		Hummock grassland	Fauna: Ghost Bat Lure	-22.563	116.7179	23/05/2024	24/05/2024
WNGB06		Hummock grassland	Fauna: Ghost Bat Lure	-22.5677	116.4622	23/05/2024	24/05/2024
WNGB07		Drainage Line/River/Creek (major)	Fauna: Ghost Bat Lure	-22.5659	116.6632	24/05/2024	25/05/2024
WNGB08		Drainage Line/River/Creek (major)	Fauna: Ghost Bat Lure	-22.6483	116.829	25/05/2024	26/05/2024
WNGB09		Hills/Ranges/Plateaux	Fauna: Ghost Bat Lure	-22.4643	116.7062	25/05/2024	26/05/2024
WNGB10		Drainage Line/River/Creek (major)	Fauna: Ghost Bat Lure	-22.4336	116.6131	26/05/2024	27/05/2024
WNGB11		Hills/Ranges/Plateaux	Fauna: Ghost Bat Lure	-22.598	116.5781	26/05/2024	27/05/2024
WNGB12		Drainage Line/River/Creek (major)	Fauna: Ghost Bat Lure	-22.5656	116.4172	27/05/2024	28/05/2024
WNGB13		Drainage Line/River/Creek (major)	Fauna: Ghost Bat Lure	-22.5425	116.5032	27/05/2024	28/05/2024
Motion cameras							
WNQT 01	WNMC01	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	Fauna: Motion Camera	-22.5291	116.5845	20/04/2024	20/05/2024
	WNMC02	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	Fauna: Motion Camera	-22.5288	116.5833	20/04/2024	20/05/2024
	WNMC03	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	Fauna: Motion Camera	-22.5272	116.5829	20/04/2024	20/05/2024
	WNMC04	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	Fauna: Motion Camera	-22.5261	116.5843	20/04/2024	20/05/2024
	WNMC05	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	Fauna: Motion Camera	-22.526	116.5871	20/04/2024	20/05/2024
	WNMC06	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	Fauna: Motion Camera	-22.5261	116.5902	20/04/2024	20/05/2024
	WNMC07	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	Fauna: Motion Camera	-22.5252	116.5918	20/05/2024	20/05/2024
	WNMC08	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	Fauna: Motion Camera	-22.5252	116.5951	20/04/2024	20/05/2024
	WNMC09	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	Fauna: Motion Camera	-22.5246	116.5893	20/04/2024	20/05/2024
	WNMC10	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	Fauna: Motion Camera	-22.526	116.5898	20/04/2024	20/05/2024
WNQT 02	WNMC11	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	Fauna: Motion Camera	-22.52	116.7116	21/04/2024	21/05/2024
	WNMC12	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	Fauna: Motion Camera	-22.5199	116.7104	21/04/2024	21/05/2024
	WNMC13	Hills/Ranges/Plateaux	Fauna: Motion Camera	-22.5185	116.7082	21/04/2024	21/05/2024
	WNMC14	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	Fauna: Motion Camera	-22.5207	116.708	21/04/2024	21/05/2024
	WNMC15	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	Fauna: Motion Camera	-22.5217	116.7088	21/04/2024	21/05/2024
	WNMC16	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	Fauna: Motion Camera	-22.522	116.7074	21/04/2024	21/05/2024
	WNMC17	Gorge/Gully	Fauna: Motion Camera	-22.5153	116.7055	21/04/2024	21/05/2024
	WNMC18	Gorge/Gully	Fauna: Motion Camera	-22.5153	116.7003	21/04/2024	21/05/2024
	WNMC19	Gorge/Gully	Fauna: Motion Camera	-22.5159	116.7034	21/04/2024	21/05/2024
	WNMC20	Gorge/Gully	Fauna: Motion Camera	-22.5144	116.6986	21/04/2024	21/05/2024
WNQT 03	WNMC21	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	Fauna: Motion Camera	-22.5338	116.8218	21/04/2024	21/05/2024
	WNMC22	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	Fauna: Motion Camera	-22.5338	116.8242	21/04/2024	21/05/2024
	WNMC23	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	Fauna: Motion Camera	-22.5352	116.8267	21/04/2024	21/05/2024
	WNMC24	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	Fauna: Motion Camera	-22.536	116.8321	21/04/2024	21/05/2024
	Wnmc25	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	Fauna: Motion Camera	-22.5349	116.8315	21/04/2024	21/05/2024
	WNMC26	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	Fauna: Motion Camera	-22.5259	116.8197	21/04/2024	21/05/2024
	WNMC27	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	Fauna: Motion Camera	-22.5265	116.8213	21/04/2024	21/05/2024
	WNMC28	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	Fauna: Motion Camera	-22.527	116.8225	21/04/2024	21/05/2024

Site		Habitat type	Sample type	Latitude	Longitude	Open date	Close date
	WNMC29	Hummock grassland	Fauna: Motion Camera	-22.5281	116.8238	21/04/2024	21/05/2024
	WNMC30	Hummock grassland	Fauna: Motion Camera	-22.5273	116.8242	21/04/2024	21/05/2024
WNQT 04	WNMC31	Drainage Line/River/Creek (major)	Fauna: Motion Camera	-22.5877	116.4676	21/04/2024	21/05/2024
	WNMC32	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	Fauna: Motion Camera	-22.5421	116.7995	22/04/2024	21/05/2024
	WNMC33	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	Fauna: Motion Camera	-22.5431	116.7964	22/04/2024	21/05/2024
	WNMC34	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	Fauna: Motion Camera	-22.545	116.7956	22/04/2024	21/05/2024
	WNMC35	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	Fauna: Motion Camera	-22.5458	116.7974	22/04/2024	21/05/2024
	WNMC36	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	Fauna: Motion Camera	-22.5476	116.7977	22/04/2024	21/05/2024
	WNMC37	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	Fauna: Motion Camera	-22.5495	116.7969	22/04/2024	21/05/2024
	WNMC38	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	Fauna: Motion Camera	-22.5505	116.7951	22/04/2024	21/05/2024
	WNMC39	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	Fauna: Motion Camera	-22.5517	116.7956	22/04/2024	21/05/2024
	WNMC40	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	Fauna: Motion Camera	-22.5532	116.7953	22/04/2024	21/05/2024
WNQT 05	WNMC41	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	Fauna: Motion Camera	-22.4974	116.643	23/04/2024	21/05/2024
	WNMC42	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	Fauna: Motion Camera	-22.4979	116.6421	23/04/2024	21/05/2024
	WNMC43	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	Fauna: Motion Camera	-22.4965	116.6423	23/04/2024	21/05/2024
	WNMC44	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	Fauna: Motion Camera	-22.4952	116.6412	23/04/2024	21/05/2024
	WNMC45	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	Fauna: Motion Camera	-22.4957	116.6399	23/04/2024	21/05/2024
	WNMC46	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	Fauna: Motion Camera	-22.495	116.6389	23/04/2024	21/05/2024
	WNMC47	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	Fauna: Motion Camera	-22.4946	116.6382	23/04/2024	21/05/2024
	WNMC48	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	Fauna: Motion Camera	-22.4944	116.6361	23/04/2024	21/05/2024
	WNMC49	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	Fauna: Motion Camera	-22.4938	116.6345	21/05/2024	21/05/2024
Opportunistic collection							
WPMM MOUND 1		Hummock grassland	Fauna: Mound	-22.5874	116.7394	22/04/2024	N/A
WPMM01		Hummock grassland	Fauna: Mound	-22.5889	116.5889	15/08/2024	N/A
Corv nest		Drainage Line/River/Creek (major)	Fauna: Opportunistic Collection	-22.6316	116.7852	22/05/2024	N/A
Corv nest1		Drainage Line/River/Creek (major)	Fauna: Opportunistic Collection	-22.6294	116.785	22/05/2024	N/A
Edge camp		Hummock grassland	Fauna: Opportunistic Collection	-22.5627	116.7182	21/04/2024	N/A
Neil's Lodge		Hummock grassland	Fauna: Opportunistic Collection	-22.5875	116.3679	22/08/2024	N/A
Wyloo camp		Hummock grassland	Fauna: Opportunistic Collection	-22.5877	116.4676	25/04/2024	N/A
Autonomous recording unit							
WNBD01		Drainage Line/River/Creek (major)	Fauna: Sound Recorder	-22.6516	116.8125	22/04/2024	25/04/2024
WNBD02		Hills/Ranges/Plateaux	Fauna: Sound Recorder	-22.4632	116.7075	22/04/2024	25/04/2024
WNBD03		Hummock grassland	Fauna: Sound Recorder	-22.5314	116.5549	22/04/2024	25/04/2024
WNBD04		Drainage Line/River/Creek (major)	Fauna: Sound Recorder	-22.5433	116.66	23/04/2024	26/04/2024
WNBD05		Drainage Line/River/Creek (major)	Fauna: Sound Recorder	-22.5946	116.7939	23/04/2024	26/04/2024
WNDP01		Shrubland (open)	Fauna: Sound Recorder	-22.504	116.6364	22/04/2024	25/04/2024
WNDP02		Hills/Ranges/Plateaux	Fauna: Sound Recorder	-22.5273	116.6902	19/04/2024	22/04/2024
WNDP02		Hills/Ranges/Plateaux	Fauna: Sound Recorder	-22.5273	116.6902	14/08/2024	19/08/2024

