Miralga Creek: Level 2 Vertebrate Fauna and Short-range Endemic Invertebrate Fauna Assessment

Biologic Environmental Survey

Report to Atlas Iron Pty Ltd

28 February 2020

Miralga Creek: Level 2 Vertebrate Fauna and Short-range Endemic Invertebrate Fauna Assessment

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GLOSSARY

BC Act	Western Australian *Biodiversity Conservation Act 2016*
BIF	Banded Iron Formation
BoM	Bureau of Meteorology
DBCA	Department Biodiversity, Conservation and Attractions
DPaW	Department of Parks and Wildlife
DEWHA	Department of Environment, Water, Heritage and the Arts
DoE	Department of the Environment
DoEE	Department of the Environment and Energy
DSEWPaC	Department of Sustainability, Environment, Water, Population and Communities
EPA	Western Australian Environmental Protection Authority
EP Act	*Environmental Protection Act 1986*
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
IBRA	Interim Biogeographic Regionalisation of Australia
IUCN	International Union for the Conservation of Nature
MNES	Matters of National Environmental Significance
PEC	Priority Ecological Communities
SRE	Short-range Endemism
TEC	Threatened Ecological Communities
WAM	Western Australian Museum

EXECUTIVE SUMMARY

Atlas Iron Pty Ltd (Atlas) commissioned Biologic Environmental Survey Pty Ltd (Biologic) to undertake a two-season Level 2 vertebrate and short-range endemic (SRE) invertebrate fauna survey within Atlas's proposed Miralga Creek Project. The area surveyed (hereafter referred to as the Study Area) comprised three separate orebodies (Miralga East, Miralga West and Sandtrax) and additional areas to accommodate a stockyard, screening and crushing plant, explosives magazine and other infrastructure. The Study Area is located approximately 100 kilometres (km) south-east of Port Hedland in the Pilbara bioregion and covers approximately 7,834.60 hectares (ha). This report documents the findings of a desktop assessment and two field surveys (May 2019 and July 2019), which were conducted to identify the occurrence of vertebrate and SRE invertebrate fauna species, and their supporting habitats, within the Study Area.

Vertebrate Fauna

A desktop assessment, comprising searches of four databases and a review of 16 survey reports conducted in the vicinity of the Study Area, was undertaken prior to the current survey. The assessment identified a total of 343 vertebrate fauna species that potentially occur in the Study Area; comprising, 40 native mammal species, 12 introduced mammal species, 176 bird species, 105 reptile species and ten amphibian species. Thirty-seven of these species are of conservation significance (listed under the *Environment Protection and Biodiversity Conservation Act 1999* [EPBC Act], the *Biodiversity Conservation Act 2016* [BC Act], and/ or as Priority fauna listed by the Department of Biodiversity, Conservation and Attractions), comprising, ten mammals, 24 birds and four reptiles.

Habitat mapping was extrapolated from vertebrate fauna habitat assessments conducted during the field surveys as well as high-resolution aerial imagery, vegetation, topographical, land system and drainage mapping. Six broad fauna habitat types were identified within the Study Area. These were, in decreasing order of extent; Low Stony Hills, Stony Plain, Sandy Plain, Major Drainage Line, Hillcrest/Hillslope and Gorge/Gully. Additionally, a small portion of the Study Area comprised cleared areas from previous clearing and tracks. Within the Study Area, Gorge/Gully, Hillcrest/Hillslope and Major Drainage habitats were considered to be of high significance for vertebrate fauna as they support species of conservation significance or contain core habitats for such species. One habitat was deemed to be of moderate significance (Sandy Plain) and the remaining two habitats (Low Stony Hills and Stony Plain) were deemed to be of low significance, as they are widespread in the surrounding region and species of conservation significance are not exclusively dependent on them.

The field surveys recorded a total of 154 vertebrate fauna species in the Study Area: 24 native mammal, four introduced mammal, 84 bird, 39 reptile and three amphibian species. This is comparable to the number of species recorded during similar surveys within the vicinity of the Study Area. Of the 154 species recorded, seven conservation significance species are known to occur in the Study Area:

- Northern Quoll (*Dasyurus hallucatus*) -Endangered (EPBC Act & BC Act);

- Pilbara Leaf-nosed Bat (*Rhinonicteris aurantia*) - Vulnerable (EPBC Act & BC Act);
- Ghost Bat Vulnerable (*Macroderma gigas*) – Vulnerable (EPBC Act and BC Act);
- Northern Brushtail Possum (*Trichosurus vulpecula arnhemensis)* -Vulnerable (BC Act);
- Western Pebble-mound Mouse (*Pseudomys chapmani*) -Priority 4 (DBCA);
- Grey Falcon (*Falco hypoleucos*) – Vulnerable (BC Act); and
- Peregrine Falcon (*Falco peregrinus*) - Other Specially Protected Species (BC Act).

A further five species of conservation significance were considered likely to occur within the Study Area: Pilbara Olive Python (*Liasis olivaceus barroni*) - Vulnerable (EPBC Act & BC Act), Gane's Blind Snake (*Anilios ganei*) and Black-lined Ctenotus *(Ctenotus nigrilineatus)* both DBCA P1; Brush-tailed Mulgara (*Dasycercus blythi*) and Spectacled Hare-wallaby (*Lagorchestes conspicillatus leichardti*) both DBCA P4 . A total of 16 species of conservation significance were regarded as possibly occurring within the Study Area. However, this mostly comprised migratory shorebirds and waterbirds whose occurrence within the Study Area is likely to be infrequent and largely dependent on rainfall events. The remaining nine species identified by the desktop assessment were considered Rarely, Unlikely, or Highly Unlikely to occur in the Study Area, based on the absence of suitable habitat for the species and/or the Study Area occurring outside the known distribution of the species.

SRE Invertebrates

A desktop assessment, comprising searches of four databases of fauna records within 40 km of the Study Area, was undertaken prior to the field surveys. The assessment identified a total of 705 invertebrate records that belonged to taxonomic groups prone to short-range endemism, comprising: 27 mygalomorph spiders, one selenopid spider, 294 pseudoscorpions, 187 scorpions, 67 myriapods, nine gastropods and 120 isopods. Of these, four taxa are regarded as Confirmed SRE, although none are currently known from within the Study Area: one pseudoscorpion (*Faella tealei*), two millipedes (*Antichiropus apricus*, *Anichiropus forcipatus*) and one gastropod (Camaenidae Gen. nov. cf. `Z` n. sp.).

Six broad habitats were recorded in the Study Area, all of which are known to extend beyond the Study Area: Low Stony Hills, Stony Plain, Sandy Plain, Major Drainage, Gorge/Gully and Hillcrest/ Hillslope. Of these, one is regarded to be of high suitability for SRE invertebrates (Gorge/Gully), one of moderate/high suitability (Hilcrest/Hillslope), one of moderate suitability (Major Drainage) and one of low/moderate suitability (Sandy Plains). The remaining two habitats (Low Stony Hills and Stony Plains) are not considered suitable for SRE invertebrate fauna as they lack protection, complexity and/or are widespread, common and continuous.

