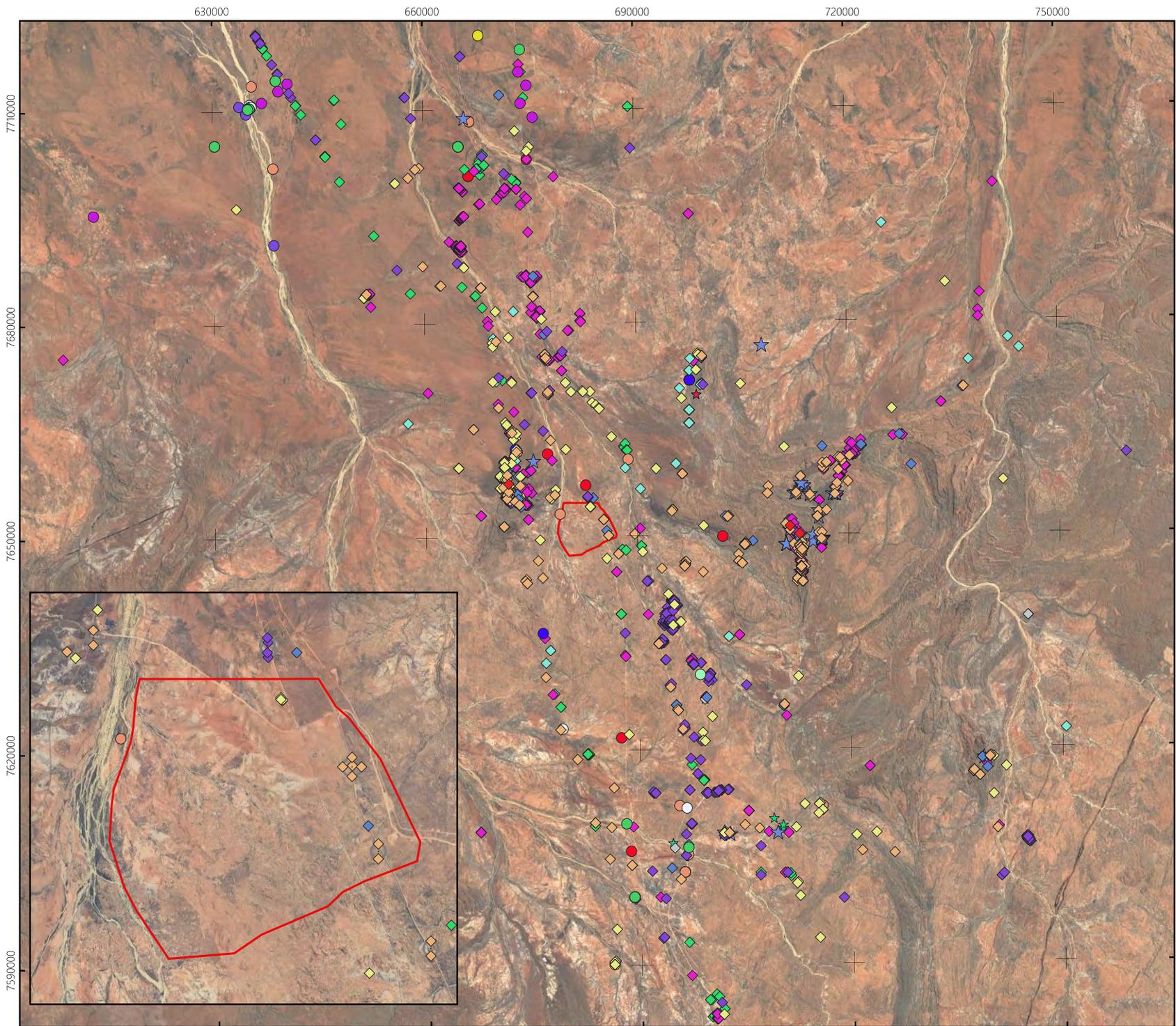


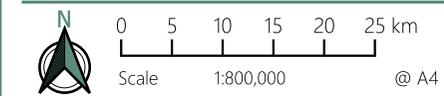
Species	Conservation Status			Database Record				No. Surveys Recorded	Previously Recorded in Survey Area
	EPBC Act	BC Act	DBCA	PMST	DBCA	NatureMap	FID*		
Osprey <i>Pandion haliaetus cristatus</i>	MI	MI	-	-	✓	-	-	-	N
Peregrine Falcon <i>Falco peregrinus</i>	OS	OS	-	-	✓	✓	✓	4	N
Reptiles									
Pilbara Olive Python <i>Liasis olivaceus barroni</i>	VU	VU	-	✓	✓	✓	✓	8	N
Pin-striped Finesnout Ctenotus <i>Ctenotus nigrilineatus</i>	-	-	P1	-	✓	✓	-	-	N
Gane's Blind Snake <i>Anilius ganei</i>	-	-	P1	-	✓	✓	✓	-	N

Notes: * - FID = Fortescue Internal Database, PA: within Night Parrot Priority Area; # - from ALA



Legend

- Survey Area
- Mammals**
 - ◆ Bilby
 - ◆ Ghost Bat
 - ◆ Long-tailed Dunnart
 - ◆ Brush-tailed Mulgara
 - ◆ Northern Quoll
 - ◆ Short-tailed Mouse
 - ◆ Pilbara Leaf-nosed Bat
 - ◆ Spectacled Hare-wallaby
 - ◆ Western Pebble-mound Mouse
- Birds**
 - Common Greenshank
 - Common Sandpiper
 - Pacific Swift
 - Grey Falcon
 - Oriental Plover
 - Oriental Pratincole
 - Osprey
 - Peregrine Falcon
 - Red-necked Stint
 - Sharp-tailed Sandpiper
 - Wood Sandpiper
- Reptiles**
 - ★ Gane's blind Snake
 - ★ Pilbara Olive Python
 - ★ Pin-striped Finesnout Ctenotus



Coordinate System: GDA 1994 MGA Zone 50
Projection: Universal Transverse Mercator
Units: Metre



Author: GF Date: 02-02-2024

DBCAs Threatened Fauna Database Results

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MAP

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3.1

3.2. Fauna Habitat Types

A total of five broad fauna habitat types were recorded from the Survey Area. The habitat types, including both the Spectrum and Fortescue naming conventions and their extents, are outlined in Table 3.3.

Table 3.3: Broad Fauna Habitat Types and Extents in the Survey Area

Spectrum Habitat Type	Fortescue Habitat Type	Extent in Survey Area (ha)	% of Survey Area
Spinifex Sand Plain	Plain (sand)	4,147.9	91.5
Spinifex Rocky Plain	Plain (stony/gibber)	3.4	0.1
Major Drainage Line	Drainage Line/River/Creek (major)	43.5	1.0
Minor Drainage Line	Drainage Line/River/Creek (minor)	61.2	1.4
Granite Domes and Boulder Piles	Granite Outcrops (boulder piles)	121.1	2.7
Cleared/Disturbed	Cleared	155.8	3.4
Total		4,532.9	100

The most common fauna habitat at the Survey Area is the Spinifex Sand Plain habitat (91.5%). The remaining four habitat types (Granite Domes and Boulder Piles, Major and Minor Drainage Lines and Spinifex Rocky Plain), occupy less than 3% of the Survey Area (Table 3.3). The Spinifex Rocky Plain habitat has been distinguished from the surrounding Spinifex Sand Plain due to the accumulation of ironstone pebbles and the presence of the Western Pebble-mound Mouse mounds. The habitat types in the Survey Area also occur in the surrounding region, so they are not restricted to this area. A brief description and potential fauna assemblage (including possible significant fauna) are listed in Table 3.4 and displayed on Map 3.2. Cleared and disturbed areas, covering 155.8 ha (3.4% of the Survey Area), offer no fauna value and have been excluded from Table 3.4.

Table 3.4 Fauna Habitat Types at the Survey Area

Habitat Type (Fortescue Habitat Type)	Habitat Description	Habitat Photo	Potential Faunal Group	Potential Species (Examples)
Spinifex Sand Plain (Plain (sand))	<p>Widespread, flat sand plains consisting of varied substrate with mostly sand, or sandy-loam with some patches of quartz or granitic stones and low granitic outcropping scattered throughout.</p> <p>Vegetation consists of sparse <i>Corymbia hamersleyana</i> over <i>Acacia orthocarpa</i> and <i>A. ancistrocarpa</i> over patches of <i>A. stellaticeps</i> over <i>Triodia epactia</i> and <i>T. lanigera</i> low hummock grasses.</p> <p>Isolated patches of <i>Corymbia hamersleyana</i> scattered trees over <i>Acacia acradenia</i> over <i>Triodia schinzii</i> low hummock grasses occur in some areas associated with the patches of calcrete and quartz stones.</p> <p>Some small patches were recorded that comprised sparse vegetation on clay, however the small size of the area is unlikely to support a distinct fauna assemblage.</p> <p>Leaf and wood litter sparse, and generally restricted to underneath vegetation.</p> <p>Fauna microhabitats: <i>Triodia</i> hummocks, <i>Corymbia</i> trees (flowers, leaf litter & bark), shrubs, and substrate for burrowing.</p>		Mammals	Desert Mouse (<i>Pseudomys desertor</i>), Sandy Inland Mouse (<i>Pseudomys hermannsburgensis</i>), Delicate Mouse (<i>Pseudomys delicatulus</i>).
			Birds	Painted Finch (<i>Emblema pictum</i>), Nankeen Kestrel (<i>Falco cenchroides</i>), Whistling Kite (<i>Haliastur sphenurus</i>), Little Buttonquail (<i>Turnix velox</i>), Australian Bustard (<i>Ardeotis australis</i>).
		Herpetofauna	Smooth Knob-tailed Gecko (<i>Nephurus levis</i>), North-western Sandslider (<i>Lerista bipes</i>), Narrow-banded Shovel-nosed Snake (<i>Brachyuropis fasciolatus</i>), Sand Goanna (<i>Varanus gouldii</i>), Pygmy Desert Goanna (<i>Varanus eremius</i>).	
		Significant	Bilby (<i>Macrotis lagotis</i>), Brush-tailed Mulgara (<i>Dasyercus blythi</i>), Spectacled Hare-wallaby (<i>Lagorchestes conspicillatus</i>), Night Parrot (<i>Pezoporus occidentalis</i>) – in proximity to Samphire only, Grey Falcon (<i>Falco hypoleucos</i>), Ghost Bat (<i>Macroderma gigas</i>), Pilbara Leaf-nosed Bat (<i>Rhinonictis aurantia</i> Pilbara form; lowest Priority), Oriental Plover (<i>Charadrius veredus</i>) – bare patches only.	
Spinifex Rocky Plain (Plain (stony/gibber))	<p>A small area of flat plain with abundant ironstone stones/pebbles and some quartz.</p> <p>Vegetation consists of <i>Corymbia hamersleyana</i>, over <i>Acacia acradenia</i>, over <i>Triodia schinzii</i> low hummock grasses.</p> <p>Leaf and wood litter generally sparse and restricted to underneath vegetation on loamy clay.</p> <p>Fauna microhabitats: <i>Triodia</i> hummocks, <i>Corymbia</i> trees (flowers, leaf litter & bark), shrubs, and substrate for burrowing.</p>		Mammals	Pilbara Ningauai (<i>Ningau timealeyi</i>) & Euro (<i>Osphranter robustus</i>)
			Birds	Spinifex Pigeon (<i>Geophaps plumifera</i>), Little Buttonquail (<i>Turnix velox</i>), Weebill (<i>Smicrornis brevirostris</i>), Brown Falcon (<i>Falco berigora</i>), Whistling Kite (<i>Haliastur sphenurus</i>), Pilbara Death Adder (<i>Acanthophis wellsii</i>).
			Herpetofauna	Rock Ctenotus (<i>Ctenotus saxatilis</i>), Western Ring-tailed Dragon (<i>Ctenophorus caudicinctus</i>), Short-tailed Pygmy Monitor (<i>Varanus brevicauda</i>), Moon Snake (<i>Furina ornata</i>), Southern Phasmid Gecko (<i>Strophurus jeanae</i>), Pilbara Ground Gecko (<i>Lucasium wombeyi</i>), Pilbara Death Adder (<i>Acanthophis wellsii</i>).
			Significant	Western Pebble-mound Mouse (<i>Pseudomys chapmani</i>), Night Parrot (<i>Pezoporus occidentalis</i>) – in proximity to Samphire only, Grey Falcon (<i>Falco hypoleucos</i>), occasionally Ghost Bat (<i>Macroderma gigas</i>)

Habitat Type (Fortescue Habitat Type)	Habitat Description	Habitat Photo	Potential Faunal Group	Potential Species (Examples)
<p>Major Drainage Line (Drainage Line/River/Creek (major))</p>	<p>Wide drainage lines with large eucalypts, and sandy, gravel or small creek stone substrate that may fill intermittently during the wet season or during flooding events, or create pools that retain water sporadically. This habitat also includes the immediately adjacent low-lying drainage areas which are predominately sandy or may occasionally contain granite domes or outcropping. These areas typically feature denser vegetation and may be sporadically inundated during heavy rainfall events .</p> <p>The vegetation within the drainage line consists of <i>Eucalyptus camaldulensis</i> with scattered <i>Corymbia hamersleyana</i> over <i>Acacia trachycarpa</i> and <i>A. tumida</i> over Buffel grass *<i>Cenchrus ciliaris</i> and <i>Triodia epactia</i> and <i>T. longiceps</i>. hummock grasses. The surrounding drainage areas include various <i>Acacia</i> species such as <i>A. trachycarpa</i> and <i>A. stellaticeps</i> over hummock grasses. Leaf</p> <p>Fauna microhabitats: Eucalypt trees (flowers, tree hollows, bark, leaf litter), sandy substrate for digging, woody debris, pools of surface water, sandbanks for construction of burrows and tunnels, increased moisture levels.</p>		<p>Mammals</p> <p>Birds</p> <p>Herpetofauna</p> <p>Significant</p>	<p>Brush-tail Possum (<i>Trichosurus vulpecula</i>), Sandy Inland Mouse (<i>Pseudomys hermannsburgensis</i>), Various bat species.</p> <p>Blue-winged Kookaburra (<i>Dacelo leachii</i>), Collared Sparrowhawk (<i>Accipiter cirrocephalus</i>), Pheasant Coucal (<i>Centropus phasianinus</i>), Sacred Kingfisher (<i>Todiramphus sanctus</i>), White-plumed Honeyeater (<i>Ptilotula penicillata</i>).</p> <p>Inland Dotterel (<i>Peltohyas australis</i>), Grey Teal (<i>Anas gracilis</i>) when inundated.</p> <p>Pilbara Toadlet (<i>Uperoleia saxatilis</i>), Little Red Tree Frog (<i>Litoria rubella</i>), Long-nosed Dragon (<i>Gowidon longirostris</i>), Shaded-litter Rainbow-skink (<i>Carlia munda</i>), Monk Snake (<i>Parasuta monachus</i>), Flat-shelled Turtle (<i>Chelodina steindachneri</i>).</p> <p>Northern Quoll (<i>Dasyercus hallucatus</i>), Pilbara Olive Python (<i>Liasis olivaceus barroni</i>), Bilby (<i>Macrotis lagotis</i>), Ghost Bat (<i>Macroderma gigas</i>), Pilbara Leaf-nosed Bat (<i>Rhinioncteris aurantia</i> Pilbara Form), Grey Falcon (<i>Falco hypoleucos</i>), Peregrine Falcon (<i>Falco peregrinus</i>).</p> <p>When inundated: Common Greenshank (<i>Tringa nebularia</i>), Common Sandpiper (<i>Actitis hypoleucos</i>), Wood Sandpiper (<i>Tringa glareola</i>), Oriental Pratincole (<i>Glareola maldivarum</i>), occasionally Osprey (<i>Pandion haliaetus cristatus</i>).</p>
<p>Minor Drainage Line (Drainage Line/River/Creek (minor))</p>	<p>Narrow drainage lines dominated by shrubs and a sandy substrate that fills intermittently during the wet season or from flooding events. Occasional pools of water may be retained after large rainfall events. This habitat also includes the immediately adjoining areas of low-lying drainage areas which are predominately sandy or may occasionally contain some granite domes or outcropping. These areas are generally more densely vegetated and may be intermittently flooded during significant rainfall events.</p> <p>The vegetation is characterised by <i>Acacia</i> species, such as <i>A. trachycarpa</i> and <i>Acacia tumida</i> over <i>Triodia epactia</i> and <i>Triodia longiceps</i> low hummock grasses over mixed herbs and tussock grasses. Some leaf and wood litter present.</p> <p>Fauna microhabitats: woody debris, sandbanks for construction of burrows and tunnels, and intermittent pools of water.</p>		<p>Mammals</p> <p>Birds</p> <p>Herpetofauna</p> <p>Significant</p>	<p>Delicate Mouse (<i>Pseudomys delicatulus</i>), Sandy Inland Mouse (<i>Pseudomys hermannsburgensis</i>), Desert Mouse (<i>Pseudomys desertor</i>).</p> <p>Willie Wagtail (<i>Rhipidura leucophrys</i>), Chestnut-rumped Thornbill (<i>Acanthiza uropygialis</i>), Grey-crowned Babbler (<i>Pomatostomus temporalis</i>), White-winged Triller (<i>Lalage tricolor</i>), Crested Bellbird (<i>Oreoica gutturalis</i>), Brown Honeyeater (<i>Lichmera indistincta</i>).</p> <p>Long-nosed Dragon (<i>Gowidon longirostris</i>), Sharp-snouted Delma (<i>Delma nasuta</i>), North-western Shovel-nosed Snake (<i>Brachyuropis approximans</i>), Common Dwarf Skink (<i>Menetia greyii</i>), Variegated Gehyra (<i>Gehyra variegata</i>).</p> <p>Northern Quoll (<i>Dasyercus hallucatus</i>), Pilbara Olive Python (<i>Liasis olivaceus barroni</i>), Bilby (<i>Macrotis lagotis</i>), Brush-tailed Mulgara (<i>Dasyercus blythi</i>), Pilbara Leaf-nosed Bat (<i>Rhinioncteris aurantia</i> Pilbara Form), Ghost Bat (<i>Macroderma gigas</i>), Grey Falcon (<i>Falco hypoleucos</i>), Peregrine Falcon (<i>Falco peregrinus</i>).</p>

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7656000

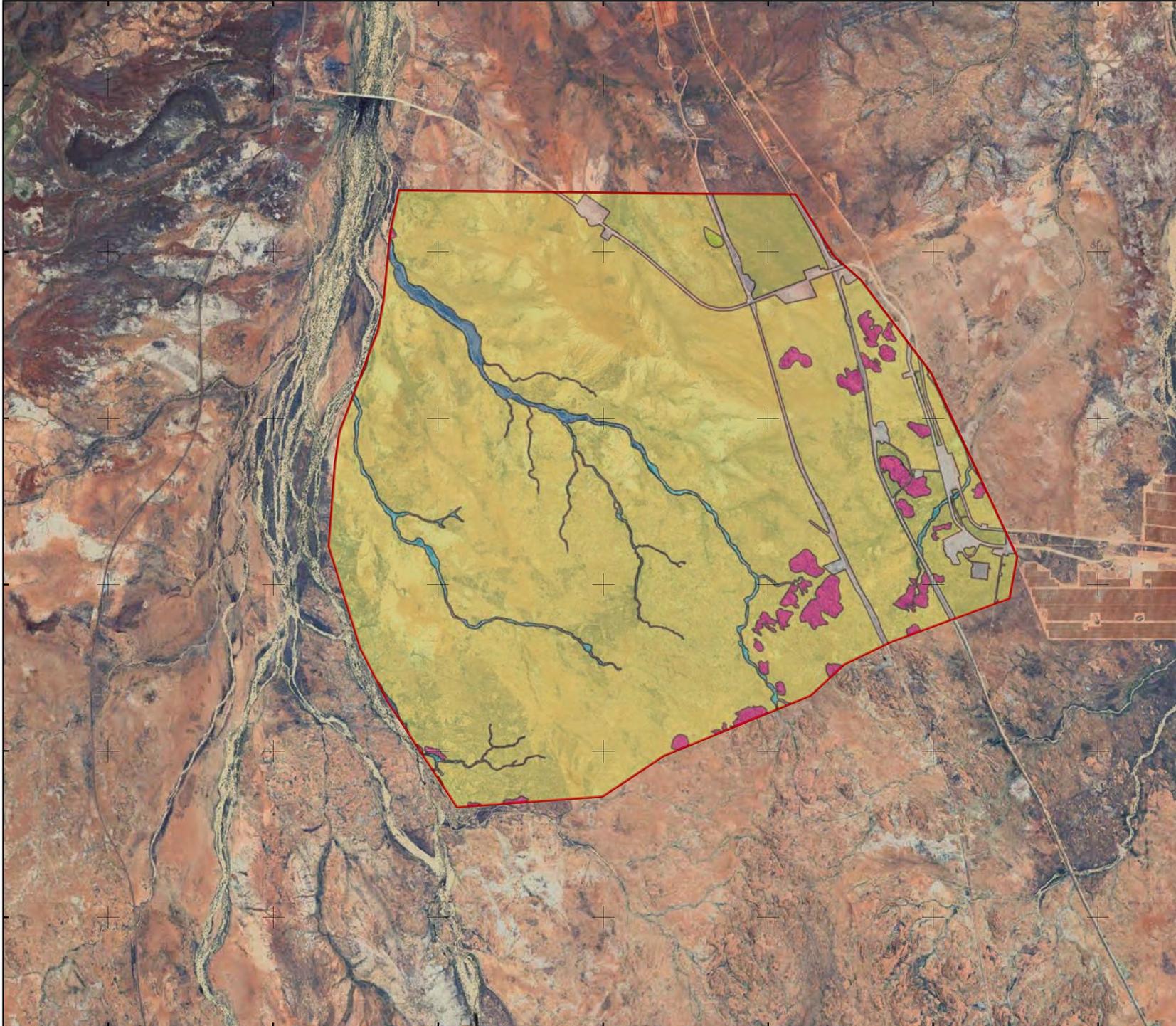
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Legend

Survey Area

Fauna Habitats
(Fortescue name in brackets)

Spinifex Sand Plain
(Plain (sand))

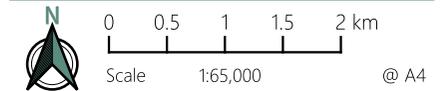
Spinifex Rocky Plain
(Plain (stony/gibber))

Major Drainage Line
(Drainage Line/River/Creek (major))

Minor Drainage Line
(Drainage Line/River/Creek (minor))

Granite Domes & Boulder Piles
(Granite Outcrops (boulder piles))

Cleared/Disturbed
(Cleared)



Coordinate System: GDA 1994 MGA Zone 50
Projection: Universal Transverse Mercator
Units: Metre



Author: EM

Date: 07-06-2024

Preliminary Fauna
Habitats

NSJW Project

MAP

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Fortescue

3.2

3.2.1. Habitat Analysis

Fauna habitats were analysed in terms non-metric MDS scatter plots, separately for vertebrate fauna species caught in trapping grids and for systematically sampled bird species. In Figure 3.1 and Figure 3.2, the three systematic trapping sites installed in Spinifex Sand Plain (NS01, NS02 and NS03) appear to differ from each other when considering the trappable fauna. This is likely due to the extensive fire that burnt through 79% of the Survey Area (section 1.7) in 2022. This fire impacted site NS03, while NS01 and NS02 were not burnt. Site NS01 was located in the vicinity of Granitic Domes and Boulder Piles and a Minor Drainage Line, which may have influenced the assemblage data. The bird assemblage data indicates that sites NS01 and NS03 were similar and that site NS02 was more like the Major Drainage Line habitat (site NS04, Figure 3.2). Both sites were in fact dominated by tall shrubs and an abundance of *Corymbia hamersleyana* trees, with NS04 including a densely regenerating shrub layer post fire, while NS02 was the most densely unburnt vegetated site. The other two Sand Plain sites were both lacking upper strata of vegetation. NS01 was located in dense spinifex grassland with a lower shrubland dominated by *Acacia stellaticeps*, whereas site NS03 was characterised by open and recently burnt vegetation.