Site	Habitat type	Sample type	Latitude	Longitude	Open date	Close date
WNDP03	Drainage Line/River/Creek (major)	Fauna: Sound Recorder	-22.6195	116.7856	20/04/2024	24/04/2024
WNDP03	Drainage Line/River/Creek (major)	Fauna: Sound Recorder	-22.6195	116.7856	13/08/2024	17/08/2024
WNDP04	Hummock grassland	Fauna: Sound Recorder	-22.5884	116.7394	19/04/2024	22/04/2024
WNDP04	Hummock grassland	Fauna: Sound Recorder	-22.5884	116.7394	13/08/2024	17/08/2024
WNDP05	Hills/Ranges/Plateaux	Fauna: Sound Recorder	-22.4499	116.623	19/04/2024	22/04/2024
WNDP06	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	Fauna: Sound Recorder	-22.5593	116.7027	19/04/2024	22/04/2024
WNDP07	Hummock grassland	Fauna: Sound Recorder	-22.575	116.8011	20/04/2024	24/04/2024
WNDP07	Hummock grassland	Fauna: Sound Recorder	-22.575	116.8011	13/08/2024	17/08/2024
WNDP08	Shrubland (open)	Fauna: Sound Recorder	-22.5312	116.6735	22/04/2024	25/04/2024
WNDP08	Shrubland (open)	Fauna: Sound Recorder	-22.5312	116.6735	14/08/2024	18/08/2024
WNDP09	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	Fauna: Sound Recorder	-22.5267	116.5872	20/04/2024	23/04/2024
WNDP09	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	Fauna: Sound Recorder	-22.5267	116.5872	15/08/2024	19/08/2024
WNDP10	Drainage Line/River/Creek (major)	Fauna: Sound Recorder	-22.5148	116.4938	22/04/2024	25/04/2024
WNDP11	Drainage Line/River/Creek (minor)	Fauna: Sound Recorder	-22.5039	116.6156	15/08/2024	19/08/2024
WNDP12	Drainage Line/River/Creek (minor)	Fauna: Sound Recorder	-22.5427	116.5772	14/08/2024	18/08/2024
WNDP13	Drainage Line/River/Creek (major)	Fauna: Sound Recorder	-22.5149	116.5919	15/08/2024	19/08/2024
WNDP14	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	Fauna: Sound Recorder	-22.6114	116.7835	13/08/2024	18/08/2024
WNDP15	Gorge/Gully	Fauna: Sound Recorder	-22.5401	116.5496	16/08/2024	19/08/2024
WNDP16	Hummock grassland	Fauna: Sound Recorder	-22.5246	116.5063	16/08/2024	19/08/2024
WNNP04	Hummock grassland	Fauna: Sound Recorder	-22.5171	116.5371	20/04/2024	26/04/2024
WNNP06	Hummock grassland	Fauna: Sound Recorder	-22.5213	116.545	22/05/2024	28/05/2024
WNNP07	Hummock grassland	Fauna: Sound Recorder	-22.5234	116.5481	22/05/2024	28/05/2024
WNNP08	Hummock grassland	Fauna: Sound Recorder	-22.5272	116.5502	22/05/2024	28/05/2024
WNNP09	Hummock grassland	Fauna: Sound Recorder	-22.5262	116.5486	22/05/2024	28/05/2024
WNNP10	Hummock grassland	Fauna: Sound Recorder	-22.5287	116.5518	22/05/2024	28/05/2024
WNNP11	Hummock grassland	Fauna: Sound Recorder	-22.5176	116.5395	17/08/2024	23/08/2024
WNNP12	Hummock grassland	Fauna: Sound Recorder	-22.5165	116.5371	17/08/2024	23/08/2024
WNNP13	Hummock grassland	Fauna: Sound Recorder	-22.5153	116.5344	17/08/2024	23/08/2024
WNNP14	Hummock grassland	Fauna: Sound Recorder	-22.5142	116.5316	17/08/2024	23/08/2024
WNTB01	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	Fauna: Sound Recorder	-22.495	116.639	21/05/2024	24/05/2024
WNTB02	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	Fauna: Sound Recorder	-22.5134	116.7279	21/05/2024	24/05/2024
WNTB03	Hummock grassland	Fauna: Sound Recorder	-22.5077	116.8027	21/05/2024	24/05/2024
WNTB04	Hummock grassland	Fauna: Sound Recorder	-22.542	116.8077	21/05/2024	24/05/2024
WNTB05	Drainage Line/River/Creek (major)	Fauna: Sound Recorder	-22.5504	116.486	23/05/2024	26/05/2024
WNTB06	Hills/Ranges/Plateaux	Fauna: Sound Recorder	-22.548	116.5363	23/05/2024	26/05/2024
WNTB07	Drainage Line/River/Creek (major)	Fauna: Sound Recorder	-22.4151	116.5843	23/05/2024	26/05/2024
WNTB08	Hills/Ranges/Plateaux	Fauna: Sound Recorder	-22.4389	116.6724	23/05/2024	26/05/2024
Systematic trap site - Phase 1						
WNDP01	Shrubland (open)	Fauna: Trap Site	-22.504	116.6364	16/04/2024	23/04/2024

Site	Habitat type	Sample type	Latitude	Longitude	Open date	Close date
WNDP02	Hills/Ranges/Plateaux	Fauna: Trap Site	-22.5273	116.6902	16/04/2024	23/04/2024
WNDP03	Drainage Line/River/Creek (major)	Fauna: Trap Site	-22.6195	116.7856	17/04/2024	25/04/2024
WNDP04	Hummock grassland	Fauna: Trap Site	-22.5884	116.7394	17/04/2024	25/04/2024
WNDP05	Hills/Ranges/Plateaux	Fauna: Trap Site	-22.4499	116.623	17/04/2024	24/04/2024
WNDP06	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	Fauna: Trap Site	-22.5593	116.7027	19/04/2024	26/04/2024
WNDP07	Hummock grassland	Fauna: Trap Site	-22.575	116.8011	19/04/2024	26/04/2024
WNDP08	Shrubland (open)	Fauna: Trap Site	-22.5312	116.6735	19/04/2024	26/04/2024
WNDP09	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	Fauna: Trap Site	-22.5267	116.5872	19/04/2024	26/04/2024
WNDP10	Drainage Line/River/Creek (major)	Fauna: Trap Site	-22.5148	116.4938	19/04/2024	26/04/2024
Systematic trap site - Phase 2						
WNDP02	Hills/Ranges/Plateaux	Fauna: Trap Site	-22.5273	116.6902	14/08/2024	22/08/2024
WNDP03	Drainage Line/River/Creek (major)	Fauna: Trap Site	-22.6195	116.7856	14/08/2024	22/08/2024
WNDP04	Hummock grassland	Fauna: Trap Site	-22.5884	116.7394	13/08/2024	22/08/2024
WNDP07	Hummock grassland	Fauna: Trap Site	-22.575	116.8011	14/08/2024	22/08/2024
WNDP08	Shrubland (open)	Fauna: Trap Site	-22.5312	116.6735	14/08/2024	22/08/2024
WNDP09	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	Fauna: Trap Site	-22.5267	116.5872	14/08/2024	22/08/2024
WNDP11	Drainage Line/River/Creek (minor)	Fauna: Trap Site	-22.5039	116.6156	14/08/2024	22/08/2024
WNDP12	Drainage Line/River/Creek (minor)	Fauna: Trap Site	-22.5427	116.5772	14/08/2024	22/08/2024
WNDP13	Drainage Line/River/Creek (major)	Fauna: Trap Site	-22.5149	116.5919	15/08/2024	22/08/2024
WNDP14	Rocky Escarpments (Ridges/Mesa/Cliffs/Outcrops/Breakaways)	Fauna: Trap Site	-22.6114	116.7835	13/08/2024	22/08/2024
WNDP15	Gorge/Gully	Fauna: Trap Site	-22.5401	116.5496	16/08/2024	23/08/2024
WNDP16	Hummock grassland	Fauna: Trap Site	-22.5246	116.5063	16/08/2024	22/08/2024

