Caramulla

Level 1 Vertebrate Fauna Assessment

BHP

25 September 2018

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FINAL	C. van den Bergh	C. van den Bergh	B. Bakker	25/09/18

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EXECUTIVE SUMMARY

Biologic Environmental Survey Pty Ltd (Biologic) completed a Level 1 Terrestrial Fauna Survey of the eastern portion of the Caramulla exploration mining lease, at the request of BHP. The Study Area, which covers an area of approximately 12,500 hectares (ha), is located approximately 50 kilometres (km) east of Newman. This survey will be used to inform future environmental approvals across the area although does not assess any specific development proposed by BHP.

The overarching objective of this assessment was to identify the potential occurrence of vertebrate fauna habitats, potential fauna assemblages and fauna species regarded as being of conservation significance. The objective was achieved through a desktop assessment, site reconnaissance (Level 1 survey) and an assessment of the likelihood of conservation significant fauna occurrence.

The vertebrate fauna desktop assessment was conducted via reviewing literature relevant to the Study Area and conducting several database searches. A total of ten literature sources were reviewed and four databases were searched.

A total of nine fauna habitats were recorded from the Study Area, with the Sand Plain and Breakaway/Cliff habitats being of high significance for supporting or potentially providing critical habitat for conservation fauna species. In addition, the Major Drainage Line habitat is considered to be of high significance for providing potential breeding, dispersal and foraging habitat for conservation significant fauna.

Habitats of the Study Area are moderately common throughout the region. Ten surveys were used in the literature review of this assessment although many others, although not all are publicly available, have been conducted within the local area. Given this, the vertebrate fauna assemblages occurring within the habitats present is relatively well-understood and documented.

Evidence of Greater Bilby and Brush-tailed Mulgara were recorded from the Sand Plains habitat, with the identification of active and inactive burrows and a dead individual of Brush-tailed Mulgara. In addition to the two confirmed conservation significant fauna species, the Long-tailed Dunnart and Western Pebble-Mound Mouse were considered highly likely to occur based on the habitats present, while the Spectacled Hare-wallaby, Short-tailed Mouse and Peregrine Falcon were considered likely to occur based on the habitats present.

The presence of Greater Bilby was identified from an inactive burrow. Although the burrow was old and there was no indication of current occupation, despite extensive survey effort, the presence of the species confirms that the Sand Plain habitat within the Study Area can provide suitable habitat for the species, with the correct temporal variables.

The Brush-tailed Mulgara was recorded on sixteen occasions (nine locations) within Sand Plain habitat in the Study Area during the current survey. This included eleven active burrows, three inactive burrows, one digging and one recently dead individual, all found in the central section of Study Area. The Sand Plain habitat is an important habitat for this Priority species.

Assuming that all habitats may potentially be impacted to some degree, the proposed Project is unlikely to be at variance to Principles A (biological diversity) and B (threatened fauna) of the ten clearing principles listed under Schedule 5 of the *Environmental Protection Act 1986*. The remaining eight clearing principles have not been addressed within this current survey.

1 INTRODUCTION

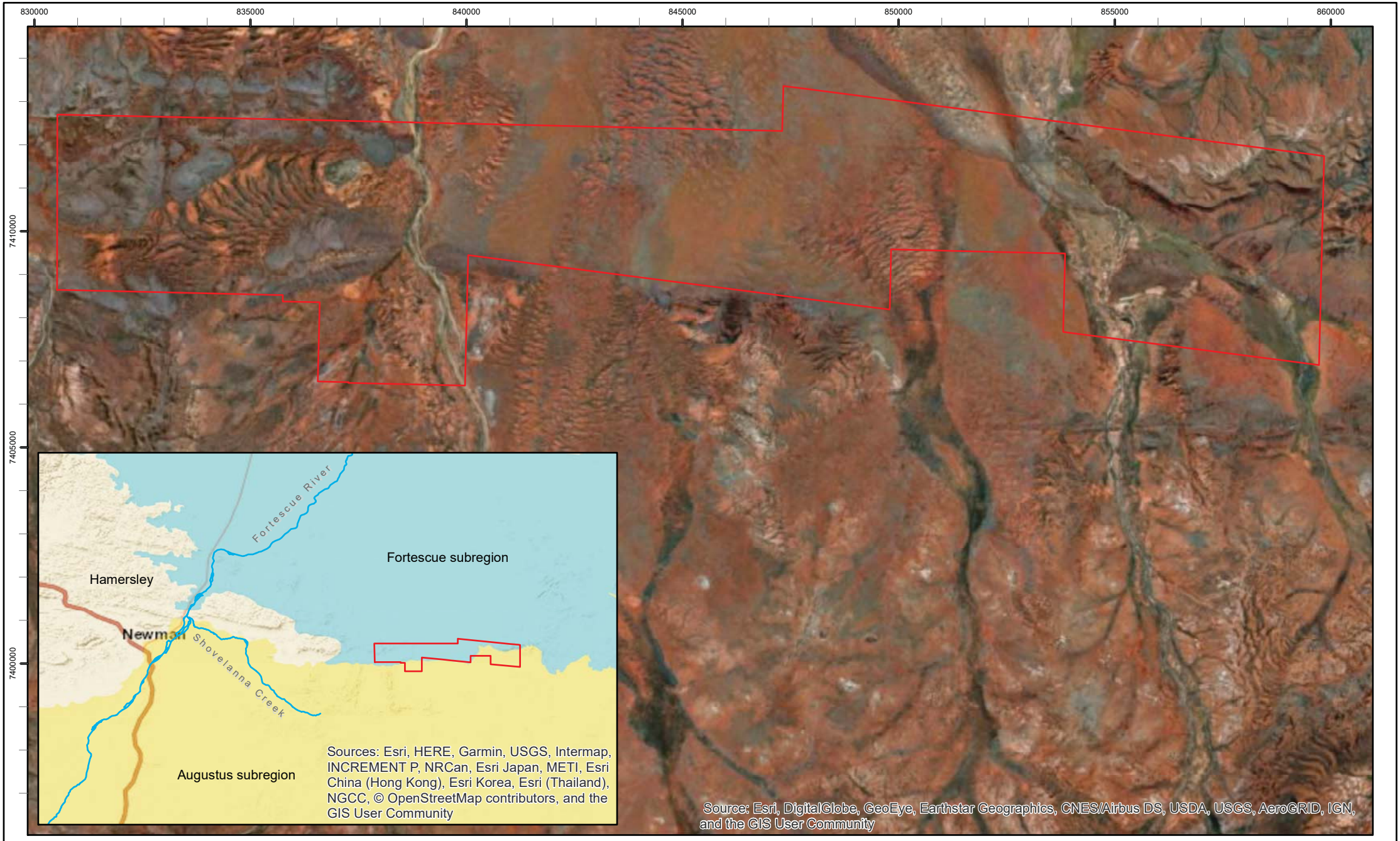
1.1 Background

Biologic Environmental Survey Pty Ltd (Biologic) was commissioned by BHP Western Australia Iron Ore (BHP) to undertake a Level 1 Terrestrial Fauna Survey of the eastern portion of the Caramulla exploration mining lease (hereafter referred to as the Study Area). The Study Area, which covers an area of approximately 12,500 hectares (ha), is located approximately 50 kilometres (km) east of Newman (Figure 1.1).

1.2 Objectives

The overarching objective of this assessment was to identify the potential occurrence of vertebrate fauna habitats, potential fauna assemblages and fauna species regarded as being of conservation significance. Specifically, this report provides:

- a review of vertebrate fauna recorded within the vicinity of the Study Area as an indication of species that are likely to occur within the Study Area;
- mapping of broad vertebrate fauna habitats occurring across the Study Area; and
- an assessment on the presence, or likely presence, of vertebrate fauna currently considered to be of conservation significance (under state and federal legislation).



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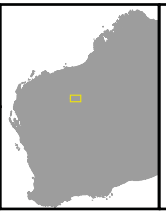
StudyArea



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Caramulla Level 1 Fauna Survey

Figure 1.1: Study Area and regional location

Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994

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1.3 Background to Protection of Fauna

Within Western Australia, native fauna is protected under the *Wildlife Conservation Act 1950* (WC Act) and at a national level under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Any action that has the potential to impact native fauna needs to be approved by relevant state and/or federal departments as dictated by the state *Environmental Protection Act 1986* (EP Act).

Some species of fauna that are determined to be at risk of extinction or decline are afforded extra protection under these Acts. For the purposes of this report, these species are deemed to be of conservation significance. A summary of applicable legislation and status codes is provided in Table 1.1 and additional information on status codes is provided in Appendix A. A number of migratory bird species are also prioritised for conservation under international agreements and therefore protected under the EPBC Act and WC Act as Migratory.

For some species, there is insufficient information to determine their conservation status. These species are generally considered by the Environmental Protection Agency (EPA) and the Department of Biodiversity, Conservation and Attraction's (DBCA) as being of conservation significance for all development related approvals and are listed on a 'Priority List' that is regularly reviewed and maintained by the DBCA (Table 1.1).

Table 1.1 Definitions and terms for fauna of conservation significance

Agreement, Act or List	Status Codes
Federal	
***Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)** The Department of the Environment and Energy (DoEE) lists threatened fauna, which are determined by the Threatened Species Scientific Committee (TSSC) per criteria set out in the Act. The Act lists fauna that are considered to be of conservation significance under one of eight categories (listed under 'Status Codes').	• Extinct (Ex) • Extinct in the Wild (EW) • Critically Endangered (Cr) • Endangered (En) • Vulnerable (Vu) • Conservation Dependent (CD) • Migratory (Mi) • Marine (Ma)
State	
***Wildlife Conservation Act 1950* (WC Act)** At a state level, native fauna is protected under the *Wildlife Conservation Act 1950*. Species in need of conservation are given a ranking ranging from Critically Endangered to Vulnerable.	• Schedule 1 (Critically Endangered) (S1) • Schedule 2 (Endangered) (S2) • Schedule 3 (Vulnerable) (S3) • Schedule 4 (Extinct) (S4) • Schedule 5 (Migratory) (S5) • Schedule 6 (Conservation Dependent) (S6) • Schedule 7 (Other Specially Protected) (S7)
DBCA Priority List DBCA produces a list of Priority species that have not been assigned statutory protection under the *Wildlife Conservation Act 1950*. This system gives a ranking from Priority 1 to Priority 4.	• Priority 1 (Poorly-known species) (P1) • Priority 2 (Poorly-known species) (P2) • Priority 3 (Poorly-known species) (P3) • Priority 4 (Rare, Near Threatened, and other species in need of monitoring) (P4)

2 ENVIRONMENT

2.1 Biogeography

The Study Area falls within the Pilbara and the Gascoyne biogeographical region as defined by the Interim Biogeographic Regionalisation of Australia (IBRA) (Thackway & Cresswell, 1995).

The Pilbara bioregion is characterised by vast coastal plains and inland mountain ranges with cliffs and deep gorges (Thackway & Cresswell, 1995). Vegetation is predominantly mulga low woodlands or snappy gum over bunch and hummock grasses (Bastin, 2008). Within the Pilbara bioregion the Study Area is located within the Fortescue Plains subregion (PIL2). The Fortescue Plains sub-region is characterised by alluvial plains and river frontage (Kendrick, 2001). The Fortescue Plains contain extensive salt marsh, mulga-bunch grass and short grass communities on alluvial plains, and river gum woodlands fringing major drainage lines (Kendrick, 2001). The significant and dominant feature of this subregion is the Fortescue Marsh. This drainage feature, 100 km long, is effectively the terminus of the upper Fortescue River. The lower Fortescue River arises from streams draining the Chichester and Hamersley Ranges below the Marsh and west of the Goodiadarrie Hills (McKenzie *et al.*, 2002).

The Gascoyne bioregion is characterised by low, rugged ranges and broad, flat valleys. The vegetation is dominated by open mulga low woodlands (McKenzie *et al.*, 2002). Within the Gascoyne bioregion the Study Area is located within the Augustus subregion (GAS3). The Augustus subregion is characterised by rugged low Proterozoic sedimentary and granite ranges divided by broad flat valleys (Desmond *et al.*, 2001). The subregion also comprises the Narryera Complex and Bryah Basin of the Proterozoic Capricorn Orogen (on northern margin of the Yilgarn Craton), as well as the Archaean Marymia and Sylvania Inliers (Desmond *et al.*, 2001). The Gascoyne River System provides the main drainage of this subregion and it is also the headwaters of the Ashburton and Fortescue Rivers. Mulga woodlands with *Triodia* occur on shallow stony loams on rises, while the shallow earthy loams over hardpan on the plains are covered by Mulga parkland (Desmond *et al.*, 2001).

2.2 Climate

The Pilbara bioregion has a semi-desert to tropical climate, with rainfall occurring sporadically throughout the year, although mostly during summer (Thackway & Cresswell, 1995). Summer rainfall is usually the result of tropical storms in the north or tropical cyclones that impact upon the coast and move inland (Leighton, 2004). The winter rainfall is generally lighter and is the result of cold fronts moving north easterly across the state (Leighton, 2004). The average annual rainfall ranges from 200-350 mm, although there are significant fluctuations between years (BoM, 2018), with up to 1200 mm falling in some locations in some years (McKenzie *et al.*, 2009). The Gascoyne bioregion has an arid climate with predominantly winter rainfall in the west, and summer rainfall in the east. Spatially averaged median rainfall for the region is 202 mm (April to March rainfall year) (BoM, 2018). A desert climate with bimodal rainfall characterises the Augustus subregion (Desmond *et al.*, 2001).

Long-term rainfall data was available for Newman Airport (Station 7176; BoM, 2018) 44.7 km west of the Study Area. The long-term average (LTA) annual rainfall at Newman Airport is 332.6 mm (BoM, 2018) (Figure 2.1). The average monthly maximum temperature ranges from 22.9°C in July to 39°C in

December and January. Average monthly minimum temperature ranges from 6.4°C in July to 25°C in January (BoM, 2018) (Figure 2.1).

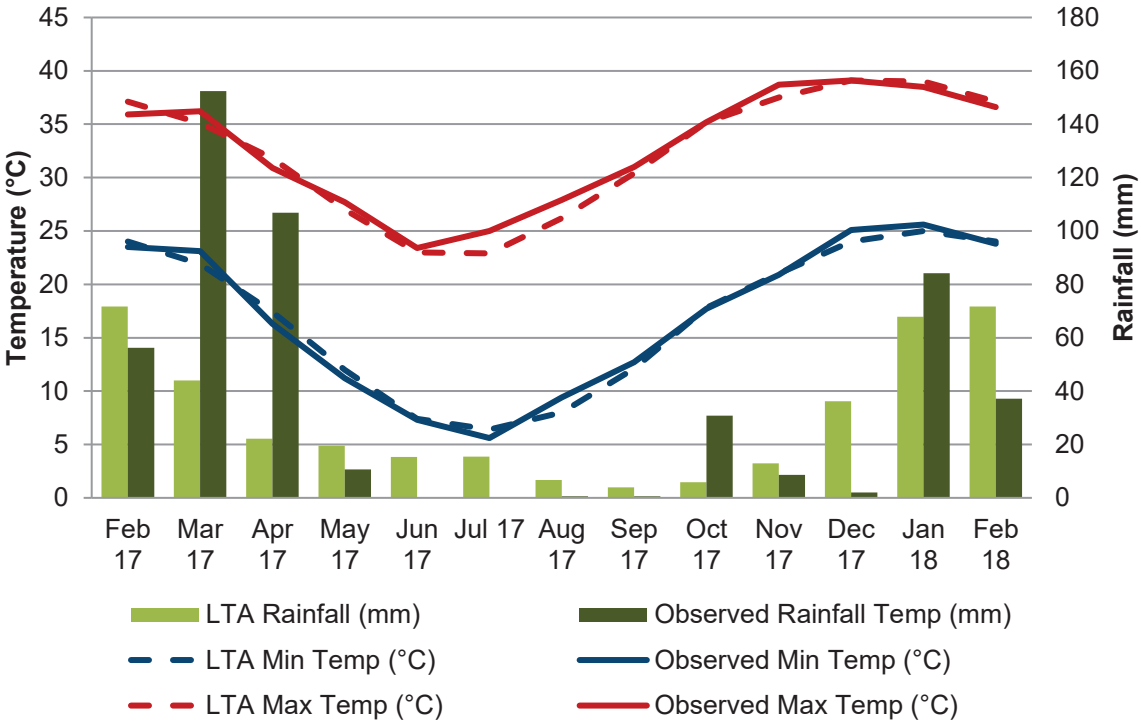

Figure 2.1: Long-term average monthly rainfall) and temperature data (BoM, 2018)

2.3 Vegetation

Beard (1975) broadly (1:1,000,000) mapped the major structural vegetation types of Western Australia. The Study Area is located on the boundary between the Hamersley Plateau (Fortescue Botanical District) and the Ashburton Botanical District, straddling the Pilbara and Gascoyne Bioregions (Beard, 1975) (Figure 1.1).

The Study Area occurs within two systems, the Fortescue Valley and Kumarina Hills, as delineated by Shepherd et al. (2000). The Study Area overlaps seven vegetation associations (Table 2.1; Figure 2.2), of which two associations (29 and 111) occur within both systems. Vegetation association 29 is the most extensive across the Study Area, while vegetation association 157 is the least extensive, with a small portion located near the eastern boundary (Table 2.1).

A more recent desktop vegetation study of the Study Area (Onshore 2015), identified and mapped 11 vegetation associations based around six broad floristic formations. The broad floristic formations were dominated by Mulga species (i.e. Acacia Low Woodland, Low Open Woodland and High Open Shrubland), although there were also areas of *Corymbia* Low Open Woodland around Shovelanna Creek located to the west of Study Area (approximately 25 km west), and large swathes of *Triodia* Hummock Grassland and Open Hummock Grassland.

Table 2.1: Vegetation system associations across the Study Area

System	Vegetation associations	Descriptions	Within Study Area	
			Ha	%
Fortescue Valley	29	Sparse low woodland; mulga, discontinuous in scattered groups	4,543	36
	82	Hummock grasslands, low tree steppe; snappy gum over *Triodia wiseana*	1,476	12
	111	Hummock grasslands, shrub steppe; *Eucalyptus gamophylla* over hard spinifex	1,582	13
	199	Hummock grasslands, shrub steppe; mulga over soft spinifex Triodia on rises	550	4
	216	Low woodland; mulga (with spinifex) on rises	289	2
Kumarina Hills	18	Low woodland; mulga (*Acacia aneura*)	340	3
	29	Sparse low woodland; mulga, discontinuous in scattered groups	2,965	24
	111	Hummock grasslands, shrub steppe; *Eucalyptus gamophylla* over hard spinifex	655	5
	157	Hummock grasslands, grass steppe; hard spinifex, *Triodia wiseana*	49	<1
Total			12,448	100

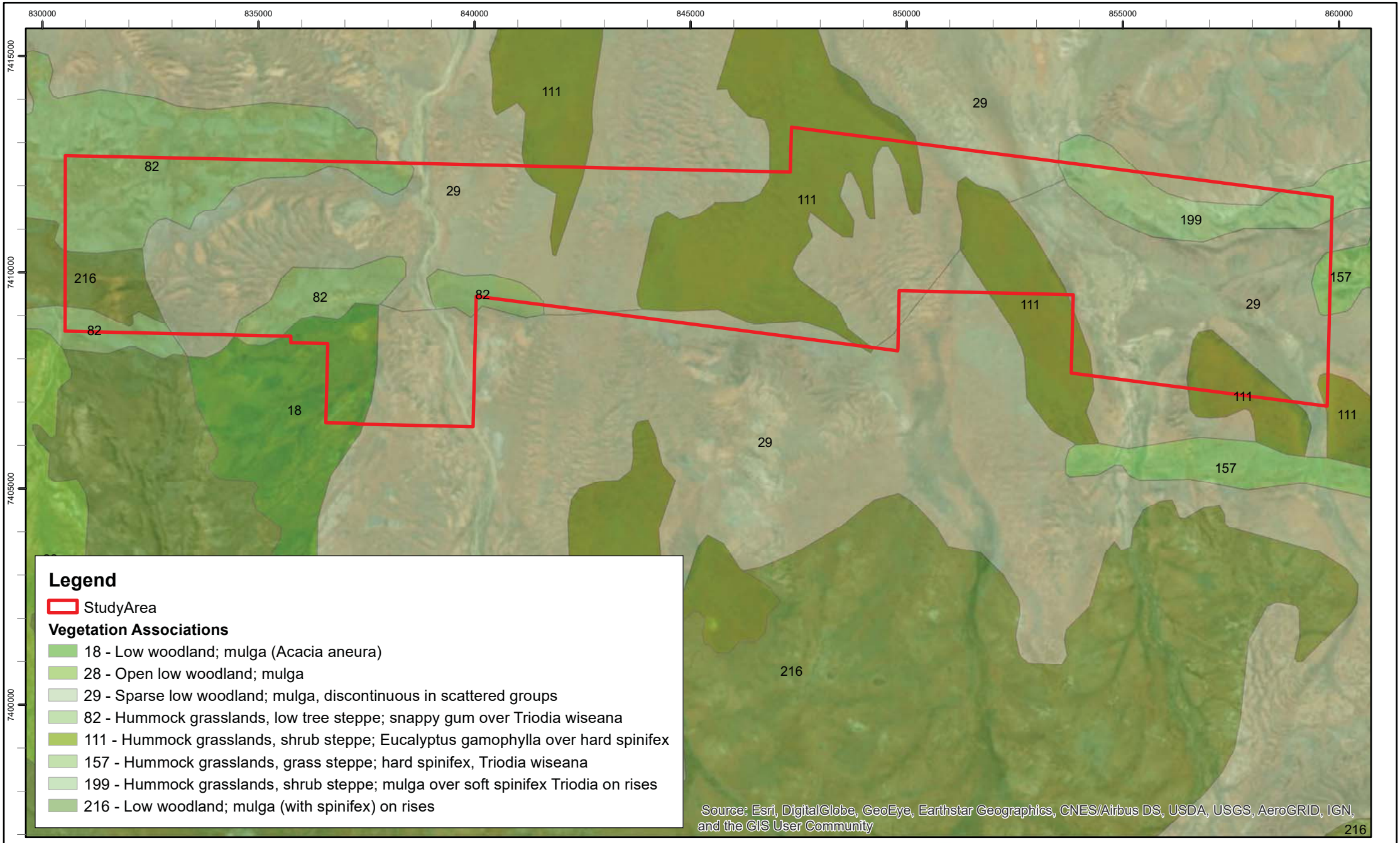

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Figure 2.2: Pre-European vegetation of the Study Area

Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994

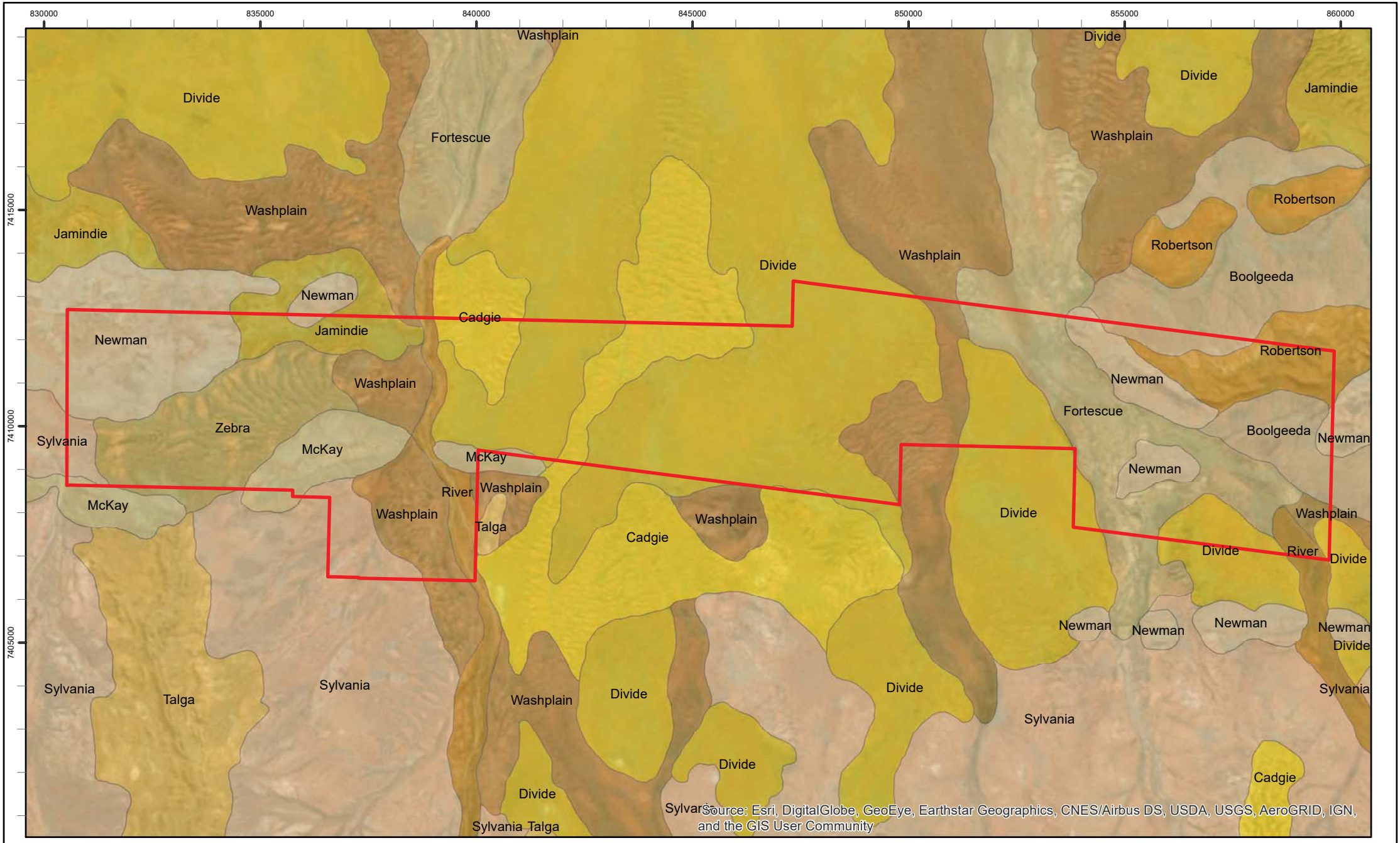
Size A4. Created 29/04/2018

2.4 Land Systems

The land systems of the Pilbara region are classified according to similarities in landform, soil, vegetation, geology and geomorphology, following van Vreeswyk *et al.* (2004). Thirteen (13) land systems are mapped across the Study Area, categorised by six distinct land types (Table 2.2; Figure 2.3). The most dominant land system within the Study Area is the Divide land system, defined as Sandplains and occasional dunes supporting shrubby hard spinifex grasslands and occurs across 32% of the Study Area. Together hardpan wash plains and sandplains/gravelly sandplains/sand dunes occur across 60% of the Study Area, therefore occurring as the dominant landscape within the Study Area.

Table 2.2 Land Systems of the Study Area

Land System	Land Type	Description	Extent in Study Area	
			Ha	%
Boolgeeda	Stony plains	Stony lower slopes and plains below hill systems supporting hard and soft spinifex grasslands or mulga shrublands.	571	5
Cadgie	Hardpan wash plains	Hardpan plains with thin sand cover and sandy banks supporting mulga shrublands with soft and hard spinifex.	674	5
Divide	Sandplains, gravelly sandplains and sand dunes	Gently undulating sandplains with minor dunes, supporting hard spinifex hummock grasslands with numerous shrubs.	3,977	32
Fortescue	River flood plains	Alluvial plains and flood plains supporting patchy grassy eucalypt and acacia woodlands and shrublands and tussock grasslands.	1,315	11
Jamindie	Hardpan wash plains	Stony hardpan plains and rises supporting groved mulga shrublands, occasionally with spinifex understorey.	331	3
McKay	Hills and ridges	Hills, ridges, plateaux remnants and breakaways of meta sedimentary and sedimentary rocks supporting hard spinifex grasslands with acacias and occasional eucalypts.	513	4
Newman	Hills and ridges	Rugged jaspilite plateaux, ridges and mountains supporting hard spinifex grasslands.	1,369	11
River	River flood plains	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.	338	3
Robertson	Hills and ridges	Hills and ranges of sedimentary rocks supporting hard spinifex grasslands.	457	4
Sylvania	Stony plains and gritty surfaced plains	Gritty surfaced plains and low rises on granite supporting *Acacia-Eremophila-Senna* shrublands.	394	3
Talga	Hills and ridges	Hills and ridges of greenstone and chert and stony plains supporting hard and soft spinifex grasslands.	<1	<1
Washplain	Hardpan wash plains	Hardpan plains supporting groved mulga shrublands.	1,352	11
Zebra	Hardpan wash plains	Hardpan plains with large linear gravelly sand banks supporting acacia tall shrublands with soft and hard spinifex.	1,157	9
		Total	12,448	100



Legend

StudyArea

Land Systems

- Boolgeeda
- Cadgie
- Divide
- Fortescue
- Jamindie
- McKay
- Newman
- River
- Robertson
- Sylvania
- Talga
- Washplain
- Zebra

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Figure 2.3: Land Systems of the Study Area

Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994

Size A4. Created 13/08/2018

3 METHODOLOGY

3.1 Compliance

The survey was carried out in a manner consistent with the Western Australian Environmental Protection Authority (EPA), DBCA, Department of the Environment and Energy (DoEE), and BHP guidelines for the environmental surveying and reporting of fauna. The relevant government documents, guidelines and technical guidance documents that were reviewed and considered during this assessment include:

- Environmental Protection Authority (EPA, 2016a) Technical Guidance: Sampling Methods for Terrestrial Vertebrate Fauna;
- EPA (2016b) Technical Guidance: Terrestrial Fauna Surveys;
- BHPBIO (2016) Biological Survey Spatial Data Requirements (SPR-IEN-EMS-015);
- BHPBIO (2017) Guidance for Vertebrate Fauna Surveys in the Pilbara Region Ver 6.0 (SPR-IEN-EMS-012);

3.2 Desktop Assessment

3.2.1 Literature Review

The vertebrate fauna desktop assessment was conducted via reviewing literature relevant to the Study Area and conducting a number of database searches.

A review of all available literature relevant to the Study Area was undertaken to compile a list of vertebrate fauna species with the potential to occur with the Study Area. This list comprised ten surveys, including one Level 1 Fauna survey which was undertaken within the Study Area and one Reconnaissance Fauna Survey, three Level 1 survey reports and six Level 2 fauna survey reports within the vicinity of the Study Area (Table 3.1).

Table 3.1 Literature sources used for the review

Survey Title	Reference	Survey Type	Distance from Study Area (km)
Carramulla Exploration Area Flora and Vegetation Survey and Fauna Assessment	GHD (2009)	Level 1 Fauna Survey	Within
Wheelarra Hill North Fauna Assessment	ENV Australia (2012)	Level 2 Survey	~4.5 km west
Orebody 31 Vertebrate Fauna Survey	Biologic (2014b)	Level 2 Fauna Survey	~8 km north-west
OB31 Jimblebar Access Track VCP Level 1 Flora & Vegetation Survey and Vertebrate Fauna Assessment	Onshore (2015a)	Level 1 Fauna Survey	~8 km north-west
South-West Jimblebar Vertebrate Fauna Survey	Biologic (2013)	Level 2 Fauna Survey	~14 km west
Orebody 19 Level 2 Vertebrate Survey	Biologic (2014a)	Level 2 Fauna Survey	~19 km north-west west
Orebody 18 Fauna Assessment Phase II	ENV Australia (2007)	Level 2 Fauna Survey	~20 km west

Survey Title	Reference	Survey Type	Distance from Study Area (km)
Tenement E52/2238 Level 1 Flora and Vegetation and Level 1 Vertebrate Fauna Survey	Onshore (2015b)	Level 1 Vertebrate Fauna Survey	~20 km west
Dynasty Level 1 Vertebrate Fauna Survey	Biologic (2016b)	Level 1 Fauna Survey	~22 km west
Dynasty Level 2 Vertebrate Fauna Survey	Biologic (2016c)	Level 2 Fauna Survey	~22 km west
Hashimoto Terrestrial Vertebrate Fauna Assessment	ecologia Environmental (2006)	Level 2 Fauna Survey	~1 km west
East Jimblebar Exploration Project Biological Survey	ecologia (2005)	Level 1 Fauna Survey	~4 km west
Jimblebar Iron Ore Project Terrestrial Vertebrate Fauna Assessment	Outback Ecology Services (2009a)	Level 2 Fauna Survey	~10 km west

3.2.2 Database Searches

Four fauna databases were searched (Table 3.2); two to obtain information on all species previously recorded (Birdlife Australia, 2018; DBCA, 2018), one to identify species of conservation significance previously recorded (DBCA, 2018), and one to identify species of conservation significance known or likely to occur within the region (DoEE, 2018).

Table 3.2: Details of database searches conducted

Provider	Reference	Database	Parameters
Department of Biodiversity, Conservation and Attractions	NatureMap Database	DBCA (2018)	Circle of radius 40 km centred on the coordinates: -23.3775°, 120.370833°
Department of Biodiversity, Conservation and Attractions	Threatened and Priority Fauna Database	DBCA (2018)	Circle of radius 150 km centred on the coordinates: -23.377372°, 120.370763°
BirdLife Australia	Birdata Bird Atlas	Birdlife Australia (2018)	Circle of radius 40 km centred on the coordinates: -23.377372°, 120.370763°
Department of Environment and Energy	Protected Matters Database	DoEE (2018)	Circle of radius 40 km centred on the coordinates: -23.377372°, 120.370763°

3.3 Field Survey

A Level 1 field survey was undertaken by Biologic personnel from the 17th to the 21st of February 2018. In the six months prior to the Survey (August 2017 to January 2018), Newman Airport recorded 126.8 mm of rainfall. This was slightly below the long-term annual average rainfall for the same period (133.5 mm; BoM, 2018). Minimum temperatures during the Survey ranged from 20.9°C to 24.5°C, with an average minimum of 23.4°C, and maximum temperatures ranged from 33.6°C to 39.5°C with an average maximum of 34.5°C (BoM, 2018). Rainfall recorded during the Survey period was 18.8 mm (BoM, 2018). Conditions experienced prior to and during the Survey were typical for the time of year and suitable for the type and level of the Survey undertaken.

3.3.1 Survey Team and Licensing

The vertebrate fauna sampling for this survey was conducted under a DBCA Regulation 17 "Licence to Take Fauna for Scientific Purposes" (08-001824-2) issued to B. Downing. A Remotely Piloted Aircraft (RPA) used during the Survey was piloted by Thomas Rasmussen under licences issued by the Australian Civil Aviation Safety Authority (CASA). The following personnel were involved in the field component of the project:

- Mr Thomas Rasmussen (Senior Zoologist); and
- Miss Brighton Downing (Zoologist).

3.3.2 Habitat Assessments and Mapping

Habitat assessments were undertaken at 21 locations across the Study Area (Appendix B), including at every targeted search, acoustic and ultrasonic recorder and motion camera location (Figure 3.1). Habitats in the Study Area were assessed using methodology and terminology modified from the Australian Soil and Land Survey Field Handbook (National Committee on Soil and Terrain, 2009). The characteristics recorded during the habitat assessments were:

- site information, photo and location;
- landform: slope, relative inclination of slope, morphological type and landform type;
- vegetation: leaf litter %, twig litter %, wood litter, dead stags and hollow bearing trees, broad floristic formation, vegetation structure (tall, mid and low), and dominant species;
- land surface: micro relief, sheet erosion, rill erosion, gully erosion, gully depth, abundance and size of coarse fragments, rock outcropping, water bodies, comments on nests, burrows, roosts and diggings;
- soil: texture, colour;
- substrate: bare ground, rock size, rock type, rock outcropping; and
- disturbance: time since last fire, evidence of weeds, grazing, or human disturbances.

Fauna habitats were assessed for the likelihood that they may support conservation significant fauna. All major fauna habitats present within the Study Area were rated (High, Moderate or Low) per the criteria in Table 3.3.

3.3.3 Targeted Searches

Targeted searches were undertaken to identify the occurrence of fauna of conservation significance and to search for important habitat features, such as waterpools and caves. Targeted searches were conducted within the most prospective areas in terms of habitat features and habitats suitable for species of conservation significance. During the targeted searches, and while traversing the Study Area, the team recorded all vertebrate fauna species of conservation significance encountered, either from primary (*i.e.* direct observation) or secondary (*e.g.* burrows, scratching's, diggings and scats) evidence. A total of nine walked targeted searches were undertaken across the Study Area, totalling approximately nine person hours (Figure 3.1).

Table 3.3 Fauna habitat significance assessment criteria

Score	Possible criteria (score results from any possible criterion being met)
High	Fauna listed as threatened on the EPBC Act or WC Act have been recorded within the habitat.
	Habitat is known to be suitable core habitat for EPBC listed species, and there are records of the species within 50 km. If survey work in the vicinity of the Study Area has been limited, then the species will be considered likely to be present, using a precautionary approach.
	Habitat is uncommon (regionally) and considered critical for DBCA listed Priority fauna. For example, if the habitat for a Priority species is limited in the region and the extent within the Study Area forms a large proportion of the known habitat, it would be scored 'high'.
	Habitat that only occurs in small, isolated geographic areas.
Moderate	Habitat is known to supports DBCA listed Priority fauna that do not occur in any of the other habitat types.
	Habitat that supports EPBC Act listed Migratory fauna. Habitat may be used by EPBC Act listed fauna but it is not their core habitat *(i.e.* may be used periodically/ seasonally or for dispersal).
	Habitat supports a particularly diverse and uncommon faunal assemblage. Habitat that occurs throughout region, and does not occur in small or isolated areas, is excluded.
Low	Habitat is widespread, common, and does not solely support any significant fauna.

3.3.4 Remotely Piloted Aircraft Searches

A DJI Phantom 4 Remotely Piloted Aircraft (RPA) was used to conduct searches for important habitat features (i.e. caves, waterpools) and locate suitable habitat to perform targeted searches (such as cave-forming geology, sandy substrate for Greater Bilby (*Macrotis lagotis*) and Brush-tailed Mulgara (*Dasyurus blythi*). Where prospective habitat was identified from the drone, on-foot searches were undertaken as a follow-up to search for evidence of targeted species, as per Section 3.3.3. Drone flights were conducted within the most prospective areas in terms of habitat features and habitats suitable for species of conservation significance. Approximately 1.5 hrs of drone flight time was undertaken across 4 flights (Figure 3.1).

Where potential habitat was identified for Greater Bilby and Brush-tailed Mulgara from the ground, a grid-like flight path was developed and flown to search for potential Greater Bilby signs (i.e. burrows and diggings) which were subsequently verified on foot (Figure 3.1) to gain confirmation that these signs were actual evidence of Greater Bilby. Within such areas, the drone was flown at a height of

approximately 20 m giving a resolution between 2-5 cm per pixel. All flights were undertaken in accordance with CASA's Standard Operating Conditions.

3.3.5 Ultrasonic Recordings – Bats

Overnight recordings of bat echolocation calls were undertaken using SM4BAT+ (SM4; Wildlife Acoustics, USA) fitted with an external, omnidirectional SMX-US ultrasonic microphone. The location of each SM4 unit was selected based on prospective bat foraging grounds, such as at overhangs. The unit was positioned to provide shelter from direct sun or rain, whilst retaining an unobstructed 'line of sight' between the microphone and the likely bat flyway. Each SM4 was preconfigured to activate at astronomical sunset each day and deactivate at astronomical sunrise the following morning. Jumper settings, audio settings, selectable filters and selectable triggers used to preconfigure each SM4 unit, and hence define the volume and frequency ranges sought, followed the manufacturer's recommendations for bat detection (Wildlife Acoustics, 2017).

SM4 units were deployed at 6 locations: four within the Study Area and two adjacent to the Study Area, for a total of 12 recording nights (Figure 3.1; Appendix B). Bat calls were analysed by Robert Bullen of Bat Call WA for species of conservation significance only.

3.3.6 Acoustic Recordings – Night Parrot

Overnight recordings using SM4 units were also undertaken for the Night Parrot. SM4 units were fitted with SMX-II acoustic microphones and set to record between 0-500 Hz each night. Units were deployed within long unburnt spinifex hummock grasslands, specifically *Triodia longiceps* hummock grasslands, which is similar to habitat confirmed to support populations elsewhere (Murphy *et al.*, 2017a; Murphy *et al.*, 2017b) and in accordance with interim guidelines developed by (DPaW, 2017).

SM4 units targeting Night Parrot were deployed across the Study Area at three locations for a total of 8 recording nights (Figure 3.1; Appendix B). All recordings were analysed by Robert Bullen of Bat Call WA. Acoustic recorders were deployed in habitat recommended with the *Interim Guideline for Preliminary Surveys of Night Parrot* (Pezoporus occidentalis) *in Western Australia* (DPaW, 2017) – "stands of large, old clumps of spinifex (*Triodia*)... especially so if the identified area is part of a palaeo-drainage system or contains healthy stands of samphire."

3.3.7 Motion Cameras

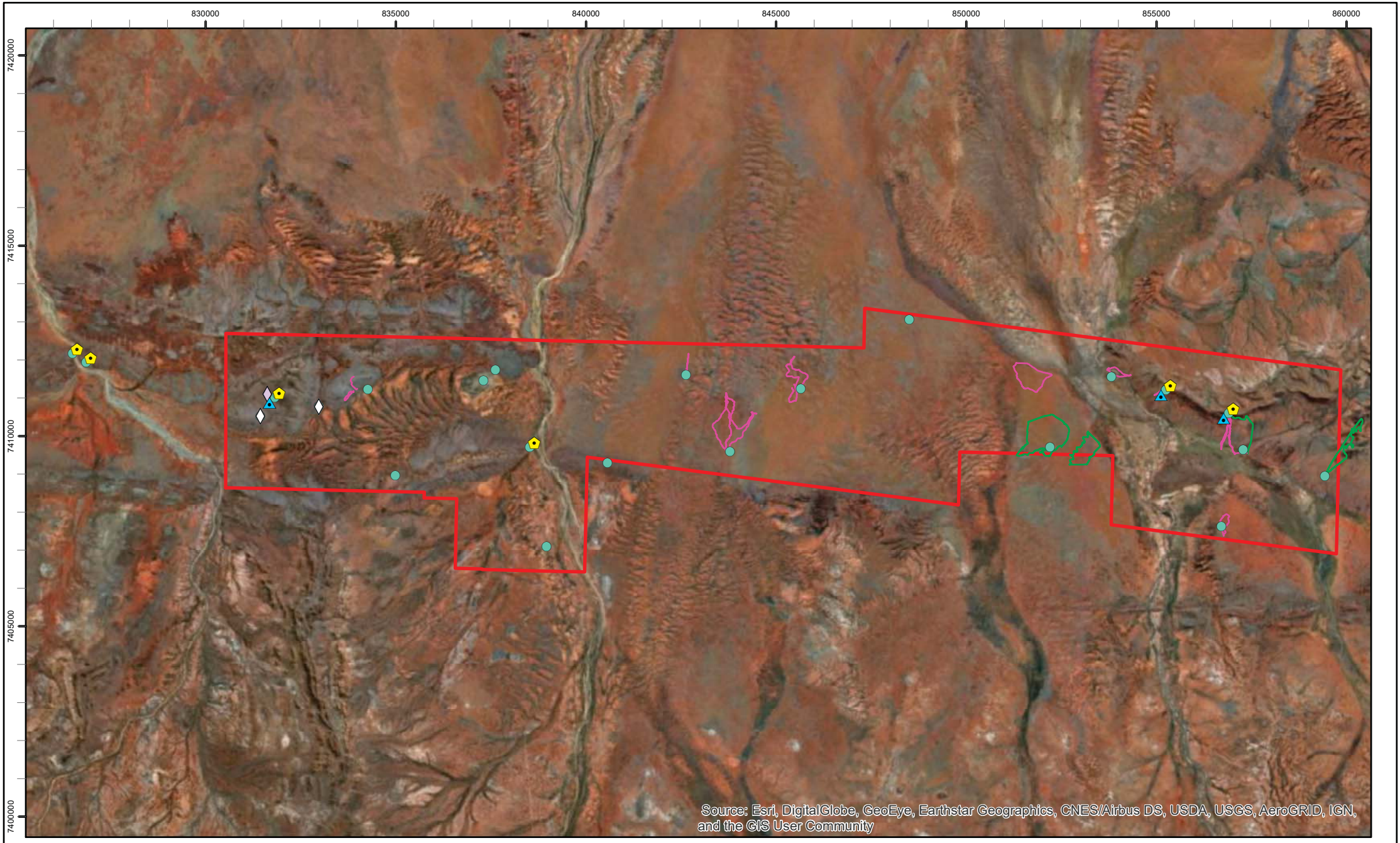
Bushnell Trophy Cam motion cameras were deployed to survey for species of conservation significance, specifically Northern Quoll (*Dasyurus hallucatus*) and Long-tailed Dunnart (*Sminthopsis longicaudata*). Motion cameras were deployed at three locations for a total of 15 nights. The resulting footage was analysed manually by Biologic personnel. One site comprised one motion camera (CAR-07), another comprised two cameras (CAR-12) and the final site comprised three motion cameras (CAR-01). Sites were selected based on the likelihood for detecting fauna of conservation significance, in this case within Breakaway Cliff and Hillcrest/Hillslope habitat types (Appendix B).