A total of 184 invertebrate specimens were collected during the field surveys, including one mygalomorph spider, seven selenopid spiders, 48 pseudoscorpions, eight scorpions, 90 snails and 29 isopods. These belonged to 27 unique taxa. Eighteen taxa are currently regarded as Potential SRE whilst the remaining nine are considered to be Widespread. Of these, two Potential SREs are currently regarded as being of importance to the Study Area, i.e. they have a higher likelihood of being restricted to the Study Area or the local area; these are *Karaops* sp. indet.(Selenopid spider) and *Indohya* sp. indet (Pseudoscorpion). A further two species could be of taxonomic interest based on the general data available on the genera for the

Pilbara; these were *Aname* sp. Indet (Mygalomorphae spider) and *Xenolpium* sp. Indet (Pseudoscorpion). No Confirmed SRE taxa were recorded.

1 INTRODUCTION

1.1 Background

Atlas Iron Pty Ltd (Atlas) commissioned Biologic Environmental Survey Pty Ltd (Biologic) to undertake a two-season Level 2 vertebrate and short-range endemic (SRE) invertebrate fauna survey within Atlas's proposed Miralga Creek Project. The area surveyed (hereafter referred to as the Study Area) comprised three separate orebodies (Miralga East, Miralga West and Sandtrax), and additional areas to accommodate a stockyard, screening and crushing plant, explosives magazine and other infrastructure. The Study Area is located approximately 100 kilometres (km) south-east of Port Hedland in the Pilbara bioregion and covers approximately 7,834.60 hectares (ha) (Figure 1.1).

1.2 Objectives

The overarching objective of this assessment was to identify the occurrence of vertebrate and SRE invertebrate fauna species within the Study Area, and their supporting habitats. Specifically, the key objectives of the assessment were to:

- conduct a comprehensive desktop assessment of vertebrate and SRE invertebrate fauna likely to occur within and within the vicinity of the Study Area;
- define and delineate broad fauna habitats occurring within the Study Area, and report on their significance;
- conduct a Level 2 survey for vertebrate fauna to determine vertebrate fauna assemblages occurring within the Study Area;
- conduct a Level 2 SRE invertebrate fauna survey to determine the occurrence and likelihood of occurrence for SRE invertebrates; and
- assess the likelihood for vertebrate and SRE fauna of conservation significance occurring within the Study Area.

1.3 Background to Protection of Fauna

1.3.1 Conservation Significance

Within Western Australia, native fauna are protected under the *Biodiversity Conservation Act 2016* (BC Act) and at a national level under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Any action that has the potential to impact on native fauna needs to be approved by relevant state and/or federal departments as dictated by the state *Environmental Protection Act 1986* (EP Act).

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

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

Table 1.1: Definitions and terms for fauna of conservation significance

Agreement, Act or List	Status Codes
Federal	
***Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)** The Department of the Environment and Energy (DoEE) lists threatened fauna, which are determined by the Threatened Species Scientific Committee (TSSC) per criteria set out in the Act. The Act lists fauna that are considered to be of conservation significance under one of eight categories (listed under 'Status Codes').	• Extinct (EX) • Extinct in the Wild (EW) • Critically Endangered (CR) • Endangered (EN) • Vulnerable (VU) • Conservation Dependent (CD) • Migratory (MIG)
State	
***Biodiversity Conservation Act 2016* (BC Act)** At state level, native fauna are protected under the *Biodiversity Conservation Act 2016*. Species in need of conservation are given a ranking ranging from Critically Endangered to Vulnerable.	• Extinct (EX) • Extinct in the Wild (EW) • Critically Endangered (CR) • Endangered (EN) • Vulnerable (VU) • Migratory (MIG) • Conservation Dependent Fauna (CD) • Other specially protected species (OS)
DBCA Priority List DBCA produces a list of Priority species that have not been assigned statutory protection under the *Wildlife Conservation Act 1950*. This system gives a ranking from Priority 1 to Priority 4.	• Priority 1 (Poorly-known species) (P1) • Priority 2 (Poorly-known species) (P2) • Priority 3 (Poorly-known species) (P3) • Priority 4 (Rare, Near Threatened, and other species in need of monitoring) (P4)

1.3.2 Short-range Endemism

Endemism refers to the restriction of a species to a particular area, whether it is at the continental, national or local scale, the latter being commonly referred to as short-range endemism (Allen *et al.*, 2006; Harvey, 2002). Short-range endemism is influenced by several factors including life history, physiology, habitat requirements, dispersal capabilities, biotic and abiotic interactions and historical conditions which not only influence the distribution of a species, but also the tendency for differentiation and speciation (Ponder & Colgan, 2002).

In recent years a number of taxonomic groups of invertebrates have been highlighted as comprising a high proportion of species likely to be regarded as SREs (i.e. Harvey, 2002; terrestrial snails, Johnson *et al.*, 2004; Mygalomorph spiders, Main *et al.*, 2000; freshwater snails, Ponder & Colgan, 2002). This identification of restricted taxonomic groups has led to SRE invertebrate fauna being recognised as a potentially significant biodiversity issue, and that SRE fauna "may be at a greater risk of changes in conservation status as a result of habitat loss or other threatening processes" (EPA, 2016c).

Harvey (2002) proposed a range criterion for terrestrial short-range endemic (SRE) species at less than 10,000 km^2 (or 100 km x 100 km), which has been adopted by regulatory authorities in Western Australia (EPA, 2016c). SRE invertebrate species often share similar biological, behavioural and life history characteristics that influence their restricted distributions and limit their wider dispersal (Harvey, 2002). For example, burrowing taxa such as mygalomorph spiders and *Urodacus* scorpions may only leave their burrows (or a narrow home territory around the burrow) as juveniles dispersing from the maternal burrow, or when males search for a mate. In other cases, SRE taxa are dispersal-limited because of their slow pace of movement and cryptic habitats (such as isopods, millipedes and snails), while some specialised taxa can be limited by very specific habitat requirements, such as selenopid spiders within fractured rocky outcrops.

An increasingly large number of terrestrial invertebrates are discovered to exhibit short-range endemism in Western Australia. While protection for listed species (species of conservation significance) and/ or Threatened or Priority Ecological Communities is provided under state and federal legislation (see Section 1.3.1), the majority of SRE species and communities are not currently listed. This is due largely to incomplete taxonomic or ecological knowledge. As such, the assessment of conservation significance for SRE is guided primarily by expert advice provided by the Western Australian Museum (WAM) and other taxonomic experts.

1.3.1 SRE Categorisation

The SRE status categories used in this report broadly follow the WAM's revised categorisation for SRE invertebrates. This system is based upon the 10,000 km^2 range criterion proposed by Harvey (2002), and uses three broad categories to deal with varying levels of taxonomic certainty that may apply to any given taxon (Table 1.2).