Appendix I Post-survey likelihood of occurrence assessment

Taxon	Common name	WA status	EPBC status	Number of records		Latest record	Preferred habitat type	Comments	Likelihood of occurrence
				DBCA	Fortescue				
BIRD									
Actitis hypoleucos	Common sandpiper	MI	MI	1	0	2015	Inland wetlands and sheltered coastal areas, utilises permanent and ephemeral wetlands.	One record located 39.1 km southeast of the survey area. Permanent habitat does not occur within survey area. If present, this species may occasionally utilise habitat associated with Duck Creek; however, presence restricted to transient/occasional visitation rather than permanent occupancy.	**Unlikely**
Apus pacificus	Fork-tailed swift	MI	MI	1	2	2012	Occupies low to very high airspace over varied habitat.	Although not recorded during the current survey, this species recorded during previous surveys at Wyloo in 2022. Species does not utilise terrestrial habitats; however, may utilise the airspace above the survey area while transiting. Species unlikely to be impacted by on ground disturbances.	**Recorded (previous survey)**
Falco hypoleucos	Grey falcon	VU	VU	3	4	2019	Resident or nomadic to most of semi-arid interior.	Closest database record located < 10 kilometres north of the survey area. Suitable habitat and potential breeding habitat occurs within the Drainage Line/River/Creek (major) habitat type. Species recorded north of the survey area during previous surveys undertaken by GHD (2020) in the Western Hub.	**High**
Charadrius veredus	Oriental plover	MI	MI	1	2	2018	Inland wetlands and sheltered coastal areas, utilises permanent and ephemeral wetlands.	One database record located 37.8 km south of the survey area. If present, this species may occasionally utilise habitat associated with Duck Creek; however, presence restricted to transient/occasional visitation rather than permanent occupancy. Permanent habitat does not occur within survey area.	**Unlikely**
Pandion cristatus	Osprey	MI	MI	1	1	2013	Usually associated with coastal habitats and occasional visitor to inland water bodies.	Species previously recorded by ecologia (2013). This species may occasionally utilise habitat associated with Duck Creek; however, presence restricted to transient/occasional visitation rather than permanent occupancy. Critical habitat does not occur within survey area.	**Recorded (previous surveys)**
Falco peregrinus	Peregrine falcon	OS	-	16	6	2022	Cliffs and gorges, inland drainage systems, lowland plains, acacia shrublands intersected by water courses.	Four DBCA records and one Fortescue database record located within the survey area. Species not recorded during current survey; however, two birds were recorded nesting within the survey area by Stantec (2021) within the survey area. Suitable breeding and foraging habitat present within survey area within the Rocky Escarpment habitat type.	**Recorded (previous survey)**
Amytornis striatus striatus	Striated grasswren (sandplain)	P4	-	2	-	2005	Occupies open mallee shrublands with dense understorey of Triodia hummock grassland.	The distribution of this subspecies does not occur within the Pilbara. These database records have not been updated to reflect recent taxonomic revisions.	**Does not occur**
Rostratula australis	Australian painted snipe	EN	EN	0	0	?	Usually found in shallow inland wetlands that are either permanently or temporarily filled.	No known records of species within100km of survey area. EPBC Act Protected Matters Search identified species/species habitat as potentially occurring within survey area. If present, this species may occasionally utilise habitat associated with Duck Creek; however, presence restricted to transient/occasional visitation rather than permanent occupancy. Permanent habitat does not occur within survey area.	**Unlikely**
Hirundo rustica	Barn swallow	MI	MI	0	0	?	Typically occur is airspace above open areas, including grasslands, low vegetation, creek lines and shallow waters.	No known records of species within 100km of survey area. EPBC Act Protected Matters Search identified species/species habitat as potentially occurring within survey area. Potential usage of habitat within the survey area restricted to transient presence rather than permanent occupancy. Species typically utilises aerial habitat and is unlikely to be impacted by on ground disturbances.	**Unlikely**
Calidris acuminata	Sharp-tailed sandpiper	MI	VU & MI	0	0	?	Prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation.	No known records of species within 50km of survey area. EPBC Act Protected Matters Search identified species/species habitat as potentially occurring within survey area. If present, this species may occasionally utilise habitat associated with Duck Creek; however, presence restricted to transient/occasional visitation rather than permanent occupancy. Permanent habitat does not occur within survey area.	**Unlikely**
Calidris ferruginea	Curlew sandpiper	CR	CR & MI	0	0	?	The species utilises coastal and near-coastal waterbodies including saltmarshes, wetlands, sewage ponds and shallow estuaries.	No known records of species within 50km of survey area. EPBC Act Protected Matters Search identified species/species habitat as potentially occurring within survey area. If present, this species may occasionally utilise habitat associated with Duck Creek; however, presence restricted to	**Unlikely**

Taxon	Common name	WA status	EPBC status	Number of records		Latest record	Preferred habitat type	Comments	Likelihood of occurrence
				DBCA	Fortescue				
								transient/occasional visitation rather than permanent occupancy. Permanent habitat does not occur within survey area.	
Motacilla cinerea	Grey wagtail	MI	MI	0	0	?	Typically occurs along freshwater habitats such as creeks and streams, however species could occur in any habitats during migration.	No known records of species within 100km of survey area. EPBC Act Protected Matters Search identified species/species habitat as potentially occurring within survey area. If present, this species may occasionally utilise habitat associated with Duck Creek; however, presence restricted to transient/occasional visitation rather than permanent occupancy. Permanent habitat does not occur within survey area.	**Unlikely**
Pezoporus occidentalis	Night parrot	EN	EN	0	0	?	Old, long unburnt, ring-forming *Triodia* grasslands and/or chenopod shrublands in arid and semi-arid zones.	Analysis of vegetation mapping undertaken within the survey area indicates that *Triodia longiceps* does not occur within the survey area. Vast sections of the survey area have been impacted by recent fires and long-unburnt spinifex is generally absent from the survey area. The survey area is located within the High Priority region for night parrot surveys. No night parrot calls recorded during the current or previous surveys and significant portions of the survey area have been recently burnt (<25 years).	**Unlikely**
Glareola maldivarum	Oriental pratincole	MI	MI	0	0	?	Open habitats with close proximity to water, this species prefers shallow wetlands with little or no emergent vegetation.	No known records of species within 100km of survey area. EPBC Act Protected Matters Search identified species/species habitat as potentially occurring within survey area. If present, this species may occasionally utilise habitat associated with Duck Creek; however, presence restricted to transient/occasional visitation rather than permanent occupancy. Permanent habitat does not occur within survey area.	**Unlikely**
Calidris melanotos	Pectoral sandpiper	MI	MI	0	0	?	Occupies a wide range of inland and coastal freshwater and brackish wetlands.	No known records of species within 100km of survey area. EPBC Act Protected Matters Search identified species/species habitat as potentially occurring within survey area. If present, this species may occasionally utilise habitat associated with Duck Creek; however, presence restricted to transient/occasional visitation rather than permanent occupancy. Permanent habitat does not occur within survey area.	**Unlikely**
Polytelis alexandrae	Princess parrot	P4	VU	0	0	?	Preferred habitat is lightly wooded country, including desert oak (*Casuarina decaisneana*), open mallee-spinifex and open marble gum (*Eucalyptus gongylocarpa*) woodland.	No known records of species within 100km of survey area. EPBC Act Protected Matters Search identified species/species habitat as potentially occurring within survey area. No suitable habitat identified within survey area.	**Unlikely**
Erythrotriorchis radiatus	Red goshawk	VU	EN	0	0	?	The preferred habitat is tall open eucalypt forest and riparian areas, including paperbark forest and gallery forests.	No known records of species within 100km of survey area. EPBC Act Protected Matters Search identified species/species habitat as potentially occurring within survey area. If present, this species may occasionally utilise habitat associated with Duck Creek; however, presence restricted to transient/occasional visitation rather than permanent occupancy.	**Unlikely**
Aphelocephala leucopsis	Southern whiteface	P4	VU	0	0	?	Occupies a wide range of open woodlands and shrublands with an understorey of grasses and/or shrubs. Habitat usually dominated by *Acacia* or *Eucalyptus* on ranges, foothills, lowlands and plains.	No known records of species within 50km of survey area; however, EPBC Act Protected Matters Search identified species/species habitat as potentially occurring within survey area. Survey area occurs at the north-western boundary of species distribution; however, species has not been recorded despite extensive survey effort.	**Unlikely**
Motacilla flava	Yellow wagtail	MI	MI	0	0	?	This species typically prefers habitats with close proximity to water including marshes and creeks.	No known records of species within 100km of survey area. EPBC Act Protected Matters Search identified species/species habitat as potentially occurring within survey area. Potential usage of habitat within the survey area restricted to transient presence rather than permanent occupancy. Species typically utilises aerial habitat and is unlikely to be impacted by on ground disturbances.	**Unlikely**
FISH									
Leiopotherapon aheneus	Fortescue grunter	P4	-	18	1	2018	Slow to fast moving streams and pools over sand or rocky substrates.	Species not recorded during current survey; however, was recorded by ecologia (2013) in the northern portion of Duck Creek. Suitable habitat present within Duck Creek and species may occur during periods of seasonal inundation.	**Recorded (previous surveys)**