The Minor Drainage Line habitat (site NS05) was distinctly different in both, avian and trappable fauna (Figure 3.1, Figure 3.2).

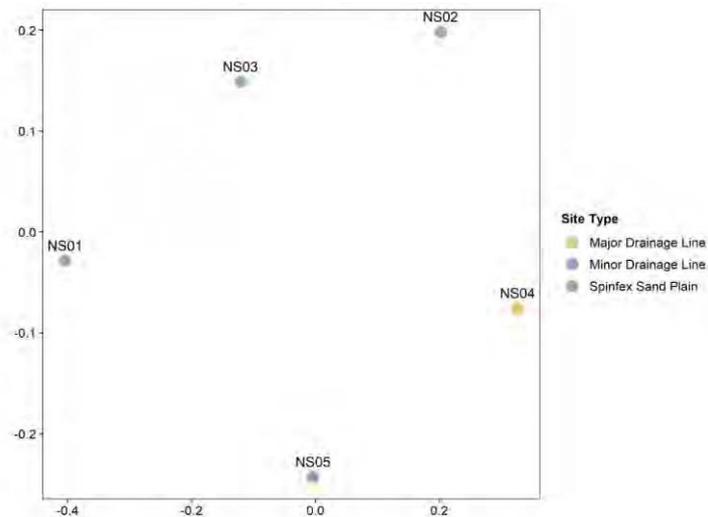


Figure 3.1: Non-metric MDS Scatter Plot of Trapping Grid Vertebrate Fauna Data

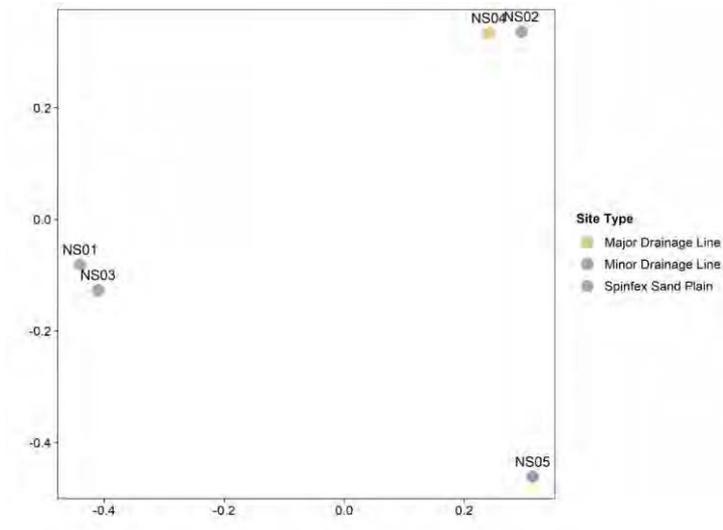


Figure 3.2: Non-metric MDS Scatter Plot of Systematic Bird Survey Data

3.3. Vertebrate Fauna

A total of 123 vertebrate fauna species were recorded during the two phases of surveying: 12 species of native non-volant mammals, eight (or nine due to ambiguous calls) species of bats, five introduced mammals, 54 bird species, 42 reptiles and two amphibians (Appendix D).

The number of mammal species recorded was similar across both survey phases. This consistency suggests that mammal activity was less influenced by the seasonal or environmental differences between the two survey periods.

Bird activity was higher in Phase 1, with 49 species recorded compared to 34 in Phase 2. Notably, 18 bird species, including four birds of prey, were observed exclusively during Phase 1. This increased activity is likely due to Phase 1 being conducted shortly after the wet season, coinciding with peak flowering. Above-median rainfall during this time likely enhanced food resources, attracting more species (section 2.2.2). Conversely, Phase 2 was conducted post dry season, outside the typical flowering period for most plants. Unseasonably high temperatures during Phase 2 may have further reduced bird presence. Additionally, the 2022 fire, which burned 79% of the Survey Area, likely impacted bird diversity by reducing flowering plants and microhabitats.

Reptile activity showed an opposite trend, with 40 species recorded in Phase 2 compared to 23 species in Phase 1. The higher temperatures during Phase 2 likely contributed to this increase, as reptiles are more active in warmer conditions (section 2.2.2). In contrast, the cooler temperatures experienced during Phase 1, conducted just after the wet season, may have limited reptile activity.

Amphibians showed a slight increase in Phase 2, with two species recorded compared to one species in Phase 1. This increase is likely linked to unusual winter rainfall within three months of the Phase 2 survey (June 2023, section 2.2.2). Such rainfall can activate estivating species, like burrowing frogs.

Overall, the above-median rainfall prior to both survey phases created favourable conditions for many fauna groups by enhancing food resources, such as seeds and flowering plants, and stimulating breeding activity. These conditions likely benefited amphibians, birds, and mammals, particularly seed-eating birds and nomadic species. However, the positive effects of the rainfall may have been offset by the 2022 fire, which significantly reduced habitat availability. Additionally, the hot temperatures during Phase 2 may have further mitigated the benefits of the increased rainfall. Weather data from the Marble Bar station (#4106), presented in Figure 2.2, highlight these seasonal variations.

3.3.1. Survey Adequacy

Analyses of both the vertebrate trapping grid and bird data produced Rarefaction Curves which approached the horizontal asymptote. The graphs below display two data sets, trappable fauna at systematic trapping sites and bird census at systematic sites (Figure 3.3). A comparison of these two curves shows that approximately 80 % of the estimated total number of combined mammal, reptile, and amphibian species and 78 % of the potential bird species were recorded (Figure 3.3). The estimators indicate that with further trapping effort an additional 12 trappable species (mammal, reptile or amphibian species) and another 13 bird species may have been detected (estimator = 57 birds and 61 trappable fauna). After adding the opportunistic observations made during the survey, a total of 54 birds were recorded which represents 96 % of the species estimated to occur. Opportunistic observations (including motion cameras) also recorded an additional 12 species of native mammal (total of 58 species) which represents 95 % of the estimated number of species present at the Survey Area.

It is important to consider the influence of the survey methods on the data collected, as all methods have inherent biases that can favour the detection of certain species over others. Some species are more easily

trapped, while others are considered trap-shy and rarely captured, if at all. Additionally, other species may be too large to fit into traps, easily escape or be temporarily absent from a site due to their irruptive, migratory or nomadic nature. Species distributions might be scattered within suitable habitats and may be influenced by the resources present during the survey period. The large fire that impacted the Survey Area in 2022, may have negatively impacted the fauna assemblage.

Therefore, the results from the surveys are considered to be an adequate representation of the fauna present.

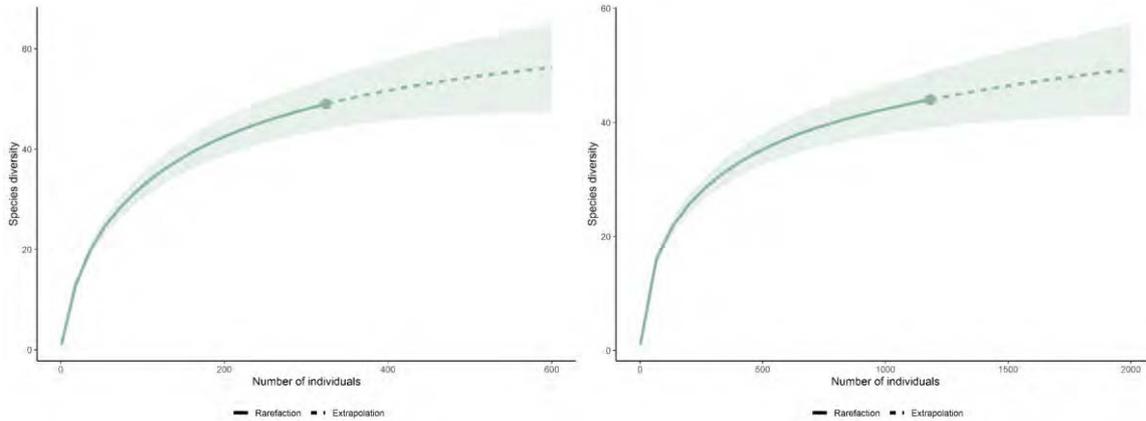


Figure 3.3: Rarefaction Curves for Mammal, Reptile & Amphibian (Left) and Birds (Right)

3.4. Significant Vertebrate Fauna

The literature review, database searches and survey results indicate that 28 species of significant vertebrate fauna have the potential to occur in the Survey Area or surrounding region: nine mammals, 16 bird species, three reptile species (see Table 3.2 and Table 3.5). The seven species that have been recorded within the Survey Area or immediate surrounding vicinity (<300 m) during previous and/or current surveys include six mammals (four non-volant and two bat species), and one bird species (3.1.1.1, Table 3.2). A further seven species (one mammal, four birds, two reptiles) were assessed to have a medium to high likelihood of occurrence based on previous regional records and the habitat types present within the Survey Area. The remaining 14 species have a low to very low likelihood to occur (based on the criteria listed in section 2.1.3).

Six species of significance were recorded from the Survey Area from both phases of this survey and include:

- Northern Quoll (*Dasyurus hallucatus*);
- Bilby (*Macrotis lagotis*);
- Pilbara Leaf-nosed Bat (*Rhinionicteris aurantia* Pilbara Form);
- Brush-tailed Mulgara (*Dasyercus blythi*);
- Western Pebble-mound Mouse (*Pseudomys chapmani*); and
- Grey Falcon (*Falco hypoleucos*).

All the species are listed in Table 3.5, while recorded species and those with a medium to high likelihood of occurrence are discussed in further detail in the following sections 3.4.1 to 3.4.3.

Table 3.5: Significant Fauna Species Likely to Occur

Species	Conservation Status			Preferred Habitats	Previous Records	Likelihood of Occurrence
	EPBC Act	BC Act	DBCA			
Mammals						
Northern Quoll <i>Dasyurus hallucatus</i>	EN	EN		Most common on dissected rocky escarpments, gorges and boulder piles. Typically prefers rocky areas with suitable denning sites and access to surface water. Major drainage lines and treed creek lines may be used for movement and dispersal (Department of the Environment, 2016).	Numerous DBCA database (225) records from 2009-2018 within 10 km of the Survey Area. The majority of these records are from Wodgina to the west, within rocky escarpments and gorges. Other records located to the north and south of the Survey Area are from granite outcropping and drainage lines. Numerous other records exist at Iron Bridge/North Star to the east, in rocky escarpments and gorges.	Recorded This species was recorded during both phases of the survey (trapping and motion camera). Suitable habitat is present for this species and numerous records exist near the Survey Area. Critical habitat: Granite Domes and Boulder Piles Supporting habitat: Major Drainage Line & Minor Drainage Lines
Bilby <i>Macrotis lagotis</i>	VU	VU		A variety of habitats with suitable soil substrates and plant species that are fed on directly or host insect larvae. Habitats can include spinifex hummock grassland, acacia shrubland, open woodland and cracking clays (Dziminski and Carpenter, 2016, 2018).	Fortescue’s internal database returned one record from within the Survey Area from 2009 from secondary evidence, and two additional records are less than 100 m outside, from 2019 and 2021. Four recent records from 2013 (DBCA) are located 1 km to the north of the Survey Area. Numerous other records exist to the north and south of the Survey Area in suitable sandy plain habitat. Most records are from secondary evidence such as tracks, scats, and diggings.	Recorded This species was recorded during both phases of the survey (trapping, motion camera and confirmed secondary evidence). Suitable habitat exists with numerous other records in the vicinity. Critical habitat: Spinifex Sand Plain, Major Drainage Line & Minor Drainage Line Supporting habitat: Spinifex Rocky Plain and sandy patches of Granite Domes and Boulder Piles only in the vicinity of critical habitat.

Species	Conservation Status			Preferred Habitats	Previous Records	Likelihood of Occurrence
	EPBC Act	BC Act	DBCA			
Pilbara Leaf-nosed Bat <i>Rhinonictis aurantia</i> Pilbara form	VU	VU		Dissected rocky escarpments with suitable roost caves with high humidity (85 - 100% RH) and stable temperatures (28 - 32°C). Forages in a variety of habitats, particularly along water bodies and riparian vegetation (Armstrong, 2001a; Cramer <i>et al.</i> , 2016).	Previously recorded in 2013-2014, 2016 and 2019 in the Survey Area from Fortescue's fauna monitoring program. Numerous other recent records located to the west at Wodgina and at Iron Bridge to the east, with both sites containing preferred rocky escarpment habitat. Both areas contain known roost sites.	Recorded The Pilbara Leaf-nosed Bat was previously recorded within the Survey Area. In addition, this species was recorded at 7 sites during the current survey. None of these records were close to sunset/sunrise, indicating there are no roosts nearby. Suitable foraging habitat exists. Critical habitat: N/A Supporting habitat: Granite Domes and Boulder Piles, Major & Minor Drainage Line.
Ghost Bat <i>Macroderma gigas</i>	VU	VU		A variety of habitats including caves, rock piles and abandoned mines may be utilised as transient roosts. Maternity/ breeding roosts require dark, warm and humid (>80% RH) microclimates (Armstrong and Anstee, 2000). Will travel up to 2 km from a roost to hunt and will utilise other structures such as culverts, rock overhangs and trees for feeding roosts (Tidemann <i>et al.</i> , 1985).	One record from 2014 occurs within the Survey Area, with one additional record located <1 km north. Numerous recent records to the west at Wodgina and further records to the east at Iron Bridge, with both areas containing known roost sites and preferred rocky escarpment habitat.	Recorded One previous record in the Survey Area. No suitable roosts were recorded during the survey. This species likely uses the Survey Area for foraging only, with potential use of Granite Domes and Boulder Piles habitat and/or culverts as intermittent transient roosts. Critical habitat: N/A Supporting habitat: Granite Domes and Boulder Piles, Major Drainage Line, Minor Drainage Line, Spinifex Sand Plain & Spinifex Rocky Plain.
Long-tailed Dunnart <i>Antechinomys longicaudatus</i>			P4	Rocky hills, ranges and escarpments with open woodland and/or shrubland over spinifex (Pavey, 2006b).	Three records from 2011-12, 8-26 km east and west of the Survey Area in rocky habitat.	Low Records within 50 km but no suitable habitat is present within the Survey Area.

Species	Conservation Status			Preferred Habitats	Previous Records	Likelihood of Occurrence
	EPBC Act	BC Act	DBCA			
Brush-tailed Mulgara <i>Dasyercus blythi</i>			P4	Sandy, loamy and sometimes stony/ gibber plains and dunes vegetated with spinifex and/ or tussock grasses (Pavey <i>et al.</i> , 2011; Newman-Martin <i>et al.</i> , 2023)	12 records within the last 20 years <10 km from the Survey Area in suitable burrowing habitat (sand plains), with numerous more within 50 km.	<p>Recorded</p> <p>This species was recorded during Phase 1 (one individual captured, records on camera traps and secondary evidence observed throughout the Survey Area).</p> <p>Critical habitat: Spinifex Sand Plain, Minor Drainage Lines.</p> <p>Supporting habitat: Major Drainage Line, Spinifex Rocky Plain and potential use of lower areas of Granite Domes and Boulder Piles in the vicinity of preferred habitat.</p>
Spectacled Hare-wallaby <i>Lagorchestes conspicillatus leichardti</i>			P4	Acacia shrubland and spinifex in Tanami Desert and tropical grasslands, open forests and woodlands, shrublands with tussock grasses as well as inland areas of hummock grassland (Van Dyck and Strahan, 2008a).	No records within the Survey Area, however recorded on motion camera <500 m away in 2022. In addition, four DBCA records within 10 km mostly to the north-east, with two from 2018.	<p>High</p> <p>Four records within 10 km and some suitable habitat was present within the Survey Area.</p> <p>Critical habitat: Spinifex Sand Plain & Spinifex Rocky Plain.</p> <p>Supporting habitat: Major Drainage Line & Minor Drainage Line.</p>
Short-tailed Mouse <i>Leggadina lakedownensis</i>			P4	Spinifex and tussock grassland on cracking clays. Also, acacia shrubland, samphire, woodlands and stony ranges in Northern Australia (Kutt and Kemp, 2005).	Two records within 50 km of the Survey Area from 2001 in the Chichester range.	<p>Low</p> <p>Records not recent and only marginal suitable habitat is present. This species prefers cracking clays in the Pilbara.</p>

Species	Conservation Status			Preferred Habitats	Previous Records	Likelihood of Occurrence
	EPBC Act	BC Act	DBCA			
Western Pebble-mound Mouse <i>Pseudomys chapmani</i>			P4	Rocky ranges and hills where suitably sized pebbles are available for mound construction. Most common on the lower slopes of ridges vegetated with spinifex hummock grassland (Dunlop and Pound, 1981).	Many historical and contemporary records from DBCA database search within the vicinity and recorded within the Survey Area in 2012 from secondary evidence (mounds).	<p>Recorded</p> <p>This species was previously recorded in 2012 from four mounds. The mounds were visited during Phase 1 and appeared to be recently active.</p> <p>Critical habitat: Spinifex Rocky Plain & Spinifex Sand Plain in vicinity of Granite Domes and Boulder Piles, where suitable substrate occurs.</p> <p>Supporting habitat: N/A</p>
Birds						
Curlew Sandpiper <i>Calidris ferruginea</i>	CR & MI	CR		Tidal flat systems and freshwater to brackish wetlands. Ephemeral and permanent lakes, dams and waterholes, usually with bare edges, mud and sand.	No DBCA Records. Returned in the PMST search as species or species habitat may occur in the area.	<p>Very Low</p> <p>Based on satellite imagery, as well as field survey, optimal habitat for this species is not present within the Survey Area.</p>
Night Parrot <i>Pezoporus occidentalis</i>	EN	CR		Recorded from long unburnt, ring forming <i>Triodia</i> grasslands in association with low lying saline lakes and drainages hosting chenopods/samphire (N.A. Jackett <i>et al.</i> , 2017).	<p>The Night Parrot is rare and elusive, resulting in very few confirmed records of this species. These include:</p> <ul style="list-style-type: none"> • A population is known to occur at Fortescue Marsh with records between 2005 and 2023 (Davis and Metcalf, 2008; Fortescue Metals Group, 2021a); • Near Lake Disappointment, about 285 km east of Newman in 2017-2018 (Harewood, 2018); • Martu country, Great Sandy and Little Sandy deserts in 2020 (Australian Geographic, 2020); • Lake Mackay, border of WA and NT in 2020 (Stantec, 2021); • East Murchison (Hamilton <i>et al.</i>, 2017; Nigel A. Jackett <i>et al.</i>, 2017); 	<p>Low</p> <p>There are no records within the Survey Area or surrounding area. This species is unlikely to be present as suitable <i>Triodia</i> hummocks that form rings of hummock grassland are sparse. Especially after the 2022 fire that impacted 79% of the Survey Area. The Survey Area also lacks drainage areas/saline wetlands that support foraging activity for this species.</p>