3.3.8 Opportunistic Vertebrate Fauna Records

Opportunistic records of vertebrate species encountered during the survey were documented. Birds were recorded on a presence/absence basis, determined by call identification, visual identification and/or tracks and traces.

3.3.9 Taxonomy and Nomenclature

BHP's checklist of vertebrate fauna was followed for nomenclature and taxonomy of mammal, birds, reptile and amphibian. This list broadly follows the latest checklist published by the Western Australian Museum (WAM, 2018) (for mammals, reptiles and amphibians), and the current checklist of Australian birds maintained by Birds Australia (based on, Christidis & Boles, 2008).



Legend

- StudyArea
- Ultrasonic Recorder
- Motion Camera
- Habitat Assessments

Targeted Searches
- via Drone
- Walked

Outback Ecology (2009a)
- Trapping Site

ecologia Environment (2006)
- Trapping Site

biologic Environmental Survey

N

1:125,000

0 1.25 2.5 5 km

BHP Billiton - Western Australia Iron Ore

Caramulla Level 1 Fauna Survey

Figure 3.1: Survey sampling locations

Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994

Size A4. Created 13/08/2018

3.4 Assessment on Occurrence

Conservation significant fauna species recorded from the databases and previous reports were assessed for their likelihood to occur within the Study Area using the decision matrix below (Table 3.4).

Table 3.4: Species likelihood of occurrence decision matrix

Range categories:	Habitat Categories				
	Core habitat known to occur	Foraging habitat known to occur	Dispersal habitat known to occur	Potential dispersal habitat	No known habitat occurs
Species recorded <5 km	Highly Likely	Likely	Likely	Possible	Possible
Species recorded 5-10 km	Likely	Likely	Possible	Possible	Rarely
Species recorded 10-40 km	Likely	Possible	Possible	Rarely	Unlikely
Species recorded >40 km	Possible	Possible	Rarely	Rarely	Unlikely
Species rarely recorded in region	Possible	Rarely	Unlikely	Unlikely	Highly Unlikely

This decision matrix is only intended to be an indicative guide, and was applied with the following considerations:

- The range categories are subject to interpretation based on the known range of each species and its natural dispersal capabilities (for example, >50 km range may be a significant distance for a fossorial skink, but not a migratory bird);
- Both the range categories and the habitat categories can vary markedly for different types of fauna such as birds, reptiles, mammals, and amphibians, and fauna with different ecological niches within each of these groups;
- The degree of habitat specificity for each species is a major determining factor for each of the habitat categories, and this in turn is dependent on the current state of ecological knowledge of the species;
- The amount and location of previous sampling is a major factor influencing the applicability of the range categories, as well as the amount of effort that has been expended in (and the accessibility of) the area in question for sampling;
- The current state of taxonomy is another major factor for species that are poorly known taxonomically and thus difficult to identify accurately, as well as for any recent changes of classification and/or conservation category. Such taxonomic changes can affect the reliability of previous records within fauna databases, the conservation status of the newly defined species/ populations, and the assumptions regarding species ranges and habitat preferences;
- The language used in each of the habitat and range categories may be useful for some taxa and not for others (for example, ‘rarely’ occurrences may be useful for describing birds or fauna which can traverse large distances, but in the case of fauna with more limited dispersal

capabilities such as reptiles, there is no basis for 'rarely' occurrences. Such likelihoods are more likely to represent range extensions.

3.5 Potential Limitation and Constraints

The EPA (2016b) outlines several potential limitations to fauna surveys. These aspects are assessed and discussed in Table 3.5 below.

Table 3.5: Survey limitations and constraints

Potential limitation or constraint	Applicability to this survey
Experience of personnel	The field personnel involved in the survey have a combined total of more than 10 years of fauna survey experience in the Pilbara.
Scope (faunal groups sampled and whether any constraints affect this)	The scope was a Level 1 survey and was conducted within that framework. No nocturnal work was undertaken by the field personal; this reduced the ability for opportunistic detection of nocturnally active species.
Proportion of fauna identified	All observed fauna were identified at the point of observation. All recorded bat calls were successfully identified.
Sources of information (recent or historic) and availability of contextual information	A significant amount of survey work has been undertaken in the wider local area and the surrounding region, and the majority of these previous survey results were available for review.
Proportion of the task achieved	A Level 1 survey of the Study Area was completed and related to the results of surveys in the broader area.
Disturbances (e.g. fire or flood)	Conditions experienced during the survey were ideal for recording conservation significant species targeted.
Intensity of survey	A Level 1 and targeted survey was identified by BHP as the requirement for this survey.
Completeness of survey	The survey was adequately completed to meet the requirements of a Level 1 targeted survey.
Resources (e.g. degree of expertise available)	All resources required to complete the survey were available.
Remoteness or access issues	The majority of the Study Area was accessible either by vehicle or on foot, thus the sampling techniques used during this survey were unconstrained by accessibility or remoteness.

4 RESULTS AND DISCUSSION

4.1 Desktop Assessment

The literature review and database searches identified a total of 299 species of vertebrate fauna, which have previously been recorded and/ or have the potential to occur within the Study Area. This comprised 38 native mammals, nine non-native mammals, 142 birds, 102 reptiles, seven amphibians and one fish (Appendix C). Note that some of these species are unlikely to occur in the Study Area as the database searches were undertaken over a larger area than the Study Area itself, therefore containing habitats that do not necessarily occur within the Study Area. Additionally, many species tend to be patchily distributed even where appropriate habitats are present, and many species of birds can occur as regular migrants, occasional visitors or vagrants.

Of the 299 species of vertebrate fauna identified as being previously recorded and/ or having the potential to occur, 38 species are of conservation significance, comprising ten mammals, 23 birds and five reptiles (Table 4.1). Please note that in preparation of Table 4.1, a number of modifications were made to ensure a representative list was formed, this includes:

- Merging all records of the Crest-tailed Mulgara (*Dasycercus cristicauda*) with the Brush-tailed Mulgara (*Dasycercus* blythi). It is now recognised that the former has a distribution confined to the Northern Territory (Woinarski *et al.*, 2014) and the latter is the only species known to occur in the Pilbara region.
- Two species were completely ignored as they are considered regionally extinct; the Western Quoll (*Dasyurus geoffroii*; van Dyck & Strahan, 2008) - listed as Vulnerable under the EPBC Act and Schedule 3 under the WC Act; and the Black-flanked Rock-wallaby (*Petrogale lateralis lateralis*; Pearson, 2013) - listed as Endangered under the EPBC Act and Schedule 2 under the WC Act); and
- A further two species were also completely ignored as they are considered completely extinct, as listed under the EPBC Act and WC Act - the Burrowing Bettong (*Bettongia lesueur graii*) and the Lesser Stick-nest Rat (*Leporillus apicalis*).

The above mentioned species are removed from any further discussion within this report.

Table 4.1: Species of conservation significance identified during the desktop assessment

Scientific name	Common name	Conservation Status			
		EPBC	WCA	DBCA	IUCN
MAMMALS					
Dasyurus hallucatus	Northern Quoll	En	S2		EN
Macrotis lagotis	Greater Bilby	Vu	S3		VU
Macroderma gigas	Ghost Bat	Vu	S3		VU
Rhinonicteris aurantia	Pilbara Leaf-nosed Bat	Vu	S3		
Lagorchestes conspicillatus subsp. *leichardti*	Spectacled Hare-Wallaby			P3*	
Dasycercus blythi	Brush-tailed Mulgara			P4	
Sminthopsis longicaudata	Long-tailed Dunnart			P4	

Scientific name	Common name	Conservation Status			
		EPBC	WCA	DBCA	IUCN
Leggadina lakedownensis	Short-tailed Mouse			P4	
Pseudomys chapmani	Western Pebble-mound Mouse			P4	
Notoryctes caurinus	Northern Marsupial Mole			P4	
BIRDS					
Calidris ferruginea	Curlew Sandpiper	Cr/Mi	S3/5		NT
Pezoporus occidentalis	Night Parrot	En	S1		EN
Macronectes giganteus	Southern Giant Petrel	En/Mi	S5		
Polytelis alexandrae	Princess Parrot	Vu		P4	NT
Falco hypoleucos	Grey Falcon		S3		VU
Pandion haliaetus	Eastern Osprey	Mi	S5		
Anas querquedula	Garganey	Mi	S5		
Apus pacificus	Fork-tailed Swift	Mi	S5		
Charadrius veredus	Oriental Plover	Mi	S5		
Hirundo rustica	Barn Swallow	Mi	S5		
Motacilla cinerea	Grey Wagtail	Mi	S5		
Motacilla flava	Yellow Wagtail	Mi	S5		
Calidris acuminata	Sharp-tailed Sandpiper	Mi	S5		
Calidris melanotos	Pectoral Sandpiper	Mi	S5		
Calidris ruficollis	Red-necked Stint	Mi	S5		NT
Calidris subminuta	Long-toed Stint	Mi	S5		
Tringa glareola	Wood Sandpiper	Mi	S5		
Tringa hypoleucos	Common Sandpiper	Mi	S5		
Tringa nebularia	Common Greenshank	Mi	S5		
Tringa stagnatilis	Marsh Sandpiper	Mi	S5		
Tringa totanus	Common Redshank	Mi	S5		
Plegadis falcinellus	Glossy Ibis	Mi	S5		
Falco peregrinus	Peregrine Falcon		S7		
REPTILES					
Liopholis kintorei	Great Desert Skink	Vu	S3		VU
Liasis olivaceus subsp. *barroni*	Pilbara Olive Python	Vu	S3		
Anilios ganei	Pilbara Flat-headed Blind-snake			P1	
Ctenotus uber subsp. *johnstonei*	Spotted Ctenotus			P2	
Lerista macropisthopus subsp. *remota*				P2	

4.2 Fauna Habitats

A total of nine broad fauna habitat types were recorded and mapped across the Study Area. This comprised, in increasing order of extent, Claypan, Breakaway/Cliff, Minor Drainage Line, Major Drainage Line, Stony Plain, Drainage Area/Floodplain, Hillcrest/Hillslope, Mulga Woodland and Sand Plain (Table 4.2; Figure 4.1). The Breakaway/Cliff, Sand Plain and Major Drainage habitats were deemed to be of high significance as evidence of conservation significant fauna were recorded from these habitats. Evidence of Greater Bilby and Brush-tailed Mulgara were recorded from the Sand Plain

habitat, while the Night Parrot and Spectacled Hare-wallaby may also utilise the habitat if present. The Breakaway/Cliff habitat may provide denning and foraging habitat for the Northern Quoll, Long-tailed Dunnart, Peregrine Falcon and Pilbara Olive Python. The Major Drainage Line habitat provides key dispersal habitat for the Northern Quoll and Pilbara Olive Python, while also potentially providing suitable habitat for the Peregrine Falcon and the Grey Falcon.

Two of the remaining habitats recorded (i.e. Stony Plain and Hillcrest/ Hillslope) were considered to be of moderate significance. Stony Plain habitat provides potential habitat for the Spectacled Hare-Wallaby, Western Pebble-mound Mouse, Northern Quoll, Short-tailed Mouse and *Ctenotus uber* subsp. *johnstonei*. The Hillcrest/ Hillslope habitat contains small rocky breakaways that provide additional denning habitat of the Northern Quoll, although such features are small in extent and sparsely distributed. The Hillcrest/Hillslopes habitat may also provide habitat for the Western Pebble-mound Mouse and the Peregrine Falcon. The remaining five habitats were deemed to have a low significance as they either do not support species of high conservation value and/ or such species are not dependent on these habitats at the broad-scale. Descriptions of the distinguishing characteristics and the occurrence inside and outside of the Study Area for each of these habitat types are presented in Table 4.2.

The condition of habitats within the Study Area ranged from Very Good to Pristine. The largest disturbance was caused by mining explorations, grazing by Cattle (*Bos taurus*) and clearing of road/ access tracks. The occurrence of weeds, particularly Buffel Grass (*Cenchrus ciliaris*) was apparent in the Major Drainage Line (western portion of the Study Area).

Table 4.2: Fauna habitat descriptions

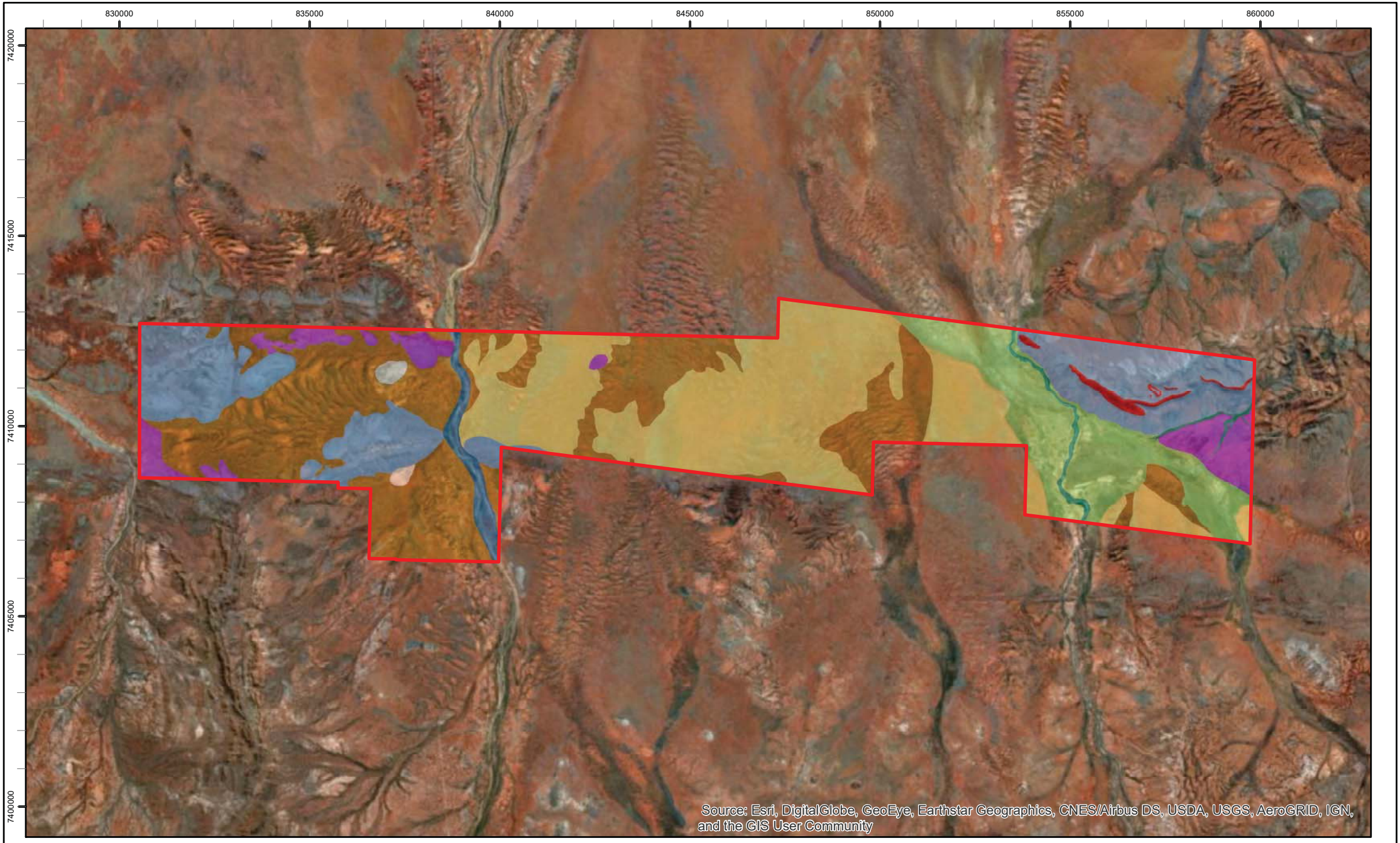
Habitat	Distinguishing habitat characteristics	Extent of the habitat	Conservation Significant Species	Photo
Claypan **65 ha** **<1%** **Significance: Low**	Often associated with tussock grasses. Cracking clay soils, usually containing weak crabhole (gilgai) microrelief, and which are generally saline at depth. Surface mantles are absent or common to abundant as pebbles and cobbles of ironstone, basalt and other rocks.	The claypan habitat occurs as an isolated habitat in the south-west of the Study Area. Claypans occur throughout the Pilbara, however they are generally not a dominant feature and occur sporadically.	Suitable for: • Migratory wader species (temporarily when inundated)	
Breakaway / Cliff **90 ha** **<1%** **Significance: High**	Breakaways/Cliffs are rugged, incised rocky hills and ranges. They tend to contain large rock fragments and more rock outcropping than other fauna habitats. Significant habitat features such as caves are sometimes encountered in this habitat type. Vegetation can be dense and complex in areas of soil deposition or sparse and simple where erosion has occurred.	The Breakaway/Cliff habitat occurs in the east of the Study Area, amongst the Hillcrest/Hillslope habitat. Breakaways and cliffs occur throughout the Pilbara, mainly associated with large ranges (for example the Hamersley Ranges), however, they can occur on minor hills, mesas and plateaus also.	Suitable for: • Northern Quoll • Pilbara Olive Python • Long-tailed Dunnart • Peregrine Falcon	

Habitat	Distinguishing habitat characteristics	Extent of the habitat	Conservation Significant Species	Photo
Minor Drainage Line **99 ha** **<1%** **Significance: Low**	Located within the minor gullies and depressions, generally through the Crest/Slope habitat. Consists primarily of Acacia low shrubland. The understorey generally lacks density and often consists solely of sparse tussock grassland, often including the weed Buffel Grass (**Cenchrus ciliaris*) where it has been introduced. The substrate can be sandy in places but generally consists of a skeletal loam gravel or stone.	The Minor Drainage Line habitat includes minor flow lines in the east of the Study Area that flowed from the hills and occurred within the Drainage Area/Floodplain habitat. Minor drainage lines are extensive in the Pilbara, taking shape as either shallow incised channels on low relief to rocky gullies and flow lines from high relief.	Suitable for: • Pilbara Olive Python	
Major Drainage Line **207 ha** **2%** **Significance: High**	Major Drainage Lines comprise mature River Red Gums/ Coolibahs over dry river pools. Open, sandy or gravelly riverbeds characterise this habitat type. In non-grazed areas, the vegetation adjacent to the main channel or channels is denser, taller and more diverse than adjacent terrain.	This habitat type is the lowest in the landscape and flows south to north through the western boundary of the study area, to join the Fortescue River near the marsh. Common habitat throughout the Pilbara and are generally associated with all major rivers in the Pilbara, such as the Fortescue, De Grey, Yule and Turner rivers. However, because they tend to be relatively narrow, linear features, they only represent a small proportion of the total land area.	Suitable for: • Northern Quoll • Pilbara Olive Python • Peregrine Falcon • Grey Falcon	

Habitat	Distinguishing habitat characteristics	Extent of the habitat	Conservation Significant Species	Photo
Stony Plain **632 ha** **5%** **Significance: Moderate**	These are erosional surfaces of gently undulating plains, ridges and associated footslopes. Mainly support hard spinifex (and occasionally soft spinifex) with a mantle of gravel and pebbles.	Occurs sporadically in the western, northern and eastern portions of the Study Area. Common habitat throughout the Pilbara, especially in the south east. Occurs within National Parks in the Pilbara.	Suitable for: • Northern Quoll • Western Pebble-mound Mouse • Spectacled Hare-wallaby • Short-tailed Mouse • *Ctenotus uber* subsp. *johnstonei*	
Drainage Area / Floodplain **1,470 ha** **12%** **Significance: Low**	Characterised by a low woodland over broad-leafed *Acacia* shrubland on sandy loam soils sometimes with exposed rocky areas. These can have high vegetation density, complexity and diversity, and because they tend to occur on accretional or depositional areas, often have deeper and richer soils than other fauna habitats. Grasses tend to be dominated by tussock grasses rather than spinifex, or the weed Buffel Grass (**Cenchrus ciliaris*).	The Drainage Area/Floodplain habitat occurs in the east of the Study Area, with a small occurrence in the west. The habitat is low in relief and has been shaped by surface water movement and presence. Drainage areas and floodplains are generally located adjacent to major drainage lines, in low relief away from the large ranges through the central Pilbara.	Suitable for: • None	

Habitat	Distinguishing habitat characteristics	Extent of the habitat	Conservation Significant Species	Photo
Hillcrest / Hillslope **2,225 ha** **18%** **Significance: Moderate**	These fauna habitats tend to be more open and structurally simple due to their position in landscape than other fauna habitats, and are dominated by varying species of spinifex. A common feature of these habitats is a rocky substrate, often with exposed bedrock, and skeletal red soils. These are usually dominated by *Eucalyptus* woodlands, *Acacia* and *Grevillea* scrublands and *Triodia* low hummock grasslands.	The Hillcrest/Hillslope habitat is the third most extensive, with large extents occurring in the east and west. The habitat occurred in association with high relief. Hill crests and hill slopes occur extensively throughout the Pilbara with various land tenure, including National Parks and unallocated crown land.	Suitable for: • Western Pebble-mound Mouse • Northern Quoll • Peregrine Falcon	
Mulga Woodland **3,819 ha** **31%** **Significance: Low**	This habitat includes woodlands and other ecosystems in which Mulga (*Acacia aneura* and close relatives) is dominant, either as the principal Acacia species or mixed with others. It consists of broad groves on stony or sandy soils, with little undergrowth.	At Caramulla this habitat occurs in bands or groves adjacent to drainage lines, floodplains and the lower areas of the Study Area. The Mulga is taller than 2 metres in height and has formed in moderately dense groves - suggesting that it has remained unburnt for a reasonably long time. Mulga woodlands occur extensively in the southern portions of the Pilbara bioregion, extending south through the Gascoyne and Murchison bioregions.	Suitable for: • None	

Habitat	Distinguishing habitat characteristics	Extent of the habitat	Conservation Significant Species	Photo
Sand Plain **3,843 ha** **31%** **Significance: High**	Sand Plain habitat is characterised by relatively deep sandy soils supporting dense spinifex grasslands and sparse low shrubs. This habitat transitions into patches of Mulga in places. This habitat often occurs as terraces along Major Drainage Lines and extensive plains.	This habitat is extensive throughout the central portion of the Study Area, with additional occurrences near the eastern boundary. Common habitat throughout the Fortescue and Chichester sub-regions of the Pilbara, especially in the north and east. Also common within the Augustus sub-region of the Gascoyne, which extends south and east of the Study Area.	Suitable for: • Greater Bilby • Brush-tailed Mulgara • Spectacled Hare-wallaby • Night Parrot	



Legend

StudyArea

Habitat Type

- Breakaway/ Cliff
- Claypan
- Drainage Area/ Floodplain
- Hillcrest/ Hillslope
- Major Drainage Line
- Minor Drainage Line
- Mulga Woodland
- Sand Plain
- Stony Plain

biologic Environmental Survey

N

1:125,000

0 1.25 2.5 5 km

BHP Billiton - Western Australia Iron Ore

Caramulla Level 1 Fauna Survey

Figure 4.1: Fauna habitats occurring within the Study Area

Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994

Size A4. Created 13/06/2018

4.3 Fauna Habitat Features

Two adits were found outside of the Study Area. One was located 3.6 km west of the Study Area in Hillcrest/Hillslope habitat. The entrance of the adit was blocked by a metal gate, with small openings (Plate 1). It is unlikely that larger bats (such as the Ghost Bat) could fit through the opening. An SM4 Ultrasonic recorder was placed at the entrance of the adit for one recording night. No Ghost Bat or Pilbara Leaf-nosed Bats were detected.