Table 1.2: SRE categorisation used by WAM taxonomists

Distribution	Taxonomic Certainty	Taxonomic Uncertainty
< 10 000 km^2	Confirmed SRE • A known distribution of < 10,000 km^2. • The taxonomy is well known. • The group is well represented in collections and/ or via comprehensive sampling.	Potential SRE • Patchy sampling has resulted in incomplete knowledge of geographic distribution. • Incomplete taxonomic knowledge. • The group is not well represented in collections. • Category applies where there are significant knowledge gaps. **SRE Sub-categories may apply:** A) Data Deficient B) Habitat Indicators C) Morphology Indicators D) Molecular Evidence E) Research & Expertise
> 10 000 km^2	Widespread (not an SRE) • A known distribution of > 10,000 km^2. • The taxonomy is well known. • The group is well represented in collections and/ or via comprehensive sampling.	

Under this system, "Potential SRE" status is the default categorisation for species within the typical SRE taxonomic groups including mygalomorph spiders, selenopid spiders, land snails, pseudoscorpions, scorpions, and isopods, unless sufficient evidence exists to confirm widespread or confirmed SRE status.

Potential SRE status is sub-categorised by what is currently known about the species in question; *i.e.* whether there are B) habitat indicators, C) morphology indicators, D) molecular

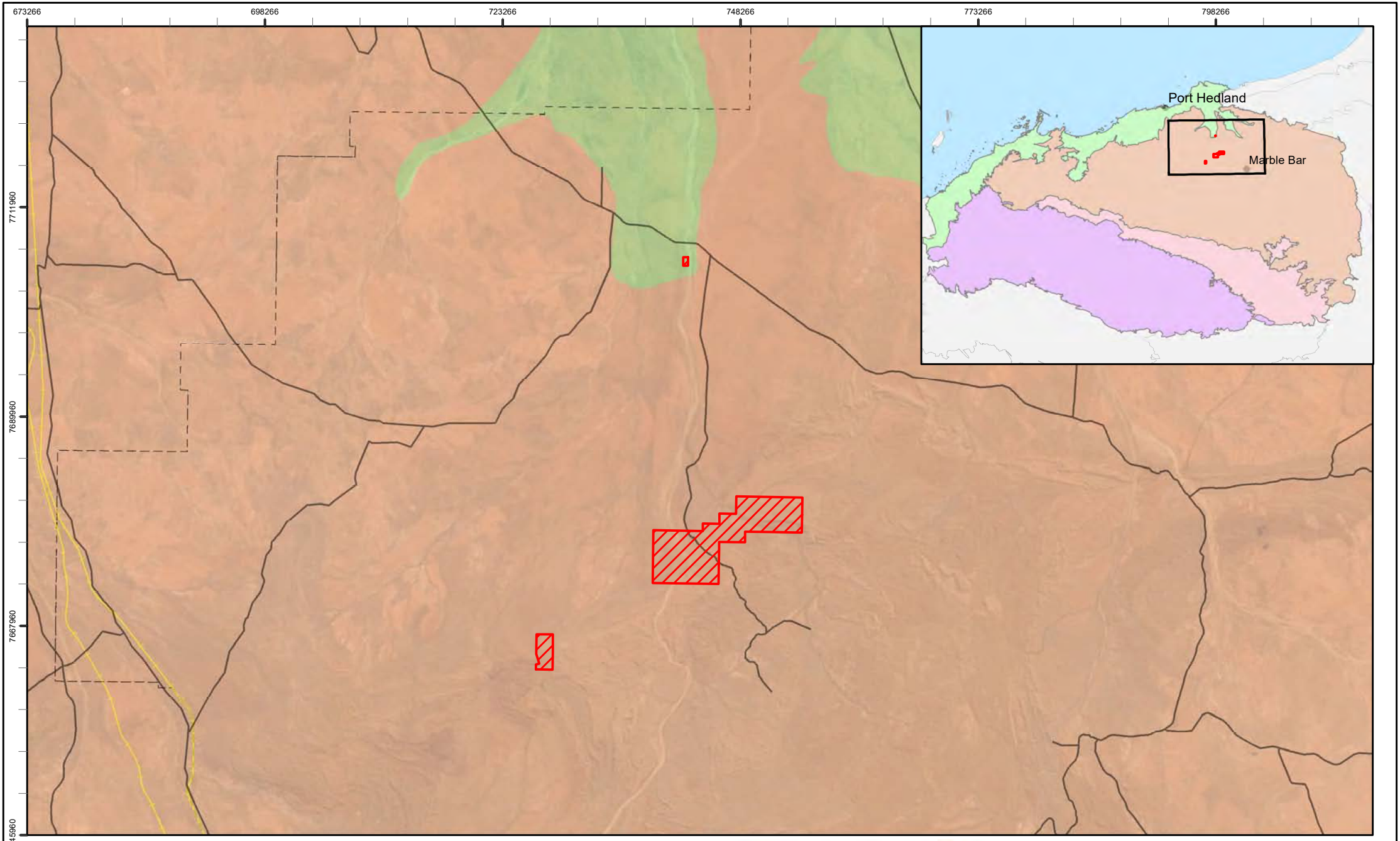
evidence, or E) a weight of general knowledge and experience with the group that suggests a reasonable likelihood that the species could be SRE. In terms of SRE likelihood, the more evidence that exists under subcategories 'B', 'C', 'D', and 'E', the greater the likelihood that further investigation would confirm that the species is a SRE.

However, the Potential SRE category 'A' - data deficient is unique; this category indicates that the current information is insufficient to adequately assess the SRE status of the taxa in question. In such cases, where the SRE status cannot be confirmed, a conservative approach would be unable to assess the species as high potential to be SRE where:

A. the taxonomy of the genus (or family) requires significant review in order to make any statement on SRE status, and/or

B. the genus is not known to include any confirmed SRE species within the region (subject to the extent of prior sampling / taxonomic effort).

To avoid confusion with other Potential SRE species for which there is some certainty and/or some precedent for their SRE status, this report represents the WAM's "Potential SRE - category 'A' - data deficient" only as "data deficient". The results from taxonomists are also presented within the broader context of the results from habitat assessment, desktop review, habitat connectivity, and other ecological information collected during the survey. This approach aims to provide a more holistic assessment of SRE likelihood at scales relevant to the project, as well as the standard SRE range criterion of <10,000 km^2 (Harvey, 2002).



Legend

- Study Area
- Local Government Areas
- Railway
- Road

IBRA Subregions

- Chichester
- Fortescue
- Hamersley
- Roebourne

biologic Environmental Survey

N

1:500,000

0 5 10 20 km

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Figure 1.1: Study Area and regional location

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

Size A4, Created 1/09/2019

2 ENVIRONMENT

2.1 Biogeography

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

The Pilbara bioregion is characterised by vast coastal plains and inland mountain ranges with cliffs and deep gorges (Thackway & Cresswell, 1995). Vegetation is predominantly mulga low woodlands or snappy gum over bunch and hummock grasses (Bastin, 2008). Within the Pilbara bioregion there are four subregions: Hamersley, Chichester, Roebourne and Fortescue Plains.