Species	Conservation Status			Preferred Habitats	Previous Records	Likelihood of Occurrence
	EPBC Act	BC Act	DBCA			
					<ul style="list-style-type: none"> Near Lake Gregory in the Great Sandy Desert in the Kimberley region in 2018 (Kimberley Land Council, 2018); and Ngururpa Indigenous Protected Area population in the Great Sandy Desert (Ngururpa Rangers <i>et al.</i>, 2024). 	
Australian Painted Snipe <i>Rostratula benghalensis australis</i>	EN	EN		Shallow terrestrial freshwater wetlands, lakes, and swamps, typically with low, dense fringing vegetation. Favours sites with shallow water and exposed mud (Menkhorst <i>et al.</i> , 2019a).	No DBCA Records. Returned in the PMST search as species or species habitat may occur in the area.	Very Low Based on satellite imagery, as well as field survey, optimal habitat for this species is not present within the Survey Area.
Red Goshawk <i>Erythrotriorchis radiatus</i>	VU	VU		Open forest and woodland with mixed vegetation, particularly along streams, swamps and wetlands, mostly along coastal fringes (Morcombe, 2003a; Menkhorst <i>et al.</i> , 2019a).	No DBCA Records. Returned in the PMST search as species or species habitat may occur in the area.	Low This species was not known to occur in the Pilbara. However, recent reliable observations have recorded both adults and juveniles in the region, representing a 500 km south range extension. It is unknown if individuals are just passing through or breeding (MacColl <i>et al.</i> , 2023).
Grey Falcon <i>Falco hypoleucos</i>	VU	VU		Arid and semi-arid grasslands, plains and timbered watercourses (Olson and Olson, 1986; Schoenjahn, 2013).	One bird was recorded close to the Survey Area in 2012. A further 11 records from both north and south of the Survey Area were within 50 km.	Recorded This species was recorded during Phase 1 and suitable habitat for breeding and foraging exists within the Survey Area. The species is rare but widespread throughout the semi-arid interior of Australia (Morcombe and Stewart, 2013). Critical habitat: Major Drainage Line Supporting habitat: Spinifex Sand Plain, Spinifex Rocky Plain & Minor Drainage Line
Pacific Swift <i>Apus pacificus</i>	MI	MI		Nomadic, almost entirely aerial lifestyle over a variety of habitats; associated with storm fronts (Australian Government &	Two previous DBCA records from 2011-14, located >10 km north and east of the Survey Area.	Medium No records of this species within the Survey Area; however, its almost entirely ariel lifestyle and wide

Species	Conservation Status			Preferred Habitats	Previous Records	Likelihood of Occurrence
	EPBC Act	BC Act	DBCA			
				Department of Agriculture Water and the Environment, 2020).		range of suitable habitats means it has the potential to fly over the Survey Area. Critical habitat: N/A Supporting habitat: N/A
Oriental Plover <i>Charadrius veredus</i>	MI	MI		Open grasslands and sparsely vegetated plains. During hottest parts of the day collects in large flocks on wet ground associated with wetlands though often found far from water (Pizzey and Knight, 2012).	One DBCA record 21 km north-east of the Survey Area in 1999. Returned in the PMST search as species or species habitat may occur in the area.	Medium No recent, nearby records however the species can occur sporadically in a variety of habitats including those found within the Survey Area. Critical habitat: N/A Supporting habitat: Spinifex Sand Plain and Major Drainage Line, particularly after rainfall events.
Sharp-tailed Sandpiper <i>Calidris acuminata</i>	MI	MI		Inland lakes, and coastal, along brackish and freshwater wetlands, saltmarsh, lakes and pools (Morcombe, 2003a).	No DBCA Records. This species only appeared in the PMST (species or species habitat may occur in the area), and ALA database searches.	Very Low No recent, nearby records and no suitable habitat occurs within the Survey Area.
Red-necked Stint <i>Calidris ruficollis</i>	MI	MI		Inhabit coastal areas, particularly tidal flats. Some species may also inhabit mangroves, ocean beaches and rocky shorelines. Also known to inhabit inland temporary waters and sewage dams (Menkhorst <i>et al.</i> , 2019a).	No DBCA Records. This species only appeared in the ALA database searches.	Low Only marginal habitat is present when drainage lines or other low areas are inundated.
Pectoral Sandpiper <i>Calidris melanotos</i>	MI	MI		Coastal wetland, both fresh and saline but also inland on permanent and temporary wetlands. Prefers sites with mudflats, fringing vegetation or swamps with heavy vegetation (Morcombe, 2003a).	No DBCA Records. Returned in the PMST search as species or species habitat may occur in the area.	Very Low No recent, nearby records and no suitable habitat occurs within the Survey Area.
Common Sandpiper	MI	MI		Coastal and inland ephemeral wetland habitat types. Sheltered, narrow and	Two DBCA Records approximately 20km to the North. This species appeared in the PMST	Low

Species	Conservation Status			Preferred Habitats	Previous Records	Likelihood of Occurrence
	EPBC Act	BC Act	DBCA			
<i>Actitis hypoleucos</i>				steep shorelines. Mangrove-lined creeks and varied wetland habitats including areas of mud with outcropping rocks, sewage ponds and dams (Morcombe, 2003a; Menkhorst <i>et al.</i> , 2019a).	(species or species habitat may occur in the area), and ALA database searches.	Marginal suitable habitat occurs within the Survey Area. It may occasionally fly over and use Major Drainage Line habitat or the small claypan located in the Spinifex Sand Plain only when inundated.
Wood Sandpiper <i>Tringa glareola</i>	MI	MI		Well-vegetated, shallow freshwater wetlands, lakes, pools and swamps. Usually near shorelines either on mud or in shallow water (Morcombe, 2003a; Menkhorst <i>et al.</i> , 2019a).	Two DBCA records from 2005 and 2007, <50 km south of the Survey Area in Coonarie Creek.	Low Two recent records <50 km from Survey Area. It may occasionally fly over and use Major Drainage Line habitat or the small claypan located in the Spinifex Sand Plain, only when inundated.
Common Greenshank <i>Tringa nebularia</i>	MI	MI		Variety of coastal to inland permanent and ephemeral wetlands, swamps, lakes, waterholes and well as open mudflats (Morcombe and Stewart, 2013; Menkhorst <i>et al.</i> , 2019a).	Three DBCA records <50 km south of Survey Area (2004, 2005 & 2012) in drainage line habitat (Yule River and Coonarie Creek).	Medium Majority of records are <20 km from Survey Area some marginally suitable habitat under wet conditions is present within the Survey Area. Critical habitat: N/A Supporting habitat: Spinifex Sand Plain - small claypan and Major Drainage Line, only when inundated
Oriental Pratincole <i>Glareola maldivarum</i>	MI	MI		Often found at wetlands with an abundance of insects or in open areas near tidal flats and beach lands (Morcombe, 2003a). Known to congregate in large flocks (Menkhorst <i>et al.</i> , 2019a).	No previous records returned from DBCA database search within 50km. Included in PMST results only (Species or species habitat may occur within area).	Very Low Suitable habitat does not occur within the Survey Area, and there are no previous records from the region.
Osprey <i>Pandion haliaetus</i>	MI	MI		Coastal and terrestrial wetlands of tropical and temperate Australia and offshore islands, occasionally ranging inland along rivers (Menkhorst <i>et al.</i> , 2019a).	Two records from DBCA from 2013. Two records are >24-38 km from the Survey Area at Chichester Gorge.	Low No records of this species within the Survey Area. Marginal suitable habitat within Survey Area and species occurs inland only occasionally. Existing records are >20 km from the Survey Area.

Species	Conservation Status			Preferred Habitats	Previous Records	Likelihood of Occurrence
	EPBC Act	BC Act	DBCA			
Peregrine Falcon <i>Falco peregrinus</i>	OS	OS		Widespread but uncommon; variety of habitats including open woodlands, grasslands with trees, lakes, timbered watercourses and urban areas (Pizzey and Knight, 2012). Cliff faces are preferred nesting sites (Morcombe, 2003b; Menkhorst <i>et al.</i> , 2019b).	Four DBCA records within 25 km of the Survey Area from 2000-2013.	<p>High</p> <p>Species occupies a diverse range of habitats and therefore has the potential to utilise the Survey Area predominately for foraging.</p> <p>Critical habitat: N/A</p> <p>Supporting habitat: Major Drainage Line, Minor Drainage Line, Spinifex Sand Plain & Spinifex Rocky Plain</p>
Reptiles						
Pilbara Olive Python <i>Liasis olivaceus barroni</i>	VU	VU		Inhabits gorges, gullies, stony ranges, rock piles and along watercourses. Often associated with permanent and temporary water bodies though is not restricted to them (DSEWPaC 2011b).	Sixteen DBCA records within 25 km, mostly to the east of the Survey Area (2011, 2014-2017). One record from 2011 within 7.2 km to NE of Survey Area.	<p>Medium</p> <p>Some marginal suitable habitat is present for this species in Turner River East that runs adjacent to the western border of the Survey Area. This species may occasionally use the Major/Minor Drainage Lines for movement. Known sites are nearby <25km at Iron Bridge Mine site where more favourable habitat is present.</p> <p>Critical habitat: N/A</p> <p>Supporting habitat: Major Drainage Line & Minor Drainage Line, & Granite Domes and Boulder Piles (especially near Major Drainage Line habitat, for dispersal and foraging).</p>
Pin-striped Finesnout Ctenotus <i>Ctenotus nigrilineatus</i>			P1	Spinifex plains adjacent to granite outcrops and watercourses at hilly interior of Pilbara near Woodstock, Meentheena and Nullagine (Wilson and Swan, 2021).	One DBCA record 25 km S of Survey Area in 2012. Four other records to the south within 50 km.	<p>Medium</p> <p>Recorded 25 km south of Survey Area in 2001. Survey Area contains suitable habitat for this species.</p> <p>Critical habitat: Spinifex Sand Plain</p>

Species	Conservation Status			Preferred Habitats	Previous Records	Likelihood of Occurrence
	EPBC Act	BC Act	DBCA			
						Supporting habitat: Major Drainage Line & Minor Drainage Line, & Granite Domes and Boulder Piles
Gane's Blindsnake <i>Anilius ganei</i>			P1	A variety of habitats; thought to prefer moist gorges though habitat data is limited (Aplin, 1998). Its cryptic nature and predominantly subterranean lifestyle reduce the likelihood of recording the species during fauna assessments.	Three DBCA records <30 km E of the Survey Area from 2005 to 2018.	Low Recorded in vicinity of Survey Area. Previous records indicate a preference for rocky gorges, which are absent within the Survey Area.

3.4.1. Mammals

3.4.1.1. Northern Quoll (*Dasyurus hallucatus*)

Conservation Status: EPBC Act & BC Act: Endangered.

Distribution, Habitat and Ecology: The Northern Quoll is the smallest of the four quoll species occurring in Australia (Oakwood, 2008). The species formerly occurred across the northern parts of Australia. Since the arrival of the Cane Toad (*Rhinella marina*) the Northern Quolls' distribution has declined significantly, especially in the more arid parts of its range (DotEE 2018a). The Pilbara population typically find refuge in rocky habitats during the day in crevices, cracks and small caves. These critical denning habitats include rocky gorges, basalt hills, escarpments, mesas, plateaux, granite boulder piles, caves and adjacent cliff faces but also along coastal fringes and beaches (DoE, 2018b). Foraging occurs across any adjacent habitat that provides suitable cover and food resources. Drainage lines and rivers are used for dispersal and as foraging habitat. The species is adaptable and has also been recorded in artificial habitat such as rock armour underneath bridges, in quarries, camp sites and along breakwaters (ecologia, 2012; DMP, 2013; Ecoscape, 2016a). The Northern Quoll is an omnivorous, opportunistic feeder that mostly consumes insects, fruits, vegetation, molluscs but also a large number of vertebrate species including mammals, birds, reptiles and frogs (Dunlop et al., 2017).

Occurrence in the Survey Area: The Northern Quoll was previously recorded in the Survey Area from Fortescue's Internal Database, with a record from the fauna monitoring program in 2019 as outlined in Table 3.6. This record was captured by a motion camera in a culvert situated in a minor drainage line, mapped as part of the broader fauna habitat of Spinifex Sand Plain. This culvert is also in the vicinity of Granite Domes and Boulder Piles habitat. The individual was recorded using the culvert three times, with two sightings on the 19 July 2019 (2:01 am and 6:14 pm) and one on the 3 July 2019 from 5:38 am.

An additional 225 records from the DBCA database are located within 10 km of the Survey Area, with the majority located to the west at Wodgina, where rocky escarpments and gorges are present. Other records occur to the north and south of the Survey Area, where the Northern Quoll has been recorded from granite outcropping and drainage lines. Further to the east, there are also numerous records at Iron Bridge, within rocky escarpments and gorges habitat, where they are frequently observed.

The species was recorded 12 times during both phases of the current survey within Granite Domes and Boulder Piles habitat. The records included:

- Trapping of three individuals (Plate 3.1):
 - Two females at satellite sites S01 and S03; and
 - One male at S01.
- Capture on motion camera at:
 - Satellite sites S01 and S03 (possibly same individuals as trapped); and
 - Motion camera site NSMC02, located in the south-east of the Survey Area.

All records from the Survey Area are detailed in Table 3.6 and displayed on Map 3.3.

Table 3.6: Northern Quolls Records within the Survey Area and 2 km Buffer

Survey Phase or Date	Site / Location	Type of Record	Fauna Habitat	Habitat Definition	Easting	Northing
Previous Records – Fortescue Internal Database – Fauna Monitoring						
19/06/2019 03/07/2019	R_F_P_MR_CU_02	Recorded 3 times on motion camera (Spectrum, 2021)	Spinifex Sand Plain – this camera is in a culvert for a very minor drainage, that has not been pulled out of the surrounding habitat.	Supporting / Critical	685589	7650772
This Survey						
Phase 1	S03	Scat	Granite Domes and Boulder Piles	Critical	685249	7653038
Phase 1	S03-MC01	One individual recorded on motion camera over two days. Could be two different individuals	Granite Domes and Boulder Piles	Critical	685249	7653004
Phase 1	S03-MC05	One individual recorded on camera	Granite Domes and Boulder Piles	Critical	685249	7653004
Phase 1	S03-MC01	One individual recorded on motion camera over two days. Could be two different individuals	Granite Domes and Boulder Piles	Critical	685246	7653039
Phase 1	S03-MC143	One individual recorded on motion camera	Granite Domes and Boulder Piles	Critical	685230	7653051
Phase 1	S01-MC134	One individual recorded on camera	Granite Domes and Boulder Piles	Critical	683786	7648419
Phase 1	S01-MC135	One individual recorded on motion camera	Granite Domes and Boulder Piles	Critical	683848	7648397
Phase 1	S01	Male in cage	Granite Domes and Boulder Piles	Critical	683847	7648455
Phase 1	S03	Female in cage, undeveloped pouch	Granite Domes and Boulder Piles	Critical	685248	7653003
Phase 1	S01	Female in cage, undeveloped pouch	Granite Domes and Boulder Piles	Critical	683829	7648523
Phase 2	NSMC02-MC110	One individual recorded on camera	Granite Domes and Boulder Piles	Critical	685766	7649828
Phase 2	NSMC02-MC27	One individual recorded on camera	Granite Domes and Boulder Piles	Critical	685767	7649797

Critical habitat in Survey Area: Granite Domes and Boulder Piles (2.7%).

Two females were recorded at both satellite sites in this habitat. It is likely that the Northern Quoll is using this habitat for breeding and foraging.

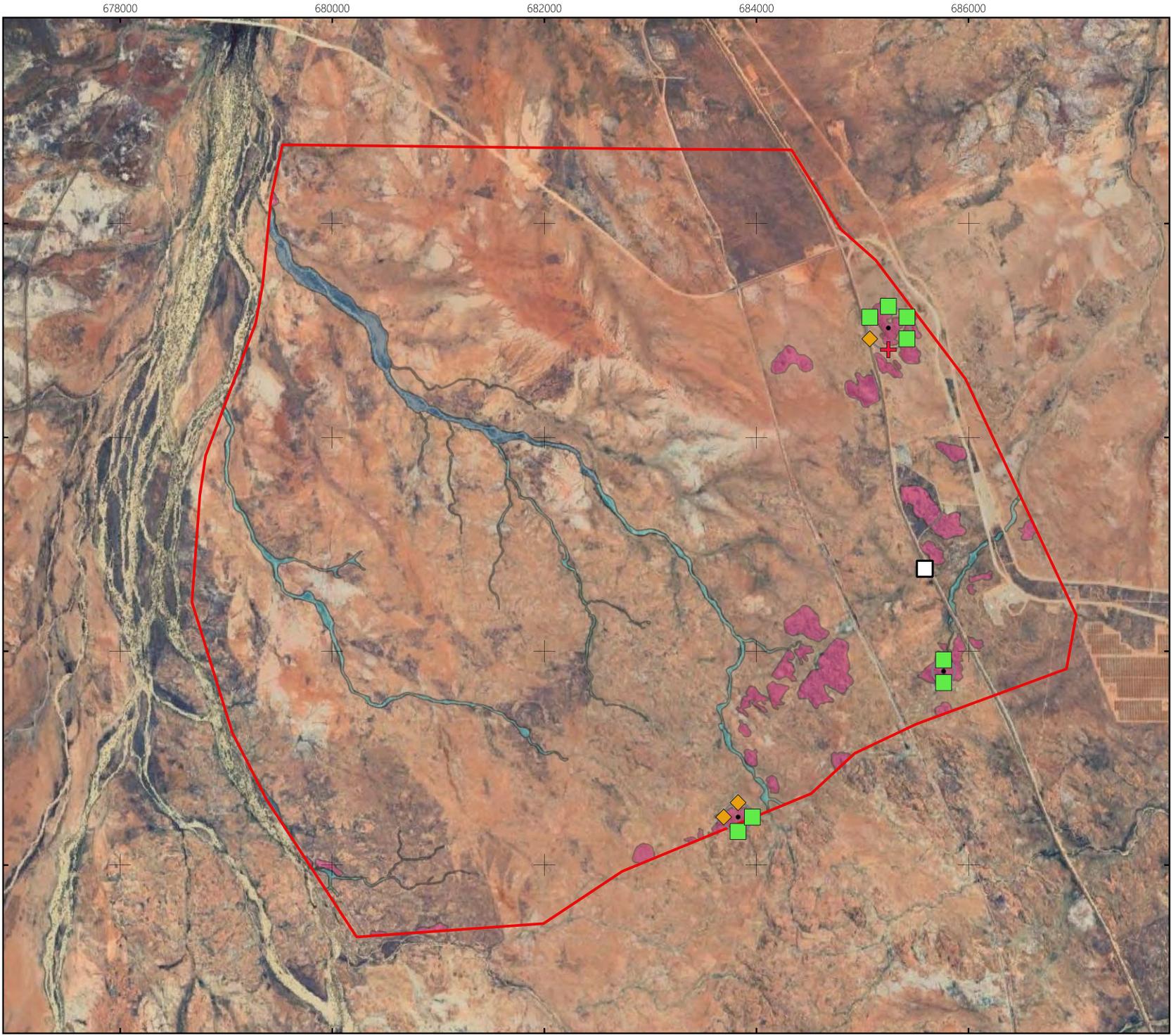
Supporting habitat in Survey Area: Major Drainage Line (1.0%) and Minor Drainage Line (1.4%).

The Northern Quoll is likely using the Major Drainage Line habitat in the Survey Area and surrounding Turner River West & East, along with the Minor Drainage Lines, for foraging and dispersal.

Potential habitat within the Survey Area and details of species records are displayed on Map 3.3.



Plate 3.1: Northern Quoll Female Captured During the Survey



Legend

- Survey Area
- Northern Quoll Records**
- This Survey
 - ◆ Capture
 - Motion camera
 - + Scat
- Fortescue Internal Database - Fauna Monitoring
 - Northern Quoll (Spectrum, 2021)
- Fauna Habitats**
- Critical Habitat
 - Granite Domes & Boulder Piles
- Supporting Habitats
 - Major Drainage Line
 - Minor Drainage Line



Coordinate System: GDA 1994 MGA Zone 50
 Projection: Universal Transverse Mercator
 Units: Metre



Author: EM Date: 08-01-2025

Northern Quoll Records & Habitat

NSJW Project

3.4.1.2. Bilby (*Macrotis lagotis*)

Conservation Status: EPBC Act & BC Act: Vulnerable.

Distribution, Habitat and Ecology: The Bilby is a medium-sized marsupial that formerly inhabited the arid and semi-arid zones of 70% of Australia (Department of Environment and Conservation [DEC], 2012). The distribution of this species has contracted to less than 20% of their former range, and the distribution is thought to have further decreased to the north, due to threatening processes (DCCEEW, 2023a). The remaining populations occur in the Northern Territory, some isolated areas in south-west Queensland and within central and northern WA (DEC, 2012; Dziminski et al., 2020; Northover et al., 2023).

Within WA, the Bilby populations are limited to the Pilbara, Kimberley and the central desert and rangelands regions. The current Bilby distribution within the Pilbara region encompasses the eastern portion or around 48%. The western boundary of this distribution extends south-east from around 50 km west of Port Hedland to approximately 350 km past Newman (Dziminski, Carpenter and Morris, 2020). However, there are historic or unreliable records in areas to the west and south-west of their current distribution in the Pilbara. These areas require further survey work to confirm the Bilby is absent (Dziminski, Carpenter and Morris, 2020).

The Bilby inhabits a variety of substrate and vegetation types in northern WA from sand plains with low *Acacia* spp. over hummock grasses to Mulga shrubland on loamy-clay soils, and can broadly fit into three landscape types as per the Cramer et al. (2017) conceptual model (Cramer et al., 2017; Northover et al., 2023) which is detailed in Table 3.7.