Taxon	Common name	WA status	EPBC status	Number of records		Latest record	Preferred habitat type	Comments	Likelihood of occurrence
				DBCA	Fortescue				
MAMMALS									
Macroderma gigas	Ghost bat	VU	VU	117	74	2024	Rocky habitat for roosting, will forage in all habitat types	Twenty-one DBCA and one Fortescue database records located within the survey area. Primary evidence (sightings or video recordings/ARU calls) recorded at three sites during the current survey and secondary evidence recorded at five caves. An additional 14 records (sightings, calls or middens) recorded during previous surveys. Middens belonging to the ghost bat were recorded at five caves during the current survey, with an additional four middens recorded during previous surveys. Hills/Ranges/Plateaux, Gorge/Gully and Rocky Escarpments within the survey area provide critical nocturnal shelter and diurnal roosting habitat for the ghost bat, with all other habitat types providing foraging and dispersal habitat.	**Recorded (current and previous surveys)**
Antechinomys longicaudata	Long-tailed dunnart	P4	-	4	3	2017	Rugged, rocky habitat in areas with hummock grasses, shrubs and open shrubland or woodland.	Closest database record located 19.1 km east of the survey area. Suitable habitat occurs within the survey area. Species not recorded during current or previous surveys despite extensive survey effort in rocky habitats.	**Possible**
Dasyurus hallucatus	Northern quoll	EN	EN	1669	59	2024	Rocky escarpments provide denning and shelter habitats, also known to inhabit riverine habitats and utilise drainage lines for distribution.	One hundred and twenty-three DBCA and 35 Fortescue database records located within survey area. Species recorded on 35 occasions during the current survey during the current survey, with an additional 570 records obtained during previous surveys. Based on the number of individuals identified and frequency of detections during current and previous surveys, the survey area appears to support a high density, reproductive population of northern quolls. Rocky Escarpment, Gorge/Gully, Drainage Line/River/Creek (major) and Hills/Ranges/Plateaux habitat within the survey area is considered critical for the survival of the northern quoll. All other habitat types may be utilised by the species during foraging and dispersal activities.	**Recorded (current and previous surveys)**
Leggadina lakedownensis	Northern short-tailed mouse	P4	-	11	6	2014	Semi-arid habitats including spinifex and tussock grasslands, samphire and sedge lands, Acacia shrublands and stony ranges. Known to occur in seasonally inundated areas with red or white sandy clay soils.	Closest record located 39.4 km northeast of the survey area. Limited suitable habitat within the survey area.	**Unlikely**
Rhinonicteris aurantia (Pilbara)	Pilbara leaf-nosed bat	VU	VU	368	298	2024	Restricted to the Pilbara region. Roosts in deep caves and mines with high temperatures and humidity and will forage in all habitat types.	Nine DBCA and 55 Fortescue records within the survey area. Primary evidence of the species (echolocation call recordings) recorded during current survey and previous surveys. Low time calls recorded by GHD (2020) and Biologic (2013) in the central and eastern portion of the survey area; however, no low-time calls recorded within the survey area between 2021 and current. Species recorded on 94 occasions during previous surveys. Rocky Escarpment, Gorge/Gully and Hills/Ranges/Plateaux habitat within the survey area represents roosting habitat for the Pilbara leaf-nosed bat. All habitat types may be utilised by the species during foraging and dispersal activities.	**Recorded (current and previous surveys)**
Pseudomys chapmani	Western pebble-	P4	-	52	81	2024	Restricted to Pilbara and Gascoyne regions. Occupies stony habitat with hummock	Six DBCA and one Fortescue record located within survey area and species recorded on numerous occasions during current and previous surveys.	**Recorded (current and**

Taxon	Common name	WA status	EPBC status	Number of records		Latest record	Preferred habitat type	Comments	Likelihood of occurrence
				DBCA	Fortescue				
	mound mouse						grasslands. Constructs large mounds of pebbles on stony slopes, with active mounds characterised by craters.	Mounds belonging to the western pebble-mound mouse were recorded on three occasions during the current survey, with an additional eight mounds recorded within the survey area during previous surveys.	**previous surveys)**
REPTILES									
Anilios ganei	Gane's blind snake (Pilbara)	P1	-	4	4	2024	Often recorded in rocky or stony areas, potentially associated within moist gorges and gullies.	Closest database record located <10 km north of the survey area. Species recorded during the current survey. The Gane's blind snake was recorded within survey area on one occasion (WNDP15) within the Gorge/Gully habitat type.	**Recorded (current and previous survey)**
Notoscincus butleri	Lined soil-crevice skink	P4	-	46	42	2024	Spinifex dominated areas near creek and river margins.	No database records located within survey area; however, a number of database records located in close proximity to the survey area. Species recorded in the survey area at six sites within the survey area during current and previous surveys. Suitable habitat occurs within Hummock Grassland, Hills/Ranges/Breakaways and Drainage Line/River/Creek (minor) habitat types.	**Recorded (current and previous surveys)**
Liasis olivaceus barroni	Pilbara olive python	VU	VU	36	48	2023	Range restricted to Pilbara region, northern Western Australia and the Dampier Archipelago. Occupies rocky escarpments, gorges and waterholes.	Five DBCA database records located within the survey area and species recorded within the survey area by Stantec (2021). Species was not recorded during the current survey. Hills/Ranges/Plateaux, Gorge/Gully, Drainage Line/River/Creek (major) and Rocky Escarpment habitat types within the survey area provide critical habitat for the Pilbara olive python. Permanent and semi-permanent pools within the survey area provide aquatic habitat for the species.	**Recorded (previous survey)**
Underwoodisaurus seorsus	Pilbara barking gecko	P2	-	1	0	2019	Rocky habitats within the Hamersley ranges, including gorges/gullies and sparse low vegetation with *Triodia*, *Acacia* and *Eucalyptus*.	One record located 31.7 km north of the survey area. Limited information known about this species. Insufficient evidence to rule out presence.	**Possible**

Appendix J Bat call data (current survey).