Plate 1: Adit recorded outside the Study Area

Another adit was located 4 km west of the Study Area along a Major Drainage Line (Plate 2). This adit had also been blocked using rocks. Although there are was some openings near the top of the rock pile it seems unlikely that larger bats (such as the Ghost Bat) would enter the adit. An SM4 Ultrasonic recorder was placed at the entrance of the adit for one recording night. No Ghost Bat or Pilbara Leaf-nosed Bats were detected.

Plate 2: Blocked adit recorded outside the Study Area

No semi-permanent or permanent waterbodies were recorded within the Study Area during the survey. It is likely that temporary waterbodies, such as in the Claypan and Major Drainage Line habitats, will be present in the Study Area after significant rainfall events. No significant caves were recorded within the Study Area.

4.4 Fauna Recorded

A total of 36 vertebrate fauna species, comprising eight mammal species (three of which were introduced), 20 bird species, and eight reptile species were recorded within the Study Area directly or via secondary evidence (Table 4.3, Appendix D). Eighteen of the species recorded during this survey were new to the Study based on a survey of the Study Area by GHD (2009). The eighteen-species new to the Study Area were:

- The Common Rock-rat (*Zyzomys argurus*)
- Greater Bilby (*Macrotis lagotis*)
- Brush-tailed Mulgara (*Dasycercus blythi*) – however, this species was recorded by DBCA (2018b) within the Study Area.
- Budgerigar (*Melopsittacus undulates*)
- Bourke's Parrot (*Neopsephotus bourkii*)
- White-plumed Honeyeater (*Ptilotula pencillata*)
- Brown Songlark (*Megalurus cruralis*)
- Diamond Dove (*Geopelia cuneate*)
- Horsfield's Bushlark (*Mirafra javanica*)
- Whistling Kite (*Haliastur sphenurus*)
- Wedge-tailed Eagle (*Aquila audax*)
- Spotted Harrier (*Circus assimilis*)
- Military Dragon or Crested Dragon (*Ctenophorus isolepis* subsp. *isolepis*)
- Central Netted Dragon (*Ctenophorus nuchalis*)
- Western Brown Snake (*Pseudonaja mengdeni*)
- Perentie (*Varanus giganteus*)
- Gould's Monitor or Bungarra (*Varanus gouldii*)
- Spiny-tailed Monitor (*Varanus acanthurus*)

However, each of these species is known to occur within the wider region and was recorded within the desktop assessment (Section 4.1). The number of species recorded during this survey is lower than many other survey conducted within the vicinity of the Study Area (Table 4.3). However, such surveys are Level 2 surveys and contained much greater sampling effort, including trapping. Level 2 surveys employ a greater diversity of methods and increased sampling effort. Hence, species that are generally not elusive, diurnal and lacking in distinctive secondary traits were generally observed during the current survey.

The number of species recorded is however comparable to other surveys of similar scope (Level 1) conducted within the vicinity of the Study Area.

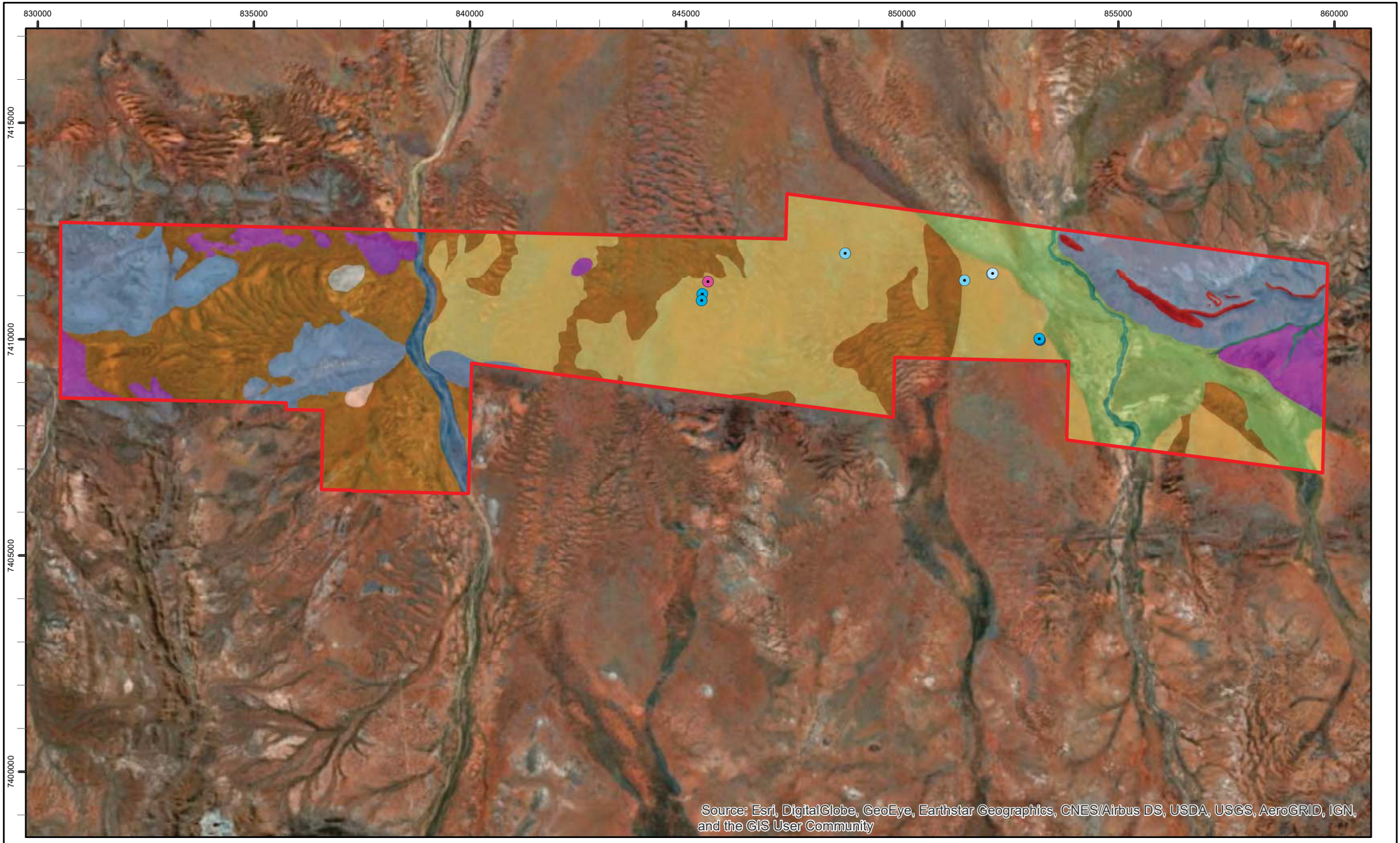
Table 4.3: Summary of fauna species recorded or reported from the literature review database searches within the vicinity of the Study Area.

Source	Survey Type	Mammals	Birds	Reptiles	Amphibians	Fish	Total Species
Carramulla Exploration Area Flora and Vegetation Survey and Fauna Assessment	Level 1	6	26	2	0	0	34
Wheelarra Hill North Fauna Assessment	Level 2	22	59	55	2	0	138
Orebody 31 Vertebrate Fauna Survey	Level 2	22	39	42	0	0	103
OB31 Jimblebar Access Track VCP Level 1 Flora & Vegetation Survey and Vertebrate Fauna Assessment	Level 1	4	11	1	0	0	16
South-West Jimblebar Vertebrate Fauna Survey	Level 2	22	55	39	2	0	118
Orebody 19 Level 2 Vertebrate Survey	Level 2	25	62	48	1	0	136
Orebody 18 Fauna Assessment Phase II	Level 2	15	55	42	0	0	112
Tenement E52/2238 Level 1 Flora and Vegetation and Level 1 Vertebrate Fauna Survey	Level 1	11	21	5	0	0	37
Dynasty Level 1 Vertebrate Fauna Survey	Level 1	13	27	2	0	0	42
Dynasty Level 2 Vertebrate Fauna Survey	Level 2	15	39	32	2	0	88
Hashimoto Level 2 Fauna Survey	Level 2	23	85	52	5	0	180

Source	Survey Type	Mammals	Birds	Reptiles	Amphibians	Fish	Total Species
East Jimblebar Level 1 Fauna Survey	Level 1	10	41	17	0	0	68
Jimblebar Level 2 Fauna Survey	Level 2	16	47	27	2	0	92
DBCA NatureMap	N/A	32	95	78	6	1	211
DoEE Protected Matters	N/A	4	11	1	0	0	16
DBCA Threatened and Priority Fauna Database	N/A	11	21	4	0	0	36
BirdLife	N/A	0	86	0	0	0	86
Current Survey	Level 1	8	20	8	0	**0**	**36**
Total species		**47 (9 intro.)**	**142**	**102**	**7**	**1**	**299**
Species of conservation significance		**10**	**23**	**5**	**0**	**0**	38

4.5 Fauna of Conservation Significance

Based on the results of the desktop assessment, a total of 38 conservation significant species (10 mammals, 23 birds and 5 reptiles) have the potential to occur within the Study Area (Table 4.1). Two of these species were detected within the Study Area during the current survey; the Greater Bilby (*Macrotis lagotis*) and the Brush-tailed Mulgara (*Dasycercus blythi*) (Figure 4.2; Appendix E). Each of the other 36 conservation significant species have been given a likelihood of occurrence, detailed in Table 4.4. Apart from the two species already observed, only two other species were “highly likely” to occur: the Long-tailed Dunnart and the Western Pebble-mound Mouse. Three species were “likely” to occur: the Spectacled Hare-wallaby, Peregrine Falcon and Short-tailed Mouse. The remaining species were given a likelihood of occurrence of possible (8), rarely (8) or unlikely (15) (Table 4.4).



Legend

- StudyArea
- **Habitat Type**
  - Breakaway/ Cliff
  - Claypan
  - Drainage Area/ Floodplain
  - Hillcrest/ Hillslope
  - Major Drainage Line
  - Minor Drainage Line
  - Mulga Woodland
  - Sand Plain
  - Stony Plain
- **Brush-tailed Mulgara**
  - Individual (dead)
  - Burrow (active)
  - Burrow (inactive)
  - Digging
- **Bilby**
  - Burrow (inactive)

biologic Environmental Survey

N

1:110,000

0 1 2 4 km

BHP Billiton - Western Australia Iron Ore

Caramulla Level 1 Fauna Survey

Figure 4.2: Records of species of conservation significance in the Study Area

Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994

Size A4. Created 13/08/2018

Table 4.4 Conservation significant species likelihood assessment

Species	Conservation Status		Preferred Broad Habitats Within Region	Habitat Within Study Area	Within Current Known Distribution	Distance to Nearest Record - Year	Recorded Within Study Area	Likelihood of Occurrence
	EPBC Act	WC Act						
Mammals								
Northern Quoll (*Dasyurus hallucatus*)	EN	S2	The species tends to inhabit rocky habitats which offer protection from predators and are generally more productive in terms of availability of resources (Braithwaite & Griffiths, 1994; Oakwood, 2000). Other microhabitat features important to the species include: rock cover; proximity to permanent water and time-since last fire (Woinarski *et al.*, 2008).	Likely	Yes	~121 km (W) – 2014 (DBCA 2018b)	No	Possible
Greater Bilby *(Macrotis lagotis)*	VU	S3	Variety of habitats including spinifex hummock grassland and Acacia shrubland, on soft soils (Burrows *et al.*, 2012). In the Pilbara often associated with major drainage line sandy terraces (How *et al.*, 1991).	Confirmed	Yes	Confirmed within Study Area	Yes	Confirmed
Ghost Bat *(Macroderma gigas)*	VU	S3	Ghost Bats roost in deep, complex caves beneath bluffs of low, rounded hills, granite rock piles and abandoned mines (Armstrong & Anstee, 2000). These features often occur within habitats including gorge/gully, hill crest/hill slope and low hills (Armstrong & Anstee, 2000).	Unlikely	Yes	~57 km (NW) – 2013, ~59 km (W) - 2016 (DBCA 2018b); <2 km – 2006 (ecologia Environmental, 2006)	No	Unlikely (roost), Possible (foraging)
Pilbara Leaf-Nosed Bat *(Rhinonicteris aurantia)*	VU	S3	Species roosts within caves and abandoned mines with high humidity (95%) and temperature (32 °C) (Armstrong, 2001). Species forages in caves and along waterbodies with fringing vegetation (TSSC, 2016).	Unlikely	Yes	~52 km (NW) – 2013 (DBCA 2018b) ; <2 km – 2006 (ecologia Environmental, 2006)	No	Unlikely (roost), Possible (foraging)

Species	Conservation Status		Preferred Broad Habitats Within Region	Habitat Within Study Area	Within Current Known Distribution	Distance to Nearest Record - Year	Recorded Within Study Area	Likelihood of Occurrence
	EPBC Act	WC Act						
Spectacled Hare-wallaby *(Lagorchestes conspicillatus leichardti)*	-	P3	Within the Pilbara the Spectacled Hare-wallaby is known to occur in tussock and hummock grasslands and *Acacia* shrublands (Ingleby & Westoby, 1992).	Highly Likely	Yes	~11 km (SSW) – no date (DBCA, 2018b)	No	Likely
Long-tailed Dunnart *(Sminthopsis longicaudata)*	-	P4	Typically occurs on plateaus near breakaways and scree slopes, and on rugged boulder-strewn scree slopes (Gibson & McKenzie, 2012). Once considered rare but now shown to be relatively common and widespread in rocky habitats (Burbidge *et al.*, 2008).	Highly Likely	Yes	~16 m (N) – 2006 (DBCA, 2018b)	No	Highly Likely
Western Pebble-mound Mouse *(Pseudomys chapmani)*	-	P4	This species occurs on the gentler slopes of rocky ranges where the ground is covered with a stony mantle and vegetated by hard spinifex, often with a sparse overstorey of eucalypts and scattered shrubs (Anstee, 1996; Start *et al.*, 2000).	Highly Likely	Yes	~9 km (W) – no date, ~10 km (SW) – 2006 ~10 km (SSW) - 1899 (DBCA, 2018b)	No	Highly Likely
Brush-tailed Mulgara *(Dasycercus blythi)*	-	P4	Prefers *Triodia* spp. grasslands on sand plains and the swales between low dunes (Pavey *et al.*, 2012; Woolley, 2006). Mature spinifex hummocks appear to be important for protection from introduced predators (Körtner *et al.*, 2007).	Confirmed	Yes	Confirmed within Study Area	Yes	Confirmed

Species	Conservation Status		Preferred Broad Habitats Within Region	Habitat Within Study Area	Within Current Known Distribution	Distance to Nearest Record - Year	Recorded Within Study Area	Likelihood of Occurrence
	EPBC Act	WC Act						
Short-tailed Mouse (*Leggadina lakedownensis)*	-	P4	The species occupies a diverse range of habitats from the monsoon tropical coast to semiarid climates, including spinifex and tussock grasslands, samphire and sedgelands, Acacia shrublands, tropical eucalypt and Melaleuca woodlands and stony ranges; however, the species is usually found in seasonally inundated habitats on red or white sandy-clay soils (Moro and Kutt 2008).	Highly Likely	Yes	Three records ~79 km (N) – 2004 (DBCA, 2018b)	No	Likely
Northern Marsupial Mole (kakarratul) (*Notoryctes caurinus*)	-	P4	The kakarratul inhabits sand dunes and, to a lesser extent, adjacent swales where there is suitable deep, loose sand. Trenching surveys have shown that potential habitat appears to be simply described as aeolian dunes.	Unlikely	No	~108 km (NE) – 1995 (DBCA, 2018b)	No	Unlikely
Birds								
Curlew Sandpiper *(Calidris ferruginea)*	CR/MI	S5	Inhabits intertidal mudflats in sheltered coastal areas (i.e. estuaries, bays, inlets and lagoons) (Geering *et al.*, 2007). This rare species generally roosts on bare dry shingle, shell or sand beaches, sandspits and islets in or around coastal or near-coastal lagoons and other wetlands (Geering *et al.*, 2007).	Unlikely	No	~36 km (W) moderately certain - 2005 (DBCA, 2018b)	No	Unlikely
Night Parrot *(Pezoporus occidentalis)*	EN	S1	The Night Parrot prefers sandy/stony plain habitat with old-growth spinifex (*Triodia*) for roosting and nesting in conjunction with native grasses and herbs for foraging (DPaW, 2017).	Likely	Yes	~84 km (NW) moderately certain sighting and uncertain secondary sign - 1970 (DBCA, 2018b)	No	Possible

Species	Conservation Status		Preferred Broad Habitats Within Region	Habitat Within Study Area	Within Current Known Distribution	Distance to Nearest Record - Year	Recorded Within Study Area	Likelihood of Occurrence
	EPBC Act	WC Act						
Southern Giant Petrel (*Macronectes giganteus*)	EN/MI	S5	The Southern Giant-Petrel is marine bird that occurs in Antarctic to subtropical waters. In summer, it mainly occurs over Antarctic waters, and it is widespread south as far as the pack-ice and onto the Antarctic continent. It occurs in both pelagic and inshore waters. It is attracted to land at sewage outfall.	Unlikely	No	~114 km (NW) - 2011 (DBCA, 2018b)	No	Unlikely
Grey Falcon (*Falco hypoleucos*)	-	S3	Timbered lowlands, particularly Acacia shrubland and along inland drainage systems. Also frequent spinifex and tussock grassland (Burbidge *et al.*, 2010; Olsen & Olsen, 1986)	Possible	Yes	~97 km (NNW) - 2016 (DBCA, 2018b)	No	Possible
Princess Parrot (*Polytelis alexandrae*)	VU	P4	It is restricted to the arid zone of Western Australia, the Northern Territory and South Australia. The Princess Parrot inhabits sand dunes and sand flats. It occurs in open savanna woodlands and shrublands that usually consist of scattered stands of *Eucalyptus*, *Casuarina* or *Allocasuarina* trees; an understorey of shrubs such as *Acacia*, *Cassia*, *Eremophila*, *Grevillea*, *Hakea* and *Senna*; and a ground cover dominated by *Triodia* species. It also frequents *Eucalyptus* or *Allocasuarina* trees in riverine or littoral areas.	Possible	Yes	~27 km (E) - 2012 (Birdlife Australia, 2018)	No	Unlikely
Barn Swallow (*Hirundo rustica*)	MI	S5	The Barn Swallow is a non-breeding summer visitor to the Pilbara. It favours areas near water (Johnstone *et al.*, 2013).	Possible	No	~358 km (NNW) - 2001 (DBCA, 2018a)	No	Rarely