Table 3.7: Suitable Habitat Characteristics of the Bilby in the North of WA

Landform	Substrate	Vegetation
Fluvial, includes a variety of drainage lines: <ul style="list-style-type: none"> • creek lines including upland systems • broad paleodrainage, low-lying and perched systems • calcrete 	<ul style="list-style-type: none"> • sandy to sandy loam soils • alluvial and calcrete • salt channels and lakes 	<ul style="list-style-type: none"> • Low shrubs of <i>Acacia</i> spp. and <i>Melaleuca</i> spp. over <i>Cyperus bulbosus</i>. and hummock grasslands usually with <i>Triodia basedowii</i>, <i>T. pungens</i> and <i>T. schinzii</i>
Residual, includes: <ul style="list-style-type: none"> • Laterite • Silcrete • Stony rises • Uplands • Breakaways • Plateaus • Granitic hills 	<ul style="list-style-type: none"> • sandy to sandy loam soils • red earths usually with lateritic, small gravel, stony matrix 	<ul style="list-style-type: none"> • Low shrubs of <i>Acacia</i> spp., including Mulga shrubland (<i>A. aneura</i>), over hummock and tussock grasslands
Sand plain and sand dune, includes: <ul style="list-style-type: none"> • Flat to gently undulating plains • Dune fields • Isolated dunes 	<ul style="list-style-type: none"> • Soil texture ranges from coarse sand to light medium clay • Non-calcareous gradational soils • Duplex soils – red sand, loamy sand plains and dune fields 	<ul style="list-style-type: none"> • Low woodland (<10 m) of <i>Eucalyptus</i> and <i>Acacia</i> spp. over shrub-steppe communities over <i>Triodia</i> hummock grasslands, occasionally with rich understorey; or • Pindan woodland over hummock and tussock grassland (Kimberley)

Where rainfall is higher in northern WA, the Bilby tends to occupy all three landforms, while in the south of WA, they are more restricted to fluvial and residual landforms (Cramer et al., 2017). It is uncertain why the residual landforms are so important, as the substrate tends to be harder and includes less inundated run-off areas. They also include shrub species such as *Acacia hilliana* that support root-dwelling larvae that the

Bilby use for food, so it appears these areas are more suitable for foraging (Cramer *et al.*, 2017). Additionally, it appears that fire may influence the type and availability of food resources and may assist in improving habitat favourability in parts of the Bilby's range (Cramer *et al.*, 2017; Northover *et al.*, 2023).

Within the Pilbara, some preliminary distribution modelling undertaken by Dziminski and Carpenter (2017) showed that the habitat variables of soil type, depth and elevation are the major variables predicting preferred Bilby habitat. Observations have also shown that in addition to the species requiring a substrate that is suitable for burrowing, such as sand, sandy clay or sandy gravel, the Bilby also has an association with certain stands of *Acacia* species (and other plants) that provide a key food resource as they host root-dwelling larvae (RDL) (Cramer *et al.*, 2017; Northover *et al.*, 2023). In particular, the Cossidae (moth) larvae appears to be a major food resource for the Bilby (Dziminski and Carpenter, 2017; Southgate *et al.*, 2019). Within the Pilbara, these plant species include:

- *Acacia bivenosa*;
- *A. coleii*;
- *A. dictyophleba*;
- *A. hilliana*[^]
- *A. melleodora*;
- *A. rhodophloia*[^]
- *A. stellaticeps*;
- *A. trachycarpa* including dwarf variant; and
- *Senna notabilis*.

Note: [^] - species occurs in the Pilbara, but observations of Bilby diggings for RDL only in Tanami Desert (NT), Central Desert or Gibson Desert IBRA regions (Southgate *et al.*, 2019).

The larvae are extracted from the root systems by the Bilby which is the only known species in the arid and semi-arid areas of Australia that opens the root system in this specific way (Southgate *et al.*, 2019).

The Bilby also consumes a variety of invertebrates such as spiders, beetles, and termites, along with plant materials such as seeds and bulbs. The majority of the food resources for the Bilby are either acquired from the soil surface or by digging (Southgate *et al.*, 2019).

The Bilby is a nocturnal species that shelters during the day in an extensive burrow system of up to 4.5 m in length and 2 m deep, which could spiral down, have side branches, or blocked tunnel entrances (freshly dug soil). Most burrows have a single entrance; however, some can have multiple entrances like rabbit warrens. A single individual may use up to 18 burrows (Moseby *et al.*, 2003; DEC, 2012).

Bilbies are exceedingly mobile and can cover vast distances while foraging (DCCEEW, 2023a). The size of the Bilby's home range is estimated to be between 0.18 km² and 3.16 km² (from Arid Recovery in SA) and is dependent on the location and availability of foraging habitat supporting insects, fungi and vegetation (Pavey, 2006; DCCEEW, 2023). However, their home range in many areas is still not well understood (DCCEEW, 2023a). Sudden shifts in spatial distribution can occur, particularly in sandy deserts, in response to changing food availability. Females can display long-term site fidelity whereas males display a roaming behaviour allowing them to mate with multiple females (Pavey, 2006a).

Occurrence in the Survey Area:

The Fortescue Internal Database has a previous record for the Bilby in the Survey Area approximately 150 m from the Bilby recorded during this assessment (Table 3.8, Map 3.4). This record was from a burrow located between two granite boulders within Spinifex Sand Plain habitat, and was not noted as active (Ecoscape, 2009). Two further secondary evidence records are located less than 100 m away from the Survey Area in 2019 and 2021. The record from 2019 was from an old burrow (27 m east), while the 2021 record included three potential Bilby diggings (84 m east). Additional records up to 2 km from the Survey Area have been included in Table 3.8, which includes further records from fauna monitoring (three 1.4 km south) and four records from the DBCA Database, including two motion camera records (confirmed presence) from 2013, located up to 900 m north near the Roy Hill Rail Line. Numerous additional records surround the Survey Area, generally to the north and south, where suitable habitat occurs.

During this assessment, the female Bilby was recorded several times during both phases of the assessment and included a capture in a cage, scats, active burrows, and confirmed diggings, scratchings, and tracks. These records and other potential evidence are outlined in Table 3.8 and displayed on Map 3.4, whilst dubious and inaccurate records have been removed. This individual is shown on Plate 3.2 with two active burrows displayed on Plate 3.3.

Table 3.8: Bilby Records within the Survey Area and 2 km Buffer

Survey Phase or Date	Site / Location / Distance	Type of Record / Reference	Fauna Habitat	Habitat Definition	Easting [^]	Northing [^]
Previous Records – Fortescue Internal Database – Previous Surveys & Fauna Monitoring						
22/07/2009	GDP2449	Old burrow (Ecoscape, 2009)	Spinifex Sand Plain	Critical	686333	7650954
Previous Records – Fortescue Internal Database – Previous Surveys & Fauna Monitoring (up to 2 km outside)						
22/09/2019	HV1905 27 m E	Old burrow (Ecoscape, 2020a)	Was Spinifex Sand Plain, now Cleared/Disturbed	N/A	686974	7650492
27/05/2021	NSJ_FN_P_FS04 84 m E	Potential diggings (x3) (Ecoscape, 2021)	Spinifex Sand Plain	Critical	686880	7650825
16/05/2019	R_F_P_MR GB OS15 1.4 km S	Two potential old diggings (Spectrum, 2020b)	Spinifex Sand Plain	Critical	686904	7648294
11/07/2020	R_F_P_MR GB OS15 1.4 km S	Potential tracks (gait pattern only) (Spectrum, 2021)	Spinifex Sand Plain	Critical	686904	7648294
22/07/2022	R_F_P_MR GB OS15 1.4 km S	Scats (Spectrum, 2023)	Spinifex Sand Plain	Critical	686904	7648294
Previous Records – DBCA Database – Previous Survey (up to 2 km outside)						
4/12/2013	Roy Hill Rail Line 767 m	Motion camera recording	Spinifex Sand Plain	Critical	682989	7655465
4/12/2013	Roy Hill Rail Line 776 m	Unknown	Spinifex Sand Plain	Critical	682991	7655474
4/12/2013	Roy Hill Rail Line 889 m	Motion camera recording	Spinifex Sand Plain	Critical	682971	7655587
4/12/2013	Roy Hill Rail Line 898 m	Unknown	Spinifex Sand Plain	Critical	682971	7655596
This Survey						
Phase 1	NS01	Female in cage	Spinifex Sand Plain	Critical	685937	7650777
Phase 1 & Phase 2	NS01	Active burrow	Spinifex Sand Plain	Critical	685937	7650778
Phase 1 & Phase 2	NS01	Old burrow recorded during Phase 1, active in Phase 2	Spinifex Sand Plain	Critical	685904	7650708

Survey Phase or Date	Site / Location / Distance	Type of Record / Reference	Fauna Habitat	Habitat Definition	Easting [^]	Northing [^]
Phase 1 & Phase 2	NS01	Inactive burrow	Spinifex Sand Plain	Critical	685906	7650707
Phase 2	NS01	Active burrow	Minor Drainage Line	Critical	685960	7650764
Phase 2	NS01	Active Bilby burrow	Spinifex Sand Plain	Critical	685858	7650640
Phase 2	NS01	Lots of confirmed diggings, scratchings and scat piles within the general area	Spinifex Sand Plain	Critical	685843	7650632
Phase 1	NS01-TS	Confirmed tracks	Minor Drainage Line	Critical	686045	7650915
Phase 1	NS01-TS	Confirmed tracks	Spinifex Sand Plain	Critical	686078	7650998
Phase 1	NS01-TS	Confirmed tracks	Spinifex Sand Plain	Critical	686173	7651006
Phase 1	NS01-MC30-LT	39 video records of the female Bilby coming and going from her burrow between 24/05/23 to 29/06/23	Spinifex Sand Plain	Critical	685942	7650774
Phase 1 & Phase 2	NS01-MC33-LT	Three photos of the female Bilby at her burrow over three days on 4/06/23, 16/06/23 & 7/09/23	Spinifex Sand Plain	Critical	685943	7650777
Phase 1 & Phase 2	NS01-MC57	Two photos of Bilby at burrow on 1/09/23 & 21/09/23	Spinifex Sand Plain	Critical	685944	7650775
Phase 1 & Phase 2	NS01-MC63	Five photos of Bilby at burrow between 26/08/23 to 21/09/23	Spinifex Sand Plain	Critical	685944	7650776
Phase 1	NSOPP06	Potential, old burrow	Spinifex Sand Plain	Critical	685739	7652040
Phase 1	NSOPP08	Potential old disused burrow	Spinifex Sand Plain	Critical	679715	7650593
Phase 2	NSOPP12	Potential old digging	Spinifex Sand Plain	Critical	682368	7649956
Phase 2	NSOPP13	Potential old digging	Spinifex Sand Plain	Critical	679770	7654577
Phase 2	BD01	Potential old digging	Spinifex Sand Plain	Critical	686420	7651188

[^] = Coordinate reference system – GDA94, MGA94, Zone 50

Critical habitat in Survey Area: Spinifex Sand Plain (91.5%), Major Drainage Line (1.0%) and Minor Drainage Line (1.4%).

The majority of the Spinifex Sand Plain habitat in the Survey Area is considered potential habitat; however, the Bilby is typically found in the vicinity of Minor (and Major) Drainage Lines, in particular, in areas where *Acacia bivenosa*, *A. colei*, *A. dictyophleba*, *A. melleodora*, *A. stellaticeps* and *A. trachycarpa* occurs (Southgate *et al.*, 2019; Northover *et al.*, 2023). However, it is likely that the recent fires in 2021-2022 have impacted the suitability of some of these habitats, especially in the south-western portion of the Survey Area. The Bilby find suitable breeding conditions within the Spinifex Sand Plain and Minor Drainage Line habitats and uses all three habitats for foraging (Map 3.4).

Supporting habitat in Survey Area: Spinifex Rocky Plain (0.1%) and possibly Granite Domes and Boulder Piles (2.7%).

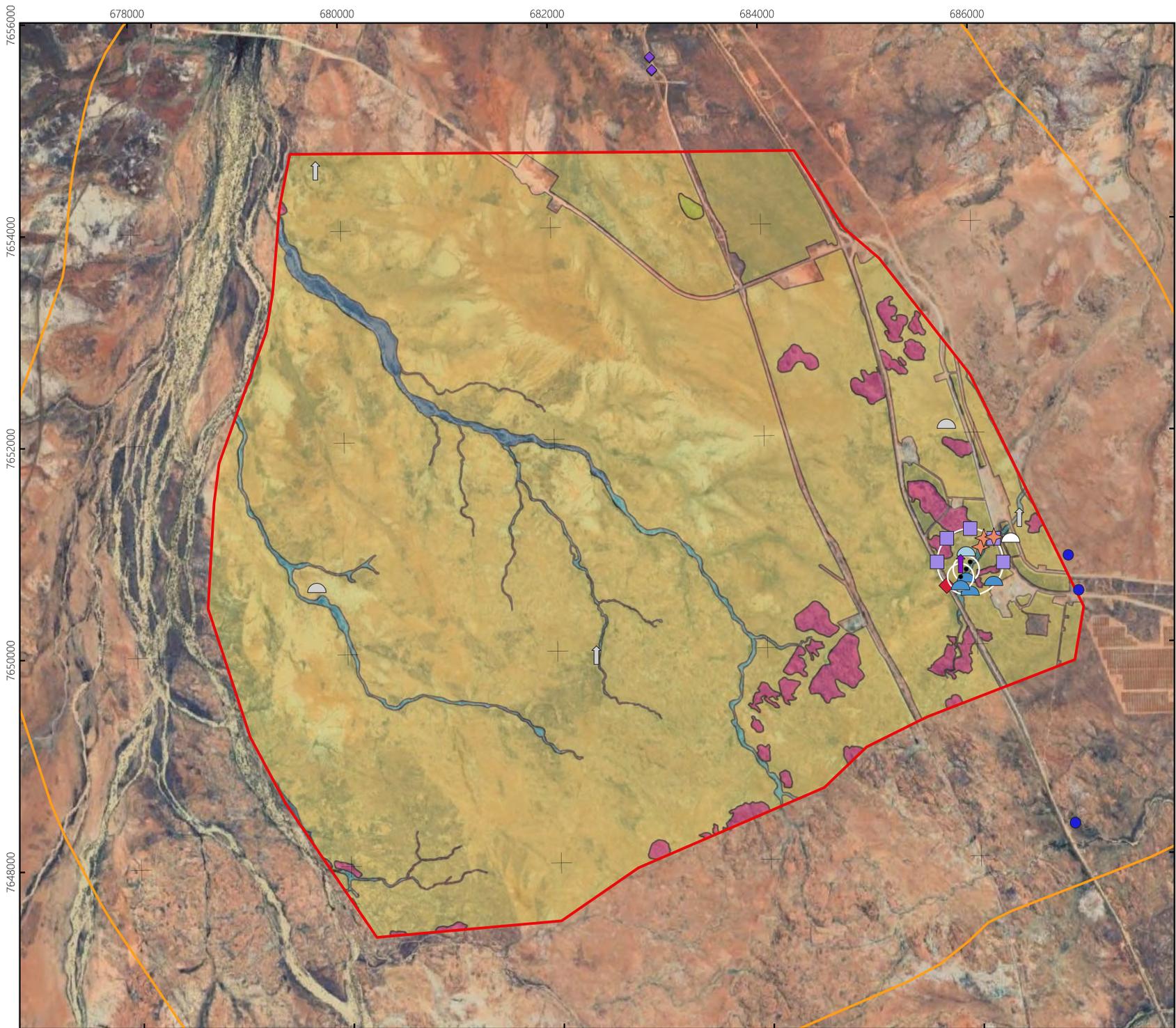
Due to the surrounding critical habitat, the Bilby may use these two habitats within the Survey Area infrequently (particularly the latter), especially when foraging and dispersing.



Plate 3.2: Motion Camera Image of Bilby Recorded During the Survey



Plate 3.3: Active Bilby Burrows Recorded from Site NS01 (left is from Phase 1, right from Phase 2)



Legend

Survey Area

Bilby Records

This Survey

- Capture
- Motion camera
- Confirmed active burrow
- Confirmed digging
- Confirmed tracks
- Potential old burrow
- Inactive burrow
- Potential old digging

Fortescue Internal Database - Previous Survey

Bilby (Ecoscape, 2009)

Outside Survey Area (<2 km)

- Fortescue Internal Database
- DBCA Database

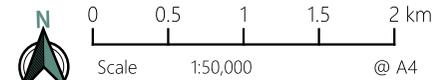
Fauna Habitats

Critical Habitats

- Spinifex Sand Plain
- Major Drainage Line
- Minor Drainage Line

Supporting Habitats

- Spinifex Rocky Plain
- Granite Domes & Boulder Piles



Coordinate System: GDA 1994 MGA Zone 50
 Projection: Universal Transverse Mercator
 Units: Metre



Author: EM

Date: 08-01-2025

Bilby Records & Habitat

NSJW Project

MAP

Prepared for
Fortescue

3.4

3.4.1.3. Pilbara Leaf-nosed Bat (*Rhinonictoris aurantia* Pilbara form)

Conservation Status: EPBC Act & BC Act: Vulnerable.

Distribution, Habitat and Ecology: The Pilbara Leaf-nosed Bat is the Pilbara form of the Orange Leaf-nosed Bat, a small orange coloured bat that occurs across northern Australia (K.N. Armstrong, 2006). There are two populations of Orange Leaf-nosed Bat, one in the Pilbara and the other in the Kimberley region. They differ genetically, morphologically and in the frequency of their echolocation calls (Armstrong, 2001b, 2003; Kyle N Armstrong, 2006).

The Pilbara Leaf-nosed Bat requires two different habitats, suitable caves or mine adits for roosting during the day, and an external habitat for foraging at night. These habitats are defined in the Conservation Advice for this species (Threatened Species Scientific Committee (TSSC), 2016). Roosting occurs in deep, warm and humid caves and adits (horizontal tunnels). Some caves are used all year around, whereas others are visited for a variety of purposes including specific maternity roost caves (Churchill, 2009; TSSC, 2016; Department of the Environment, 2018c). A standardised nomenclature for the different roost types has been established and include four types of roosts:

- Permanent diurnal roost;
- Non-permanent breeding roost;
- Transitory diurnal roosts; and
- Nocturnal refuge.

Permanent diurnal roosts are occupied all year and are utilised for breeding and rearing of young. Non-permanent breeding roosts are also used for mating and transitory diurnal roosts facilitate long-distance dispersal. These roost types are considered critical habitat for the survival of the species. Nocturnal refuge roosts are used for shelter and feeding, and while not classified as critical habitat, they are important for the species persistence in the local area (Churchill, 2009; Department of the Environment, 2018c).

The Conservation Advice for the Pilbara Leaf-nosed Bat has categorised critical foraging habitat based on number of encounters at night and the theory that the conditions of these habitats are important for supporting a neighbouring colony (Threatened Species Scientific Committee (TSSC), 2016). These habitats and priorities include:

- Priority 1 – rocky gorges with waterpools;
- Priority 2 – gullies;
- Priority 3 – rocky outcrops;
- Priority 4 – major watercourses; and
- Priority 5 – open grassland and woodland (TSSC 2016).

Pilbara Leaf-nosed Bats are insectivorous, with a large proportion of their diet consisting of moths, termites and beetles. The bats emerge from their nocturnal roost after dusk and forage along rock faces, rocky gullies, gorges, and creek lines and water holes (Churchill, 2009; Department of the Environment, 2018c). The Pilbara Leaf-nosed Bat is vulnerable to the loss of body heat and moisture, and therefore requires a stable warm microclimate. Their breeding cycle stretches over a 9-month period, with mating taking place in July and the dispersal of independent young in February/March (Churchill, 2009; Department of the Environment, 2018c).

Occurrence in the Survey Area: The Pilbara Leaf-nosed Bat was previously recorded in the Survey Area, along Fortescue's Main Line Rail in 2013-2014, 2016 and 2019 (Table 3.9). All records are from Fortescue's on-going fauna monitoring program. The older records from 2013-2014 were recorded on both the DBCA

database and Fortescue’s internal database, while the more recent records were only on Fortescue’s. Additional monitoring records from the Survey Area in 2015 (on both databases) have been removed due to discrepancies with the locational information. Further records exist from 1.5 km NW of the Survey Area at another monitoring site in 2018 and 2019.

Numerous additional records for this species are located to the west at Wodgina and to the east at Iron Bridge. Both areas feature rocky escarpments, the preferred habitat for this species, and include known roosting locations.

The Pilbara Leaf-nosed Bat was recorded during both phases of the current survey from seven of the eight trapping/satellite sites across the Survey Area. Call patterns from the sites were well after sunset and well before sunrise, indicating foraging activity within the Survey Area (Appendix E). It is unclear if all records represent foraging individuals or if they just pass through whilst travelling between suitable habitats.

All records from the Survey Area and surrounds (up to 2 km) are summarised in Table 3.9 with locations shown on Map 3.5. The bat call analysis report is included in Appendix E.

Table 3.9: Pilbara Leaf-nosed Bat Records within the Survey Area and 2 km Buffer

Survey Phase or Date	Site / Location Distance	Type of Record	Fauna Habitat	Habitat Definition (Fortescue & TSSC)	Easting	Northing
Previous Records – Fortescue’s Internal Database – Fauna Monitoring						
22-23/12/2016	MR Bat I3.1	2 nights, 3 call passes between 21:59 to 23:02 (Ecoscape, 2017a)	Granite Domes and Boulder Piles	Supporting (Priority 3)	685891	7650102
16-17/11/2019 19/11/2019	R_F_P_ML_Bat_I3	3 nights, 3 call passes between 21:09 to 1:19 (Spectrum, 2020a)	Granite Domes and Boulder Piles	Supporting (Priority 3)	686046	7650043
Previous Records – DBCA Database & Fortescue’s Internal Database – Fauna Monitoring						
22/05/2013	J-ML-FA_SM2 4699 21/5	1 night, 2 call passes, one at 19:12 (ecologia, 2014a)	Spinifex Sand Plain – edge of granites	Supporting (Priority 5)	685224	7652369
30/08/2013- 02/09/2013	J-ML-FA- MLPLNBIS3	4 nights, 4 call passes between 19:40 to 12:04 (ecologia, 2014a)	Spinifex Sand Plain – edge of granites	Supporting (Priority 5)	685212	7652338
23-25/08/2014	J-ML-FA- MLPLNBIS3	3 nights, 7 call passes between 19:40 to 00:50 (ecologia, 2015b)	Spinifex Sand Plain – edge of granites	Supporting (Priority 5)	685212	7652338
Previous Records – DBCA Database & Fortescue’s Internal Database – Fauna Monitoring (up to 2 km outside)						
27/11/2018	R_F_P_MR_BAT_C6 1.5 km NW	1 night, 1 call pass at 23:13 (Spectrum, 2019)	Minor Drainage Line	Supporting (Priority 5)	678448	7655829
17/12/2019, 19-20/12/2019	R_F_P_MR_BAT_C6 1.5 km NW	3 nights, 1 call pass from 20:00 to 4:08 (Spectrum, 2020b)	Minor Drainage Line	Supporting (Priority 5)	678448	7655829
This Survey						
Phase 1	NS01	1 night; 1 call pass at 19:35	Minor Drainage Line	Supporting (Priority 5)	685958	7650763
Phase 2	NS01	1 night; 1 call pass at 22:03	Minor Drainage Line	Supporting (Priority 5)	685953	7650760
Phase 1	NS02	4 nights; 15 call passes between 21:02 to 02:38	Spinifex Sand Plain	Supporting* (Priority 5)	683945	7653596
Phase 2	NS02	4 nights; 4 call passes between 20:02 to 22:26	Spinifex Sand Plain	Supporting* (Priority 5)	683945	7653596

Survey Phase or Date	Site / Location Distance	Type of Record	Fauna Habitat	Habitat Definition (Fortescue & TSSC)	Easting	Northing
Phase 1	NS03	1 night; 3 call passes between 21:44 to 23:52	Spinifex Sand Plain	Supporting* (Priority 5)	682171	7653959
Phase 2	NS03	3 nights; 5 call passes between 19:50 to 4:14	Spinifex Sand Plain	Supporting* (Priority 5)	682174	7653956
Phase 1	NS04	1 night; 2 call passes between 22:12 to 2:24	Major Drainage Line	Supporting (Priority 4)	680038	7653289
Phase 2	NS04	3 nights; 7 call passes between 20:43 to 00:26	Major Drainage Line	Supporting (Priority 4)	680006	7653287
Phase 1	S01	1 night, 1 call pass at 23:08 (Phase 1)	Granite Domes and Boulder Piles	Supporting (Priority 3)	683834	7648480
Phase 1	S02	2 nights; 2 call passes between 19:33 to 22:13	Major Drainage Line	Supporting (Priority 4)	681530	7652069
Phase 2	S02	1 night; 4 call passes between 1:10 to 1:26	Major Drainage Line	Supporting (Priority 4)	681518	7652073
Phase 1	S03	1 night; 3 call passes between - 19:48 to 3:01	Granite Domes and Boulder Piles	Supporting (Priority 3)	685299	7652927

*records are likely individuals passing through and not utilising the habitat. Area is likely used as fly path.