The Study Area lies within the Chichester subregion which comprises the northern section of the Pilbara Craton (Kendrick & McKenzie, 2001). Undulating Archaean granite and basalt plains include significant areas of basaltic ranges. The basalt plains host a shrub steppe characterised by *Acacia inaequilatera* over *Triodia* spp. hummock grasslands, while *Eucalyptus leucophloia* tree steppes occur on ranges. The Chichester subregion drains to the north via numerous rivers (e.g. De Grey, Oakover, Nullagine, Shaw, Yule, Sherlock) (Kendrick & McKenzie, 2001).

2.2 Climate

The Pilbara region has a semi-desert to tropical climate with highly variable, mostly summer rainfall (McKenzie et al., 2002) (Leighton, 2004). The average annual rainfall over the broader Pilbara area ranges from about 200–350 millimetres (mm) (predominantly in January, February and March), although rainfall may vary widely from year to year (van Etten, 2009). The Pilbara climate is heavily influenced by tropical cyclones that develop over the Indian Ocean in the north of Australia (Leighton, 2004). These sometimes cross the northwest coastline, bringing heavy rainfall to inland regions of the Pilbara. The Bureau of Meteorology (BoM) weather station at Marble Bar, located approximately 40 km south-east of the Study Area, is the closest to the Study Area and provides an indication of temperature and rainfall patterns in the area. Average annual rainfall and average monthly minimum and maximum temperatures are shown in Figure 3.2

2.3 Land Systems

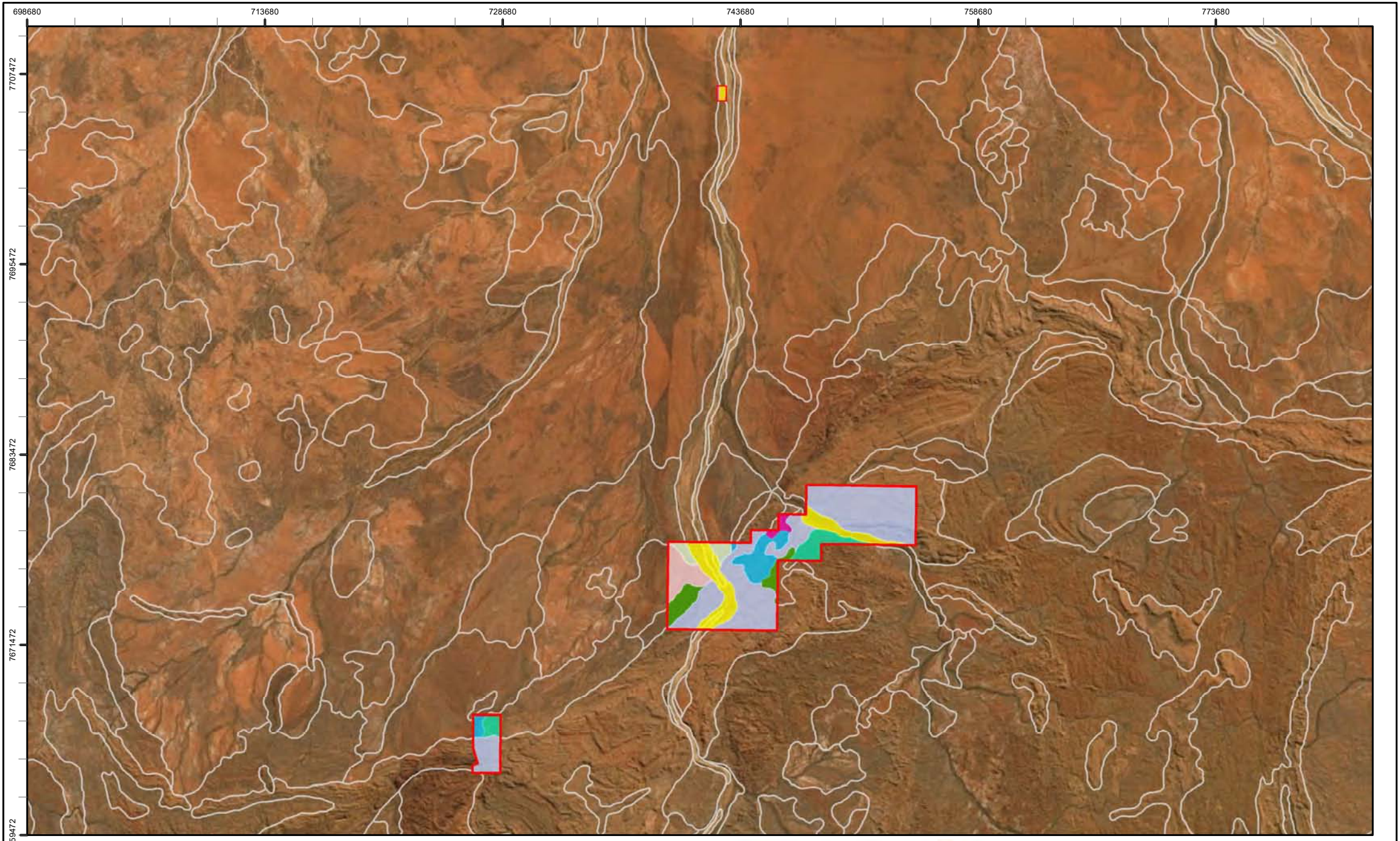
Van Vreeswyk *et al*. (2004) classified and mapped the land systems of the Pilbara according to similarities in landform, soil, vegetation, geology and geomorphology. An assessment of land systems provides an indication of the occurrence and distribution of fauna habitats present in study area.

The Study Area comprises nine land systems (Figure 2.1; Table 2.1), none of which are limited in extent or protected as Priority Ecological Communities (DBCA, 2019b).The dominant land system is the Capricorn land system, which covers 55.09% of the Study Area (Table 2.1). The Capricorn land system is defined as “Hills and ridges of sandstone and dolomite supporting shrubby hard and soft spinifex grasslands”, and tends to have isolated, moist and sheltered microhabitats that can support terrestrial SRE invertebrate fauna. The River land system

comprises the second largest portion, 12.95% of the Study Area, whilst the remaining seven land systems each occupy less than 10% of the Study Area (Table 2.1).

Table 2.1: Land Systems mapped within the Study Area and their extent

Land System	Description	Extent in Study Area	
		Area (ha)	%
Capricorn	Hills and ridges of sandstone and dolomite supporting shrubby hard and soft spinifex grasslands.	4,316.36	55.1
River	Active flood plains and major rivers supporting grassy eucalypt woodlands, tussock grasslands and soft spinifex grasslands.	1,014.39	13.0
Boolgeeda	Stony lower slopes and plains below hill systems supporting hard and soft spinifex grasslands or mulga shrublands.	608.40	7.8
Rocklea	Basalt hills, plateaux, lower slopes and minor stony plains supporting hard spinifex (and occasionally soft spinifex) grasslands.	560.01	7.2
Satirist	Stony plains and low rises supporting hard spinifex grasslands, and gilgai plains supporting tussock grasslands	486.69	6.2
Platform	Dissected slopes and raised plains supporting hard spinifex grasslands.	448.81	5.7
Macroy	Stony plains and occasional tor fields based on granite supporting hard and soft spinifex grasslands	240.36	3.1
Calcrete	Low calcrete platforms and plains supporting shrubby hard spinifex grasslands.	101.12	1.3
Uaroo	Broad sandy plains supporting shrubby hard and soft spinifex grasslands	58.46	0.8
Total		**7,834.60**	**100**