Pilbara leaf-nosed bat calls (current survey)

Site	Date	Passes	Sunset	Dusk	Dawn	Sunrise	Time first detection	Time last detection	Time since sunset	Time until sunset
WNBD02	22/04/2024	42	22/04/2024 17:52	22/04/2024 18:15	23/04/2024 6:01	23/04/2024 6:23	19:24:47	1:32:37	1H 32M 3S	4H 51M 13S
WNBD02	23/04/2024	12	23/04/2024 17:52	23/04/2024 18:14	24/04/2024 6:01	24/04/2024 6:24	19:19:13	2:23:45	1H 27M 12S	4H 0M 26S
WNBD02	24/04/2024	13	24/04/2024 17:51	24/04/2024 18:13	25/04/2024 6:01	25/04/2024 6:24	19:51:21	3:11:41	2H 0M 31S	3H 12M 52S
WNBD03	24/04/2024	1	24/04/2024 17:51	24/04/2024 18:13	25/04/2024 6:01	25/04/2024 6:24	20:24:53	20:24:53	2H 33M 35S	9H 59M 40S
WNGB10	26/05/2024	1	26/05/2024 17:36	26/05/2024 18:00	27/05/2024 6:13	27/05/2024 6:37	19:23:25	19:23:25	1H 46M 40S	11H 14M 12S
WNTB08	25/05/2024	1	25/05/2024 17:36	25/05/2024 18:00	26/05/2024 6:13	26/05/2024 6:37	23:38:53	23:38:53	6H 1M 56S	6H 58M 19S
WNDP08	16/08/2024	1	16/08/2024 17:59	16/08/2024 18:22	17/08/2024 6:14	17/08/2024 6:37	1:44:42	1:44:42	7H 45M 25S	4H 52M 58S
WNDP14	13/08/2024	2	13/08/2024 17:58	13/08/2024 18:21	14/08/2024 6:16	14/08/2024 6:39	23:56:14	0:24:12	5H 58M 3S	6H 15M 41S
WNDP14	14/08/2024	1	14/08/2024 17:58	14/08/2024 18:21	15/08/2024 6:16	15/08/2024 6:39	19:03:01	19:03:01	1H 4M 28S	11H 36M 9S
WNDP14	15/08/2024	3	15/08/2024 17:58	15/08/2024 18:21	16/08/2024 6:15	16/08/2024 6:38	23:03:56	4:55:19	5H 5M 1S	1H 43M 6S
WNDP14	16/08/2024	4	16/08/2024 17:59	16/08/2024 18:22	17/08/2024 6:14	17/08/2024 6:37	1:03:55	3:36:19	7H 4M 38S	3H 1M 21S
WNDP15	17/08/2024	1	17/08/2024 17:59	17/08/2024 18:22	18/08/2024 6:13	18/08/2024 6:36	20:16:23	20:16:23	2H 16M 45S	10H 20M 31S

Ghost bat lure records (current survey)

Acoustic lure sites	Date	*M. gigas* detections
WNGB03	23/04/2024	detected on video from 19:26:37 to 19:27:41.
WNGB05	23/05/2024	echolocation only

Appendix K Bat call data (previous surveys).

Elevation-Hendrix Pilbara leaf-nosed bat calls (*ecologia*, 2023b)

Site	Date	Passes	Sunset	Dusk	Dawn	Sunrise	Time of first detection	Time of last detection	Time since sunset	Time until dawn
April										
644439	7/04/2022	3	7/04/2022 18:09	7/04/2022 18:31	8/04/2022 6:01	8/04/2022 6:24	22:06:22	1:18:42	3H 57M 7S	5H 5M 47S
EHDP01	7/04/2022	1	7/04/2022 18:09	7/04/2022 18:31	8/04/2022 6:01	8/04/2022 6:24	2:45:10	2:45:10	8H 35M 55S	3H 39M 19S
EHDP01	8/04/2022	1	8/04/2022 18:08	8/04/2022 18:30	9/04/2022 6:02	9/04/2022 6:24	3:31:04	3:31:04	9H 22M 44S	2H 53M 46S
EHDP02	7/04/2022	2	7/04/2022 18:09	7/04/2022 18:31	8/04/2022 6:01	8/04/2022 6:24	23:00:16	0:43:03	4H 51M 1S	5H 41M 26S
EHDP02	8/04/2022	3	8/04/2022 18:08	8/04/2022 18:30	9/04/2022 6:02	9/04/2022 6:24	1:25:00	2:39:13	7H 16M 40S	3H 45M 37S
EHDP04	8/04/2022	1	8/04/2022 18:08	8/04/2022 18:30	9/04/2022 6:02	9/04/2022 6:24	2:39:31	2:39:31	8H 31M 11S	3H 45M 19S
EHDP05	7/04/2022	1	7/04/2022 18:09	7/04/2022 18:31	8/04/2022 6:01	8/04/2022 6:24	2:22:21	2:22:21	8H 13M 6S	4H 2M 8S
EHDP05	8/04/2022	1	8/04/2022 18:08	8/04/2022 18:30	9/04/2022 6:02	9/04/2022 6:24	22:48:51	22:48:51	4H 40M 31S	7H 35M 59S
EHDP07	8/04/2022	1	8/04/2022 18:08	8/04/2022 18:30	9/04/2022 6:02	9/04/2022 6:24	0:10:07	0:10:07	6H 1M 47S	6H 14M 43S
EHDP09	7/04/2022	1	7/04/2022 18:09	7/04/2022 18:31	8/04/2022 6:01	8/04/2022 6:24	20:25:25	20:25:25	2H 16M 10S	9H 59M 4S
July										
EHBD02	15/07/2022	1	15/07/2022 17:46	15/07/2022 18:10	16/07/2022 6:29	16/07/2022 6:53	22:47:38	22:47:38	5H 1M 6S	8H 6M 15S
EHBD04	17/07/2022	4	17/07/2022 17:47	17/07/2022 18:11	18/07/2022 6:29	18/07/2022 6:53	22:15:22	1:44:52	4H 28M 2S	5H 8M 34S
EHBD04	19/07/2022	1	19/07/2022 17:48	19/07/2022 18:12	20/07/2022 6:28	20/07/2022 6:52	2:32:11	2:32:11	8H 44M 1S	4H 20M 43S
EHBD05	17/07/2022	1	17/07/2022 17:47	17/07/2022 18:11	18/07/2022 6:29	18/07/2022 6:53	21:03:54	21:03:54	3H 16M 34S	9H 49M 32S
EHBD06	18/07/2022	1	18/07/2022 17:47	18/07/2022 18:11	19/07/2022 6:29	19/07/2022 6:53	20:42:07	20:42:07	2H 54M 22S	10H 11M 4S

Wyloo Pilbara leaf-nosed bat calls (*ecologia*, 2022c). Green shading denotes low-time calls.