Critical habitat in Survey Area: Not applicable.

No critical habitat was identified within the Survey Area.

Supporting habitat in Survey Area: Granite Domes and Boulder Piles (2.7%), Major Drainage Line (1.0%) and Minor Drainage Line (1.4%)

Spinifex Sand Plain (91.5%) and Spinifex Rocky Plain (0.1%) have been discounted for the Survey Area despite 'open grasslands and woodlands' being listed in the species advice (TSSC 2016). The open plains in the Survey Area may be crossed or overflowed to access habitats in the area, but they are unlikely to provide suitable conditions. Habitats present in the Survey Area are likely used for foraging (supporting) only and provide connectivity to the known roost locations to the east and west. The Granite Domes and Boulder Piles may be suitable for infrequent and temporary nocturnal roosting during the wet season, provided suitable shelters exist. However, the absence of deep crevices and humid caves likely restricts this activity to humid weather conditions.

Based on the TSSC (2016), the fauna habitats present within the Survey Area, form supporting (foraging) habitat only, and fit into the following categories (see Map 3.5):

- Priority 3:
 - Granite Domes and Boulder Piles (121.1 ha / 2.7 % of the Survey Area).
- Priority 4:
 - Major and Minor Drainage Lines (104.5 ha / 2.4 % of the Survey Area).

3.4.1.4. Ghost Bat (*Macroderma gigas*)

Conservation Status: EPBC Act & BC Act: Vulnerable.

Distribution, Habitat and Ecology: The Ghost Bat is a large, specialist carnivorous bat and is the sole member of its genus (Hoyle, Pople and Toop, 2001; Worthington Wilmer *et al.*, 2008). The species once occurred across much of Australia but is now only known from isolated locations in northern Australia (Armstrong and Anstee, 2000; Bat Call WA, 2021).

Ghost Bats use a range of cave structures for short-term transient feeding roosts, long-term roosts and maternity roosts (DoE 2023b). Short-term transient roosts can include overhangs, small shallow caves, granite boulders, and rail culverts. These sites have microclimates close to ambient conditions (Armstrong and Anstee, 2000; Ecoscape 2017b, 2018). Maternity roosts require a stable, warm, and humid climate with a relative humidity over 80%. They are usually deep, complex, or large domed caves or mine adits with an ideal isothermal zone (23-26°C) and a cavern size large enough for the species to manoeuvre in (Pettigrew *et al.*, 1986; Hall *et al.*, 1997). Medium-sized caves with suitable microclimates are used for a variety of activities such as foraging and long-term roosting. Caves that provide complete darkness are reported to be preferred for roosting (Schulz and Menkhorst, 1986).

Female Ghost Bats exhibit long-term philopatry, using the same roost caves, resulting in low mitochondrial DNA diversity (Worthington Wilmer *et al.*, 2008). Tracking studies have shown that up to 75% of the population disperse in winter with the remaining individuals (possibly pregnant females) occupying the warm caves over winter (Toop, 1985). The dispersing parties typically consist of small groups of paired Ghost Bats which can utilise smaller caves than those used during the breeding season. Females and males aggregate for breeding purposes at the end of the wet season (Pettigrew *et al.*, 1986) and females give birth to young between late August and November. The young are nursed in large maternity caves over the wet season (Toop, 1985).

The Ghost Bat is a carnivorous predator, feeding on other bats, rodents, invertebrates, and birds (Pettigrew *et al.*, 1986; Boles, 1999; Ecoscape 2018). Prey detection is through a combination of passive listening, vision, and echolocation. Detection through movement is thought to be the primary stimulus (Pettigrew *et al.*, 1988).

Occurrence in the Survey Area: The Ghost Bat was previously recorded from the Survey Area in 2014 from a motion camera image within a culvert during Fortescue's fauna monitoring program, as outlined in Table 3.10 (ecologia, 2015b). This species has been recorded using other culverts along the Main Line Rail for foraging and/or temporary nocturnal roosts, with remains and scats recorded over multiple years (Ecoscape, 2017a; Spectrum, 2020). Additionally, this species was also recorded in 2011, less than 1 km north of the Survey Area, from a survey along the Roy Hill rail line. Numerous additional records exist for this species to the west at Wodgina and to the east at Iron Bridge. Both areas have preferred roosting habitat for this species (rocky escarpments) and contain known maternity roost locations. Further infrequent records exist to the south and north from culverts and other foraging areas.

The species was not recorded during the survey; however, survey methods current at the time of survey area were inadequate to detect the Ghost Bat reliably. Recent developments have improved detection probabilities (Ruykys, Hanrahan and Stokeld, 2023, K. Armstrong, pers. comms, 2023).

The record from the Survey Area is outlined in Table 3.10 and shown on Map 3.5.

Table 3.10: Ghost Bat Records within the Survey Area and 2 km Buffer

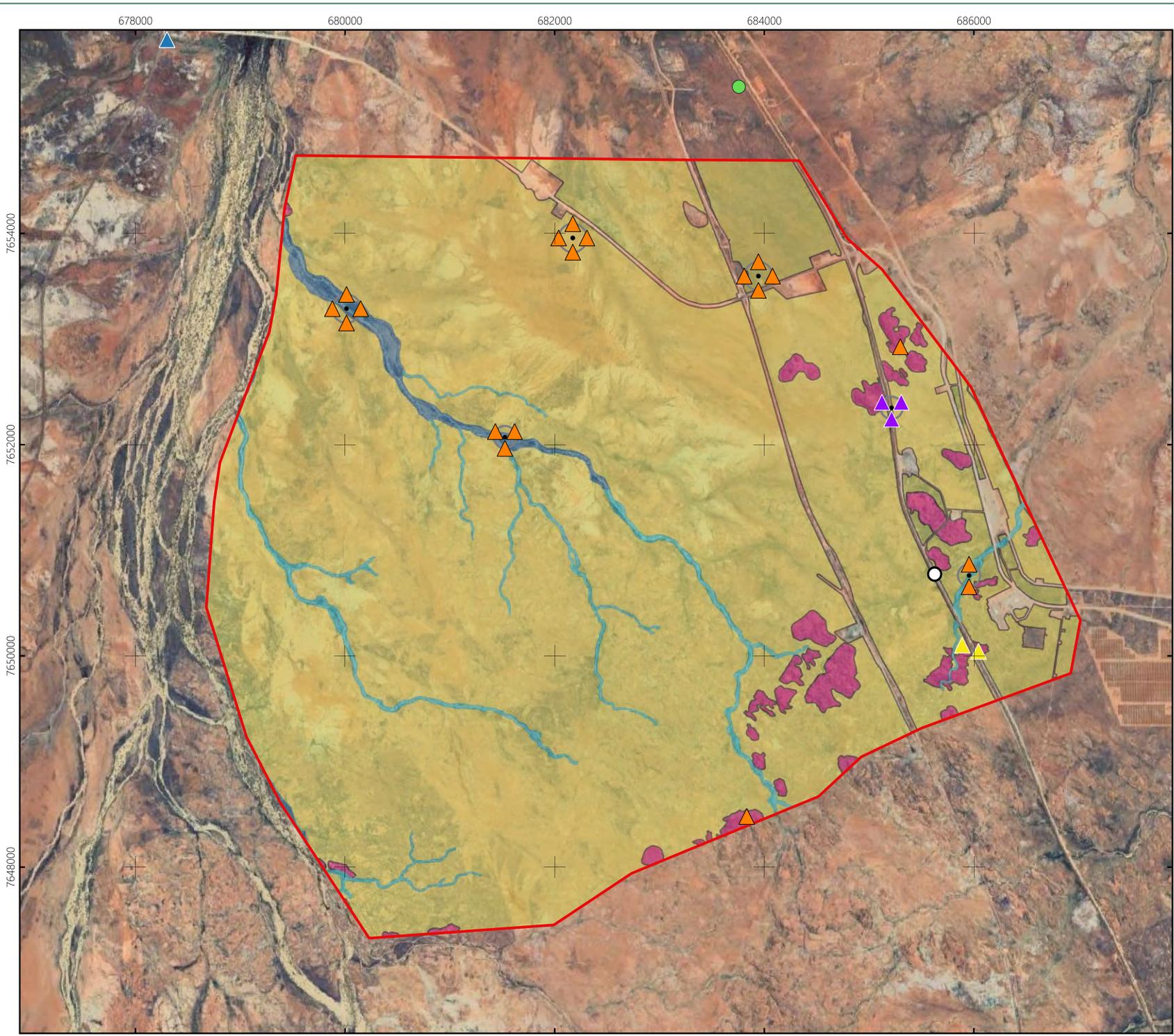
Survey Phase or Date	Site / Location	Type of Record	Fauna Habitat	Habitat Definition (Fortescue)	Easting	Northing
Previous Records – DBCA Database & Fortescue's Internal Database – Fauna Monitoring						
29/11/2014	J-ML-FA-MLCM8 (now known as R_F_P_MR CU02)	On motion camera in culvert (ecologia, 2015b)	Spinifex Sand Plain – this camera is in a culvert within minor drainage line habitat.	Supporting	685627	7650774
Previous Records – DBCA Database – Previous Survey						
21/03/2011	Roy Hill Railway 695 m N	Likely call recorded on bat recorder	Spinifex Sand Plain	Supporting	683758	7655388

Critical habitat in Survey Area: Not applicable.

No critical habitat was identified in the Survey Area for the Ghost Bat.

Supporting habitat in Survey Area: Granite Domes and Boulder Piles (2.7%), Spinifex Sand Plain (91.5%), Major Drainage Line (1.0%) and Minor Drainage Line (1.4%) and Spinifex Rocky Plain (0.1%).

The Major Drainage Line, Minor Drainage Line, Granite Dome and Boulder Piles and possibly the Spinifex Sand Plain habitats in the Survey Area are likely used by the Ghost Bat for foraging on an occasional basis (Map 3.5). These habitats provide connectivity to the known roost locations to the east and west of the Survey Area (Iron Bridge and Wodgina). The habitats are unlikely to be utilised for roosting due to the lack of deep, humid crevices or caves in the Granite Dome and Boulder Piles and the absence of suitable roost sites in the remaining habitat types. However, any suitable shelters present in the Granite Dome and Boulder Piles habitat could potentially be used intermittently as a transient roost. Additionally, the culverts present in the Survey Area may also be used for foraging and/or temporary nocturnal roosts on an occasional basis.



Legend

Survey Area

Pilbara Leaf-nosed Bat & Ghost Bat Records

This Survey

Pilbara Leaf-nosed Bat

Previous Records - Fauna Monitoring

Ghost Bat - DBCA Database

Pilbara Leaf-nosed Bat - both databases

Pilbara Leaf-nosed Bat - Fortescue Internal Database

Outside Survey Area (<2 km)

Ghost Bat - both databases

Pilbara Leaf-nosed Bat - both databases

Fauna Habitats

Supporting Habitats - TSSC Priority

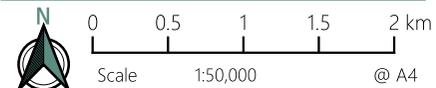
Granite Domes & Boulder Piles - Priority 3

Major Drainage Line - Priority 4

Minor Drainage Line - Priority 4

Spinifex Sand Plain - Ghost Bat only

Spinifex Rocky Plain - Ghost Bat only



Coordinate System: GDA 1994 MGA Zone 50
 Projection: Universal Transverse Mercator
 Units: Metre



Author: EM

Date: 20-01-2025

Significant Bat Records & Habitat

NSJW Project

MAP

Prepared for Fortescue

3.5

3.4.1.5. Brush-tailed Mulgara (*Dasyercus blythi*)

Conservation Status: DBCA: Priority 4.

Distribution, Habitat and Ecology: The Brush-tailed Mulgara is a medium sized carnivorous marsupial belonging to the family Dasyuridae. It occupies the arid and semi-arid interior of Australia with records from Western Australia, the Northern Territory, and Queensland (Woolley et al, 2013; Newman-Martin et al., 2023). Preferred habitats include sandy and loamy flats and dunes vegetated with hummock and/ or tussock grasses. Brush-tailed Mulgara have also been recorded from stony gibber plains where wind-blown soil or sand has accumulated and allowed burrowing (Pavey *et al.*, 2011).

The Brush-tailed Mulgara excavates single entrance burrows (often at the edges of *Triodia* spp. hummocks) with multiple side tunnels that may terminate at surface ‘pop-holes’. It is a nocturnal hunter, predated upon rodents, reptiles, and arthropods. Breeding takes place during the winter months with females recorded carrying young in September (Van Dyck and Strahan, 2008). They are solitary, seasonal breeders with low dispersal once a home range has been established (Masters, 2003).

Occurrence in the Survey Area: The Brush-tailed Mulgara was previously recorded from secondary evidence at five locations in the Survey Area from three surveys conducted in 2009, 2019 and 2021, as detailed in Table 3.11 and shown on Map 3.6. An additional six previous records are within 2 km, with further records within 2 km to 10 km of the Survey Area.

This species was recorded during both phases of the survey from sites NS01, NS05, NSOPP08 and NSOPP10. Sites NS01 and NS05 both recorded captures and secondary evidence (Table 3.11, Map 3.6). The Brush-tailed Mulgara is likely a resident of the Survey Area.

Table 3.11: Brush-tailed Mulgara Records within the Survey Area and 2 km Buffer

Survey Phase or Date	Site / Location	Type of Record	Fauna Habitat	Habitat Definition (Fortescue)	Easting	Northing
Fortescue’s Internal Database – Previous Surveys						
10/06/2009	GDP 2449	Inactive burrow (Ecoscape, 2009)	Spinifex Sand Plain	Critical	685937	7650658
10/06/2009	GDP 2449	Active burrow (Ecoscape, 2009)	Spinifex Sand Plain	Critical	6861556	7650862
22/09/2019	HV1909	Digging or burrow (Ecoscape, 2020a)	Was Spinifex Sand Plain, now Cleared/Disturbed	N/A	686927	7650507
27/05/2021	NSJ_FN_P_FS08	Digging (Ecoscape, 2021)	Was Spinifex Sand Plain, now Cleared/Disturbed	N/A	686222	7650310
27/05/2021	NSJ_FN_P_FS09	Digging (Ecoscape, 2021)	Was Spinifex Sand Plain, now Cleared/Disturbed	N/A	686382	7650388
DBCA Database – Previous Survey (up to 2 km outside)						
01/07/2001	Proposed Hope Downs Rail – HAE9b 1.9km S	Capture	Spinifex Sand Plain	Critical	687826	7648131
Fortescue’s Internal Database – Previous Surveys (up to 2 km outside)						
09/06/2009	P4D 287 m E	Inactive burrow (Ecoscape, 2009)	Spinifex Sand Plain	Critical	685071	7654089
09/06/2009	P4D 313 m E	Active burrow (Ecoscape, 2009)	Was Spinifex Sand Plain, now Cleared/Disturbed	N/A	684675	7654731
09/06/2009	P4D 422 m E	Inactive burrow (Ecoscape, 2009)	Spinifex Sand Plain	Critical	684974	7648294
27/05/2021	NSJ_FN_P_FS06 99 m E	Digging or burrow (Ecoscape, 2021)	Spinifex Sand Plain	Critical	686902	7650813

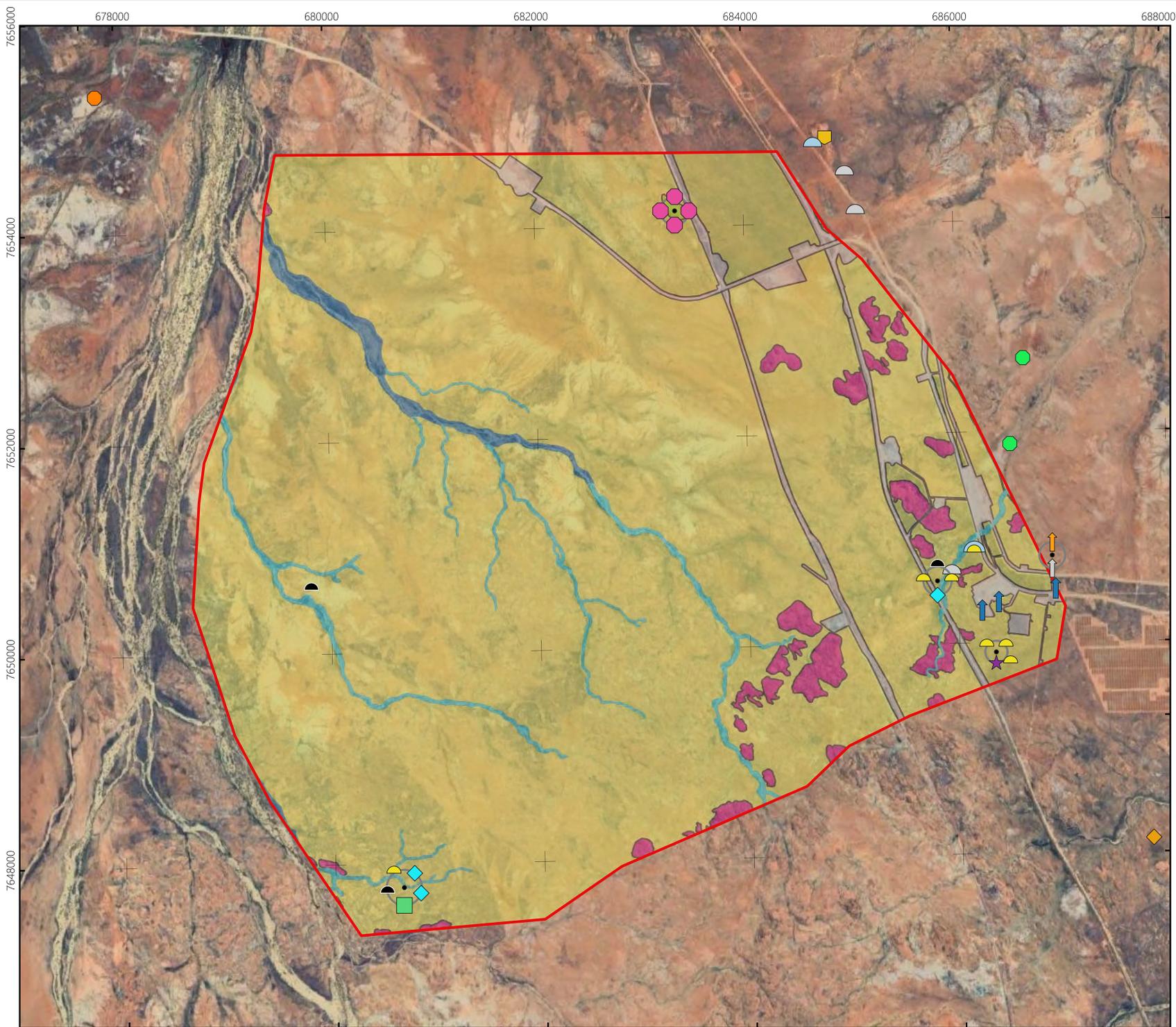
Survey Phase or Date	Site / Location	Type of Record	Fauna Habitat	Habitat Definition (Fortescue)	Easting	Northing
27/05/2021	NSJ_FN_P_FS07 101 m E	Digging (Ecoscape, 2021)	Spinifex Sand Plain	Critical	686897	7650828
This Survey						
Phase 1	NS05	Burrow	Minor Drainage Line	Critical	680657	7647798
Phase 1	NS01-TS	Inactive burrow	Spinifex Sand Plain	Critical	686153	7650861
Phase 1	NS05-MC105	Individual on motion camera	Spinifex Sand Plain	Critical	680683	7647779
Phase 1	NS05	Female captured in pitfall	Spinifex Sand Plain	Critical	680624	7647777
Phase 1	NSOPP08	Inactive burrow	Spinifex Sand Plain	Critical	679811	7650612
Phase 2	NS01	Female with pouch young captured in Elliott	Spinifex Sand Plain	Critical	685777	7650594
Phase 2	NS05	Male captured in Elliott	Spinifex Sand Plain	Critical	680630	7647758
Phase 2	NS01	Burrow	Spinifex Sand Plain	Critical	685753	7650614
Phase 2	NS01	Burrow	Spinifex Sand Plain	Critical	685813	7650557
Phase 2	NS01	Burrow & pophole	Spinifex Sand Plain	Critical	685851	7650611
Phase 2	NS05	Inactive burrow	Minor Drainage Line	Critical	680661	7647762
Phase 2	NSOPP10	Burrow & diggings	Spinifex Sand Plain	Critical	686330	7649879
Phase 2	NSOPP10	Burrow	Spinifex Sand Plain	Critical	686365	7649910
Phase 2	NSOPP10	Burrow	Spinifex Sand Plain	Critical	686352	7649944
Phase 2	NSOPP10	Pophole	Spinifex Sand Plain	Critical	686484	7649804

Critical habitat in Survey Area: Spinifex Sand Plain (91.5%) and Minor Drainage Line (1.4%).