Species	Conservation Status		Preferred Broad Habitats Within Region	Habitat Within Study Area	Within Current Known Distribution	Distance to Nearest Record - Year	Recorded Within Study Area	Likelihood of Occurrence
	EPBC Act	WC Act						
Common Sandpiper (*Actitis hypoleucos*)	MI	S5	Estuaries and deltas of streams, as well as banks farther upstream; around lakes, pools, billabongs, reservoirs, dams and claypans (Johnstone & Storr, 1998).	Unlikely	Yes	~19 km (W) - 2006 (Birdlife Australia, 2018)	No	Unlikely
Fork-tailed Swift (*Apus pacificus*)	MI	S5	Inhabits dry/open habitats, inclusive of riparian woodlands and tea-tree swamps, low scrub, heathland or saltmarsh, as well as treeless grassland and sandplains covered with spinifex, open farmland and inland and coastal sand-dunes (Johnstone & Storr, 1998).	Possible	Yes	~96 km (NNW) – 2013 (DBCA, 2018b)	No	Rarely
Grey Wagtail (*Motacilla cinerea*)	MI	S5	A rare vagrant to Western Australia where it has been recorded within various habitats with open waterbodies (Johnstone & Storr, 2004).	Unlikely	No	~700 km (NE) – 2013 (DBCA, 2018a)	No	Unlikely
Oriental Plover (*Charadrius veredus*)	MI	S5	A variety of habitats, including coastal habitats, such as estuarine mudflats and sandbanks, on sandy or rocky ocean beaches as well as open inland environments such as, semi-arid or arid grasslands, where the grass is short and sparse (Johnstone & Storr, 2004).	Possible	Yes	~49 km (W) – 1981 (DBCA, 2018b)	No	Rarely
Pectoral Sandpiper (*Calidris melanotos*)	MI	S5	Coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands (Johnstone & Storr, 2004; Johnstone *et al.*, 2013). It prefers wetlands with open fringing mudflats and low, emergent or fringing vegetation (Geering *et al.*, 2007).	Unlikely	No	~51 km (W) – 1981 (DBCA, 2018b)	No	Unlikely

Species	Conservation Status		Preferred Broad Habitats Within Region	Habitat Within Study Area	Within Current Known Distribution	Distance to Nearest Record - Year	Recorded Within Study Area	Likelihood of Occurrence
	EPBC Act	WC Act						
Sharp-tailed Sandpiper (*Calidris acuminata)*	MI	S5	Favours flooded samphire flats and grasslands, mangrove creeks mudflats, beaches, river pools, saltwork ponds, sewage ponds and freshwater soaks (Johnstone *et al.*, 2013).	Possible	No	~36 km (W) moderately certain - 2001, 2009 (DBCA, 2018b)	No	Rarely
Yellow Wagtail (*Motacilla flava)*	MI	S5	An uncommon but regular visitor to the Pilbara region (Johnstone *et al.*, 2013). Occupies a range of damp or wet habitats with low vegetation although favours edges of fresh water, especially sewage ponds (Oakwood, 2000)	Unlikely	No	~624 km (NNE) – 2002, 2003 (DBCA, 2018b)	No	Unlikely
Osprey (*Pandion haliaetus)*	MI	S5	Occurs mainly in sheltered seas around islands, tidal creeks, estuaries and saltwork ponds, also large river pools (Johnstone *et al.*, 2013)	Unlikely	No	~115 km (NW) – 2011 (DBCA, 2018b)	No	Unlikely
Common Greenshank *(Tringa nebularia)*	MI	S5	Species occurs as a non-breeding summer migrant which occurs throughout the region. Occurs mainly in Tidal mudflats, mangrove creeks, flooded samphire flats, beaches, river pools, and saltwork and sewage ponds (Johnstone *et al.*, 2013).	Temporary Only	Yes	~36 km (W) moderately certain - 2007, ~57 km (W) - 2012 (DBCA, 2018b)	No	Rarely
Wood Sandpiper (*Tringa glareola)*	MI	S5	Species occurs as a non-breeding summer migrant which occurs throughout the region. Occurs mainly in river pools, sewage ponds, flooded claypans, freshwater lagoons and bore overflows (Johnstone *et al.*, 2013).	Temporary Only	Yes	~36 km (W) moderately certain - 2007, two records ~97 km (NNW) -2016 (DBCA, 2018b)	No	Rarely
Garganey (*Anas querquedula*)	MG	S5	Garganey is small teal. This duck is a rare visitor to Australia recorded from lakes and inland waterbodies (Johnstone & Storr, 1998).	Unlikely	No	~123 km (SW) moderately certain – 1980 (DBCA, 2018b)	No	Unlikely

Species	Conservation Status		Preferred Broad Habitats Within Region	Habitat Within Study Area	Within Current Known Distribution	Distance to Nearest Record - Year	Recorded Within Study Area	Likelihood of Occurrence
	EPBC Act	WC Act						
Red-necked Stint (*Calidris ruficollis*)	MG	S5	Mostly found in coastal areas, including in sheltered inlets, bays, lagoons and estuaries with intertidal mudflats. It mostly forages on bare wet mud on intertidal mudflats or sandflats, or in very shallow water; mostly in areas with a film of surface water and mostly close to edge of water. This species roosts on sheltered beaches, spits, banks or islets, of sand, mud, coral or shingle, sometimes in saltmarsh or other vegetation. They occasionally roost on exposed reefs or shoals (Johnstone & Storr, 1998).	Possible	No	Two records ~36 km (W) moderately certain – 2005 (DBCA, 2018b)	No	Rarely
Long-toed Stint (*Calidris subminuta*)	MG	S5	They prefer shallow freshwater or brackish wetlands but are also fond of muddy shorelines, growths of short grasses, weeds, sedges, low or floating aquatic vegetation, reeds, rushes and occasionally stunted samphire. The Long-toed Stint also frequents permanent wetlands and forages on wet mud or in shallow water, often among short grass, weeds and other vegetation on islets or around the edges of wetlands. They roost or loaf in sparse vegetation at the edges of wetlands and on damp mud near shallow water. It also roosts in small depressions in the mud (Johnstone & Storr, 1998).	Unlikely	No	Two records ~36 km (W) moderately certain – 2001, ~51 km (W) – 1981 (DBCA, 2018b)	No	Unlikely

Species	Conservation Status		Preferred Broad Habitats Within Region	Habitat Within Study Area	Within Current Known Distribution	Distance to Nearest Record - Year	Recorded Within Study Area	Likelihood of Occurrence
	EPBC Act	WC Act						
Marsh Sandpiper (*Tringa stagnatilis*)	MG	S5	Lives in permanent or ephemeral wetlands of varying salinity, and also regularly at sewage farms and saltworks. They are recorded less often at reservoirs, waterholes, soaks, bore-drain swamps and flooded inland lakes. In Western Australia they prefer freshwater to marine environments. The species usually forages in shallow water at the edge of wetlands and roost or loaf on tidal mudflats, near low saltmarsh, and around inland swamps (Johnstone & Storr, 1998).	Unlikely	No	~36 km (W) moderately certain – 2005, 106 km (NW) – 2016 (DBCA, 2018b)	No	Unlikely
Common Redshank (*Tringa totanus*)	MG	S5	It is found at sheltered coastal wetlands with bare open flats and banks of mud or sand. They are also found around saltlakes, freshwater lagoons, artificial wetlands and saltworks and sewage farms. The species has been observed feeding in shallow water, on wet bare mud or sand, or on algal deposits and roosting on small elevated areas such as estuarine sandbars and muddy islets surrounded by water (Johnstone & Storr, 1998).	Unlikely	No	~57 km (W) - 2012(DBCA, 2018b)	No	Unlikely
Glossy Ibis *(Plegadis falcinellus)*	-	S5	Freshwater wetlands, irrigated areas, margins of dams, floodplains, brackish and saline wetlands, tidal mudflats, pastures, lawns and public gardens (Johnstone *et al.*, 2013).	Possible	Yes	Five records ~36 km (W) moderately certain – 2001, 2009 and 2010. 97 km (NW) – 2016 (DBCA, 2018b)	No	Rarely

Species	Conservation Status		Preferred Broad Habitats Within Region	Habitat Within Study Area	Within Current Known Distribution	Distance to Nearest Record - Year	Recorded Within Study Area	Likelihood of Occurrence
	EPBC Act	WC Act						
Peregrine Falcon *(Falco peregrinus)*	-	S7	In arid areas, it is most often encountered along cliffs above rivers, ranges and wooded watercourses where it hunts birds (Johnstone & Storr, 1998). It typically nests on rocky ledges occurring on tall, vertical cliff faces between 25 m and 50 m high (Olsen *et al.*, 2004; Olsen & Olsen, 1989).	Likely	Yes	~ 2 km (S) – 2010, ~3 km (W) – 2011 (DBCA, 2018b)	No	Likely
Reptiles								
Pilbara Olive Python *(Liasis olivaceus barroni)*	VU	S3	Associated with drainage systems, including areas with localised drainage and watercourses (Pearson, 1993). In the inland Pilbara the species is most often encountered near permanent waterholes in rocky ranges or among riverine vegetation (Pearson, 1993).	Possible	Yes	~33 km (W) – 2015 (DBCA, 2018b)	No	Possible
Great Desert Skink (*Liopholis kintorei*)	VU	S3	Endemic to the Australian arid zone in the western deserts region. Occurs on red sandplains and sand ridges. In Western Australia it occur on sites dominated by *Triodia basedowii* and *Triodia schinzii* with some *Eremophila leucophylla* shrubs. Regenerating vegetation appears to be a critical habitat requirement. The Skink appears to prefer a mosaic landscape of different aged vegetation and inhabits sites that have been burnt in the previous three to fifteen years Preferred habitat has at least 50% bare ground. Regenerating areas may provide ample food while unburnt patches provide shelter (DoE, 2018).	Unlikely	No	~4 km (SE) secondary evidence – 2012 (DBCA, 2018b)	No	Unlikely

Species	Conservation Status		Preferred Broad Habitats Within Region	Habitat Within Study Area	Within Current Known Distribution	Distance to Nearest Record - Year	Recorded Within Study Area	Likelihood of Occurrence
	EPBC Act	WC Act						
Pilbara Flat-headed Blind-snake (*Anilios ganei*)	-	P1	Little is known of the species' ecology but this species is often associated with moist soils and leaf litter within gorges and gullies (Wilson and Swan 2014), and potentially within a wide range of other stony habitats. The species has been recorded from numerous habitats but is most likely to be present in rocky terrain and along drainage lines (DBCA, 2018).	Possible	Yes	~55 km (W) – 1985 (DBCA, 2018b)	No	Possible
Spotted Ctenotus (*Ctenotus uber* subsp. *johnstonei*)		P2	As a precautionary approach, the Pilbara taxon is treated as the Priority 2 subspecies. Within the Pilbara, the taxon is known from *Triodia* on hillslopes, *Acacia xiphophylla* over chenopods, and *Acacia xiphophylla* scattered tall shrubs to high open shrubland (Cogger, 2014).	Possible	Yes	~22 (W) – 2009 (DBCA, 2018a)	No	Possible
Lerista macropisthopus subsp. *remota*		P2	Woodlands and semi-arid scrubs with sandy substrate (Cogger, 2014).	Possible	Yes	~52 km (W) – 1996 (DBCA, 2018b)	No	Unlikely

4.5.1 Species Confirmed within Study Area

The Greater Bilby (*Macrotis lagotis*)

The Greater Bilby is listed as Vulnerable under the EPBC Act and Schedule 3 under the WC Act. The Greater Bilby was formerly associated with a variety of inland habitats, including desert sandplains, dune fields with hummock grasslands, and massive red earths and *Acacia* shrublands (Woinarski *et al.*, 2014), but populations underwent a sudden and widespread collapse in the early 1900s (van Dyck & Strahan, 2008). The species is now restricted to approximately 20% of its' former range, with wild populations restricted predominantly to the Tanami Desert in the Northern Territory, the Great Sandy and Gibson Deserts and Pilbara region in Western Australia (Woinarski *et al.*, 2014).

There are 76 certain, one moderately certain and 19 uncertain and/or undefined records of this species within 150 km of the Study Area (DBCA, 2018). A burrow belonging to the species was recorded within the central section of Study Area, ~1 km from the northern border within the Sand Plain habitat. (Figure 4.2; Appendix E). The burrow was old (likely >3 years), with no scats and there was no indication of current occupation (Plate 3, water bottle left in photo for scale), despite extensive survey effort. Given the lack of mining-related development near the record, it is likely that the absence of the species is due to other pressures, such as changes to fire regimes and the presence of introduced predators, which are known factors influencing the occurrence of the species. While not present at the time of survey, the presence of the species (albeit old evidence) confirms that the Sand Plain habitat within the Study Area can provide suitable habitat for the species with the correct temporal variables. The Greater Bilby typically uses multiple burrows, having up to 18 and using up to three each night (Lavery & Kirkpatrick, 1997). The longevity of burrow use is variable and relatively unknown although they are known to vacate areas when resources are depleted, such as after a fire (Dziminski & Carpenter, 2016).

Plate 3: Old Greater Bilby (*Macrotis lagotis*) burrow – water included for scale.

Brush-tailed Mulgara (*Dasycercus blythi*)

The Brush-tailed Mulgara (DBCA Priority 4) is a small carnivorous marsupial occurring from south-western Queensland across the Simpson, Tanami, and Great Sandy Deserts and central Western Australia, including parts of the Pilbara (DSEWPaC, 2011). The Brush-tailed Mulgara occurs in *Triodia* sand plain and gibber plain habitats (Pavey *et al.*, 2012). Mulgara are renowned for using multiple burrow systems within a home-range and changing these frequently. A study in Kata Tjuta National Park found that on average burrows were used for only 3.2 days by one individual over a 55-day period, and numerous burrows were used by a single individual, indicating little burrow fidelity (Körtner *et al.*, 2007).

Evidence of the Brush-tailed Mulgara was recorded on 16 occasions (from eight locations) within Sand Plain habitat in the Study Area. Eleven active burrows were found in the central section of Study Area (example Plate 4), ~1 km from the northern border (Figure 4.2; Appendix E). One other recently active burrow was found ~3.5 km north east of the formerly mentioned records. Two inactive burrows and a digging were recorded ~8 km from the eastern border and 1km from the northern border of the Study Area (Figure 4.2; Appendix E). Finally, an individual (found dead at the entrance of a burrow) and an active burrow were recorded ~500 m from the southern border and ~0.65 km from the eastern border of the Study Area. The Sand Plain habitat, which covers approximately 31% of the Study Area, appears to be an important habitat for this species within the Study Area.

Plate 4: Active Brush-tailed Mulgara (*Dasycercus blythi*) burrow

4.5.2 Highly Likely to Occur

Long-tailed Dunnart (*Sminthopsis longicauda*)

This species is currently listed as Priority 4 under the WC Act. It is a nocturnal and agile species that is distributed through the Pilbara, north eastern goldfields and Gibson desert, south to the Nullarbor Plain, to central Northern Territory and western South Australia (van Dyck & Strahan, 2008). Its core habitat includes rocky scree slopes with hummock grass and shrubs, and tall open *Acacia* shrubland and woodlands (McKenzie *et al.*, 2008)

The nearest record of this species is located approximately 16 km north of the Study Area from 2006 (DBCA, 2018). There are a further 7 records within 130 km of the Study Area (DBCA, 2018). Owing to the occurrence of suitable habitats on Breakaway/ Cliff habitat along the north border of the eastern portion of the Study Area, it is highly likely the species occurs within the Study Area.

Western Pebble-mound Mouse (*Pseudomys chapmani*)

This species is listed as Priority 4 under the WC act. The Western Pebble-mound Mouse has experienced a significant decline in their range through the Gascoyne and Murchison and is now considered endemic to the Pilbara (Start *et al.*, 2000). This species almost exclusively occurs on the gentler slopes of rocky ranges where the ground is covered with a stony mantle and vegetated by hard spinifex, often with a sparse overstorey of eucalypts and scattered shrubs (Anstee & Armstrong, 2001).

The three nearest records of the Western Pebble-mound Mouse are located approximately 9 km west (no date provided), 10 km south-west (from 2006) and 10 km south south-west (from 1899) of the Study Area (DBCA, 2018). There are a further 14 records within 45 km of the Study Area (DBCA, 2018). There are a further 181 records within 140 km of the Study Area (DBCA, 2018). All these records have been rated as certain or WAM vouched with the exception of one which was rated moderately certain. Although not recorded during the survey, it is highly likely that the species occurs in the Study Area, particularly within the Stony Plains and potentially within the Hillcrest/ Hillslope habitats in the western portion of the Study Area.

4.5.3 Likely to Occur

Spectacled Hare-wallaby (*Lagorchestes conspicillatus leichardti*)

This species is currently listed as Priority 3 under the WC Act. The Spectacled Hare-wallaby is sparsely distributed and generally uncommon across northern Australia, distributed from northern Queensland in the east, to the Pilbara where the species is considered relatively rare (van Dyck & Strahan, 2008). The species shelters within grass tussocks and spinifex hummocks and low shrubs (Ingleby & Westoby, 1992).

The nearest record of this species is 11 km SSW of the Study Area from an unknown date (DBCA, 2018). The species is patchily distributed throughout the Pilbara region with few records of the species. The Stony Plain habitat and Sandy Plain habitat which are comprised of expanses of *Triodia* hummock grasslands provides suitable habitat for the species. Such habitats comprise 36% of the Study Area.

Short-tailed Mouse (*Leggadina lakedownensis*)

This species is endemic to northern Australia, where it occurs from Cape York in the east to the Pilbara in the west, although the distribution is considered patchy (Moro & Morris, 2000). There are populations present on Thevenard Island and Serrurier Island in Western Australia, although the latter is a translocated population – intentionally introduced for conservation purposes (Lee, 1995; Moro & Morris, 2000). The species occupies a diverse range of habitats from the monsoon tropical coast to semiarid climates, including spinifex and tussock grasslands, samphire and sedgelands, Acacia shrublands, tropical eucalypt and Melaleuca woodlands and stony ranges; however, the species is usually found in seasonally inundated habitats on red or white sandy-clay soils (Moro & Morris, 2000)

The nearest record of this species is located approximately 79 km north of the Study Area from 2004 (DBCA, 2018). Owing to the occurrence of suitable habitats of stony hummock, it is likely the species occurs within the Study Area.

Peregrine Falcon (*Falco peregrinus*)

The Peregrine Falcon is listed under the WC Act as Schedule 7 “other specially protected fauna” and is considered rare over much of its range (Johnstone & Storr, 1998). In arid areas, it is most often encountered along cliffs above rivers, ranges and wooded watercourses where it hunts birds (Johnstone & Storr, 1998). It typically nests on rocky ledges occurring on tall, vertical cliff faces between 25 m and 50 m high (Olsen & Olsen, 1989). It also appears to prefer nesting on large ledges a reasonable distance (average of 13 m) from the top of the cliff (Olsen & Olsen, 1989), possibly to avoid ground dwelling predators.

The Peregrine falcon was recorded in 2010 approximately 2 km south of the Study Area and in 2011 ~3 km west of the Study Area (DBCA, 2018). Potential nesting habitat may be present within Breakaway/ Cliff habitat as well as instances of the Hillcrest/ Hillslope. The Major Drainage Line within the Study Area is likely to provide suitable foraging habitat for the species.

4.5.4 May Possibly Occur

Night Parrot (*Pezoporus occidentalis*)

The Night Parrot is currently listed as Endangered under the EPBC Act and Schedule 1 under the WC Act. It is one of Australia’s rarest birds, with very few confirmed sightings in recent years (Pyke & Ehrlich, 2014). Night Parrots reportedly occur in spinifex grasslands in stony or sandy areas on floodplains or near creeks, shrubby samphire and chenopod vegetation on claypans or at the edges of salt lakes, and in dense, low vegetation around watercourses (Murphy *et al.*, 2017b; Night Parrot Recovery Team, 2017; Pyke & Ehrlich, 2014). There are only two contemporary records of the species within Western Australia, one located at Minga Qwirriawirie Well, south of the Cloudbreak mine site (Davis & Metcalf, 2008) and the other from an unnamed location in early 2017 (Night Parrot Recovery Team, 2017). The nearest record is ~84 km north-west (moderately certain sighting and uncertain secondary sign) of the Study Area from 1970 (DBCA, 2018). Given the ambiguity of the species-specific habitat requirements, it is

considered possible that the species can occur in most habitats dominated by long unburnt *Triodia* hummock grasses such as the Sand Plain habitat.

Northern Quoll (*Dasyurus hallucatus*)

The Northern Quoll is currently listed as Endangered under the EPBC act and Schedule 2 under the WC Act. The species, once widely distributed across northern Australia, is now restricted to three isolated mainland populations: the Pilbara, the Kimberley and Northern Territory, and Queensland. Small isolated populations occur on a number of islands along the north coast (DoE, 2016). Such declines are primarily due to the western expansion of the Cane Toad (*Rhinella marina*), which is highly toxic to predators when consumed (Woinarski *et al.*, 2008). Other threats include predation from feral predators such as foxes and cats, inappropriate fire regimes, disease, habitat degradation through grazing as well as habitat destruction through mining and agriculture (Woinarski *et al.*, 2011). At present, Northern Quolls are relatively common in the northern Pilbara region (generally within 150 km of the coast) but are much less common in southern and south-eastern parts of the region (Cramer *et al.*, 2016). The Northern Quoll is both arboreal and terrestrial, inhabiting ironstone and sandstone ridges, scree slopes, granite boulders and outcrops, drainage lines and riverine habitats (Braithwaite & Griffiths, 1994; Oakwood, 2002). Rocky habitats tend to support higher densities, as they offer protection from predators and are generally more productive in terms of availability of resources (Braithwaite & Griffiths, 1994; Oakwood, 2000). Other microhabitat features important to the species include: rock cover; proximity to permanent water and time-since last fire (Woinarski *et al.*, 2008). Dens occur in a wide range of situations including rock overhangs, tree hollows, hollow logs, termite mounds, goanna burrows and human dwellings/infrastructure, where individuals usually den alone (Oakwood, 2002; Woinarski *et al.*, 2008).

The nearest record is ~121 km west of the Study Area from 2014 (DBCA, 2018b). A further 4 records are documented ~105 to 130km north-west of the Study Area (DBCA, 2018b). The Breakaway/ Cliff habitat of the Study Area provides suitable denning and foraging habitat for the species. Additional denning habitat is also present within small instances of the Hillcrest/ Hillslope habitat (i.e. in small rocky breakaways) and the Major Drainage Line habitat, which also provides foraging and dispersal habitat for the species. Remainder of habitats are unlikely to provide significant habitat for the species.