Legend

Study Area

Land System

- Boolgeeda Land System
- Calcrete Land System
- Capricorn Land System
- Macroy Land System
- Platform Land System
- River Land System
- Rocklea Land System
- Satirist Land System
- Uaroo Land System

biologic Environmental Survey

N

1:300,000

0 3.5 7 14 km

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Miralga Creek Project Level 2 Terrestrial Fauna and SRE Assessment

Figure 2.1: Land Systems of the Study Area

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

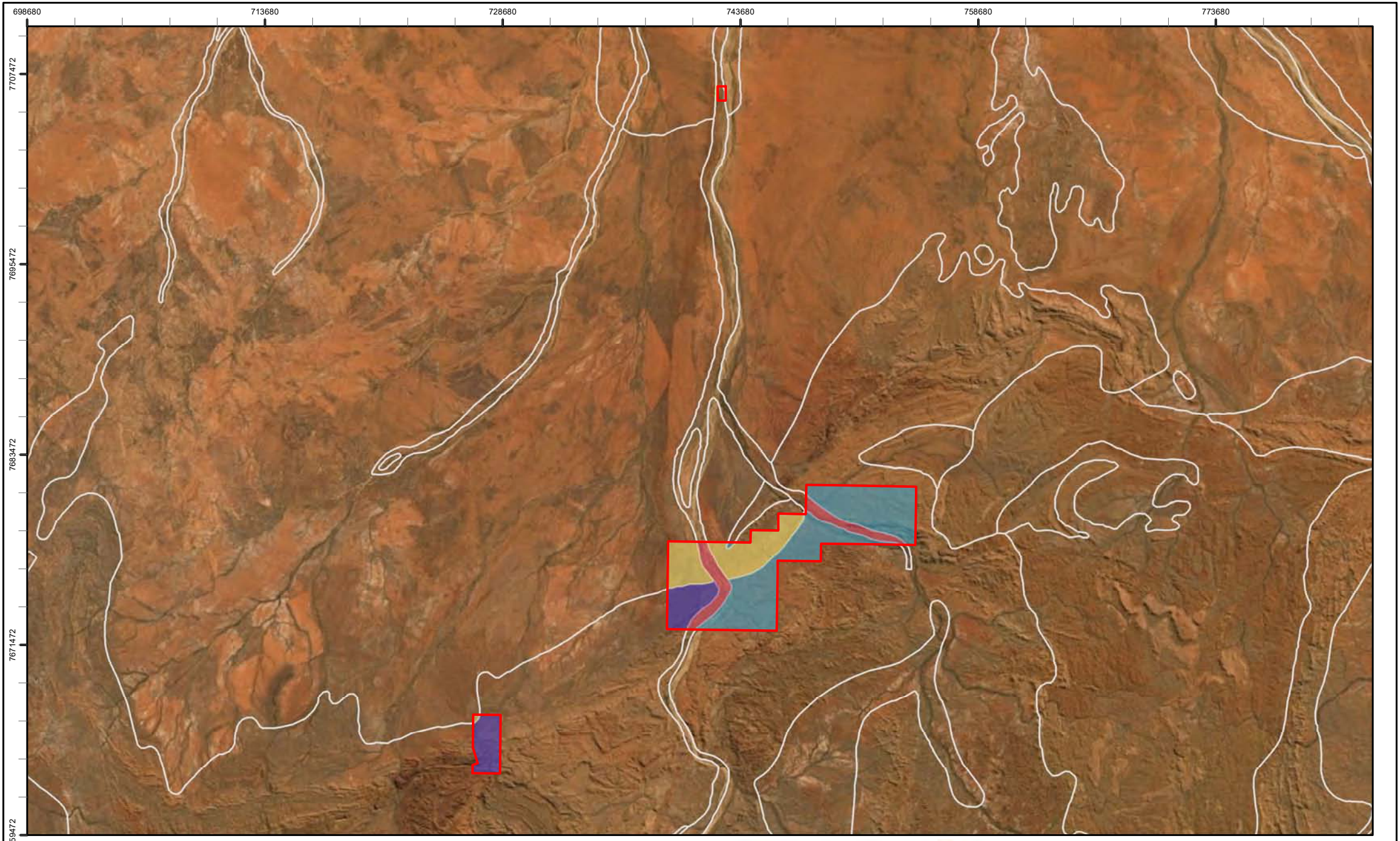
Size A4, Created 2/09/2019

2.4 Pre-European Vegetation

Beard (1975) broadly (1:1,000,000) mapped the major structural vegetation types of Western Australia. Shepherd *et al.* (2002) attempted to reinterpret and update the vegetation association mapping to reflect the National Vegetation Information System (NVIS) standards (ESCAVI, 2003). The update also accounts for extensive clearing since Beard (1975) mapping. Some of Beard's vegetation associations have been separated to remove mosaic vegetation associations; however, some mosaics still occur. To assist with the removal of mosaic vegetation, Shepherd *et al.* (2002) created a series of "Systems". Five vegetation associations occur within the Study Area (Table 2.2; Figure 2.2). The dominant vegetation association is 171, which covers 50.49% of the Study Area (Table 2.2). It is defined as "*Eucalyptus leucophloia* over soft spinifex and *Triodia brizoides* hummock grasslands/ low tree steppe". Vegetation association 93 comprises the second largest portion, 21.77% of the Study Area, whilst the remaining three vegetation associations each occupy less than 20% of the Study Area (Table 2.2).

Table 2.2: Vegetation associations mapped within the Study Area and their extent

Vegetation Association	Description	Extent in Study Area	
		Area (ha)	%
171	*Eucalyptus racemosa* over soft spinifex and *Triodia brizoides* hummock grasslands/ low tree steppe	3,955.38	50.5
93	Kanji over soft spinifex hummock grasslands/ shrub steppe	1,705.57	21.8
82	*Eucalyptus racemosa* over *Triodia wiseana* hummock grasslands/ low tree steppe	1,264.89	16.1
619	*Eucalyptus camaldulensis* medium woodland	862.39	11.0
589	Soft spinifex hummock grasslands/ grass steppe, short bunch grassland – Savanna/ grass plain	46.36	0.6
Total		**7,834.60**	**100**



Legend

Study Area

Vegetation Association

- 171
- 619
- 82
- 93
- 589
- 619

N

1:300,000

0 3.5 7 14 km

Atlas Iron Limited

Miralga Creek Project Level 2 Terrestrial Fauna and SRE Assessment

Figure 2.2: Pre-European Vegetation

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

Size A4, Created 1/09/2019

2.5 Geology and Surface Drainage

The Miralga Creek Project is situated within the Eastern Pilbara Domain of the Archean Pilbara Craton. The area is dominated by granite-greenstone terrain in which large granitic batholiths are disconnected by synclinally folded volcanic belts with interbedded volcaniclastic and clastic successions. Banded Iron Formation (BIF)-hosted iron ore mineralisation at Miralga Creek is hosted by the 3.02 GA Cleaverville formation (Gorge Creek group, De Grey Supergroup) consisting of a package of banded iron formations, cherts and shales which locally form a prominent ridge striking approximately east-west and dipping steeply to the north. The surface geology of the Study Area is shown in Figure 2.3 and Table 2.3.