Site	Date	No. passes	Time of first detection	Time of last detection	Sunset	End Civil Twilight	Begin Civil Twilight	Sunrise	Time since sunset	Time before sunrise
May										
MDSM4-01	10/05/2021	2	21:56:51	22:14:51	10/05/2021 7:46	10/05/2021 18:09	11/05/2021 6:16	11/05/2021 6:39	4H 10M 40S	8H 25M 2S
MDSM4-02	10/05/2021	5	20:13:08	4:47:16	10/05/2021 7:46	10/05/2021 18:09	11/05/2021 6:16	11/05/2021 6:39	2H 26M 57S	1H 52M 37S
MDSM4-02	11/05/2021	2	23:11:43	23:24:52	11/05/2021 17:45	11/05/2021 18:09	12/05/2021 6:16	12/05/2021 6:40	5H 26M 2S	7H 15M 29S
MDSM4-03	8/05/2021	2	20:41:23	1:05:10	8/05/2021 17:47	8/05/2021 18:10	9/05/2021 6:15	9/05/2021 6:38	2H 54M 9S	5H 33M 48S
MDSM4-04	10/05/2021	5	19:01:49	3:52:09	10/05/2021 7:46	10/05/2021 18:09	11/05/2021 6:16	11/05/2021 6:39	1H 15M 38S	2H 47M 44S
WPD01	1/05/2021	1	2:07:48	2:07:48	1/05/2021 17:51	1/05/2021 18:14	2/05/2021 6:12	2/05/2021 6:35	8H 16M 25S	4H 28M 3S
WPD02	1/05/2021	7	19:49:22	2:02:56	1/05/2021 17:51	1/05/2021 18:14	2/05/2021 6:12	2/05/2021 6:35	1H 57M 59S	4H 32M 55S
WPD03	6/05/2021	1	22:19:18	22:19:18	6/05/2021 17:48	6/05/2021 18:11	7/05/2021 6:14	7/05/2021 6:38	4H 30M 58S	8H 18M 46S
WPD04	1/05/2021	2	20:27:02	20:43:16	1/05/2021 17:51	1/05/2021 18:14	2/05/2021 6:12	2/05/2021 6:35	2H 35M 39S	9H 52M 35S
WPD05	1/05/2021	2	19:33:23	21:35:57	1/05/2021 17:51	1/05/2021 18:14	2/05/2021 6:12	2/05/2021 6:35	1H 42M 0S	8H 59M 54S
WPD05	6/05/2021	1	2:16:56	2:16:56	6/05/2021 17:48	6/05/2021 18:11	7/05/2021 6:14	7/05/2021 6:38	8H 28M 36S	4H 21M 8S
WPD06	6/05/2021	1	1:54:16	1:54:16	6/05/2021 17:48	6/05/2021 18:11	7/05/2021 6:14	7/05/2021 6:38	8H 5M 56S	4H 43M 48S
WPD07	6/05/2021	1	4:45:02	4:45:02	6/05/2021 17:48	6/05/2021 18:11	7/05/2021 6:14	7/05/2021 6:38	10H 56M 42S	1H 53M 2S
WPD08	6/05/2021	3	22:00:43	2:59:36	6/05/2021 17:48	6/05/2021 18:11	7/05/2021 6:14	7/05/2021 6:38	4H 12M 23S	3H 38M 28S
WPD09	6/05/2021	1	4:02:05	4:02:05	6/05/2021 17:48	6/05/2021 18:11	7/05/2021 6:14	7/05/2021 6:38	10H 13M 45S	2H 35M 59S
August										
WBD01	4/08/2021	30	19:51:08	2:01:32	4/08/2021 17:56	4/08/2021 18:19	5/08/2021 6:24	5/08/2021 6:47	1H 54M 46S	4H 46M 27S
WBD01	5/08/2021	30	20:03:54	3:47:07	5/08/2021 17:56	5/08/2021 18:20	6/08/2021 6:24	6/08/2021 6:47	2H 7M 8S	3H 0M 17S
WBD01	6/08/2021	30	19:23:26	3:25:10	6/08/2021 17:57	6/08/2021 18:20	7/08/2021 6:23	7/08/2021 6:46	1H 26M 16S	3H 21M 38S
WBD02	4/08/2021	367	18:46:49	5:42:50	4/08/2021 17:56	4/08/2021 18:19	5/08/2021 6:24	5/08/2021 6:47	50M 27S	1H 5M 9S
WBD02	5/08/2021	1197	18:44:35	5:56:09	5/08/2021 17:56	5/08/2021 18:20	6/08/2021 6:24	6/08/2021 6:47	47M 49S	51M 15S
WBD02	6/08/2021	908	18:37:53	5:52:45	6/08/2021 17:57	6/08/2021 18:20	7/08/2021 6:23	7/08/2021 6:46	40M 43S	54M 3S
WBD03	4/08/2021	309	19:05:53	5:15:13	4/08/2021 17:56	4/08/2021 18:19	5/08/2021 6:24	5/08/2021 6:47	1H 9M 31S	1H 32M 46S
WBD03	5/08/2021	310	19:18:29	5:36:42	5/08/2021 17:56	5/08/2021 18:20	6/08/2021 6:24	6/08/2021 6:47	1H 21M 43S	1H 10M 42S

Site	Date	No. passes	Time of first detection	Time of last detection	Sunset	End Civil Twilight	Begin Civil Twilight	Sunrise	Time since sunset	Time before sunrise
WBD03	6/08/2021	300	19:00:18	5:44:25	6/08/2021 17:57	6/08/2021 18:20	7/08/2021 6:23	7/08/2021 6:46	1H 3M 8S	1H 2M 23S
WBD04	5/08/2021	72	19:29:58	3:20:25	5/08/2021 17:56	5/08/2021 18:20	6/08/2021 6:24	6/08/2021 6:47	1H 33M 12S	3H 26M 59S
WBD04	6/08/2021	77	19:23:18	5:14:23	6/08/2021 17:57	6/08/2021 18:20	7/08/2021 6:23	7/08/2021 6:46	1H 26M 8S	1H 32M 25S
WBD04	7/08/2021	168	19:18:37	5:07:44	7/08/2021 17:57	7/08/2021 18:20	8/08/2021 6:22	8/08/2021 6:46	1H 21M 3S	1H 38M 27S
WBD05	5/08/2021	6	19:36:44	3:27:41	5/08/2021 17:56	5/08/2021 18:20	6/08/2021 6:24	6/08/2021 6:47	1H 39M 58S	3H 19M 43S
WBD05	6/08/2021	7	19:47:09	3:15:54	6/08/2021 17:57	6/08/2021 18:20	7/08/2021 6:23	7/08/2021 6:46	1H 49M 59S	3H 30M 54S
WBD05	7/08/2021	9	19:41:01	2:46:44	7/08/2021 17:57	7/08/2021 18:20	8/08/2021 6:22	8/08/2021 6:46	1H 43M 27S	3H 59M 27S
WBD06	7/08/2021	207	19:47:07	4:51:53	7/08/2021 17:57	7/08/2021 18:20	8/08/2021 6:22	8/08/2021 6:46	1H 49M 33S	1H 54M 18S
WBD06	8/08/2021	312	22:55:47	4:56:10	8/08/2021 17:57	8/08/2021 18:21	9/08/2021 6:22	9/08/2021 6:45	4H 57M 49S	1H 49M 23S
WBD07	7/08/2021	8	19:34:42	2:23:19	7/08/2021 17:57	7/08/2021 18:20	8/08/2021 6:22	8/08/2021 6:46	1H 37M 8S	4H 22M 52S
WBD08	7/08/2021	174	20:34:03	4:04:45	7/08/2021 17:57	7/08/2021 18:20	8/08/2021 6:22	8/08/2021 6:46	2H 36M 29S	2H 41M 26S
WBD08	8/08/2021	20	22:47:47	4:09:16	8/08/2021 17:57	8/08/2021 18:21	9/08/2021 6:22	9/08/2021 6:45	4H 49M 49S	2H 36M 17S
WBD09	7/08/2021	8	20:57:28	4:23:27	7/08/2021 17:57	7/08/2021 18:20	8/08/2021 6:22	8/08/2021 6:46	2H 59M 54S	2H 22M 44S
WBD10	8/08/2021	18	19:02:54	1:34:12	8/08/2021 17:57	8/08/2021 18:21	9/08/2021 6:22	9/08/2021 6:45	1H 4M 56S	5H 11M 21S
WBD11	8/08/2021	4	22:51:56	5:08:58	8/08/2021 17:57	8/08/2021 18:21	9/08/2021 6:22	9/08/2021 6:45	4H 53M 58S	1H 36M 35S
November										
WBD20	18/11/2021	1539	19:14:47	4:46:59	18/11/2021 18:38	18/11/2021 19:03	19/11/2021 4:59	19/11/2021 5:24	35M 50S	37M 6S
WBD20	19/11/2021	1856	19:11:34	4:42:57	19/11/2021 18:39	19/11/2021 19:03	20/11/2021 4:59	20/11/2021 5:23	31M 56S	40M 56S
WBD20	20/11/2021	242	19:10:09	20:53:13	20/11/2021 18:40	20/11/2021 19:04	21/11/2021 4:59	21/11/2021 5:23	29M 50S	—
WDP10	12/11/2021	4	20:08:20	21:41:20	12/11/2021 18:34	12/11/2021 18:58	13/11/2021 5:01	13/11/2021 5:25	1H 33M 23S	7H 44M 29S
WDP10	13/11/2021	69	19:43:02	1:22:48	13/11/2021 18:35	13/11/2021 18:59	14/11/2021 5:01	14/11/2021 5:25	1H 7M 25S	4H 2M 40S
WDP10	14/11/2021	10	19:31:42	2:00:22	14/11/2021 18:36	14/11/2021 19:00	15/11/2021 5:01	15/11/2021 5:25	55M 26S	3H 24M 47S
WDP11	12/11/2021	6	0:38:07	2:46:25	12/11/2021 18:34	12/11/2021 18:58	13/11/2021 5:01	13/11/2021 5:25	6H 3M 10S	2H 39M 24S
WDP11	13/11/2021	6	21:57:24	4:24:10	13/11/2021 18:35	13/11/2021 18:59	14/11/2021 5:01	14/11/2021 5:25	3H 21M 47S	1H 1M 18S
WDP11	14/11/2021	3	22:18:53	0:59:01	14/11/2021 18:36	14/11/2021 19:00	15/11/2021 5:01	15/11/2021 5:25	3H 42M 37S	4H 26M 8S
WDP15	15/11/2021	2	20:19:39	20:43:53	15/11/2021 18:36	15/11/2021 19:01	16/11/2021 5:00	16/11/2021 5:24	1H 42M 43S	8H 40M 58S