Ghost Bat *(Macroderma gigas)*

In the Pilbara region, the Ghost Bat (IUCN Vulnerable, EPBC Act Vulnerable, WC Act Schedule 3) roosts in deep, complex caves beneath bluffs or hills composed of Marra Mamba or Brockman Iron Formation, granite rock piles and abandoned mine shafts (Armstrong & Anstee, 2000). Ghost Bats in the Northern Territory have been recorded foraging on average within 2 km of their day roost each night (Tidemann *et al.*, 1985), although this range may be larger in the semi-arid Pilbara region.

The SM2BAT+ recorders used during the survey did not record any Ghost Bat calls, however the Ghost Bat has been previously recorded ~2 km west of the Study Area through ANABAT recordings (ecologia Environmental, 2006). No significant caves were recorded and therefore it is unlikely that the species would be recorded roosting in the Study Area. Most habitat types within the Study Area may support the

species in the form of foraging habitat, although the species is unlikely to be dependent on these habitats on the Study Area itself.

Pilbara Leaf-nosed Bat (*Rhinonicteris aurantia*)

The Pilbara Leaf-nosed Bat is classified as Vulnerable under the EPBC Act and Schedule 3 under the WC Act. The few known roosts of this species are concentrated in five disused mines in the eastern Pilbara, and one gorge system in Barlee Range Nature Reserve (Armstrong, 2001), which are thought to contain most of the region's population. The Pilbara Leaf-nosed Bat has a very limited ability to conserve heat and water and requires very hot (28–32ºC) and humid (96–100%) roost sites in caves and/or abandoned mines (Armstrong, 2001).

The SM2BAT+ recorders used during the survey did not record any Pilbara Leaf-nosed Bat calls, however the species has been previously recorded ~2 km west of the Study Area through ANABAT recordings (ecologia Environmental, 2006). No significant caves were recorded and therefore it is unlikely that the species would be recorded roosting in the Study Area. The Major Drainage Line habitat type within the Study Area may support the species in the form of foraging habitat, although the species is unlikely to be dependent on the Study Area itself.

Pilbara Olive Python (*Liasis olivaceus barroni*)

The Pilbara Olive Python is listed as Vulnerable under the EPBC Act and Schedule 3 under the WC Act. It is moderately common through the ranges of the Pilbara and Mt Augustus, Western Australia, where it inhabits water courses and pools in rocky gorges and gullies. This species is primarily nocturnal and tends to shelter in small caves or under vegetation during the day, although it is occasionally active after sunrise, particularly in the warmer summer months (Pearson, 1993). The Pilbara Olive Python is known from a number of sites throughout the Pilbara and is associated with drainage systems, including areas with localised drainage and watercourses (Pearson, 1993).

The nearest record of Pilbara Olive Python is located approximately 33 km west of the Study Area (DBCA, 2018b). Habitat suitable for the species within the Study Area appears limited to the Breakaway/ Cliff, Major Drainage Line and Minor Drainage Line habitats. Therefore, this species may possible occur within the Study Area.

Grey Falcon (*Falco hypoleucos*)

The Grey Falcon is currently listed as Schedule 3 under the WC Act. This species appears to have a distribution centred on ephemeral or permanent creek lines (Garnett & Crowley, 2000), with numerous records from the Fortescue Marsh region (DBCA, 2018). Grey Falcons prefer sparsely-treed, open plains and creek lines for hunting (Olsen & Olsen, 1986). They typically nest in the abandoned nest of a raptor or corvid (Olsen & Olsen, 1986) in trees or man-made structures, most notably repeater towers.

The nearest record for this species is approximately 97 km north-west of the Study Area from 2011 (DBCA, 2018). The Major Drainage Line habitat within the Study Area provides potentially nesting and foraging habitat for the species. The remaining habitats may be flown over, and opportunistically used for foraging, if individuals are resident within the local area.

Ctenotus uber subsp. *johnstonei*

The subspecies *johnstonei* of this species of skink was first described in 1980 (Storr, 1980) from Balgo Hill in the far north east of Western Australia and is listed as Priority 2 by the DBCA. Little is known of this taxon, and its taxonomic status is uncertain. Specimens from the Pilbara may be grouped with *Ctenotus uber* subsp. *johnstonei*, or they may belong to an undescribed taxon, in which case they would have no official conservation status. As a precautionary approach, the Pilbara taxon is treated as the Priority 2 subspecies. Within the Pilbara, the taxon is known from *Triodia* on hillslopes, *Acacia xiphophylla* over chenopods, and *Acacia xiphophylla* scattered tall shrubs to high open shrubland (ENV Australia, 2004).

Within the Dynasty Tenement (~22km west of the Study Area), five individuals were recorded by Biologic (2016b) in a variety of suitable habitat, including Sand Plain, Hardpan Plain and Mulga woodland. A further individual was trapped in a funnel trap within the Sand Plain habitat by Biologic (2016a) within the Dynasty tenement. This species may possibly occur within the Stony Plain habitat within the Study Area.

Pilbara Flat-headed Blind Snake (Anilios ganei)

The Pilbara Flat-headed Blind Snake is endemic to the Pilbara region and is listed as Priority 1 by the DBCA. Given its cryptic fossorial habit, this species is rarely encountered during surveys. Little is known of the species' ecology but like most other blind snakes, it is insectivorous, feeding on termites and their eggs, and larvae and pupae of ants (Wilson & Swan, 2014). This species is known to be associated with moist soils and leaf litter within gorges and gullies (Wilson & Swan, 2014), and potentially within a wide range of other stony habitats.

This species has been recorded from Hillcrest/ Hillslope and rocky hilltop habitats at Orebody 17/18, approximately 19 km west north-west of the Study Area (Biologic, 2014a; ENV Australia, 2007). It has been also recorded within alluvial plain habitats at Jimblebar, west of the Study Area (Outback Ecology Services, 2009b). Based on the known habitat characteristics and distribution, the Pilbara Flat-headed Blind Snake has the potential to occur within any of the habitats throughout the Study Area.

4.6 Assessment of Vertebrate Fauna Values Against the Ten Clearing Principles

There are ten clearing principles that apply to the clearing of native vegetation in Western Australia, two of which apply to native fauna. An assessment of the likely impacts to native fauna in regard to clearing principles A and B are addressed herein. Because no specific areas to be cleared were known at the time of this report, the assessment follows a precautionary approach considering all habitats present.

a) Native vegetation should not be cleared if it comprises a high level of biological diversity

In total, 36 vertebrate fauna species were recorded within the Study Area during this survey. This comprises five native mammals, three introduced mammals, 20 birds and eight reptiles species. However, the desktop assessment identified that 299 species of vertebrate fauna have the potential to occur within the Study Area based on species distributions previous records. This level of diversity is considered average for the Pilbara. Additionally, the habitats that were delineated as part of this assessment are relatively widespread and common habitats of the region and they are not expected to host a significantly high level of faunal diversity.

As such, it is unlikely that clearing within the Study Area would be at variance with this clearing principle with reference to vertebrate fauna (Table 4.5)

b) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia

The Greater Bilby is currently listed as Vulnerable under the EPBC Act and Schedule 3 under the WC Act. One old burrow belonging to the species was recorded within the central section of Study Area ~1 km from the northern border during the current survey. While not present at the time of survey, the presence of the burrow (albeit old) confirms that the Sand Plain habitat within the Study Area can provide suitable habitat for this species. The Brush-tailed Mulgara is currently listed as Priority 4 by DBCA. This species was recorded on 16 occasions (eight locations) during the survey; via eleven active burrows, three inactive burrows, one digging and one individual (dead). All records were taken from within Sand Plain habitat.

The Western Pebble-Mound Mouse (*Pseudomys chapmani*) and the Long-tailed Dunnart (*Sminthopsis longicauda*) which are listed as Priority 4 by the DBCA are considered highly likely to occur within the Study Area based on the occurrence of preferred habitat and nearby recent records. The Western Pebble-mound Mouse, if present, is likely to occur within the Hillcrest/Hillslope and Stony Plain habitats. The Long-tailed Dunnart, if present, is likely to occur within the Breakaway/ Cliff and Hillcrest/Hillslope habitats.

Local populations of the significant species recorded and highly likely to occur may be temporarily impacted by clearing of any active denning sites (including burrows and mounds). It is recommended that any clearing activities should avoid such features (i.e. for burrows and mounds) and such habitats (Sand Plain, Hillcrest/ Hillslope, Breakaway/ Cliff, Stony Plain) to minimise impacts to such species. However, such habitats are widely dispersed both in and outside the Study Area and therefore it is unlikely that such fauna require these areas specifically.

As such clearing is unlikely to be at variance to this clearing principal.

Table 4.5. Summary of assessment of vertebrate fauna values against the ten clearing principles

Principle	Criteria	Assessment	Outcome
a) Native vegetation should not be cleared if it comprises a high level of biological diversity.	a1) Native vegetation should not be cleared if it is representative of an area of outstanding biodiversity in the Bioregion.	The fauna habitats present within the Study Area are widespread and largely common within the Pilbara and Gascoyne bioregions.	Unlikely to be at variance to this principal (with regard to terrestrial vertebrate fauna only).
	a2) Native vegetation should not be cleared if it has higher diversity of indigenous aquatic or terrestrial plant or fauna species than native vegetation of that ecological community in good or better condition in the Bioregion.	The diversity of terrestrial vertebrate fauna occurring within the Study Area is consistent to elsewhere within the bioregion. No other biological groups (i.e. flora, aquatic fauna) were assessed as part of this assessment.	Unlikely to be at variance to this principal (with regard to terrestrial vertebrate fauna only).
	a3) Native vegetation should not be cleared if it has higher diversity of indigenous aquatic or terrestrial plant or fauna species than the remaining vegetation of that ecological community in the local area.	The diversity of terrestrial vertebrate fauna occurring within the Study Area is consistent to elsewhere within the local area. No other biological groups (i.e. flora, aquatic fauna) were assessed as part of this assessment.	Unlikely to be at variance to this principal (with regard to terrestrial vertebrate fauna only).
	a4) Native vegetation should not be cleared if it has higher ecosystem diversity than other native vegetation of that local area.	The diversity of terrestrial vertebrate fauna occurring within the Study Area is consistent to elsewhere within the local area. No other biological groups (i.e. flora, aquatic fauna) were assessed as part of this assessment.	Unlikely to be at variance to this principal (with regard to terrestrial vertebrate fauna only).
	a5) Native vegetation should not be cleared if it has higher genetic diversity than the remaining native vegetation of that ecological community.	The diversity of terrestrial vertebrate fauna occurring within the Study Area is consistent with similar ecological communities. No other biological groups (i.e. flora, aquatic fauna) were assessed as part of this assessment.	Unlikely to be at variance to this principal (with regard to terrestrial vertebrate fauna only).

Principle	Criteria	Assessment	Outcome
b) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia.	b1) Native vegetation should not be cleared if it is or is likely to be habitat for fauna that is declared Specially Protected under the WC Act.	An old burrow belonging to the Greater Bilby was recorded within the central section of Study Area during the current survey, from one old burrow systems. While not present at the time of survey, the presence of the Greater Bilby (albeit old evidence) confirms that the Sand Plain habitat within the Study Area can provide suitable habitat for the species, with the correct temporal variables. Despite extensive effort no additional evidence of the species was recorded. The Study Area is considered to provide habitat for the Peregrine Falcon, which is likely to utilise part or all of the Study Area. The Study Area has the potential to provide nesting habitat within the Breakaway/ Cliff habitat as well as instances of the Hillcrest/ Hillslope. The Major Drainage Line within the Study Area is likely to provide suitable foraging habitat for the species. Due to the mobile nature of the Peregrine Falcon, it is unlikely to wholly rely on the Study Area for its survival. In addition, no nests or individuals were sighted from the Study Area	Assuming clearing avoids the Greater Bilby burrow, then such activities are unlikely to be at variance to this principal.

Principle	Criteria	Assessment	Outcome
	b2) Native vegetation should not be cleared if it is or is likely to be habitat for Priority Listed Fauna.	Sixteen records of the Brush-tailed Mulgara were recorded within the Study Area (listed as Priority 4 by DBCA). The Sand Plain habitat provides suitable habitat for the species The Western Pebble-mound Mouse and Long-tailed Dunnart (both listed as Priority 4 by DBCA) are highly likely to occur in the Study Area. The Western Pebble-mound Mouse prefers habitats of Stony Plains and Hillcrests/Hillslopes which are common throughout the Study Area. The Long-tailed Dunnart, if present, is likely to occur within the Breakaway/ Cliff habitat. The Short-tailed Mouse (listed as Priority 4 by DBCA) and Spectacled Hare-wallaby (listed as Priority 3 by DBCA) are considered likely to occur in the Study Area. The Short-tailed Mouse occurs in a wide range of habitat, with a preference for stony hummock grasslands, while the Spectacled Hare-wallaby prefers stony and sandy plains with hummock grasses. No individuals or evidence of individuals were observed within the Study Area. All habitats supporting Priority listed species are widespread and common in the regions.	Assuming clearing avoids burrows of the Brush-tailed Mulgara and mounds of the Western Pebble-mound Mouse, then such activities are unlikely to be at variance to this principal.
	b3) Native vegetation should not be cleared if it is or is likely to be habitat for fauna that is otherwise significant.	There are no species of fauna occur within the area that are considered ‘otherwise significant’.	Not at variance with the clearing principle.
	b4) Native vegetation should not be cleared if it provides significant habitat for fauna species in the local area.	The fauna habitats present within the Study Area are widespread and largely common within the Pilbara. Moreover, no significant habitat features occur within the Study Area.	Not at variance with the clearing principle.
	b5) Native vegetation should not be cleared if it maintains ecological functions and processes that protect significant habitat for fauna.	No fauna habitat recorded in the Study Area are important for the maintenance of ecological functions and processes that protect significant fauna habitat.	Not at variance with the clearing principle.

Principle	Criteria	Assessment	Outcome
	b6) Native vegetation should not be cleared if it forms, or is part of, an ecological linkage that is necessary for the maintenance of fauna.	The vegetation associations and fauna habitats within the Study Area are contiguous with the surrounding areas, and vegetation within the Pilbara region is considered largely intact with most of the pre-European vegetation communities still present. Within the Study Area there is little prior clearing, and hence the native vegetation associations present do not occur as remnants in an area that has been extensively cleared. Thus the Study Area is not considered to form part of any ecological linkages.	Not at variance with the clearing principle.
	b7) Native vegetation should not be cleared if it provides significant habitat for fauna communities (assemblages) and meta-populations.	No fauna habitat recorded in the Study Area provide significant habitat for significant fauna communities and meta-populations.	Not at variance with the clearing principle.

5 CONCLUSION

A total of nine broad fauna habitat types were recorded and mapped across the Study Area. This comprised, in increasing order of extent, Claypan, Breakaway/Cliff, Minor Drainage Line, Major Drainage Line, Stony Plain, Drainage Area/Floodplain, Hillcrest/Hillslope, Mulga Woodland and Sand Plain. The Breakaway/Cliff and Sand Plain habitats were deemed to be of high significance. Evidence of Greater Bilby and Brush-tailed Mulgara were recorded from the Sand Plain habitat and may provide critical habitat for these species. In addition, the Night Parrot and Spectacled Hare-wallaby may utilise the sand plain habitat. The Breakaway/Cliff habitat may provide critical habitat for the Northern Quoll, Long-tailed Dunnart, Peregrine Falcon and Pilbara Olive Python.

The Major Drainage Line habitat provides key dispersal habitat and foraging habitat for the Northern Quoll and Pilbara Olive Python, while also potentially providing suitable breeding and foraging habitat for the Peregrine Falcon and the Grey Falcon. As a result, the Major Drainage Line habitat is considered to be of high significance. Two of the remaining habitats recorded (i.e. Stony Plain and Hillcrest/ Hillslope) were considered to be of moderate significance, for the ability to provide supporting habitat for threatened species of conservation of significance and core habitat to DBCA Priority listed species. Small instances of the Hillcrest/ Hillslope provide suitable denning habitat for Northern Quoll and Pilbara Olive Python, although for the most part represent supporting habitat for such species. The Stony Plain habitat is likely to provide suitable habitat for the Spectacled Hare-wallaby, Short-tailed Mouse, *Ctenotus uber* subsp. *johnstonei* and the Western Pebble-mound Mouse.

Evidence of Greater Bilby and Brush-tailed Mulgara were recorded during the survey, with all records (primary and secondary evidence) identified from the Sand Plain habitat. An inactive Greater Bilby burrow was recorded, while active and inactive Brush-tailed Mulgara burrows were recorded, along with one Brush-tailed Mulgara individual that was dead.

The Greater Bilby burrow was old and there was no indication of current occupation, despite extensive survey effort. While not present at the time of survey, the historical presence of the species confirms that the Sand Plain habitat within the Study Area can provide suitable habitat for the species, with the correct temporal variables.

The Brush-tailed Mulgara was recorded on 16 occasions (nine locations) within Sand Plain habitat in the Study Area during the current survey. This included 12 active burrows, two inactive burrows, one digging and recently dead individual, all found in the central section of Study Area. Therefore, the Sand Plain habitat is an important habitat for this Priority species, with the habitat spanning over 31% of the Study Area.

Habitats of the Study Area are moderately common throughout the region. Ten surveys were used in the literature review of this assessment although many others, although not all are publicly available, have been conducted within the local area. Given this, the vertebrate fauna assemblages occurring within the habitats present is relatively well-understood and documented.

A total of 36 vertebrate fauna species were recorded during the current survey within the Study Area, comprising five mammals belonging to four families, three introduced mammal species, 20 birds belonging to 14 families, eight reptiles belonging to three families. This level of diversity is considered average for the Pilbara, however, this number is likely to be an underestimate as no nocturnal work and no trapping was undertaken during this survey.

Although the Sand Plain and Breakaway/Cliff habitats providing suitable habitat for conservation significant fauna, including Greater Bilby, Brush-tailed Mulgara, Long-tailed Dunnart and Western Pebble-mound Mouse, which were either confirmed or considered highly likely to occur in the Study Area, the habitats are extensive in the local region and further within the Pilbara bioregion.

Assuming that all habitats may potentially be impacted to some degree, the proposed Project is unlikely to be at variance to Principles A (biological diversity) or B (threatened fauna) of the ten clearing principles listed under Schedule 5 of the *Environmental Protection Act 1986*. The remaining eight clearing principles have not been addressed within this assessment.

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7 APPENDICES

Appendix A: Conservation listings

International Union for Conservation of Nature

Category	Definition
Extinct (Ex)	A taxon is Extinct when there is no reasonable doubt that the last individual has died. A taxon is presumed Extinct when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual), throughout its historic range have failed to record an individual. Surveys should be over a time frame appropriate to the taxon's life cycle and life form.
Extinct in the Wild (Ex)	A taxon is Extinct in the Wild when it is known only to survive in cultivation, in captivity or as a naturalized population (or populations) well outside the past range. A taxon is presumed Extinct in the Wild when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual), throughout its historic range have failed to record an individual. Surveys should be over a time frame appropriate to the taxon's life cycle and life form.
Critically Endangered (Cr)	A taxon is Critically Endangered when the best available evidence indicates that it meets any of the criteria A to E for Critically Endangered (see Section V), and it is therefore considered to be facing an extremely high risk of extinction in the wild.
Endangered (En)	A taxon is Endangered when the best available evidence indicates that it meets any of the criteria A to E for Endangered (see Section V), and it is therefore considered to be facing a very high risk of extinction in the wild.
Vulnerable (Vu)	A taxon is Vulnerable when the best available evidence indicates that it meets any of the criteria A to E for Vulnerable (see Section V), and it is therefore considered to be facing a high risk of extinction in the wild.
Near Threatened (NT)	A taxon is Near Threatened when it has been evaluated against the criteria but does not qualify for Critically Endangered, Endangered or Vulnerable now, but is close to qualifying for or is likely to qualify for a threatened category in the near future
Data Deficient (DD)	A taxon is Data Deficient when there is inadequate information to make a direct, or indirect, assessment of its risk of extinction based on its distribution and/or population status. A taxon in this category may be well studied, and its biology well known, but appropriate data on abundance and/or distribution are lacking. Data Deficient is therefore not a category of threat. Listing of taxa in this category indicates that more information is required and acknowledges the possibility that future research will show that threatened classification is appropriate. It is important to make positive use of whatever data are available. In many cases, great care should be exercised in choosing between DD and a threatened status. If the range of a taxon is suspected to be relatively circumscribed, and a considerable period of time has elapsed since the last record of the taxon, threatened status may well be justified.

Environment Protection and Biodiversity Conservation Act 1999

Category	Definition
Extinct (Ex)	Taxa not definitely located in the wild during the past 50 years.
Extinct in the Wild (EW)	Taxa known to survive only in captivity.
Critically Endangered (Cr)	Taxa facing an extremely high-risk of extinction in the wild in the immediate future.
Endangered (En)	Taxa facing a very high risk of extinction in the wild in the near future.
Vulnerable (Vu)	Taxa facing a high risk of extinction in the wild in the medium-term future.
Migratory (Mi)	Consists of species listed under the following International Conventions: Japan-Australia Migratory Bird Agreement (JAMBA); China-Australia Migratory Bird Agreement (CAMBA); Convention on the Conservation of Migratory Species of Wild animals (Bonn Convention)

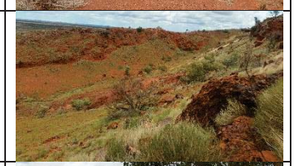
Wildlife Conservation Act 1950

Category	Definition
Schedule 1 (S1)	Rare or likely to become extinct, as critically endangered fauna.
Schedule 2 (S2)	Rare or likely to become extinct, as endangered fauna.
Schedule 3 (S3)	Rare or likely to become extinct, as vulnerable fauna.
Schedule 4 (S4)	Being fauna that is presumed to be extinct.
Schedule 5 (S5)	Birds that are subject to international agreements relating to the protection of migratory birds.
Schedule 6 (S6)	Special conservation need being species dependent on ongoing conservation intervention.
Schedule 7 (S7)	In need of special protection, otherwise than for the reasons pertaining to Schedule 1 through to Schedule 6 Fauna.