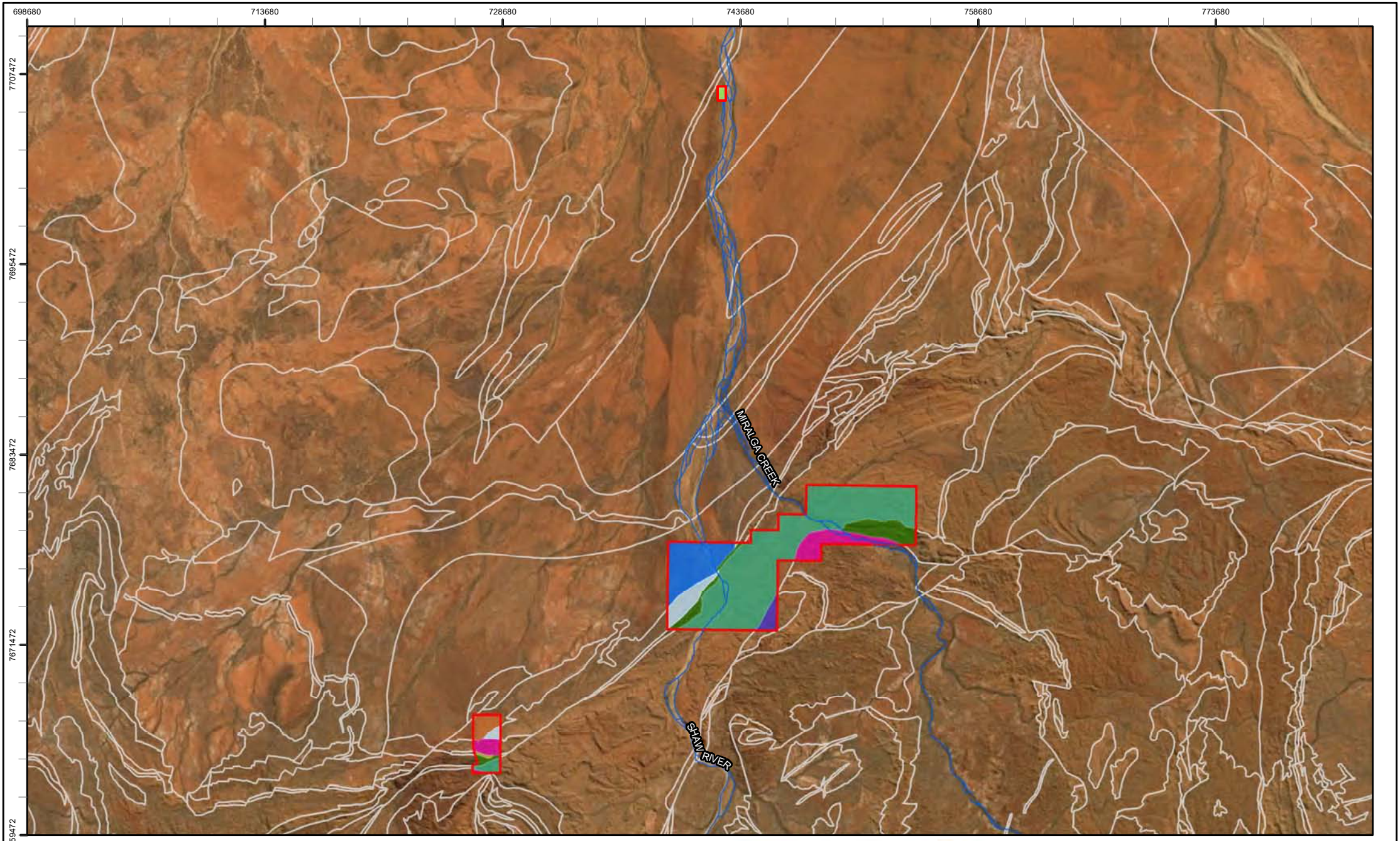
Table 2.3: Geology units within the Study Area

Geological Unit	Description	Hectares	%
Lalla Rookh Sandstone; A-CDI-st	Sandstone with beds of conglomerate and minor siltstone and shale	4,518.05	57.7
Callina Supersuite; A-CL-mg	Massive to gneissic metadiorite and metasyenogranite	994.49	12.7
Cleaverville Formation; A-GCe-ca	Banded iron-formation, ferruginous chert, sandstone, siltstone and shale	735.68	9.4
Euro Basalt; A-KEe-b	Basalt and peridotite, local dolerite and gabbro sills	725.97	9.3
Double Bar Formation; A-WAo-b	Massive or pillowed basalt, locally schistose	405.93	5.2
Coucal Formation; A-WAc-f	Felsic volcanic rocks, local felsic volcanic breccia	211.66	2.7
Mount Ada Basalt; A-WAm-b	Mafic volcanic rock, local ultramafic rock	160.24	2.1
Wilson Well Gneiss; A-TAww-mgtn	Heterogeneous orthogneiss and schlieric granodiorite	34.91	0.5
Pilbara Craton greenstones; A-ma-P	Metamorphosed ultramafic intrusive rock	23.58	0.3
Farrel Quartzite; A-GCf-stq	Quartz sandstone and quartzite, locally fuchsitic	21.56	0.3
Pilbara Craton greenstones; A-mog-P	Medium- to coarse-grained metagabbro	2.24	<0.0
Honeyeater Basalt; A-SOh-b	Massive and pillowed basalt and komatiitic basalt, locally vesicular	0.18	<0.0
Panorama Formation; A-WAp-f	Felsic volcanic rock, local sedimentary rock	0.10	<0.0
Total		**7,834.60**	**100**

The main ephemeral water course within the Study Area is the Shaw River, which flows in a northernly fashion through the western section of the Study Area before ultimately discharging into the De Grey River. A second ephemeral river, Miralga Creek, runs through the eastern part of the Study Area before joining with Shaw River (Figure 2.3).

2.6 Threatened and Priority Ecological Communities

No TECs or PECs occur within or have previously been recorded within 100 km of the Study Area (DBCA, 2019c).