Site	Date	No. passes	Time of first detection	Time of last detection	Sunset	End Civil Twilight	Begin Civil Twilight	Sunrise	Time since sunset	Time before sunrise
WDP15	17/11/2021	3	1:36:43	3:42:39	17/11/2021 18:38	17/11/2021 19:02	18/11/2021 5:00	18/11/2021 5:24	6H 58M 27S	1H 41M 40S
WDP15	18/11/2021	4	19:40:28	22:06:26	18/11/2021 18:38	18/11/2021 19:03	19/11/2021 4:59	19/11/2021 5:24	1H 1M 31S	7H 17M 39S
WDP16	16/11/2021	12	0:50:27	4:27:52	16/11/2021 18:37	16/11/2021 19:01	17/11/2021 5:00	17/11/2021 5:24	6H 12M 51S	56M 42S
WDP16	17/11/2021	4	19:49:08	0:28:44	17/11/2021 18:38	17/11/2021 19:02	18/11/2021 5:00	18/11/2021 5:24	1H 10M 52S	4H 55M 35S
WDP16	18/11/2021	2	2:24:56	4:06:01	18/11/2021 18:38	18/11/2021 19:03	19/11/2021 4:59	19/11/2021 5:24	7H 45M 59S	1H 18M 4S

Site-unit	Date	Passes	Sunset	Dusk	Dawn	Sunrise	Time of first detection	Time of last detection	Time since sunset	Time until dawn
WBAT01-MDSM4-07	2/07/2022	41	2/07/2022 17:43	2/07/2022 18:07	3/07/2022 6:32	3/07/2022 6:57	18:45:07	2:10:57	1H 2M 1S	4H 46M 17S
WBAT01-MDSM4-07	3/07/2022	35	3/07/2022 17:43	3/07/2022 18:07	4/07/2022 6:32	4/07/2022 6:57	19:04:47	4:06:57	1H 21M 21S	2H 50M 18S
WBAT02-MDSM4-04	2/07/2022	26	2/07/2022 17:43	2/07/2022 18:07	3/07/2022 6:32	3/07/2022 6:57	19:08:22	2:21:27	1H 25M 16S	4H 35M 47S
WBAT02-MDSM4-04	3/07/2022	26	3/07/2022 17:43	3/07/2022 18:07	4/07/2022 6:32	4/07/2022 6:57	18:59:15	2:02:53	1H 15M 49S	4H 54M 22S
WBAT05-MDSM4-06	6/07/2022	3	6/07/2022 17:44	6/07/2022 18:08	7/07/2022 6:32	7/07/2022 6:57	22:50:43	3:05:46	5H 6M 16S	3H 51M 25S
WBAT05-MDSM4-06	8/07/2022	1	8/07/2022 17:45	8/07/2022 18:09	9/07/2022 6:32	9/07/2022 6:57	3:39:13	3:39:13	9H 54M 2S	3H 17M 50S
WBAT06-MDSM4-07	7/07/2022	1	7/07/2022 17:44	7/07/2022 18:09	8/07/2022 6:32	8/07/2022 6:57	2:08:29	2:08:29	8H 23M 40S	4H 48M 39S
WBAT06-MDSM4-07	8/07/2022	4	8/07/2022 17:45	8/07/2022 18:09	9/07/2022 6:32	9/07/2022 6:57	1:58:34	3:22:53	8H 13M 23S	3H 34M 10S
WCHA07-MDSM4-01	1/07/2022	5	1/07/2022 17:42	1/07/2022 18:07	2/07/2022 6:32	2/07/2022 6:57	20:23:24	3:57:49	2H 40M 36S	2H 59M 23S
WCHA07-MDSM4-01	2/07/2022	14	2/07/2022 17:43	2/07/2022 18:07	3/07/2022 6:32	3/07/2022 6:57	19:01:02	4:36:29	1H 17M 56S	2H 20M 45S
WCHA07-MDSM4-01	3/07/2022	21	3/07/2022 17:43	3/07/2022 18:07	4/07/2022 6:32	4/07/2022 6:57	18:49:57	2:01:08	1H 6M 31S	4H 56M 7S
WBAT07-MDSM4-01	8/07/2022	3	8/07/2022 17:45	8/07/2022 18:09	9/07/2022 6:32	9/07/2022 6:57	4:14:24	4:37:35	10H 29M 13S	2H 19M 28S
WBAT08-MDSM4-05	6/07/2022	2	6/07/2022 17:44	6/07/2022 18:08	7/07/2022 6:32	7/07/2022 6:57	23:37:42	3:16:51	5H 53M 15S	3H 40M 20S
WBAT08-MDSM4-05	8/07/2022	1	8/07/2022 17:45	8/07/2022 18:09	9/07/2022 6:32	9/07/2022 6:57	4:38:04	4:38:04	10H 52M 53S	2H 18M 59S
WCHA11-MDSM4-02	1/07/2022	23	1/07/2022 17:42	1/07/2022 18:07	2/07/2022 6:32	2/07/2022 6:57	19:44:22	2:03:59	2H 1M 34S	4H 53M 13S
WCHA11-MDSM4-02	2/07/2022	17	2/07/2022 17:43	2/07/2022 18:07	3/07/2022 6:32	3/07/2022 6:57	20:58:00	2:09:42	3H 14M 54S	4H 47M 32S
WCHA22-MDSM4-03	3/07/2022	6	3/07/2022 17:43	3/07/2022 18:07	4/07/2022 6:32	4/07/2022 6:57	20:57:56	2:08:48	3H 14M 30S	4H 48M 27S
WCT29-MDSM4-06	3/07/2022	5	3/07/2022 17:43	3/07/2022 18:07	4/07/2022 6:32	4/07/2022 6:57	19:51:06	1:00:55	2H 7M 40S	5H 56M 20S
WCT29-MDSM4-06	4/07/2022	7	4/07/2022 17:43	4/07/2022 18:08	5/07/2022 6:32	5/07/2022 6:57	18:50:38	0:57:19	1H 6M 52S	5H 59M 56S

Wyloo ghost bat calls (*ecologia*, 2022c)

Site	Date	Number of calls	Period
WCHA01	1/07/2022	2	05:37:09 - 05:37:15
WCHA03	30/06/2022	1	02:04:12
WCHA03	1/07/2022	15	04:49:49 - 05:21:20
WCHA07	1/07/2022	2	05:27:27 - 05:33:11
WCHA15	1/07/2022	3	19:09:47 - 19:09:55 05:28:38
WCHA17A	7/07/2022	18	04:23:27 - 04:44:02
WCHA17B	3/07/2022	1	03:53:40
WCHA17B	4/07/2022	1	05:12:17
WCHA17B	6/07/2022	2	23:09:00 - 23:09:02
WCHA17B	7/07/2022	1	04:36:25
WCHA26	3/07/2022	2	22:28:31 - 22:28:38
WCT15	3/07/2022	1	02:48:12
WCT25	1/07/2022	8	19:09:10 - 20:18:44 01:05:52 05:36:24 - 05:37:05

Summary of Fortescue significant bat records within the survey area.