The majority of the Spinifex Sand Plain habitat in the Survey Area is considered potential habitat, as are Minor Drainage Lines. These habitats are suitable for breeding, as the sandy substrate provides optimal conditions for burrow construction (Map 3.6).

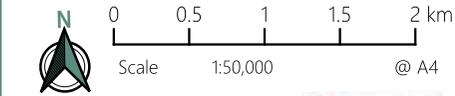
Supporting habitat in Survey Area: Spinifex Rocky Plain (0.1%), Major Drainage Line (1.0%) and Granite Domes and Boulder Piles (2.7%).

The Spinifex Rocky Plain (0.1%) could be used for foraging and dispersal and may also be used for breeding depending on the suitability of the substrate. The Major Drainage Line (1.0%) and Granite Domes and Boulder Piles (2.7%) habitat surrounding the preferred habitat, may infrequently be used, especially when foraging and dispersing.



Legend

- Survey Area
- Other Significant Fauna Records**
- This Survey**
- ◆ Brush-tailed Mulgara - capture
- Brush-tailed Mulgara - motion camera
- ▲ Brush-tailed Mulgara - active burrow
- Brush-tailed Mulgara - inactive burrow
- Brush-tailed Mulgara - camera recording
- ★ Brush-tailed Mulgara - burrow & diggings
- Western Pebble-mound Mouse - active mound
- DBCAs Database - Other Surveys**
- ◆ Brush-tailed Mulgara - capture
- Western Pebble-mound Mouse - likely mound
- Fortescue Internal Database - Other Surveys**
- ▲ Brush-tailed Mulgara - active burrow
- ↑ Brush-Tailed Mulgara - digging
- ↑ Brush-Tailed Mulgara - digging or burrow
- Brush-tailed Mulgara - inactive burrow
- Western Pebble-mound Mouse - mound
- Fortescue's Fauna Monitoring Program**
- Spectacled Hare-wallaby
- Fauna Habitats**
- Spinifex Sand Plain
- Spinifex Rocky Plain
- Major Drainage Line
- Minor Drainage Line
- Granite Domes & Boulder Piles
- Cleared/Disturbed



Coordinate System: GDA 1994 MGA Zone 50
 Projection: Universal Transverse Mercator
 Units: Metre

Author: EM Date: 13-01-2025

Other Significant Fauna Records & Habitat

NSJW Project

MAP
3.6

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3.4.1.6. Spectacled Hare-wallaby (*Lagorchestes conspicillatus*)

Conservation Status: DBCA: Priority 4.

Distribution, Habitat and Ecology: The Spectacled Hare-wallaby (*Lagorchestes conspicillatus leichardti*) is listed as Priority 4 by the DBCA due to the limited knowledge about the species' distribution and ecology. In some areas, the species was presumed extinct (Kimberley region) until 2004, when a specimen was recorded as roadkill (Wysong *et al.*, 2022). Further sightings have been recorded in the Kimberley and Pilbara regions in recent years (Wysong *et al.*, 2022; Spectrum Ecology & Spatial, 2023).

The Spectacled Hare-wallaby is an elusive species that is rarely recorded, and if so, it is mostly found through only secondary evidence (scats). The Spectacled Hare-wallaby are known to inhabit hummock grasslands with a mid-dense or sparse overstory and shelters under long, unburnt spinifex to evade predation and temperature extremes (Menkhorst and Knight, 2001; Van Dyck and Strahan, 2008). The Spectacled Hare-wallaby is solitary and well adapted to arid habitats, with a home range (of up to 177 ha). Their diet of grasses and herbs is dependent on climatic changes and individuals are expected to be nomadic in response to local environmental conditions. (Burbidge and Johnson, 2008).

Occurrence in the Survey Area: The Spectacled Hare-wallaby was recorded within 500 m of the Survey Area in 2022 as detailed in Table 3.12 and shown on Map 3.6 (Spectrum, 2024). Four records were also listed by DBCA from within 10 km of the Survey Area, of which two records were from 2018. The frequency of records in the last 10 years indicates that the species has a high likelihood to occur on an infrequent basis. In September 2024, a video recording was made of an individual crossing the road approx. 4.5 km to the east of the Survey Area (Fortescue internal database) on Spinifex Sand Plain.

Table 3.12: Spectacled Hare-wallaby Records within the Survey Area and 2 km Buffer

Survey Phase or Date	Site / Location	Type of Record	Fauna Habitat	Habitat Definition (Fortescue)	Easting	Northing
Fortescue's Fauna Monitoring Program- (up to 2 km outside)						
07/07/2022	R_F_P_MR_RE_01 455 m E	Motion camera recording	rehabbed area (Spinifex Sand Plain)	N/A / Critical	684791	7654814

Critical habitat in Survey Area: Spinifex Sand Plain (91.5%) and Spinifex Rocky Plain (0.1%).

The Spinifex Sand Plain and Spinifex Rocky Plain habitats are suitable and provides optimal conditions, especially in longer unburnt areas such as in the north-east of the Survey Area. The remainder of the Spinifex Sand Plain habitat was recently burnt, limiting the shelter and suitability for the immediate future (Map 3.6).

Supporting habitat in Survey Area: Major Drainage Line (1.0%) and Minor Drainage Line (1.4%).

Not much is known about this species habitat preferences, but it's likely this species uses both these habitats on an occasional basis for foraging and dispersal.

3.4.1.7. Western Pebble-mound Mouse (*Pseudomys chapmani*)

Conservation Status: DBCA Priority 4.

Distribution, Habitat and Ecology: The Western Pebble-mound Mouse is endemic to the Pilbara region of Western Australia. Distribution extends from southern and central Pilbara to the Little Sandy Desert (Van Dyck and Strahan, 2008) It is one of three species of Australian rodent that constructs an underground burrow system with a permanent arrangement of stones above ground at the entrances (Anstee, Roberts and Shea, 1997). They are found on pebbled soil in arid tussock grassland and acacia woodland on gentle slopes of rocky ranges, with hard spinifex and scattered shrubs. The mice have a complex social structure and are known to occur in groups of up to 12 animals, who may utilise several burrow structures (Anstee, Roberts and Shea, 1997). Male home ranges were found to be considerably larger than those of females, particularly during breeding season (Anstee, Roberts and Shea, 1997).

Occurrence in the Survey Area: Four active mounds of the Western Pebble-mound Mouse were previously recorded from the Survey Area (ecologia, 2012), with an additional three records within 2 km of the Survey Area (Table 3.13, Map 3.6). The mounds within the Survey Area were revisited during the survey and assessed as recently active (Table 3.13, Plate 3.4).

Table 3.13: Western Pebble-mound Mouse Records within the Survey Area and 2 km Buffer

Survey Phase or Date	Site / Location	Type of Record / Reference	Fauna Habitat	Habitat Definition (Fortescue)	Easting	Northing
This Survey & DBCA Database & Fortescue's Internal Database – Previous Survey						
Phase 1/2 & 17/05/2012	PMM01	Recently active mound (ecologia, 2012)	Spinifex Rocky Plain	Critical	683363	7654119
Phase 1/2 & 17/05/2012	PMM02	Recently active mound (ecologia, 2012)	Spinifex Rocky Plain	Critical	683373	7654134
Phase 1/2 & 17/05/2012	PMM03	Recently active mound (ecologia, 2012)	Spinifex Rocky Plain	Critical	683323	7654184
Phase 1/2 & 17/05/2012	PMM04	Recently active mound (ecologia, 2012)	Spinifex Rocky Plain	Critical	683322	7654144
DBCA Database – Previous Survey (up to 2 km outside)						
01/04/2013	1.8 km WNW	Unknown – likely mound	Likely Spinifex Rocky Plain	Critical	677818	7655310
Fortescue's Internal Database – Previous Survey (up to 2 km outside)						
26/05/2021	NSJ_FN_P_FS01 204 m E	Mound – status unknown (Ecoscape, 2021)	Likely Spinifex Rocky Plain	Critical	686512	7651884
26/05/2021	NSJ_FN_P_FS02 675 m E	Mound – status unknown (Ecoscape, 2021)	Likely Spinifex Rocky Plain	Critical	686649	7652696

Critical habitat in Survey Area: Spinifex Rocky Plain (0.1%), with further less optimal habitat in the Spinifex Sandy Plain (91.5%), in areas close to the Granite Domes and Boulders Piles, where suitable rocky substrate occurs (Map 3.6).

Supporting habitat in Survey Area: Not present.



Plate 3.4: Recently Active Western Pebble-mound Mouse Mounds in the Survey Area

3.4.2. Birds

3.4.2.1. Grey Falcon (*Falco hypoleucos*)

Conservation Status: EPBC Act & BC Act: Vulnerable.

Distribution, Habitat and Ecology: The Grey Falcon is the rarest falcon in Australia with an estimated population size of <1000 individuals (Schoenjahn, 2013). They occur sparsely in a wide variety of arid and semi-arid zones across an area of about 5 million km² (Schoenjahn, Pavey and Walter, 2020). They have not been found to be associated with any particular vegetation types; however, climate characteristics such as temperature and rainfall appear to strongly influence the distribution of the species (Schoenjahn et al, 2020). This species movements, including their home range size, are poorly understood (Schoenjahn et al, 2020). It is likely their home ranges are large, with the species travelling long distances. However, the Grey Falcon may also be considered, to some extent nomadic, moving to where conditions are more favourable (Schoenjahn, Pavey and Walter, 2020).

The Grey Falcon breeding period is from June to November, with a clutch size varying between 1 to 4 eggs (Olson and Olson, 1986; Garnett et al, 2011; Schoenjahn, 2013). Breeding habitat appears to be localised in zones with the highest annual average temperatures, and areas with persistently dry and winter drought climatic conditions (Schoenjahn, 2013). Grey Falcons typically use the nests of other large birds (corvids and raptors), generally in tall trees such as River Red Gums (*Eucalyptus camaldulensis*) along drainage lines or on man-made infrastructure such as repeater towers or power-line pylons (Olson and Olson, 1986). Nests are often used over several years and can be near nests of other falcons or raptor species (Schoenjahn, 2013).

The Grey Falcon forages in open landscapes such as rocky plains with hummock grasslands, lower shrublands, open woodland and small drainage lines where they predominantly prey on birds, mainly pigeons and parrots (Olson and Olson, 1986; Schoenjahn, 2013).

Occurrence in the Survey Area: The Grey Falcon was previously recorded just outside the Survey Area in 2012 as outlined in Table 3.14 and shown on Map 3.7. It's likely three individuals were recorded during the survey, with at least one individual sighted twice. The individual was soaring above the Major Drainage Line habitat in the north-west, and a pair was recorded perched on powerlines, 1.1 km south of the Survey Area (Table 3.14, Map 3.7). The pair moved along the powerlines adjacent to the Fortescue Main Line Rail in a northwards direction from Rail Camp 145 towards the Survey Area over the duration of the Phase 1 survey

which coincided with the pre-breeding season (June to November, Plate 3.5). It is likely that the pair was in search of a suitable nesting site.

Table 3.14: Grey Falcon Records within the Survey Area and 2 km Buffer

Survey Phase or Date	Site / Location	Type of Record	Fauna Habitat	Habitat Definition (Fortescue)	Easting	Northing
DBCA Database – Previous Survey (up to 2 km outside)						
17/08/2012	281 m W	Unknown but likely an observation	Major Drainage Line	Critical	679009	7653160
This Survey						
Phase 1	NS04	Soaring	Major Drainage Line / Spinifex Sand Plain	Critical / Supporting	680159	7653231
Phase 1	GFC01 (NSOPP02)	Soaring	Major Drainage Line / Spinifex Sand Plain	Critical / Supporting	679467	7653875
Phase 1	GF06 1.1 km S	Pair perched on powerlines, south of the Survey Area	Likely Spinifex Sand Plain	Supporting	686724	7648572

Critical habitat in Survey Area: Major Drainage Line (1.0% of Survey Area).

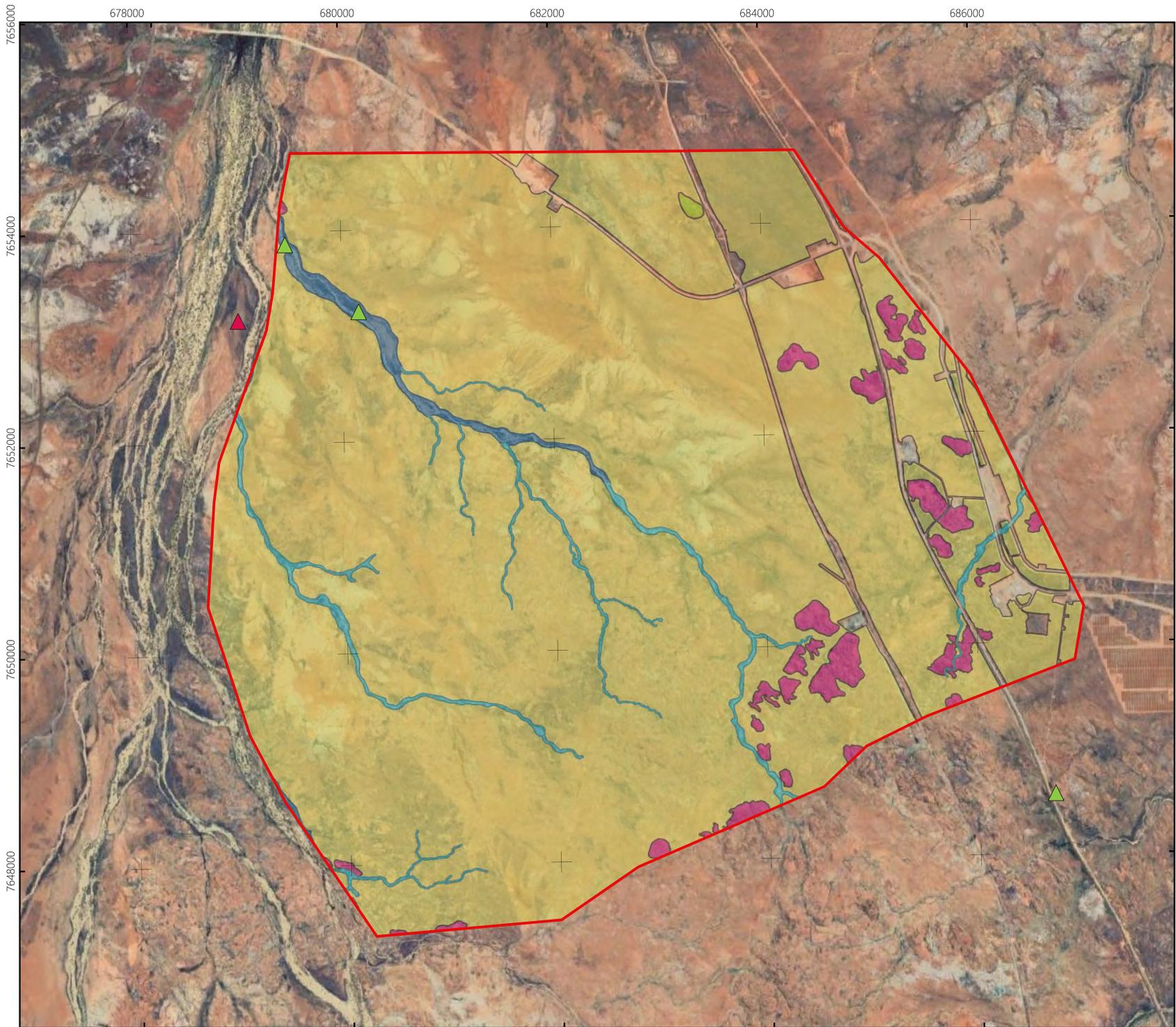
Suitable breeding habitat is present within the Survey Area in the Major Drainage Line, where tall, large trees such as River Red Gum (*Eucalyptus camaldulensis*) are present. The species may use the Major Drainage Line habitat in the Survey Area and surrounding vicinity (Turner River East) for breeding. Additionally, structures such as repeater towers and powerlines may be used for breeding. These are present in the Survey Area, along the Main Line Rail and vicinity, Junction Camp, and Roy Hill Rail Line.

Supporting habitat in Survey Area: Minor Drainage Line, Spinifex Sand Plain and Spinifex Rocky Plain.

These habitats are likely used for foraging and dispersal on a regular or occasional basis depending on if climatic conditions are favourable and if breeding is occurring in the vicinity (Map 3.7).



Plate 3.5: Pair of Grey Falcons Recorded South of the Survey Area



Legend

Survey Area

Grey Falcon Records

This Survey

▲ Sighting

Outside Survey Area (<2 km)

▲ DBCA Database

Fauna Habitats

Critical Habitats

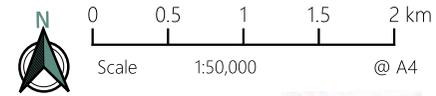
Major Drainage Line

Supporting Habitats

Minor Drainage Line

Spinifex Sand Plain

Spinifex Rocky Plain



Coordinate System: GDA 1994 MGA Zone 50
 Projection: Universal Transverse Mercator
 Units: Metre



Author: EM

Date: 14-01-2025

Grey Falcon Records & Habitat

NSJW Project

MAP

Prepared for
Fortescue

3.7

3.4.2.2. Pacific Swift (*Apus pacificus*)

Conservation Status: EPBC Act & BC Act: Migratory.

Distribution, Habitat and Ecology: The Pacific Swift is a migratory, non-breeding visitor to Australia. Within Western Australia, records are most abundant in coastal areas of the, southwest, Pilbara, and Kimberley regions (DAWE 2020). This medium sized swift is characterised by its forked tail and white rump, with back swept wings that taper to a fine point (Menkhorst et al., 2019). The species is known to be highly nomadic, rarely landing, spending much of their time foraging in large flocks high above the canopy. The species is known to be insectivorous, but its food source is relatively unknown within Australia (Menkhorst et al., 2019). Large flocks are often associated with low pressure storm systems (DAWE 2020).

Occurrence in the Survey Area: Two records were made from <10 km north and east of the Survey Area (Map 3.1). The Pacific Swift has an almost entirely aerial lifestyle and can occur anywhere when thunderstorms move through the area.

Critical habitat in Survey Area: Not present.

No critical habitat was identified in the Survey Area for the Pacific Swift.

Supporting habitat in Survey Area: Not present.

No supporting habitat was identified in the Survey Area for the Pacific Swift as this species is unlikely to land due to its aerial lifestyle and utilise any habitats on site.

3.4.2.3. Oriental Plover (*Charadrius veredus*)

Conservation Status: EPBC Act & BC Act: Migratory.

Distribution, Habitat and Ecology: The Oriental Plover has been recorded within all states In Australia but is most common in in coastal areas of Northern Australia, notably many thousands gather on Eighty-mile Beach from August onwards (Menkhorst *et al.*, 2019b). The species is migratory to Australia from breeding grounds in China. It is easily identifiable by its dark underparts and long pale legs. When in flight it is the only plover with a dark rump, no wing bar, and a distinctly grey-brown underwing. The species is generally found inland within arid and semi-arid zones. They are known to prefer open areas such as grasslands and sparsely vegetated plains including burnt and heavily grazed areas. Feeding in flocks in the morning, evening and after dark they forage in loose flocks for insects. During the hottest parts of the day they can collect in large flocks on wet ground associated with wetlands.

Occurrence in the Survey Area: The Oriental Plover has only been recorded once from within 21 km north-east of the Survey Area (Map 3.1). The Survey Area may be visited occasionally when conditions are optimal (after rainfall events), so this species has been given a medium likelihood to occur.

Critical habitat in Survey Area: Not present.

No critical habitat was identified in the Survey Area for the Oriental Plover.

Supporting habitat in Survey Area: Spinifex Sand Plain (91.5%) and Major Drainage Line (1.0%).

The species can occur sporadically in a variety of habitats, particularly after rainfall events, so the Spinifex Sand Plain and possibly the Major Drainage Line habitats may be visited infrequently for foraging (Map 3.6).

3.4.2.4. Common Greenshank (*Tringa nebularia*)

Conservation Status: EBPC & BC Act: Migratory

Distribution, Habitat and Ecology: This Common Greenshank is a migratory visitor to Australia, with breeding occurring in Eurasia, Palearctic regions, Asia, India, and Africa. They are common throughout the northern and western areas of Australia, particularly along the coastline in Autumn and Spring when migration occurs (Department of the Environment and Energy, 2018a, 2018b).

The Common Greenshank inhabits well-vegetated, wetlands, swamps, floodplains, water holes, artificial wetlands, channels, clay pans, inland lakes, estuaries and coastal areas, particularly in north-west Australia. They wade through shallow waters, feeding on a wide variety of prey including; molluscs, crustaceans, insects, fish frogs, lizards, rodents, and annelids. (Department of the Environment and Energy, 2018c, 2018a, 2018b).

Occurrence in the Survey Area: The Common Greenshank has been recorded three times in the past 20 years from within 50 km of the Survey Area (Map 3.1).

Critical habitat in Survey Area: Not present.

No critical habitat was identified in the Survey Area for the Common Greenshank.