Legend

Study Area

Geological Unit

- Callina Supersuite, A-CL-mg
- Cleaverville Formation, A-GCe-ca
- Coucal Formation, A-WAc-f
- Double Bar Formation, A-WAo-b
- Euro Basalt, A-KEe-b
- Farrel Quartzite, A-GCf-stq
- Honeyeater Basalt, A-SOh-b
- Lalla Rookh Sandstone, A-CDl-st
- Mount Ada Basalt, A-WAm-b
- Panorama Formation, A-WAp-f
- Pilbara Craton greenstones, A-ma-P
- Pilbara Craton greenstones, A-mog-P
- Wilson Well Gneiss, A-TAww-mgtn

biologic Environmental Survey

N

1:300,000

0 3.5 7 14 km

Atlas Iron Limited

Miralga Creek Project Level 2 Terrestrial Fauna and SRE Assessment

Figure 2.3: Surface geology and surface drainage of the Study Area

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

Size A4, Created 2/09/2019

3 METHODS

3.1 Compliance

This assessment was carried out in a manner consistent with the following guidelines and recommendations from the EPA, DBCA (formerly the Department of Parks and Wildlife, DPaW) and the DoEE (formerly the Department of the Environment [DoE], the Department of the Environment, Water, Heritage and the Arts [DEWHA], and the Department of Sustainability, Environment, Water, Population and Communities [DSEWPaC]). Specifically, the assessment was undertaken with consideration of the following guidelines:

- DEWHA (2010a) Survey Guidelines for Australia's Threatened Bats;
- DEWHA (2010b) Survey Guidelines for Australia's Threatened Birds;
- DSEWPaC (2011a) Survey Guidelines for Australia's Threatened Mammals;
- DSEWPaC (2011b) Survey Guidelines for Australia's Threatened Reptiles;
- EPA (2016b) Technical Guidance: Sampling Methods for Terrestrial Vertebrate Fauna
- EPA (2016c) Technical Guidance: Sampling of Short-range Endemic Invertebrate Fauna;
- EPA (2016d) Technical Guidance: Terrestrial Fauna Surveys;
- DPaW (2017) Interim guidelines for the preliminary surveys of Night Parrot (*Pezoporus occidentalis*) in Western Australia;
- DoE (2016) EPBC Act referral guideline for the endangered Northern Quoll (*Dasyurus hallucatus*).

3.2 Desktop Assessment

A desktop assessment, comprising database searches and a literature review, was undertaken prior to the field survey. The purpose of the desktop assessment was to identify fauna potentially occurring in the Study Area, to assist in identifying the faunal assemblage of the Study Area and to identify potential fauna species of conservation significance occurring in the Study Area.

3.2.1 Database Searches

Eight fauna databases were included in the desktop review (Table 3.1). Of the eight database searches, two provided records on vertebrate fauna species previously recorded within the desktop search area (NatureMap and Birdlife Birdata), one provided records of species of conservation significance previously recorded within the search area (Threatened Fauna Database), one was used to identify species of conservation significance known or likely to occur within the region based on modelled distributions (Protected Matters Database). Four databases were used to identify records of SRE groups within the desktop search area (Atlas of Living Australia and three WAM specimen databases).

Table 3.1: Details of database searches conducted

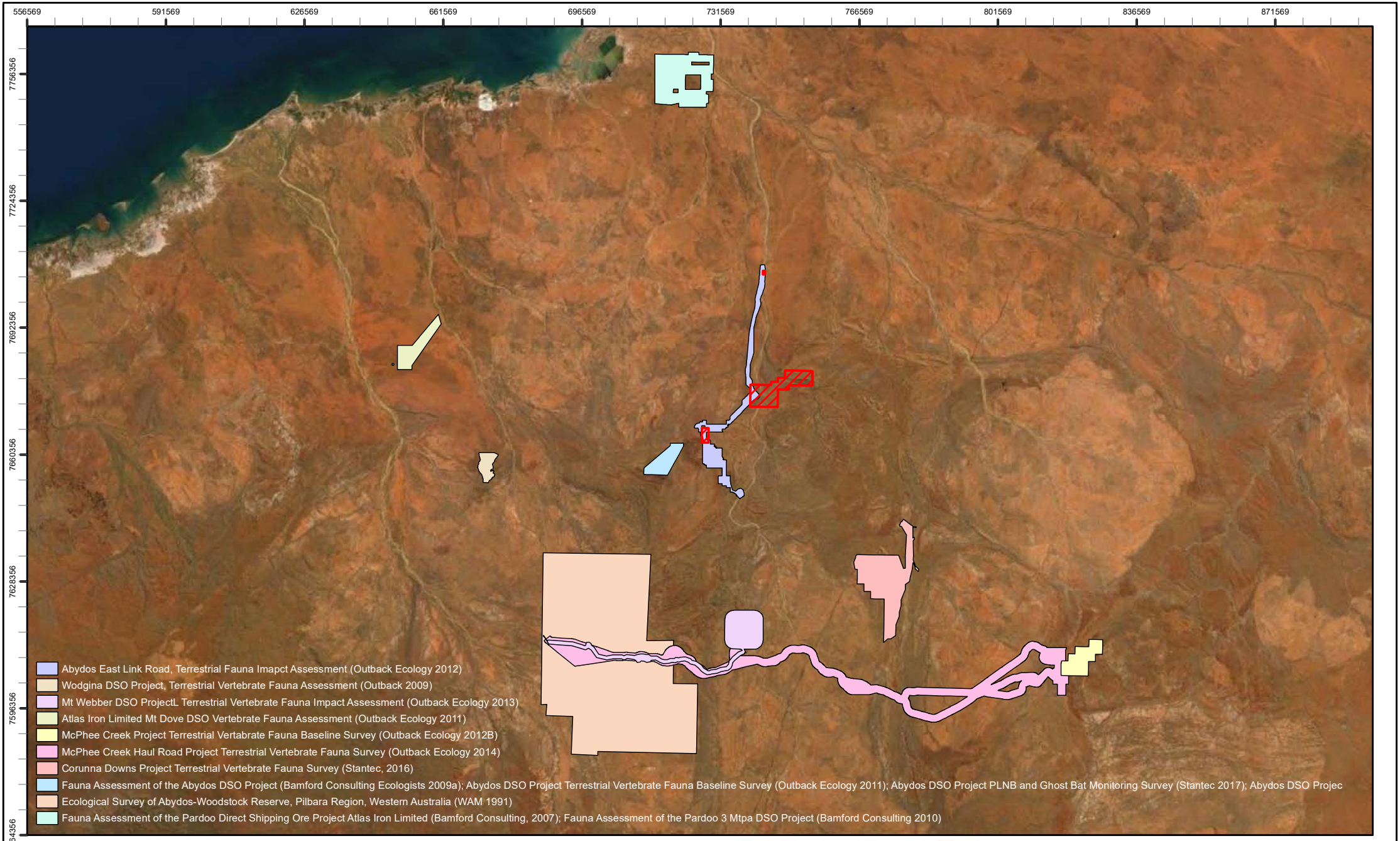
Database	Search Area	Data Access/Receival Date
DBCA (2019a) NatureMap	Circle of radius 40 km centred on the coordinates: -20.9873, 119.3628	11/04/2019
DBCA (2019e) Threatened and Priority Fauna Database	Circle of radius 40 km centred on the coordinates: -20.9873, 119.3628	15/03/2019
DBCA (2019) Threatened Ecological Communities (TEC)/ Priority Ecological Communities	Circle of radius 100 km centred on the coordinates: -20.9873, 119.3628	26/08/2019
Birdlife Australia (2019) Birdata	Circle of radius 40 km centred on the coordinates: -20.9873, 119.3628	01/04/2019
DoEE (2019) Protected Matters Search Tool	Circle of radius 40 km centred on the coordinates: -20.9873, 119.3628	01/04/2019
ALA (2019) Atlas of Living Australia Species Occurrence Search	Circle of radius 40 km centred on the coordinates: -20.9873, 119.3628	11/04/2019
WAM (2019a) Arachnid/ Myriapod Database	Circle of radius 40 km centered on the coordinates: -20.9873, 119.3628	04/04/2019
WAM (2019d) Mollusc Database	Circle of radius 40 km centered on the coordinates: -20.9873, 119.3628	15/04/2019
WAM (2019c) Crustacean Database	Circle of radius 40 km centered on the coordinates: -20.9873, 119.3628	04/04/2019

3.2.2 Literature Review

A review of available literature relevant to the Study Area was undertaken to compile a list of vertebrate fauna species with the potential to occur with the Study Area. A total of 16 assessments were reviewed, comprising 12 Level 2, three Level 1 and six targeted assessments, including some with a combination of assessment types (Table 3.2, Figure 3.1).