Department of Biodiversity, Conservation and Attractions Priority Definitions

Category	Definition
Priority 1 (P1)	Taxa with few, poorly known populations on threatened lands.
Priority 2 (P2)	Taxa with few, poorly known populations on conservation lands; or taxa with several, poorly known populations not on conservation lands.
Priority 3 (P3)	Taxa with several, poorly known populations, some on conservation lands.
Priority 4 (P4)	Taxa in need of monitoring. Taxa which are considered to have been adequately surveyed, or for which sufficient knowledge is available, and which are considered not currently threatened or in need of special protection, but could be if present circumstances change.

Appendix B: Habitat Assessments

Site ID	Habitat Type	Landform	Aspect	Slope	Soil Type	Soil Availability	Outcrop	Rock Outcropping	Rock Size	Vegetation Litter	Hollow Bearing Trees	Last Fire	Disturbance	Comments	Latitude	Longitude	Photo
CAR-01	Breakaway/ Cliff	Ironstone Outcrops	North	Low	Silty Loam	Many Large Patches	Major Outcropping	BIF	Large Rocks (21-60cm)	Many Small Patches	0	Old (6+ yr)	None Discernible	Rock outcrop also conglomerate	-23.37031	120.474588	
CAR-02	Sandy/ Stony Plain	Sandy/ Stony Plain	Flat	Flat	Sandy Clay Loam	Evenly Spread	Negligible	None Discernible	Small Rocks (11-20cm)	Many Large Patches	0	Old (6+ yr)	None Discernible	SM4 acoustic deployed here (other method)	-23.37459	120.269558	
CAR-03	Boulders/ Rockpiles	Hillcrest/ Upper Hillslope	North/ East	Moderate	Silty Clay Loam	Few Small Patches	Moderate Outcropping	BIF	Large Rocks (21-60cm)	Few Small Patches	0	Old (6+ yr)	None Discernible		-23.36939	120.35121	
CAR-04	Sand Plain	Sand Plain	Flat	Flat	Clayey Sand	Evenly Spread	Negligible	None Discernible	Negligible	Few Small Patches	0	Old (6+ yr)	Cattle Grazing		-23.3846	120.445129	
CAR-05	Stony Plain	Stony Plain	Flat	Flat	Silty Clay Loam	Few Small Patches	Negligible	None Discernible	Pebbles (5-10cm)	Many Small Patches	0	Old (6+ yr)	Road/ Access Track		-23.38982	120.515866	
CAR-06	Minor Drainage Line	Minor Drainage Line	South/ West	Low	Sand	Evenly Spread	Negligible	None Discernible	Gravel (1-4cm)	Many Large Patches	0	Old (6+ yr)	Cattle Grazing		-23.38408	120.494745	
CAR-07	Breakaway/ Cliff	Gully	South	Steep	Silty Loam	Scarce	Extensive Outcropping	BIF	Boulders (>61cm)	Few Small Patches	0	Moderate (3 to 5 yr)	None Discernible		-23.37546	120.490806	
CAR-08	Sand Plain	Sand Plain	Flat	Flat	Sandy Clay Loam	Evenly Spread	Negligible	None Discernible	Negligible	Few Small Patches	0	Old (6+ yr)	Road/ Access Track	SM4 acoustic deployed here (other method)	-23.35512	120.408244	
CAR-09	Hillcrest/ Hillslope	Hillcrest/ Upper Hillslope	West	Low	Silty Loam	Scarce	Negligible	None Discernible	Pebbles (5-10cm)	Few Small Patches	0	Old (6+ yr)	Road/ Access Track		-23.39067	120.331581	

Site ID	Habitat Type	Landform	Aspect	Slope	Soil Type	Soil Availability	Outcrop	Rock Outcropping	Rock Size	Vegetation Litter	Hollow Bearing Trees	Last Fire	Disturbance	Comments	Latitude	Longitude	Photo
CAR-10	Major Drainage Line	Major Drainage Line	North/ East	Low	Clayey Sand	Evenly Spread	Negligible	None Discernible	Gravel (1-4cm)	Many Large Patches	0	Old (6+ yr)	Cattle Grazing		-23.38744	120.311532	
CAR-11	Claypan	Gilgai Plain	Flat	Flat	Clay Loam	Evenly Spread	Negligible	None Discernible	Gravel (1-4cm)	Scarce	0	Old (6+ yr)	None Discernible		-23.37188	120.29923	
CAR-12	Hillcrest/ Hillslope	Gully	North/ West	Moderate	Silty Clay Loam	Scarce	Major Outcropping	BIF	Large Rocks (21-60cm)	Many Small Patches	0	Old (6+ yr)	Mining Exploration		-23.37704	120.245722	
CAR-13	Hillcrest/ Hillslope	Hillslope	North	Moderate	Silty Clay Loam	Scarce	Negligible	None Discernible	Pebbles (5-10cm)	Few Small Patches	0	Moderate (3 to 5 yr)	Road/ Access Track		-23.39489	120.277143	
CAR-14	Sand Plain	Sand Plain	Flat	Flat	Clayey Sand	Evenly Spread	Negligible	None Discernible	Negligible	Few Small Patches	0	Recent (0 to 2 yr)	Cattle Grazing		-23.38738	120.362969	
CAR-15	Sand Plain	Sand Plain	Flat	Flat	Clayey Sand	Evenly Spread	Negligible	None Discernible	Negligible	Few Small Patches	0	Recent (0 to 2 yr)	Cattle Grazing		-23.40224	120.489688	
CAR-16	Mulga Woodland	Sandy/ Stony Plain	Flat	Flat	Sandy Clay Loam	Evenly Spread	Negligible	None Discernible	Small Rocks (11-20cm)	Many Large Patches	0	Old (6+ yr)	Cattle Grazing		-23.41082	120.316386	
CAR-17	Stony Plain	Stony Plain	Flat	Flat	Silty Clay Loam	Scarce	Negligible	None Discernible	Pebbles (5-10cm)	Few Large Patches	0	Old (6+ yr)	Cattle Grazing	SM4 acoustic deployed here (other method)	-23.36923	120.30225	
CAR-18	Sand Plain	Sand Plain	Flat	Flat	Sandy Clay Loam	Evenly Spread	Negligible	None Discernible	Negligible	Few Small Patches	0	Moderate (3 to 5 yr)	Cattle Grazing		-23.37203	120.3808	

Site ID	Habitat Type	Landform	Aspect	Slope	Soil Type	Soil Availability	Outcrop	Rock Outcropping	Rock Size	Vegetation Litter	Hollow Bearing Trees	Last Fire	Disturbance	Comments	Latitude	Longitude	Photo
CAR-19	Calcrete Plain	Calcrete Outcrops	Flat	Low	Clayey Sand	Many Small Patches	Moderate Outcropping	Limestone	Small Rocks (11-20cm)	Many Small Patches	2	Old (6+ yr)	Cattle Grazing	Buffel Grass	-23.36741	120.460472	
CAR-20	Hillcrest/ Hillslope	Hillslope	South/ East	Steep	Silty Clay Loam	Scarce	Major Outcropping	BIF	Large Rocks (21-60cm)	Few Small Patches	0	Old (6+ yr)	Mining Exploration	Adit	-23.36972	120.197057	
CAR-21	Major Drainage Line	Major Drainage Line	North/ East	Moderate	Silty Loam	Evenly Spread	Major Outcropping	BIF	Small Rocks (11-20cm)	Few Large Patches	3	Moderate (3 to 5 yr)	Cattle Grazing	Closed Adit - blocked with rock, small space near top	-23.36766	120.193559	
EE_S05	Hillcrest/ Hillslope	Sandy/ Stony Plain	-	-	-	-	-	-	-	-	-	-	-	-	-23.38150	120.242123	
EE_S06	Hillcrest/ Hillslope	Sandy/ Stony Plain	-	-	-	-	-	-	-	-	-	-	-	-	-23.3789	120.25707	
OES_S09	Hillcrest/ Hillslope	Boulders/ Rockpiles	-	-	-	-	-	-	-	-	-	-	-	-	-23.37624	120.246446	

Appendix C: Vertebrate Fauna Identified in the Desktop Assessment

Mammals

Scientific name	Common name	Conservation Status				Database Searches			Literature Sources													Current Survey
		EPBC	WCA	DBCA	IUCN	NatureMap	DoEE Protected Matters	DBCA Threatened Fauna	GHD 2009	ENV Australia 2012	Biologic 2014a	Onshore, 2015	Biologic 2013	Biologic 2014b	ENV Australia 2007	Onshore Environmental 2014	Biologic 2016a	Biologic 2016	Ecologia 2005	Ecologia 2006	Outback Ecology 2009a	
BOVIDAE																						
**Bos taurus*	Cow					●			●	●	●		●			●	●			●	●	●
CAMELIDAE																						
**Camelus dromedarius*	Camel					●			●	●	●	●	●				●	●				●
CANIDAE																						
Canis dingo	Dingo					●			●	●	●		●	●		●			●	●	●	●
**Canis familiaris*	Dog											●	●									
**Vulpes vulpes*	Fox														●							
DASYURIDAE																						
Dasycercus blythi	Brush-tailed Mulgara			P4		●		●			●		●	●			●	●				●
Dasykaluta rosamondae	Little Red Kaluta					●				●			●	●				●		●	●	
Dasyurus hallucatus	Northern Quoll	En	S2		En		Likely	●														
Ningaui timealeyi	Pilbara Ningaui					●								●						●		
Planigale sp. 1	Undescribed Pilbara planigale									●												
Pseudantechinus roryi	Rory's Pseudantechinus					●																
Pseudantechinus woolleyae	Woolley's Pseudantechinus					●								●								
Sminthopsis crassicaudata	Fat-tailed Dunnart					●								●						●	●	
Sminthopsis longicaudata	Long-tailed Dunnart			P4		●		●														

Scientific name	Common name	Conservation Status				Database Searches			Literature Sources													Current Survey
		EPBC	WCA	DBCA	IUCN	NatureMap	DoEE Protected Matters	DBCA Threatened Fauna	GHD 2009	ENV Australia 2012	Biologic 2014a	Onshore, 2015	Biologic 2013	Biologic 2014b	ENV Australia 2007	Onshore Environmental 2014	Biologic 2016a	Biologic 2016	Ecologia 2005	Ecologia 2006	Outback Ecology 2009a	
Sminthopsis macroura	Stripe-faced Dunnart					•							•	•						•	•	
Sminthopsis ooldea	Ooldea Dunnart					•					•											
Sminthopsis youngsoni	Lesser Hairy-footed Dunnart					•				•	•		•	•				•			•	
EMBALLONURIDAE																						
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat									•	•		•			•	•	•	•	•		
Taphozous georgianus	Common Sheathtail-bat					•				•	•			•	•	•	•	•		•		
Taphozous hilli	Hill's Sheathtail-bat									•	•			•				•				
EQUIDAE																						
**Equus asinus*	Donkey					•						•					•			•	•	
**Equus caballus*	Horse												•								•	
FELIDAE																						
**Felis catus*	Cat					•			•	•		•	•	•	•	•	•		•	•	•	•
HIPPOSIDERIDAE																						
Rhinonicteris aurantia	Pilbara Leaf-nosed Bat	Vu	S3				May	•												•		
LEPORIDAE																						
**Oryctolagus cuniculus*	Rabbit								•		•											
MACROPODIDAE																						
Lagorchestes conspicillatus subsp. *leichardti*	Spectacled Hare-Wallaby			P3		•		•							•							
Osphranter robustus subsp. *erubescens*	Euro, Biggada					•				•	•			•		•			•	•	•	
Osphranter rufus	Red Kangaroo, Marlu					•			•	•			•				•		•	•	•	•

Scientific name	Common name	Conservation Status				Database Searches			Literature Sources													Current Survey
		EPBC	WCA	DBCA	IUCN	NatureMap	DoEE Protected Matters	DBCA Threatened Fauna	GHD 2009	ENV Australia 2012	Biologic 2014a	Onshore, 2015	Biologic 2013	Biologic 2014b	ENV Australia 2007	Onshore Environmental 2014	Biologic 2016a	Biologic 2016	Ecologia 2005	Ecologia 2006	Outback Ecology 2009a	
Petrogale rothschildi	Rothschild's Rock-wallaby					•								•	•							
MEGADERMATIDAE																						
Macroderma gigas	Ghost Bat	Vu	S3		Vu	•	Likely	•						•						•		
MOLOSSIDAE																						
Austronomus australis	White-striped Freetail-bat															•						
Chaerephon jobensis subsp. *colonicus*	Northern Freetail-bat					•				•	•		•	•		•	•	•	•			
Ozimops lumsdenae	Northern Free-tailed Bat									•	•		•		•					•		
MURIDAE																						
**Mus musculus*	House Mouse					•				•	•		•	•	•					•	•	
Leggadina lakedownensis	Short-tailed Mouse			P4				•							•							
Notomys alexis	Spinifex Hopping-mouse					•							•	•			•	•		•		
Pseudomys chapmani	Western Pebble-mound Mouse			P4		•		•		•				•							•	
Pseudomys desertor	Desert Mouse					•					•		•	•	•			•		•		
Pseudomys hermannsburgensis	Sandy Inland Mouse					•				•	•		•	•	•			•		•	•	
Zyzomys argurus	Common Rock-rat					•				•	•			•	•	•				•	•	•
NOTORYCTIDAE																						
Notoryctes caurinus	Northern Marsupial Mole			P4				•														
TACHYGLOSSIDAE																						
Tachyglossus aculeatus	Echidna													•							•	
THYLACOMYIDAE																						

Scientific name	Common name	Conservation Status				Database Searches			Literature Sources														Current Survey
		EPBC	WCA	DBCA	IUCN	NatureMap	DoEE Protected Matters	DBCA Threatened Fauna	GHD 2009	ENV Australia 2012	Biologic 2014a	Onshore, 2015	Biologic 2013	Biologic 2014b	ENV Australia 2007	Onshore Environmental 2014	Biologic 2016a	Biologic 2016	Ecologia 2005	Ecologia 2006	Outback Ecology 2009a	
Macrotis lagotis	Bilby, Dalgyte	Vu	S3		Vu		May	•														•
VESPERTILIONIDAE																						
Chalinolobus gouldii	Gould's Wattled Bat					•				•	•		•	•	•	•		•	•	•		
Nyctophilus geoffroyi	Lesser Long-eared Bat					•				•	•		•		•		•	•	•	•		
Scotorepens greyii	Little Broad-nosed Bat					•				•	•		•	•	•		•	•	•	•		
Vespadelus finlaysoni	Finlayson's Cave Bat					•				•	•		•	•	•	•	•	•	•	•		

Birds

Scientific name	Common name	Conservation Status				Database Searches				Literature Sources													Current Survey
		EPBC	WCA	DBCA	IUCN	NatureMap	DoEE Protected Matters	DBCA Threatened Fauna	BirdLife	GHD 2009	ENV Australia 2012	Biologic 2014a	Onshore, 2015	Biologic 2013	Biologic 2014b	ENV Australia 2007	Onshore Environmental 2014	Biologic 2016a	Biologic 2016	Ecologia 2005	Ecologia 2006	Outback Ecology 2009a	
ACANTHIZIDAE																							
Acanthiza apicalis	Inland Thornbill					•					•	•								•		•	
Acanthiza chrysorrhoa	Yellow-rumped Thornbill					•												•			•		
Acanthiza robustirostris	Slaty-backed Thornbill					•						•									•		
Acanthiza uropygialis	Chestnut-rumped Thornbill					•			•			•		•				•	•		•		
Aphelocephala leucopsis	Southern Whiteface					•																	
Aphelocephala nigricincta	Banded Whiteface					•																	
Gerygone fusca	Western Gerygone					•			•	•					•	•		•	•			•	
Pyrrholaemus brunneus	Redthroat											•											
Smicrornis brevirostris	Weebill					•			•	•	•	•			•	•	•		•		•	•	
ACCIPITRIDAE																							
Accipiter cirrocephalus	Collared Sparrowhawk					•								•	•			•					
Accipiter fasciatus	Brown Goshawk					•								•	•				•		•		
Aquila audax	Wedge-tailed Eagle					•			•		•			•	•	•		•			•	•	•
Circus assimilis	Spotted Harrier					•			•		•				•		•				•		•
Elanus caeruleus subsp. *axillaris*	Black-shouldered Kite					•			•			•			•	•							
Haliastur sphenurus	Whistling Kite					•			•		•	•		•	•	•	•				•	•	•
Hamirostra isura	Square-tailed Kite					•			•														

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Hamirostra melanosternon	Black-breasted Buzzard					•			•		•	•			•	•	•			•	•	•	
Hieraaetus morphnoides	Little Eagle					•			•											•	•	•	
Milvus migrans	Black Kite					•			•						•	•						•	
Pandion haliaetus	Eastern Osprey	Mi	S5					•															
AEGOTHELIDAE																							
Aegotheles cristatus	Australian Owlet-nightjar					•			•	•	•	•			•	•				•	•		
ALAUDIDAE																							
Mirafra cantillans	Singing Bushlark					•															•		
Mirafra javanica	Horsfield's Bushlark								•													•	•
ALCEDINIDAE																							
Dacelo leachii subsp. leachii	Blue-winged Kookaburra					•			•												•		
Todiramphus pyrrhopygius	Red-backed Kingfisher					•			•	•	•	•			•	•					•	•	
Todiramphus sanctus	Sacred Kingfisher					•			•	•				•						•	•		
ANATIDAE																							
Anas querquedula	Garganey	Mi	S5					•						•									
Chenonetta jubata	Australian Wood Duck																				•		
Tadorna tadornoides	Australian Shell Duck					•			•												•		
APODIDAE																							
Apus pacificus	Fork-tailed Swift	Mi	S5				Likely	•															

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ARDEIDAE																							
Ardea novaehollandiae	White-faced Heron																				•		
Ardea pacifica	White-necked Heron					•			•					•					•		•		
ARTAMIDAE																							
Artamus cinereus	Black-faced Woodswallow					•			•		•	•		•	•	•	•	•	•	•	•	•	
Artamus minor	Little Woodswallow					•			•		•	•			•	•							
Artamus personatus	Masked Woodswallow					•			•					•	•							•	
Cracticus nigrogularis	Pied Butcherbird					•			•		•	•		•	•	•	•		•	•	•	•	
Cracticus tibicen	Australian Magpie					•			•		•				•	•		•	•			•	
Cracticus torquatus	Grey Butcherbird					•				•	•			•					•	•	•		
BURHINIDAE																							
Burhinus grallarius	Bush Stone-curlew					•			•					•		•						•	
CACATUIDAE																							
Cacatua roseicapilla	Galah					•			•	•	•	•		•	•	•			•	•	•		•
Cacatua sanguinea	Little Corella					•			•										•		•	•	
Nymphicus hollandicus	Cockatiel					•			•		•			•		•		•	•		•		
CAMPEPHAGIDAE																							
Coracina maxima	Ground Cuckoo-shrike					•			•					•							•		
Coracina novaehollandiae subsp. *subpallida*	Black-faced Cuckoo-shrike					•			•		•	•		•	•	•	•	•	•	•	•	•	

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Lalage tricolor	White-winged Triller					•			•		•			•	•	•		•			•		
CAPRIMULGIDAE																								
Eurostopodus argus	Spotted Nightjar					•			•		•			•		•		•	•	•	•		
CASUARIIDAE (BHP)																								
Dromaius novaehollandiae	Emu					•			•							•							
CHARADRIIDAE																								
Charadrius veredus	Oriental Plover	Mi	S5				May	•																
Elseyornis melanops	Black-fronted Dotterel					•			•					•							•		
CICONIIDAE																								
Ephippiorhynchus asiaticus	Black-necked Stork				NT									•									
CLIMACTERIDAE																								
Climacteris melanurus	Black-tailed Treecreeper																							
COLUMBIDAE																								
Geopelia cuneata	Diamond Dove					•			•		•	•		•	•	•	•			•			•
Geopelia humeralis	Bar-shouldered Dove																		•					
Geopelia striata subsp. *placida*	Peaceful Dove					•												•			•		
Geophaps plumifera subsp. ferruginea	Spinifex Pigeon					•			•	•	•	•		•	•	•					•	•	
Ocyphaps lophotes	Crested Pigeon					•			•	•	•	•		•	•	•		•	•	•	•	•	•
Phaps chalcoptera	Common Bronzewing					•			•		•	•		•	•	•		•	•	•	•		

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CORVIDAE																							
Corvus bennetti	Little Crow					•			•											•	•		
Corvus orru subsp. cecilae	Torresian Crow					•			•	•	•	•		•	•	•	•	•	•	•	•	•	
CUCULIDAE																							
Cacomantis pallidus	Pallid Cuckoo					•			•		•					•	•	•			•		
Centropus phasianinus subsp. highami	Pheasant Coucal																				•		
Chrysococcyx basalis	Horsfield's Bronze-Cuckoo					•			•					•							•		
Chrysococcyx osculans	Black-eared Cuckoo					•					•												
DICAEIDAE																							
Dicaeum hirundinaceum	Mistletoebird					•			•				•		•						•		
ESTRILDIDAE																							
Emblema pictum	Painted Finch					•			•		•	•	•		•	•					•		
Taeniopygia guttata subsp. *castanotis*	Zebra Finch					•			•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
FALCONIDAE																							
Falco berigora	Brown Falcon					•			•	•	•	•		•	•	•			•	•	•	•	•
Falco cenchroides	Nankeen Kestrel					•			•	•	•	•		•	•	•				•	•	•	•
Falco hypoleucos	Grey Falcon		S3		Vu			•															
Falco longipennis	Australian Hobby					•			•		•			•	•					•	•		
Falco peregrinus	Peregrine Falcon		S7			•		•															