Supporting habitat in Survey Area: Major Drainage Line (1.0%) and Spinifex Sand Plain (91.5%).

It can be found sporadically after rainfall events in areas of inundation, such as the vicinity of the Turner River (Major Drainage Line (1.0%)) and nearby Spinifex Sand Plain habitat where clay dominated areas retain surface water (Map 3.6). Visits are for foraging purposes only.

3.4.2.5. Peregrine Falcon (*Falco peregrinus*)

Conservation Status: BC Act: Other Specially Protected Fauna (OS).

Distribution, Habitat and Ecology: The Peregrine Falcon is one of the most widespread birds in the world, breeding on all continents except Antarctica. It occurs across most of Australia, although it is an uncommon species and is rare across all states and territories (Birdlife Australia, 2012). They are known to be both a nomadic and sedentary species. They inhabit cliffs, coastal habitats, rivers, wooded water courses and lakes, as well as urban environments. Peregrine Falcons usually nest by making a scrape on a high cliff-edge but will also use stick nests of other large birds and tree hollows in some areas (Olsen *et al.*, 2006). Hunting is mainly done during the day and feeding is primarily on small- to medium-sized birds caught in flight, often above drainage lines and rivers with favoured species reflecting the local prey profile (Birdlife Australia, 2012; Palmer, Rose and Debus, 2019).

Occurrence in the Survey Area: The Peregrine Falcon is a sporadic bird of prey in the Pilbara region with four records within 25 km of the Survey Area between 2000-2013 (Map 3.1).

Critical habitat in Survey Area: Not present.

There was no nesting or roosting habitat (cliff faces) for this species in the Survey Area.

Supporting habitat in Survey Area: Major Drainage Line (1.0%), Minor Drainage Line (1.4%), Spinifex Sand Plain (91.5%) and Spinifex Rocky Plain (0.1%).

Foraging could occur along the Major and Minor Drainage Lines and possibly within the Spinifex Sand Plain and Rocky Plain habitats (Map 3.6).

3.4.3. Reptiles

3.4.3.1. Pilbara Olive Python (*Liasis olivaceus barroni*)

Conservation Status: EPBC Act & BC Act: Vulnerable.

Distribution, Habitat and Ecology: The Pilbara Olive Python is a subspecies of Olive Python which is geographically separated from populations in the Kimberley, Northern Territory and Queensland (Wilson and Swan, 2017). They are one of the largest python species in Australia, growing up to 4.5 m in length (Wilson and Swan, 2017) and are often seen near water or in pools where they ambush prey such as birds, rodents, bats and wallabies (Pearson, 2003; Ellis, 2010; Wilson and Swan, 2021). Male Pilbara Olive Pythons travel up to 4 km during the winter months in search of females to mate with, with home ranges thought to be up to 450 ha (Pearson, 2003). Habitat requirements of the Pilbara Olive Python are thought to vary throughout the year due to changes in temperature and breeding activities. Dispersal during the wet season occurs across rocky habitats supporting water sources and drainage lines (Pearson, 2003). Pools of surface water are utilised for hunting whilst nearby caves, crevices and sometimes debris or tree hollows are used for shelter. During the cooler months, the pythons will shelter in caves and rock crevices, away from water (DEWHA 2008).

Reproduction is dependent upon environmental factors attributing to body condition. Where conditions are optimal, eggs are laid in Spring with young hatching at the start of the wet season (Dec-Jan). Once hatched, the young will disperse whilst foraging conditions for reptiles are ideal (Pearson, 2003).

Occurrence in the Survey Area: The species has been sighted 16 times within 25 km of the Survey Area between 2011 – 2017. The closest record is 7.5 km north-west of the Survey Area. This species may use the Survey Area infrequently and has a medium likelihood of occurrence.

Critical habitat in Survey Area: Not present.

No critical habitat was identified for the Pilbara Olive Python.

Supporting habitat in Survey Area: Major Drainage Line (1.0%), Minor Drainage Line (1.4%), and Granite Domes and Boulder Piles (2.7%).

Habitat use within the Survey Area is likely limited to foraging and dispersal only. The Major Drainage Line habitat is suitable for foraging and dispersal, while the Minor Drainage Line habitat may also be used sporadically. The Granite Domes and Boulders Piles habitat in the vicinity of the Major Drainage Line habitat is likely also used for foraging and potentially for breeding (Map 3.8).

3.4.3.2. Pin-striped Finesnout *Ctenotus nigrilineatus*

Conservation Status: DBCA Priority 1.

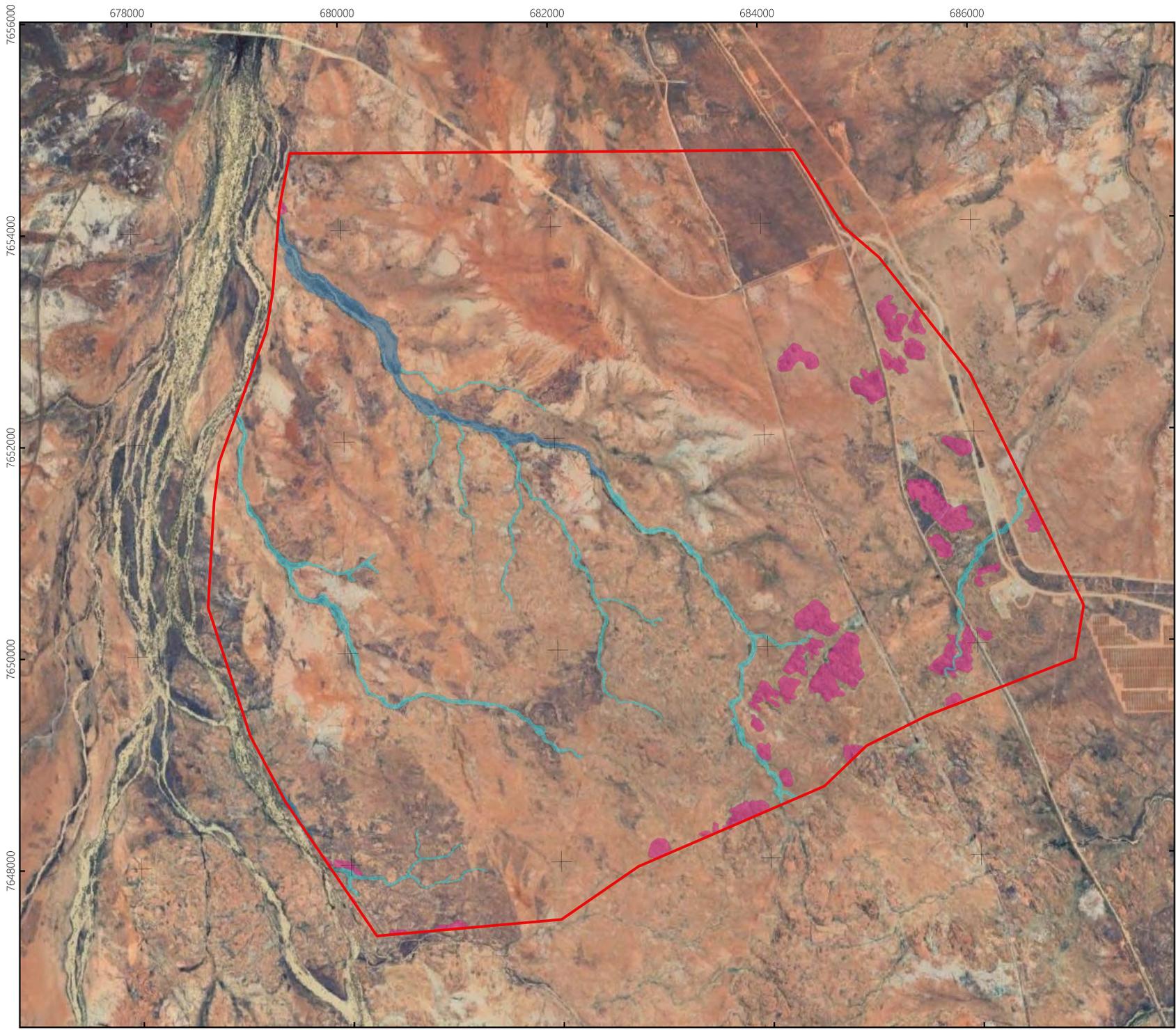
Distribution, Habitat and Ecology: The Pin-striped Ctenotus is a swift and diurnal slender skink with a pattern of eight pale stripes down its back. Most Ctenotus skinks forage as invertebrate generalists feeding on exposed terrain or along vegetation edges (Wilson and Swan, 2017). It is endemic to the Pilbara region and records are isolated and limited to Nullagine, Meentheena and Marble Bar (DPaW 2018). The Pin-striped Ctenotus is known to occur on Spinifex plains adjacent to granite outcrops and watercourses (Wilson and Swan, 2017). Very little information is known about this species due to the small number of records made to date.

Occurrence in the Survey Area: The Pin-striped Finesnout Ctenotus is only known from few records and therefore this species has a medium likelihood to occur. One record is known from 2012 within 25 km of the Survey Area, with an additional four records within 50 km (Map 3.1). However, extensive survey effort inside and surrounding the Survey Area (Table 2.2) has failed to record the species to date.

Critical habitat in Survey Area: Spinifex Sand Plain (91.5%).

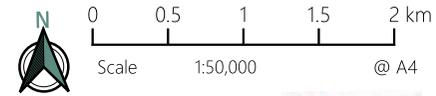
The Spinifex Sand Plain habitat in areas where this habitat intersects the Granite Domes and Boulder Piles (2.7%) and Major/Minor Drainage Lines (1.0% and 1.4%) could be considered critical as this appears to be their preferential habitat (Map 3.6).

Supporting habitat in Survey Area: Major Drainage Line (1.0%), Minor Drainage Line (1.4%), and Granite Domes and Boulder Piles (2.7%), however the habitat preference of this species is large unknown and based on very few records.



Legend

- Survey Area
- Supporting Habitats
 - Major Drainage Line
 - Minor Drainage Line
 - Granite Domes & Boulder Piles



Coordinate System: GDA 1994 MGA Zone 50
Projection: Universal Transverse Mercator
Units: Metre



Author: EM Date: 14-01-2025

Pilbara Olive Python Habitat

NSJW Project

4. CONCLUSION

A total of five fauna habitat types were recorded from the Survey Area, these include: Spinifex Sand Plain; Spinifex Rocky Plain; Major Drainage Line; Minor Drainage Line; and Granite Domes and Boulder Piles. The most common fauna habitat at the Survey Area is Spinifex Sand Plain habitat (91.5%) followed by Granite Domes and Boulder Piles (2.7%). All habitat types are common in the Pilbara region, however the Granite Domes and Boulder Piles, and the Major and Minor Drainage Lines have the highest value for significant fauna (Northern Quoll, Bilby, Pilbara Leaf-nosed Bat, Ghost Bat, Brush-tailed Mulgara, Grey Falcon, Pilbara Olive Python, and Migratory Birds) followed by the Spinifex Sand Plain (Bilby, Brush-tailed Mulgara and Spectacled Hare-wallaby).

The majority of species potentially occurring at the Survey Area were recorded during the survey with 95% of trappable fauna (mammals, reptiles and amphibians) and 96% of the potential bird species.

Seven species of significance were recorded from the Survey Area during the current or previous surveys:

- Northern Quoll (*Dasyurus hallucatus*, EPBC Act & BC Act EN);
- Bilby (*Macrotis lagotis*, EPBC Act & BC Act VU);
- Pilbara Leaf-nosed Bat (*Rhinonictis aurantia*, EPBC Act & BC Act VU);
- Grey Falcon (*Falco hypoleucos*, EPBC Act & BC Act VU);
- Brush-tailed Mulgara (*Dasyercus blythi*, DBCA P4);
- Western Pebble-mound Mouse (*Pseudomys chapmani*, DBCA P4, secondary evidence only); and
- Ghost Bat (*Macroderma gigas*; EPBC Act & BC Act VU, previously recorded).

A further seven species (one mammal, four birds, two reptiles) were assessed to have a medium to high likelihood of occurrence based on previous regional records and the habitat types present within the Survey Area.

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APPENDIX A: CONSERVATION CODES



Appendix A1: Definitions of Conservation Categories under the EPBC Act 1999.

Category	Definition
Extinct	The last member of the species has died.
Extinct in the Wild	Species known to survive only in cultivation or in captivity, or as a naturalised population well outside its past range.
Critically Endangered	Species facing an extremely high risk of extinction in the wild in the immediate future.
Endangered	Species facing a very high risk of extinction in the wild in the near future.
Vulnerable	Species facing a high risk of extinction in the wild in the medium-term future.
Conservation Dependent	Species the focus of a specific conservation program without which the species would become vulnerable, endangered, or critically endangered within five years.
Migratory	<p>The EPBC Act provides for protection of migratory species as a matter of national environmental significance. Migratory species are those animals that migrate to Australia and its external territories or pass through or over Australian waters during their annual migrations (DotE 2013). Migratory species are listed under the following international conventions:</p> <ul style="list-style-type: none"> • Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention); • China-Australia Migratory Bird Agreement (CAMBA); • Japan-Australia Migratory Bird Agreement (JAMBA); and, • Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA).

Appendix A2: Definitions of Conservation Categories Under the BC Act 2016

Category (Code)	Definition
Threatened Species	
Protected under the Biodiversity Conservation Act and listed under the most recent Wildlife Conservation (Specially Protected Fauna Notice) or Wildlife Conservation (Rare Flora Notice). Species are listed as threatened when they face a high to very high risk of extinction in the wild.	
Critically Endangered (CR)	Species facing an extremely high risk of extinction in the wild in the immediate future.
Endangered (EN)	Species facing a very high risk of extinction in the wild in the near future.
Vulnerable (VU)	Species considered to be "facing a high risk of extinction in the wild in the medium-term future.
Extinct species	
Extinct species (EX)	The last member of the species has died.
Extinct in the wild species (EW)	Species known to survive only in cultivation or in captivity, or as a naturalised population well outside its past range.
Specially protected species	
Species of special conservation interest; migratory species; cetaceans; species subject to international agreement; or species otherwise in need of special protection.	
Migratory species (MI)	<p>Fauna that periodically or occasionally visit Australia or an external Territory or the exclusive economic zone; or the species is subject of an international agreement that relates to the protection of migratory species and that binds the Commonwealth.</p> <p>Birds that are subject to an agreement between the government of Australia and the governments of Japan (JAMBA), China (CAMBA) and The Republic of Korea (ROKAMBA), and fauna subject to the Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention), an environmental treaty under the United Nations Environment Program.</p>
Conservation Dependent (CD)	Fauna or flora of special conservation need being species dependent on ongoing conservation intervention to prevent it becoming eligible for listing as threatened.
Other specially protected species (OS)	Fauna otherwise in need of special protection to ensure their conservation.

Appendix A2: Department of Biodiversity, Conservation and Attractions Priority Listing

Category	Definition
Priority species (P)	Species that do not have statutory protection under the Biodiversity Conservation Act 2016, but are identified as conservation priorities due to insufficient information to assess their conservation status or they are deemed rare but not threatened, necessitating ongoing monitoring. A register of priority species is managed by the Department of Biodiversity Conservation and Attractions (DBCA).
Priority 1	Poorly known species that are known from one or a few locations which are potentially at risk.
Priority 2	Poorly known species that are known from one or a few locations, some of which are on managed.
Priority 3	Poorly known species that are known from several locations, and the species does not appear to be under imminent threat.
Priority 4	(a) Rare. Species for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection but could be if present circumstances change. (b) Near Threatened. Species that are considered to have been adequately surveyed and that are close to qualifying for vulnerable but are not listed as Conservation Dependent. (c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.

APPENDIX B: FAUNA SITE LOCATIONS



Site Name	Coordinates		Survey Type/Effort
	Eastings	Northing	
NS01	685842	7650675	Vertebrate Trap site for 7 nights over 2 phases, 2 bat recorders, systematic bird site
NS02	683888	7653684	Vertebrate Trap site for 7 nights over 2 phases, 2 bat recorders, systematic bird site
NS03	682231	7653978	Vertebrate Trap site for 7 nights over 2 phases, 2 bat recorders, systematic bird site
NS04	680038	7653289	Vertebrate Trap site for 7 nights over 2 phases, 2 bat recorders, systematic bird site
NS05	680769	7647789	Vertebrate Trap site for 7 nights over 2 phases, 2 bat recorders, systematic bird site
S01	683793	7648471	Targeted Trap site (5 cages, 5 motion cameras & 1 bat recorder for 4 nights)
S02	681530	7652069	Targeted Trap site (5 cages, 5 motion cameras & 1 bat recorder for 4 nights)
S03	685260	7652993	Targeted Trap site (5 cages, 5 motion cameras & 1 bat recorder for 4 nights)
GFC01	679475	7653869	Grey Falcon Targeted Search Sites/nest assessment
GFC02	679008	7652245	Grey Falcon Targeted Search Sites/nest assessment
GFC03	682324	7651818	Grey Falcon Targeted Search Sites/nest assessment
GFC04	685901	7651886	Grey Falcon Targeted Search Sites/nest assessment
GFC05	681560	7652124	Grey Falcon Targeted Search Sites/nest assessment
GFC06	686725	7648572	Grey Falcon Targeted Search Sites/nest assessment
GFC07	685290	7651654	Grey Falcon Targeted Search Sites/nest assessment
GFC08	684889	7653535	Grey Falcon Targeted Search Sites/nest assessment
GFC09	684738	7653943	Grey Falcon Targeted Search Sites/nest assessment
GFC10	686485	7649807	Grey Falcon Targeted Search Sites/nest assessment
HAB01	681760	7652226	Habitat Assessment
HAB02	684435	7649958	Habitat Assessment
HAB03	683368	7651716	Habitat Assessment
HAB04	681020	7653687	Habitat Assessment
MC01	684460	7652657	Motion Camera site (5 cameras for 6 weeks)
MC02	685770	7649769	Motion Camera site (5 cameras for 6 weeks)
MC03	684802	7649768	Motion Camera site (5 cameras for 6 weeks)
MC04	680949	7647409	Motion Camera site (5 cameras for 6 weeks)
MC05	683345	7654139	Motion Camera site (5 cameras for 6 weeks)
MC06	679906	7647965	Motion Camera site (5 cameras for 6 weeks)
MC07	682656	7651824	Motion Camera site (5 cameras for 6 weeks)
MC08	686560	7651163	Motion Camera site (5 cameras for 6 weeks)
MC09	681634	7650525	Motion Camera site (5 cameras for 6 weeks)
NSOPP01	683917	7654282	Opportunistic Site
NSOPP02	679476	7653867	Opportunistic Site
NSOPP03	683917	7654282	Opportunistic Site
NSOPP04	680163	7647485	Opportunistic Site
NSOPP05	682394	7651684	Opportunistic Site
NSOPP06	683343	7654197	Opportunistic Site
NSOPP07	685620	7651974	Opportunistic Site
NSOPP08	679809	7650462	Opportunistic Site

Site Name	Coordinates		Survey Type/Effort
	Eastings	Northing	
NSOPP09	679761	7650594	Opportunistic Site
NSOPP10	682414	7650375	Opportunistic Site
NSOPP11	686318	7649938	Opportunistic Site
NSOPP12	682599	7651835	Opportunistic Site
NSOPP13	682450	7650299	Opportunistic Site
NSOPP14	679771	7654599	Opportunistic Site
NSOPP15	679918	7649903	Opportunistic Site
NSOPP16	682054	7652391	Opportunistic Site

Datum: GDA94, zone 50K

APPENDIX C: REGIONAL FAUNA APPENDIX



APPENDIX D: VERTEBRATE FAUNA SPECIES RECORDED



Family & Species Name	Common name	EPBC Act	BC Act	DIBCA	NS01		NS02		NS03		NS04		NS05		NS.MC01	NS.MC02	NS.MC03	NS.MC04	NS.MC05	NS.MC06	NS.MC07	NS.MC08	NS.MC09	S01		S02		S03		Opp			
					Phase 1	Phase 2	Phase 1	Phase 2																									
<i>Proablepharus reginae</i>	Spinifex Snake-eyed Skink				1																												
VARANIDAE																																	
<i>Varanus acanthurus</i>	Spiny-tailed Monitor														2	1		2		2		2	2										
<i>Varanus breviceuda</i>	Short-tailed Pygmy Monitor				1	1						1	1																				
<i>Varanus eremius</i>	Pygmy Desert Monitor				3				1																								
<i>Varanus giganteus</i>	Perentie														1		1	2	1	2		2	1					2					
<i>Varanus doullii</i>	Sand Monitor					1																											
<i>Varanus panoptes</i>	Yellow-spotted Monitor																																
<i>Varanus pilbarensis</i>	Pilbara Rock Monitor															1		2				1	5	1									
TYPHLOPIDAE																																	
<i>Anilius ammodetes</i>	Sand-Diving Blind Snake						1						1																				
<i>Anilius anopus</i>	Long-beaked Blind Snake					1																											
<i>Anilius pilbarensis</i>	Pilbara Blind Snake					1																											
ELAPIDAE																																	
<i>Furina ornata</i>	Moon Snake				1																												
<i>Pseudechis australis</i>	Mulga Snake				2															1													
Amphibians																																	
PELODRYADIDAE																																	
<i>Cyclorana maini</i>	Sheep Frog				5	1																											
LIMNODYNASTIDAE																																	
<i>Platyplectrum spenceri</i>	Centralian Burrowing Frog											5																					

S Species recorded via secondary sign
R Species recorded via ultrasonic bar recorder
Δ Species level cannot be determined

APPENDIX E: BAT CALL ANALYSIS

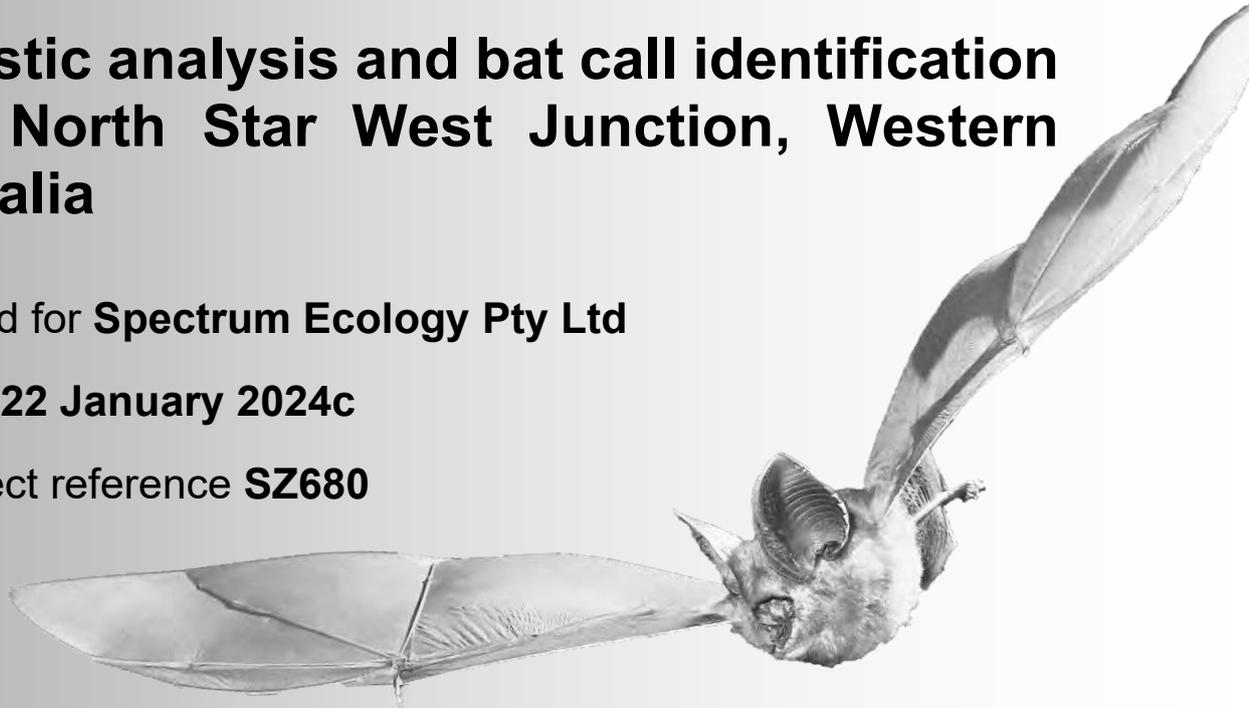


Acoustic analysis and bat call identification from North Star West Junction, Western Australia

Prepared for **Spectrum Ecology Pty Ltd**

Version **22 January 2024c**

SZ project reference **SZ680**



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Specialised Zoological (2024). Acoustic analysis and bat call identification from North Star West Junction, Western Australia. Unpublished report by Specialised Zoological for Spectrum Ecology Pty Ltd, 22 January 2024c, project reference SZ680.