Species	Site	Date	Notes	Report
Pilbara leaf-nosed bat	EM Bat C6	12/12/2019	Bat06-6503	Annual Fauna Monitoring Program 2019
Pilbara leaf-nosed bat	EM Bat C5	12/12/2019	BAT07-6498	Annual Fauna Monitoring Program 2019
Pilbara leaf-nosed bat	EM Bat C4	12/12/2019	6174	Annual Fauna Monitoring Program 2019
Pilbara leaf-nosed bat	EM Bat C3	12/12/2019	6272	Annual Fauna Monitoring Program 2019
Pilbara leaf-nosed bat	EM Bat C2	12/12/2019	6253	Annual Fauna Monitoring Program 2019
Pilbara leaf-nosed bat	EPDE-Bat1-27	24/02/2017	SM2 17344, 24/02 -01:33-01:46 (3)	Eliwana Project: Consolidated Vertebrate Fauna
Pilbara leaf-nosed bat	EPDE-Bat1-27	24/02/2017	SM2 17344, 24/02 -01:33-01:46 (3)	Eliwana Project: Consolidated Vertebrate Fauna
Pilbara leaf-nosed bat	EPDE-Bat2-17	8/04/2017	SM2-17745, 8/04 - 00:10-05:10 (3)	Eliwana Project: Consolidated Vertebrate Fauna
Pilbara leaf-nosed bat	EPDE-Bat2-17	9/04/2017	SM2-17745, 9/04 - 23:07-01:03 (2)	Eliwana Project: Consolidated Vertebrate Fauna
Pilbara leaf-nosed bat	EPDE-Bat2-17	11/04/2017	SM2-17745, 11/04 - 19:51-01:59 (4)	Eliwana Project: Consolidated Vertebrate Fauna
Pilbara leaf-nosed bat	EM Bat C6	12/01/2021	N/A	Fortescue Metals Group Annual Fauna Monitoring Program
Pilbara leaf-nosed bat	EM Bat C6	25/01/2021	N/A	Fortescue Metals Group Annual Fauna Monitoring Program
Pilbara leaf-nosed bat	EM Bat C5	12/01/2021	N/A	Fortescue Metals Group Annual Fauna Monitoring Program
Pilbara leaf-nosed bat	EM Bat C5	25/01/2021	N/A	Fortescue Metals Group Annual Fauna Monitoring Program
Pilbara leaf-nosed bat	EM Bat C7	12/01/2021	N/A	Fortescue Metals Group Annual Fauna Monitoring Program
Pilbara leaf-nosed bat	EM Bat C7	25/01/2021	N/A	Fortescue Metals Group Annual Fauna Monitoring Program
Pilbara leaf-nosed bat	EM Bat C4	12/01/2021	N/A	Fortescue Metals Group Annual Fauna Monitoring Program
Pilbara leaf-nosed bat	EM Bat C4	25/01/2021	N/A	Fortescue Metals Group Annual Fauna Monitoring Program

Species	Site	Date	Notes	Report
Pilbara leaf-nosed bat	EM Bat C3	12/01/2021	N/A	Fortescue Metals Group Annual Fauna Monitoring Program
Pilbara leaf-nosed bat	EM Bat C3	25/01/2021	N/A	Fortescue Metals Group Annual Fauna Monitoring Program
Pilbara leaf-nosed bat	DS 30	29/08/2019	DS 30	Western Hub Fauna Surveys. Level 2 and Targeted Conservation Significant Fauna Assessment
Pilbara leaf-nosed bat	DS 29	29/08/2019	DS 29	Western Hub Fauna Surveys. Level 2 and Targeted Conservation Significant Fauna Assessment
Pilbara leaf-nosed bat	DS 32	29/08/2019	DS 32	Western Hub Fauna Surveys. Level 2 and Targeted Conservation Significant Fauna Assessment
Pilbara leaf-nosed bat	DS 20	29/08/2019	DS 20	Western Hub Fauna Surveys. Level 2 and Targeted Conservation Significant Fauna Assessment
Pilbara leaf-nosed bat	DS 38	29/08/2019	DS 38	Western Hub Fauna Surveys. Level 2 and Targeted Conservation Significant Fauna Assessment
Pilbara leaf-nosed bat	SM4-1	29/08/2019	SM4-1	Western Hub Fauna Surveys. Level 2 and Targeted Conservation Significant Fauna Assessment
Pilbara leaf-nosed bat	DS 14	29/08/2019	DS 14	Western Hub Fauna Surveys. Level 2 and Targeted Conservation Significant Fauna Assessment
Pilbara leaf-nosed bat	DS 15	29/08/2019	DS 15	Western Hub Fauna Surveys. Level 2 and Targeted Conservation Significant Fauna Assessment
Pilbara leaf-nosed bat	DS 21	29/08/2019	DS 21	Western Hub Fauna Surveys. Level 2 and Targeted Conservation Significant Fauna Assessment
Pilbara leaf-nosed bat	DS 21	29/08/2019	DS 21	Western Hub Fauna Surveys. Level 2 and Targeted Conservation Significant Fauna Assessment
Pilbara leaf-nosed bat	DS 12	29/08/2019	DS 12	Western Hub Fauna Surveys. Level 2 and Targeted Conservation Significant Fauna Assessment
Pilbara leaf-nosed bat	DS 13	29/08/2019	DS 13	Western Hub Fauna Surveys. Level 2 and Targeted Conservation Significant Fauna Assessment
Pilbara leaf-nosed bat	DS 13	29/08/2019	DS 13	Western Hub Fauna Surveys. Level 2 and Targeted Conservation Significant Fauna Assessment
Pilbara leaf-nosed bat	DS 13	29/08/2019	DS 13	Western Hub Fauna Surveys. Level 2 and Targeted Conservation Significant Fauna Assessment
Pilbara leaf-nosed bat	DS 13	29/08/2019	DS 13	Western Hub Fauna Surveys. Level 2 and Targeted Conservation Significant Fauna Assessment
Pilbara leaf-nosed bat	DS 13	29/08/2019	DS 13	Western Hub Fauna Surveys. Level 2 and Targeted Conservation Significant Fauna Assessment
Pilbara leaf-nosed bat	DS 13	29/08/2019	DS 13	Western Hub Fauna Surveys. Level 2 and Targeted Conservation Significant Fauna Assessment

Species	Site	Date	Notes	Report
Pilbara leaf-nosed bat	DS 13	29/08/2019	DS 13	Western Hub Fauna Surveys. Level 2 and Targeted Conservation Significant Fauna Assessment
Pilbara leaf-nosed bat	DS 13	29/08/2019	DS 13	Western Hub Fauna Surveys. Level 2 and Targeted Conservation Significant Fauna Assessment
Pilbara leaf-nosed bat	DS 13	29/08/2019	DS 13	Western Hub Fauna Surveys. Level 2 and Targeted Conservation Significant Fauna Assessment
Pilbara leaf-nosed bat	DS 13	29/08/2019	DS 13	Western Hub Fauna Surveys. Level 2 and Targeted Conservation Significant Fauna Assessment
Pilbara leaf-nosed bat	DS 13	29/08/2019	DS 13	Western Hub Fauna Surveys. Level 2 and Targeted Conservation Significant Fauna Assessment
Pilbara leaf-nosed bat	DS 13	29/08/2019	DS 13	Western Hub Fauna Surveys. Level 2 and Targeted Conservation Significant Fauna Assessment
Pilbara leaf-nosed bat	SM4-2	29/08/2019	SM4-2	Western Hub Fauna Surveys. Level 2 and Targeted Conservation Significant Fauna Assessment
Pilbara leaf-nosed bat	DS 8	29/08/2019	DS 8	Western Hub Fauna Surveys. Level 2 and Targeted Conservation Significant Fauna Assessment
Pilbara leaf-nosed bat	SM4-5	29/08/2019	SM4-5	Western Hub Fauna Surveys. Level 2 and Targeted Conservation Significant Fauna Assessment
Pilbara leaf-nosed bat	DS 36	29/08/2019	DS 36	Western Hub Fauna Surveys. Level 2 and Targeted Conservation Significant Fauna Assessment
Pilbara leaf-nosed bat	DS 37	29/08/2019	DS 37	Western Hub Fauna Surveys. Level 2 and Targeted Conservation Significant Fauna Assessment
Pilbara leaf-nosed bat	DS 28	29/08/2019	DS 28	Western Hub Fauna Surveys. Level 2 and Targeted Conservation Significant Fauna Assessment
Pilbara leaf-nosed bat	DS 5	29/08/2019	DS 5	Western Hub Fauna Surveys. Level 2 and Targeted Conservation Significant Fauna Assessment
Pilbara leaf-nosed bat	Bat 8	26/07/2012	Recording	Western Hub Project - Delphine Terrestrial Vertebrate Assessment
Pilbara leaf-nosed bat	Bat 8	26/07/2012	Recording	Western Hub Project - Delphine Terrestrial Vertebrate Assessment
Pilbara leaf-nosed bat	N/A	17/04/2013	N/A	Western Hub Project: The Edge Vertebrate Fauna Assessment
Pilbara leaf-nosed bat	N/A	20/04/2013	N/A	Western Hub Project: The Edge Vertebrate Fauna Assessment
Pilbara leaf-nosed bat	N/A	19/04/2013	N/A	Western Hub Project: The Edge Vertebrate Fauna Assessment
Ghost bat	Bat 8	26/07/2012	feathers in shallow cave	Western Hub Fauna Surveys. Level 2 and Targeted Conservation Significant Fauna Assessment