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HIRUNDINIDAE																							
Cheramoeca leucosterna	White-backed Swallow					•			•												•	•	
Hirundo rustica	Barn Swallow	Mi	S5				May																
Petrochelidon ariel	Fairy Martin					•			•						•	•							
Petrochelidon nigricans	Tree Martin																		•				
LOCUSTELLIDAE																							
Eremiornis carteri	Spinifexbird					•			•		•			•	•	•	•					•	
Megalurus cruralis	Brown Songlark								•					•									•
Megalurus mathewsi	Rufous Songlark								•		•			•	•	•		•	•		•		
MALURIDAE																							
Amytornis striatus subsp. *whitei*	Striated Grasswren					•			•		•	•			•	•					•	•	
Malurus lamberti subsp. *assimilis*	Variegated Fairy-wren					•			•		•	•		•	•	•	•	•	•	•	•	•	
Malurus leucopterus subsp. *leuconotus*	White-winged Fairy-wren					•			•		•		•	•	•				•	•	•	•	
Malurus splendens	Splendid Fairy-wren					•																	
Stipiturus ruficeps	Rufous-crowned Emu-wren					•			•												•		
MEGAPODIIDAE																							
Acanthagenys rufogularis	Spiny-cheeked Honeyeater					•			•	•	•			•	•	•	•	•	•	•	•		
Certhionyx variegatus	Pied Honeyeater					•			•												•		
Conopophila whitei	Grey Honeyeater					•																	

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Epthianura tricolor	Crimson Chat					•			•	•				•	•	•					•		
Gavicalis virescens	Singing Honeyeater								•		•	•	•	•	•	•	•	•	•	•	•	•	
Lichmera indistincta	Brown Honeyeater					•			•		•				•	•				•	•		
Manorina flavigula	Yellow-throated Miner					•			•	•	•	•	•		•	•	•		•	•	•	•	
Melithreptus gularis subsp. *laetior*	Black-chinned Honeyeater														•								
Ptilotula keartlandi	Grey-headed Honeyeater								•		•				•	•						•	
Ptilotula pencillata	White-plumed Honeyeater								•		•			•	•	•				•	•	•	•
Purnella albifrons	White-fronted Honeyeater												•										
Sugomel niger	Black Honeyeater										•		•								•		
MEROPIDAE																							
Merops ornatus	Rainbow Bee-eater					•			•		•	•	•	•	•				•	•	•	•	
MONARCHIDAE																							
Grallina cyanoleuca	Magpie-lark					•			•	•				•	•	•		•	•	•	•	•	•
MOTACILLIDAE																							
Anthus australis subsp. *australis*	Australasian Pipit								•	•	•				•	•			•		•	•	
Motacilla cinerea	Grey Wagtail	Mi	S5				May																
Motacilla flava	Yellow Wagtail	Mi	S5				May																
NEOSITTIDAE																							
Daphoenositta chrysoptera	Varied Sittella					•																	

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OTIDIDAE																								
Ardeotis australis	Australian Bustard					•			•	•	•	•	•	•					•	•	•	•	•	
PACHYCEPHALIDAE																								
Colluricincla harmonica subsp. *rufiventris*	Grey Shrike-thrush					•			•	•	•				•	•	•			•	•	•	•	
Oreoica gutturalis	Crested Bellbird					•			•		•			•	•	•			•		•			
Pachycephala rufiventris subsp. *rufiventris*	Rufous Whistler					•			•	•	•	•		•	•	•	•	•	•	•	•	•		
PARDALOTIDAE																								
Pardalotus rubricatus	Red-browed Pardalote					•			•		•	•			•	•					•			
Pardalotus striatus subsp. *murchisoni*	Striated Pardalote														•									
PETROICIDAE																								
Melanodryas cucullata	Hooded Robin					•			•		•			•	•	•	•				•	•		
Petroica goodenovii	Red-capped Robin					•			•					•	•				•	•	•	•	•	
PHAETHONTIDAE																								
Phalacrocorax sulcirostris	Little Black Cormorant																				•			
PHASIANIDAE																								
Coturnix pectoralis	Stubble Quail					•			•		•									•				
Coturnix ypsilophora	Brown Quail																				•			
PODARGIDAE																								

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Podargus strigoides	Tawny Frogmouth					•			•	•	•					•				•	•		
POMATOSTOMIDAE																							
Pomatostomus superciliosus	White-browed Babbler																•						
Pomatostomus temporalis subsp. *rubeculus*	Grey-crowned Babbler					•			•	•	•	•		•	•	•		•	•		•	•	•
PROCELLARIIDAE																							
Macronectes giganteus	Southern Giant Petrel	En, Mi	S5					•															
PSITTACIDAE																							
Melopsittacus undulatus	Budgerigar					•			•		•		•	•	•	•		•		•	•	•	•
Neopsephotus bourkii	Bourke's Parrot																		•		•		•
Pezoporus occidentalis	Night Parrot	En	S1		En		Likely	•															
Platycercus zonarius subsp. *zonarius*	Port Lincoln Parrot					•			•	•	•	•		•	•			•	•	•	•	•	•
Polytelis alexandrae	Princess Parrot	Vu		P4	NT		Likely	•	•														
Psephotus varius	Mulga Parrot											•											
PSOPHODIDAE																							
Cinclosoma clarum	Western Chestnut Quail-thrush					•								•						•			
Psophodes occidentalis	Chiming Wedgebill																						
PTILINORHYNCHIDAE																							

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Ptilonorhynchus maculatus subsp. *guttatus*	Western Bowerbird					•			•		•	•		•	•				•		•		
RALLIDAE																							
Tribonyx ventralis	Black-tailed Native-hen					•			•					•							•		
RHIPIDURIDAE																							
Rhipidura leucophrys subsp. *leucophrys*	Willie Wagtail					•			•	•	•	•		•	•	•		•	•	•	•	•	
SCOLOPACIDAE																							
Calidris acuminata	Sharp-tailed Sandpiper	Mi	S5				May	•															
Calidris ferruginea	Curlew Sandpiper	Cr/Mi	S3/5		NT		May	•															
Calidris melanotos	Pectoral Sandpiper	Mi	S5				May	•															
Calidris ruficollis	Red-necked Stint	Mi	S5		NT			•															
Calidris subminuta	Long-toed Stint	Mi	S5					•															
Tringa glareola	Wood Sandpiper	Mi	S5					•															
Tringa hypoleucos	Common Sandpiper	Mi	S5			•	May	•	•							•							
Tringa nebularia	Common Greenshank	Mi	S5					•															
Tringa stagnatilis	Marsh Sandpiper	Mi	S5					•															
Tringa totanus	Common Redshank	Mi	S5					•															
STRIGIDAE																							
Ninox boobook	Boobook Owl								•	•	•	•									•	•	
THRESKIORNITHIDAE																							

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Plegadis falcinellus	Glossy Ibis	Mi	S5					•															
TURNICIDAE																							
Turnix velox	Little Button-quail					•			•		•	•		•	•	•	•				•		
TYTONIDAE																							
Tyto alba	Barn Owl					•									•							•	

Reptiles

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AGAMIDAE																						
Amphibolurus longirostris	Long-nosed Dragon					•			•	•	•		•					•	•	•		•
Ctenophorus caudicinctus subsp. *caudicinctus*	Ring-tailed Dragon					•			•	•	•		•	•	•	•		•	•	•	•	•
Ctenophorus isolepis subsp. *isolepis*	Military Dragon or Crested Dragon					•				•	•	•	•				•	•	•			•
Ctenophorus nuchalis	Central Netted Dragon					•							•							•	•	•
Ctenophorus reticulatus	Western Netted Dragon					•				•			•		•			•				
Diporiphora amphiboluroides	Mulga Dragon												•									
Diporiphora valens	Southern Pilbara Tree Dragon					•				•					•							
Moloch horridus	Thorny Devil					•					•											
Pogona minor subsp. *mitchelli*	Dwarf Bearded Dragon					•				•	•		•	•	•			•		•		
BOIDAE (BHP)																						
Antaresia perthensis	Pygmy Python					•				•			•	•						•		
Antaresia stimsoni	Stimson's Python																		•			
Aspidites melanocephalus	Black-headed Python																			•		
Liasis olivaceus subsp. *barroni*	Pilbara Olive Python	Vu	S3				May	•						•								
CHELUIDAE																						

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Chelodina steindachneri	Flat-shelled Turtle					•							•							•		
DIPLODACTYLIDAE																						
Diplodactylus conspicillatus	Fat-tailed Gecko					•				•	•		•	•					•	•	•	
Diplodactylus pulcher	Fine-faced Gecko					•																
Diplodactylus savagei	Southern Pilbara Beak-faced Gecko													•	•							
Lucasium stenodactylum	Gecko					•				•	•		•	•					•		•	
Lucasium wombeyi	Gecko					•				•	•			•								
Oedura fimbria	Western Marbled Velvet Gecko					•				•	•			•					•			
Rhynchoedura ornata	Western Beaked Gecko					•				•			•		•			•	•	•		
Strophurus ciliaris	Gecko																		•			
Strophurus elderi	Jewelled Gecko					•				•					•			•	•			
Strophurus jeanae	Gecko					•				•	•		•						•			
Strophurus wellingtonae	Gecko					•				•	•		•	•	•			•	•	•		
ELAPIDAE																						
Brachyurophis approximans	North-western Shovel-nosed Snake					•				•	•		•		•							
Demansia psammophis subsp. *cupreiceps*	Yellow-faced Whipsnake					•				•	•			•	•				•	•		
Demansia rufescens	Rufous Whipsnake													•	•							

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Furina ornata	Moon Snake													•								
Pseudechis australis	Mulga Snake					•								•						•	•	
Pseudonaja mengdeni	Western Brown Snake					•				•	•		•	•			•	•	•		•	•
Pseudonaja modesta	Ringed Brown Snake					•					•		•	•						•		
Suta fasciata	Rosen's Snake					•				•												
Suta punctata	Little Spotted Snake					•					•		•									
Vermicella snelli	Pilbara Bandy Bandy									•												
GEKKONIDAE																						
Diplodactylus stenodactylum	Sand Plain Gecko														•					•		
Diplodactylus wombeyi															•					•		
Gehyra pilbara	Pilbara Dtella					•				•												
Gehyra punctata	Spotted Rock Dtella					•				•	•		•	•	•	•		•		•	•	
Gehyra purpurascens	Gecko																			•		
Gehyra variegata	Tree Dtella					•				•	•		•	•	•	•		•	•	•	•	
Heteronotia binoei	Bynoe's Gecko					•				•				•	•				•	•	•	
Heteronotia spelea	Desert Cave Gecko					•				•	•			•	•					•		
PYGOPODIDAE																						
Delma butleri	Legless Lizard												•	•	•			•				

Scientific name	Common name	Conservation Status				Database Searches			Literature Sources													Current Survey
		EPBC	WCA	DBCA	IUCN	NatureMap	DoEE Protected Matters	DBCA Threatened Fauna	GHD 2009	ENV Australia 2012	Biologic 2014a	Onshore, 2015	Biologic 2013	Biologic 2014b	ENV Australia 2007	Onshore Environmental 2014	Biologic 2016a	Biologic 2016	Ecologia 2005	Ecologia 2006	Outback Ecology 2009a	
Delma desmosa	Legless Lizard					•																
Delma elegans	Legless Lizard					•				•				•						•		
Delma haroldi	Neck-barred Delma					•				•										•		
Delma nasuta	Long-nosed Delma					•				•				•	•			•				
Delma pax	Legless Lizard					•					•			•	•			•		•	•	
Delma tincta	Legless Lizard					•				•											•	
Lialis burtonis	Burton's legless lizard					•					•		•					•		•	•	
Pygopus nigriceps	Legless Lizard					•														•		
SCINCIDAE																						
Carlia munda	Shaded-litter Rainbow Skink										•									•		
Carlia triacantha	Desert Rainbow Skink					•				•	•		•		•			•				
Cryptoblepharus buchananii	Buchanan's Snake-eyed Skink					•												•				
Cryptoblepharus plagiocephalus															•							
Cryptoblepharus ustulatus	Russet Snake-eyed Skink					•								•								
Ctenotus ariadnae	Ariadna's Ctenotus												•	•	•			•				
Ctenotus duricola	Skink					•				•	•		•	•	•					•	•	
Ctenotus grandis subsp. *titan*	Grand Ctenotus									•			•		•			•		•	•	

Scientific name	Common name	Conservation Status				Database Searches			Literature Sources													Current Survey
		EPBC	WCA	DBCA	IUCN	NatureMap	DoEE Protected Matters	DBCA Threatened Fauna	GHD 2009	ENV Australia 2012	Biologic 2014a	Onshore, 2015	Biologic 2013	Biologic 2014b	ENV Australia 2007	Onshore Environmental 2014	Biologic 2016a	Biologic 2016	Ecologia 2005	Ecologia 2006	Outback Ecology 2009a	
Ctenotus hanloni	Skink					•																
Ctenotus helenae	Skink					•				•	•		•	•	•	•				•	•	
Ctenotus leonhardii	Skink					•									•				•			
Ctenotus pantherinus subsp. *ocellifer*	Leopard Ctenotus					•				•	•		•	•	•			•		•	•	
Ctenotus quattuordecimlineatus	Fourteen-lined Ctenotus					•																
Ctenotus rubicundus	Ruddy Ctenotus													•								
Ctenotus rutilans	Skink					•				•				•						•		
Ctenotus saxatilis	Rock Ctenotus					•				•	•			•	•			•		•	•	
Ctenotus schomburgkii	Skink					•				•										•		
Ctenotus uber subsp. *johnstonei*	Spotted Ctenotus			P2		•							•					•				
Ctenotus uber subsp. *uber*	Spotted Ctenotus					•				•	•									•	•	
Cyclodomorphus melanops subsp. *melanops*	Slender Blue-tongue					•				•	•			•				•		•		
Egernia cygnitos	Pygmy Spiny-tailed Skink (western)										•			•								
Egernia depressa	Pygmy Spiny-tailed Skink					•							•					•		•		
Eremiascincus richardsonii	Broad-banded Sand Swimmer					•												•	•	•		
Lerista bipes	Two-toed Skink					•					•									•		
Lerista flammicauda	Pilbara Flame-tailed Slider					•				•												

Scientific name	Common name	Conservation Status				Database Searches			Literature Sources												Current Survey
		EPBC	WCA	DBCA	IUCN	NatureMap	DoEE Protected Matters	DBCA Threatened Fauna	GHD 2009	ENV Australia 2012	Biologic 2014a	Onshore, 2015	Biologic 2013	Biologic 2014b	ENV Australia 2007	Onshore Environmental 2014	Biologic 2016a	Biologic 2016	Ecologia 2005	Ecologia 2006	Outback Ecology 2009a	
Lerista jacksoni	Jackson's Three-toed Slider									•											
Lerista macropisthopus subsp. *remota*				P2				•													
Lerista muelleri	Skink					•				•				•	•					•	•	
Lerista neander	Skink					•					•		•	•	•	•		•		•	•	
Lerista timida	Dwarf Three-toed Slider					•				•	•		•					•				
Lerista zietzi	Pilbara Blue-tailed Slider					•				•				•	•					•		
Liopholis kintorei	Great Desert Skink	Vu	S3		Vu			•														
Menetia greyii	Common Dwarf Skink					•				•	•			•	•					•	•	
Morethia ruficauda subsp. exquisita	Fire-tailed Skink					•					•			•	•					•		
Notoscincus ornatus	Ornate Soil-crevice Skink					•																
Tiliqua multifasciata	Central Blue-tongue Lizard					•				•	•		•	•	•			•	•	•	•	
TYPHLOPIDAE																						
Anilios ammodytes	Blind Snake									•												
Anilios ganei	Pilbara Flat-headed Blind-snake			P1				•						•	•							
Anilios grypus	Blind Snake									•				•	•					•		
Anilios hamatus	Blind Snake										•			•						•	•	
Anilios waitii	Blind Snake													•								

Scientific name	Common name	Conservation Status				Database Searches			Literature Sources													Current Survey
		EPBC	WCA	DBCA	IUCN	NatureMap	DoEE Protected Matters	DBCA Threatened Fauna	GHD 2009	ENV Australia 2012	Biologic 2014a	Onshore, 2015	Biologic 2013	Biologic 2014b	ENV Australia 2007	Onshore Environmental 2014	Biologic 2016a	Biologic 2016	Ecologia 2005	Ecologia 2006	Outback Ecology 2009a	
VARANIDAE																						
Varanus acanthurus	Spiny-tailed Monitor					•				•	•		•	•	•					•	•	•
Varanus brevicauda	Short-tailed Pygmy Monitor					•				•			•									
Varanus caudolineatus	Stripe-tailed Pygmy Monitor					•				•			•					•			•	
Varanus eremius	Pygmy Desert Monitor					•				•	•				•							
Varanus giganteus	Perentie					•				•			•	•				•		•		•
Varanus gouldii	Gould's Monitor or Bungarra					•				•	•		•		•					•	•	•
Varanus panoptes	Yellow Spotted Monitor					•				•	•		•					•	•	•		
Varanus pilbarensis	Pilbara Rock Monitor					•								•								
Varanus tristis subsp. *tristis*	Racehorse Goanna					•					•			•	•			•		•	•	

Amphibians

Scientific name	Common name	Conservation Status				Database Searches			Literature Sources													Current Survey
		EPBC	WCA	DBCA	IUCN	NatureMap	DoEE Protected Matters	DBCA Threatened Fauna	GHD 2009	ENV Australia 2012	Biologic 2014a	Onshore, 2015	Biologic 2013	Biologic 2014b	ENV Australia 2007	Onshore Environmental 2014	Biologic 2016a	Biologic 2016	Ecologia 2005	Ecologia 2006	Outback Ecology 2009a	
HYLIDAE																						
Cyclorana australis	Giant Frog									•										•		
Cyclorana maini	Sheep Frog					•				•			•					•	•			
Cyclorana platycephala	Water-Holding Frog					•														•		
Litoria rubella	Little Red Tree Frog					•							•	•					•	•	•	
LIMNODYNASTIDAE																						
Notaden nichollsi	Desert Spadefoot					•																
Platyplectrum spenceri	Centralian Burrowing Frog					•												•	•	•		
MYOBATRACHIDAE																						
Uperoleia saxatilis	Pilbara Toadlet					•													•		•	

Fish

Scientific name	Common name	Conservation Status				Database Searches			Literature Sources										Current Survey
		EPBC	WCA	DBCA	IUCN	NatureMap	DoEE Protected Matters	DBCA Threatened Fauna	GHD 2009	ENV Australia 2012	Biologic 2014a	Onshore, 2015	Biologic 2013	Biologic 2014b	ENV Australia 2007	Onshore Environmental 2014	Biologic 2016a	Biologic 2016	
HYLIDAE																			
Leiopotherapon unicolour	Spangled Perch					•													

Appendix D: Fauna Recorded During the Survey

Species	Scientific Name	Current Conservation Status	
		EPBC Act	WC Act
Mammals			
Greater Bilby	*Macrotis lagotis*	Vu	S3
Brush-tailed Mulgara	*Dasycercus blythi*		P4
Red Kangaroo, Marlu	*Osphranter rufus*		
Common Rock-rat	*Zyzomys argurus*		
Cattle	**Bos taurus*		
Camel	**Camelus dromedarius*		
Cat	**Felis catus*		
Dingo	*Canis dingo*		
Birds			
Diamond Dove	*Geopelia cuneata*		
Brown Songlark	*Megalurus cruralis*		
Horsfield's Bushlark	*Mirafra javanica*		
Budgerigar	*Melopsittacus undulatus*		
Bourke's Parrot	*Neopsephotus bourkii*		
Port Lincoln Parrot	*Platycercus zonarius* subsp. *zonarius*		
Nankeen Kestrel	*Falco cenchroides*		
Brown Falcon	*Falco berigora*		
Whistling Kite	*Haliastur sphenurus*		
White-plumed Honeyeater	*Ptilotula pencillata*		
Red-capped Robin	*Petroica goodenovii*		
Zebra Finch	*Taeniopygia guttata* subsp. *castanotis*		
Grey-crowned Babbler	*Pomatostomus temporalis* subsp. *rubeculus*		
Crested Pigeon	*Ocyphaps lophotes*		
Wedge-tailed Eagle	*Aquila audax*		
Grey Shrike-thrush	*Colluricincla harmonica* subsp. *rufiventris*		
Spotted Harrier	*Circus assimilis*		
Australian Bustard	*Ardeotis australis*		
Galah	*Cacatua roseicapilla*		
Magpie-lark	*Grallina cyanoleuca*		
Reptiles			
Gould's Monitor or Bungarra	*Varanus gouldii*		
Perentie	*Varanus giganteus*		
Spiny-tailed Monitor	*Varanus acanthurus*		
Long-nosed Dragon	*Amphibolurus longirostris*		

Species	Scientific Name	Current Conservation Status	
		EPBC Act	WC Act
Western Brown Snake	*Pseudonaja mengdeni*		
Ring-Tailed Dragon	*Ctenophorus caudicinctus* subsp. *caudicinctus*		
Military Dragon or Crested Dragon	*Ctenophorus isolepis* subsp. *isolepis*		
Central Netted Dragon	*Ctenophorus nuchalis*		

Appendix E: Significant Fauna Recorded During the Survey

Species	Scientific Name	Current Conservation Status		Date	Record Type	Count	Latitude	Longitude
		EPBC Act	WC Act					
Greater Bilby	*Macrotis lagotis*	VU	S3	18/02/2018	Burrow (inactive)	1	-23.3698	120.4374
Brush-tailed Mulgara	*Dasycercus blythi*		P4	18/02/2018	Burrow (inactive)	1	-23.3683	120.4436
Brush-tailed Mulgara	*Dasycercus blythi*		P4	18/02/2018	Digging	1	-23.3682	120.4437
Brush-tailed Mulgara	*Dasycercus blythi*		P4	18/02/2018	Individual (dead)	1	-23.3818	120.4548
Brush-tailed Mulgara	*Dasycercus blythi*		P4	18/02/2018	Burrow (active)	1	-23.3815	120.4546
Brush-tailed Mulgara	*Dasycercus blythi*		P4	18/02/2018	Burrow (inactive)	1	-23.3647	120.4103
Brush-tailed Mulgara	*Dasycercus blythi*		P4	20/02/2018	Burrow (active)	5	-23.3739	120.3782
Brush-tailed Mulgara	*Dasycercus blythi*		P4	20/02/2018	Burrow (active)	5	-23.3753	120.3781
Brush-tailed Mulgara	*Dasycercus blythi*		P4	20/02/2018	Burrow (inactive)	1	-23.3713	120.3794