Summary

Bat identifications from acoustic recordings are provided from the North Star West Junction project area, in the Pilbara region of Western Australia. The identification of bat species from full spectrum WAV-format recordings of their echolocation calls was based on measurements of characteristic frequency, observation of pulse shape, and the pattern of harmonics.

The recording dataset comprised 83 recording nights from 16 recording sites in two separate survey phases.

The scope of the analysis included the identification of all bat species present, but with a particular focus on species of conservation significance—Ghost Bat *Macroderma gigas* (Megadermatidae) and Pilbara Leaf-nosed Bat *Rhinonycteris aurantia* (Rhinonycteridae).

Additional acoustic processing of the bat detector recordings was conducted separately for each of the two bat species of conservation significance using methods optimised for the detection of their unique echolocation call types.

A total of eight bat species was detected (**Tables 1 – 2**). Representative echolocation calls for each identification are illustrated (**Figure 1**), as recommended by the Australasian Bat Society (ABS 2006).

No calls of the Ghost Bat were observed.

A total of 48 echolocation call sequences of the Pilbara Leaf-nosed Bat was detected at 12 separate recording sites (23 total recording nights over all sites; **Tables 3 – 4**). The detection of echolocation call sequences well after sunset and well before sunrise, and away from areas of rocky outcrop containing deep caves, is indicative of individuals of this species out foraging away from a diurnal roost.

Further details are available should verification be required.

Methods

The data provided were recorded in full spectrum WAV format with Wildlife Acoustics Song Meter SM4BAT bat detectors (sampling rate 384 kHz, set to turn on automatically at sunset and off at sunrise).

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

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

Species were identified based on information in Armstrong and Coles (2007), McKenzie and Bullen (2009) and the author's own unpublished material. Nomenclature follows Jackson and Groves (2015).

Limitations

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

1. The identifications made herein were based on the ultrasonic acoustic data recorded and provided by a 'third party' (the client named on the front of this report).
2. The scope of this report extended to providing information on the identification of all bat species in bulk ultrasonic recordings. Further comment on these species and the possible impacts of a planned project on bat species were not part of the scope.
3. In the case of the present report, the recording equipment was not set up and supplied by Specialised Zoological. The equipment was operated by the third party during the survey.
4. Other than the general location of the study area, Specialised Zoological has not been provided with detailed information of the survey area, has not made a visit to observe the habitats available for bats, nor have we visited the specific project area on a previous occasion.
5. Specialised Zoological has had no input into the overall design and timing of this bat survey, recording site placement, nor the degree of recording site replication.
6. While Specialised Zoological has made identifications to the best of our ability given the available materials, and reserves the right to re-examine the data and revise any identification following a query, it is the client's and / or proponent's responsibility to provide supporting evidence for any identification, which might require follow-up trapping effort or non-invasive methods such as video recordings. Specialised Zoological bears no liability for any follow-up work that may be required to support an identification based initially on the analysis of acoustic recordings undertaken and reported on here.
7. There are a variety of factors that affect the 'detectability' of each bat species, given the frequency, power and shape characteristics of their calls. Further information on the analysis and the various factors that can impinge on the reliability of identifications can be provided upon request.
8. The analysis of ultrasonic recordings is one of several methods that can be used to survey for bats, and comprehensive surveys typically employ more than one method. If an identification in the present report is ambiguous or in question, the application of other bat survey methods could help to resolve the presence of the possibilities in the project area.
9. The most reliable way of detecting the Ghost Bat with bat detectors is to place the equipment with the microphone facing into a potential cave roosting site. The echolocation calls of this species are of low amplitude, and therefore most detectable when a Ghost Bat flies close to the bat detector as it exits the underground structure. If there is uncertainty about whether Ghost Bats are present in a cave, then video recordings can be a useful addition to the survey. The detection of Ghost Bats with bat detectors away from cave entrances is less reliable, unless an approach based on an acoustic lure is used (e.g. see the new method described in recent papers by Ruykys et al. 2023 and Hanrahan et al. 2023).
10. This version of the document supersedes any previous version. Previous drafts are not authorised by us for submission to the regulator or the public domain.

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Table 1. Species identified from all sites combined.

RHINONYCTERIDAE	
Pilbara Leaf-nosed Bat	<i>Rhinonicteris aurantia</i>
EMBALLONURIDAE	
Yellow-bellied Sheath-tailed Bat	<i>Saccolaimus flaviventris</i>
Common Sheath-tailed Bat	<i>Taphozous georgianus</i>
VESPERTILIONIDAE	
Gould's Wattled Bat	<i>Chalinolobus gouldii</i>
Little Broad-nosed Bat	<i>Scotorepens greyii</i>
Finlayson's Cave Bat	<i>Vespadelus finlaysoni</i>
Ambiguous identifications	
Pallid Long-eared Bat / and/or Lesser Long-eared Bat	<i>Nyctophilus daedalus</i> / and/or <i>Nyctophilus geoffroyi</i>
MOLOSSIDAE	
Greater Northern Free-tailed Bat	<i>Chaerephon jobensis</i>

Table 2. Species identifications from each recording site (see *Table 1* for full species names).

Serial	Site	Coordinates	First night	Last night	Nights	<i>C. gouldii</i>	<i>C. jobensis</i>	<i>Nyctophilus</i> sp.	<i>R. aurantia</i>	<i>S. flaviventris</i>	<i>S. greyii</i>	<i>T. georgianus</i>	<i>V. finlaysoni</i>
S4U06081	S3	-21.215772, 118.785306	20/05/2023	23/05/2023	4	X	.	.	X	.	.	X	X
S4U06186	NS05	-21.262612, 118.742230	18/05/2023	23/05/2023	6	X	X	.	.	.	.	X	X
S4U06252	NS02	-21.209877, 118.772174	19/05/2023	24/05/2023	6	X	X	.	X	X	.	X	X
S4U06253	S1	-21.256064, 118.771685	19/05/2023	22/05/2023	4	X	.	.	X	.	.	X	X
S4U06256	NS03	-21.206750, 118.755078	17/05/2023	22/05/2023	6	X	X	.	X	X	.	X	X
S4U06269	NS01	-21.235248, 118.791889	19/05/2023	22/05/2023	4	X	X	.	X	.	X	X	X
S4U06272	S2	-21.223883, 118.749096	20/05/2023	23/05/2023	4	X	X	.	X	.	.	X	X
S4U06285	NS04	-21.213013, 118.734606	17/05/2023	23/05/2023	7	X	X	.	X	.	X	X	X
S4U06081	S2	-21.223883, 118.749096	30/09/2023	4/10/2023	5	X	X	.	X	.	X	X	X
S4U06174	NS02	-21.209877, 118.772174	30/09/2023	4/10/2023	5	X	X	.	X	.	X	X	X
S4U06270	NS03	-21.206750, 118.755078	30/09/2023	5/10/2023	6	X	X	.	X	X	X	X	X
S4U06285	S1	-21.256064, 118.771685	30/09/2023	4/10/2023	5	X	X	.	.	.	.	X	X
SM4 6266 / WONBAT6	NS01	-21.235248, 118.791889	30/09/2023	4/10/2023	5	X	X	.	X	.	X	X	X
SM4 6253 / WONBAT8	S3	-21.215772, 118.785306	30/09/2023	4/10/2023	5	X	X	.	.	.	.	X	X
SM4 6186 / WONBAT9	NS05	-21.262612, 118.742230	30/09/2023	4/10/2023	5	X	X	.	.	.	.	X	X
SM4 6257 / WONBAT10	NS04	-21.213013, 118.734606	30/09/2023	5/10/2023	6	X	X	X	X	X	X	X	X
16 sites					83								

Table 3. Summary of detections of the Pilbara Leaf-nosed Bat from May 2023 (alternating blue highlight distinguishes different sites).

Site	Serial	Night of	Passes	Sunset	Dusk	Dawn	Sunrise	Time first detection	Time last detection	Time since sunset	Time until sunrise
NS01	S4U06269	21/05/2023	1	21/05/2023 17:33	21/05/2023 17:56	22/05/2023 6:09	22/05/2023 6:33	19:34:45	19:34:45	2H 1M 42S	10H 58M 35S
NS02	S4U06252	19/05/2023	1	19/05/2023 17:33	19/05/2023 17:57	20/05/2023 6:09	20/05/2023 6:32	0:48:35	0:48:35	7H 15M 13S	5H 44M 19S
NS02	S4U06252	20/05/2023	8	20/05/2023 17:33	20/05/2023 17:57	21/05/2023 6:09	21/05/2023 6:32	23:38:16	1:55:04	6H 4M 54S	4H 37M 50S
NS02	S4U06252	21/05/2023	3	21/05/2023 17:33	21/05/2023 17:56	22/05/2023 6:09	22/05/2023 6:33	21:19:01	2:38:25	3H 45M 58S	3H 54M 55S
NS02	S4U06252	23/05/2023	3	23/05/2023 17:32	23/05/2023 17:56	24/05/2023 6:10	24/05/2023 6:34	21:02:23	22:54:42	3H 29M 55S	7H 39M 31S
NS03	S4U06256	18/05/2023	3	18/05/2023 17:34	18/05/2023 17:57	19/05/2023 6:08	19/05/2023 6:32	21:44:34	23:51:40	4H 10M 31S	6H 40M 20S
NS04	S4U06285	17/05/2023	2	17/05/2023 17:34	17/05/2023 17:58	18/05/2023 6:07	18/05/2023 6:31	22:12:16	2:24:02	4H 37M 51S	4H 7M 32S
S1	S4U06253	22/05/2023	1	22/05/2023 17:32	22/05/2023 17:56	23/05/2023 6:09	23/05/2023 6:33	23:08:02	23:08:02	5H 35M 17S	7H 25M 45S
S2	S4U06272	20/05/2023	1	20/05/2023 17:33	20/05/2023 17:57	21/05/2023 6:09	21/05/2023 6:32	22:12:57	22:12:57	4H 39M 35S	8H 19M 57S
S2	S4U06272	21/05/2023	1	21/05/2023 17:33	21/05/2023 17:56	22/05/2023 6:09	22/05/2023 6:33	19:32:36	19:32:36	1H 59M 33S	11H 0M 44S
S3	S4U06081	23/05/2023	3	23/05/2023 17:32	23/05/2023 17:56	24/05/2023 6:10	24/05/2023 6:34	19:47:36	3:01:01	2H 15M 8S	3H 33M 12S
7 sites		11 nights	27								

Table 4. Summary of detections of the Pilbara Leaf-nosed Bat from October 2023 (alternating blue highlight distinguishes different sites).

Site	Serial	Night of	Passes	Sunset	Dusk	Dawn	Sunrise	Time first detection	Time last detection	Time since sunset	Time until sunrise
S2	S4U06081	4/10/2023	4	4/10/2023 18:02	4/10/2023 18:25	5/10/2023 5:17	5/10/2023 5:40	1:09:43	1:26:20	7H 7M 3S	4H 14M 7S
NS02	S4U06174	30/09/2023	1	30/09/2023 18:01	30/09/2023 18:23	1/10/2023 5:21	1/10/2023 5:44	20:02:28	20:02:28	2H 1M 9S	9H 41M 58S
NS02	S4U06174	1/10/2023	1	1/10/2023 18:01	1/10/2023 18:24	2/10/2023 5:20	2/10/2023 5:43	22:26:14	22:26:14	4H 24M 35S	7H 17M 11S
NS02	S4U06174	3/10/2023	1	3/10/2023 18:02	3/10/2023 18:24	4/10/2023 5:18	4/10/2023 5:41	21:59:33	21:59:33	3H 57M 14S	7H 41M 53S
NS02	S4U06174	4/10/2023	1	4/10/2023 18:02	4/10/2023 18:25	5/10/2023 5:17	5/10/2023 5:40	20:37:00	20:37:00	2H 34M 20S	9H 3M 27S
NS03	S4U06270	3/10/2023	1	3/10/2023 18:02	3/10/2023 18:24	4/10/2023 5:18	4/10/2023 5:41	21:52:26	21:52:26	3H 50M 7S	7H 49M 0S
NS03	S4U06270	4/10/2023	1	4/10/2023 18:02	4/10/2023 18:25	5/10/2023 5:17	5/10/2023 5:40	0:44:47	0:44:47	6H 42M 7S	4H 55M 40S
NS03	S4U06270	5/10/2023	3	5/10/2023 18:03	5/10/2023 18:25	6/10/2023 5:16	6/10/2023 5:39	19:49:43	4:14:09	1H 46M 42S	1H 25M 19S
NS01	S4U06266	4/10/2023	1	4/10/2023 18:02	4/10/2023 18:25	5/10/2023 5:17	5/10/2023 5:40	22:03:06	22:03:06	4H 0M 26S	7H 37M 21S
NS04	S4U06257	30/09/2023	1	30/09/2023 18:01	30/09/2023 18:23	1/10/2023 5:21	1/10/2023 5:44	21:02:45	21:02:45	3H 1M 26S	8H 41M 41S
NS04	S4U06257	4/10/2023	5	4/10/2023 18:02	4/10/2023 18:25	5/10/2023 5:17	5/10/2023 5:40	22:10:19	0:25:30	4H 7M 39S	5H 14M 57S
NS04	S4U06257	5/10/2023	1	5/10/2023 18:03	5/10/2023 18:25	6/10/2023 5:16	6/10/2023 5:39	20:42:38	20:42:38	2H 39M 37S	8H 56M 50S
5 sites		12 nights	21								

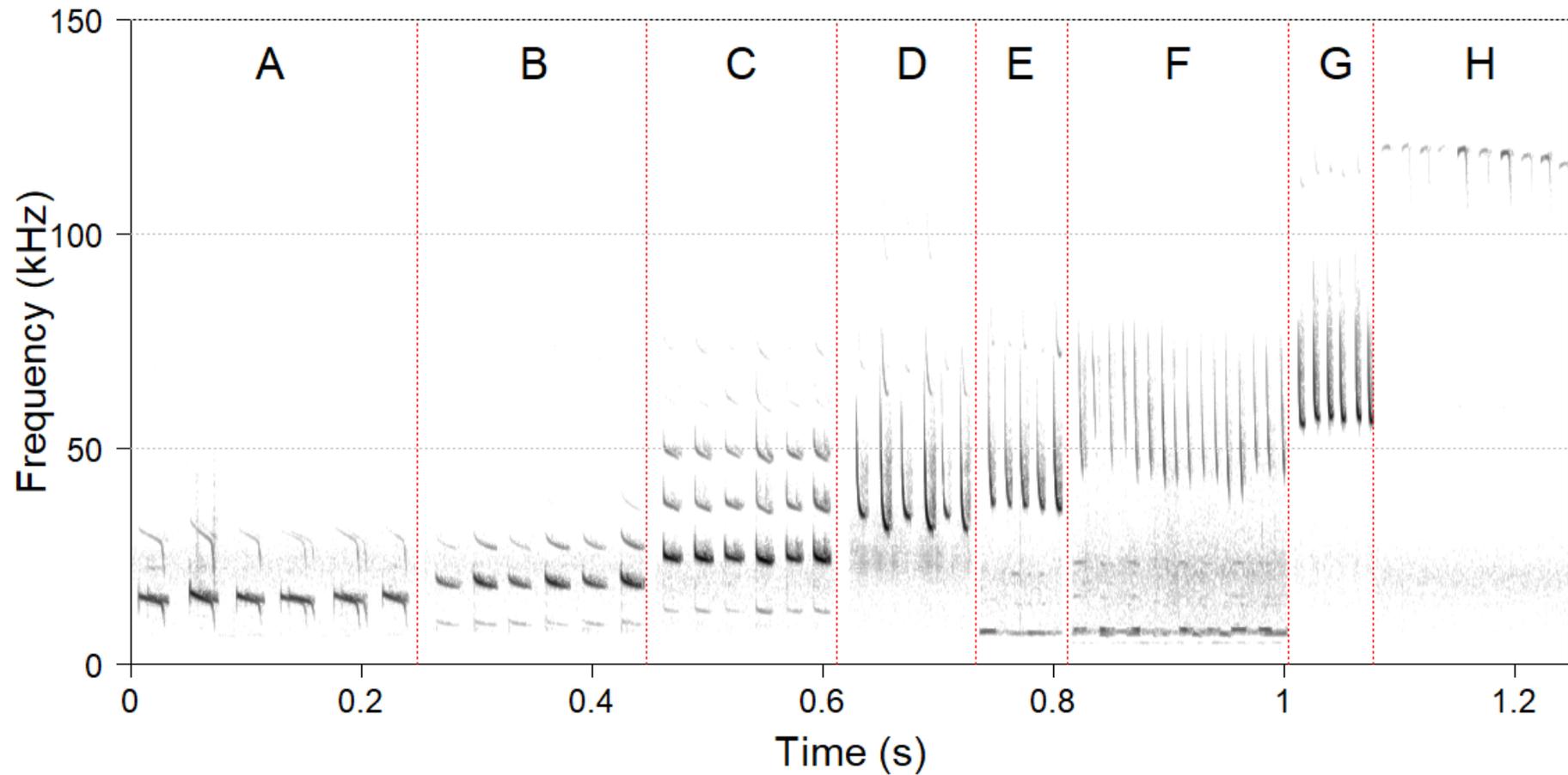


Figure 1. Representative echolocation call sequence portions of the species identified (A: *Chaerephon jobensis*; B: *Saccolaimus flaviventris*; C: *Taphozous georgianus*; D: *Chalinolobus gouldii*; E: *Scotorepens greyii*; F: *Nyctophilus* sp.; G: *Vespadelus finlaysoni*; H: *Rhinonicteris aurantia*; time between pulses has been compressed).

Species	Conservation Status			Database Record				No. Surveys Recorded	Previously Recorded in Survey Area
	EPBC Act	BC Act	DFCA	PMST	DFCA	NatureMap	FID*		
Australian Painted Snipe <i>Rostratula benghalensis australis</i>	EN	EN	-	✓	-	-	-	-	N
Red Goshawk <i>Erythrotriorchis radiatus</i>	VU	VU	-	✓	-	-	-	-	N
Grey Falcon <i>Falco hypoleucos</i>	VU	VU	-	✓	✓	✓	✓	4	N
Pacific Swift <i>Apus pacificus</i>	MI	MI	-	✓	✓	✓	✓	3	N
Oriental Plover <i>Charadrius veredus</i>	MI	MI	-	✓	✓	✓	-	1	N
Sharp-tailed Sandpiper <i>Calidris acuminata</i>	MI	MI	-	✓	✓	✓	-	-	N
Red-necked Stint <i>Calidris ruficollis</i>	MI	MI	-	-	✓	✓#	-	-	N
Pectoral Sandpiper <i>Calidris melanotos</i>	MI	MI	-	✓	-	-	-	-	N
Common Sandpiper <i>Tringa hypoleucos</i>	MI	MI	-	✓	✓	✓	✓	2	N
Wood Sandpiper <i>Tringa glareola</i>	MI	MI	-	-	✓	✓	✓	2	N
Common Greenshank <i>Tringa nebularia</i>	MI	MI	-	-	✓	✓	-	1	N
Oriental Pratincole <i>Glareola maldivarum</i>	MI	MI	-	✓	✓	✓	-	1	N