Table 3.2: Literature sources used for the review

Survey Title	Reference	Survey Type	Distance from Study Area (km)
Abydos DSO Project Northern Quoll Monitoring Survey 2017 (Stantec, 2018a)	A	Targeted Northern Quoll	~4.5km SW
Abydos DSO Project Pilbara Leaf-nosed Bat and Ghost Bat Monitoring Survey (Stantec, 2017)	B	Targeted Pilbara Leaf-nosed Bat and Ghost Bat	~4.5km SW
Corunna Downs Project Terrestrial Vertebrate Fauna Survey Stantec (2018b)	C	Level 2 and Targeted	~42km SE
McPhee Creek Haul Road Project Terrestrial Vertebrate Fauna Survey (Outback Ecology, 2014)	D	Level 2	~92km NW
Mt Webber DSO Project Terrestrial Vertebrate Fauna Impact Assessment (Outback Ecology, 2013)	E	Level 2	~52km S
McPhee Creek Project Terrestrial Vertebrate Fauna Baseline Survey (Outback Ecology, 2012)	F	Level 2	~92km NW
North Star Project Level 2 Terrestrial Vertebrate Fauna Assessment (ecologia, 2012)	G	Level 2 and Targeted	~4.5km W
Mt Dove DSO Vertebrate Fauna Assessment (Outback Ecology, 2011b)	H	Level 2	~71km NW
Abydos DSO Project Terrestrial Vertebrate Fauna Baseline Survey (Outback Ecology, 2011a)	I	Level 2	~4.5km SW
Fauna Assessment of the Pardoo 3 Mtpa DSO Project (Bamford Consulting, 2010)	J	Level 1	~69km N
Fauna Assessment of the Abydos DSO Project (Bamford Consulting, 2009)	K	Level 2 and Targeted	~5.5km W
Wodgina DSO Project, Terrestrial Vertebrate Fauna Assessment (Outback Ecology, 2009)	L	Level 2 and Targeted	~54km SW
Fauna Assessment of the Pardoo Direct Shipping Ore Project Atlas Iron Limited (Bamford Consulting, 2007a)	M	Level 1 with some elements of Level 2	~69km N
Panorama Project Mine Site and Haul Road Corridor Targeted Fauna Survey (Biota, 2007)	N	Level 1 (Plains Access) and Level 2 (Valley Access)	Overlapping
Panorama Project Area Baseline Fauna Study as Part of The Sulphur Springs Feasibility Study (Bamford Consulting, 2007b)	O	Level 2	No GIS data provided – likely overlapping or bordering.
Ecological Survey of Abydos-Woodstock Reserve, Pilbara Region, Western Australia (How *et al.*, 1991a)	P	Level 2	~31km SW



Legend

Study Area

biologic Environmental Survey

N

1:1,200,000

0 12.5 25 50 km

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Miralga Creek Project Level 2 Terrestrial Fauna and SRE Assessment

Figure 3.1: Previous surveys conducted in the area

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

Size A4, Created 2/09/2019

3.3 Field survey

The survey was undertaken across two phases; Phase 1 was undertaken between the 9th and 20th May 2019 and Phase 2 was undertaken between the 11th and 21st of July 2019. The purpose of the survey was to verify the data collated during the literature and database reviews, map and describe the fauna habitats present within the Study Area. Additionally, the primary focus of Phase 1 was to identify the faunal assemblages present in the Study Area. For this reason, the survey was undertaken directly after the summer rainfall, when faunal activity is typically high, and employed a number of survey techniques, typical of a EPA Level 2 survey, to record a wide variety of faunal groups. The Phase 2 survey took a more targeted approach, whereby the sampling design was focussed on species of conservation significance or potential SRE species (either recorded during Phase 1 or during the desktop assessment), to better understand the occurrence and distribution of such species. The Phase 2 survey was undertaken in July to ensure timing coincided with the period of peak activity for the primary target species, the Northern Quoll (*Dasyurus hallucatus*) (Hernandez-Santin *et al.*, 2019)

3.3.1 Survey Team

The fauna sampling for this survey was conducted under a DBCA Regulation 17 "Fauna Taking (Scientific or Other Purposes) License" (08-003542-1) and Regulation 27 "Fauna Taking (Biological Assessment) License" (BA27000043) issued to B. Downing. Under Section 40 of the BC Act, threatened species sampling was completed under a DBCA "Authorisation to Take or Disturbed Threatened Species" issued to B. Downing

The assessment was undertaken by zoologists with extensive experience with fauna in the region. The following personnel were involved in the field component of the project:

- Ms Talitha Moyle (Senior Zoologist) – Phase 1 and 2;
- Mr Ryan Ellis (Senior Zoologist) – Phase 1;
- Mr Ray Lloyd (Senior Zoologist) – Phase 2.
- Mr Chris Knuckey (Senior Zoologist) – Phase 1;
- Mrs Claire Brooks (Senior Zoologist) – Phase 1;
- Ms Brighton Downing (Zoologist) – Phase 1; and
- Mr Nathan Litjens (Ecologist) – Phase 1;

3.3.2 Weather Conditions During the Surveys

Weather conditions experienced prior to and during a survey can potentially have a large influence on the capture results for both vertebrate fauna (EPA, 2016a) and SRE invertebrates (EPA, 2016c).

The weather conditions during the first phase of the survey (9–20 May 2019) were consistent with the long-term averages, with maximum daytime temperatures averaging 30.8°C and minimum overnight temperatures averaging 13.7°C (Figure 3.2, Table 3.3). Marble Bar recorded no rainfall in the month before or during the first phase of the survey, and rainfall between the first and second phase of the survey was below average (Figure 3.2). However, significant rainfall was recorded in March 2019 due to Cyclone Veronica (246.2 mm; 324%

above the long-term average) (Figure 3.2). Such conditions are likely to have resulted in average fauna activity and abundance (Greenville *et al.*, 2012). The weather conditions during the second phase of the survey (11–21 July 2019) were consistent with the long-term averages, with maximum daytime temperatures averaging 28.4°C and minimum overnight temperatures averaging 12.6°C (Figure 3.2; Table 3.3).

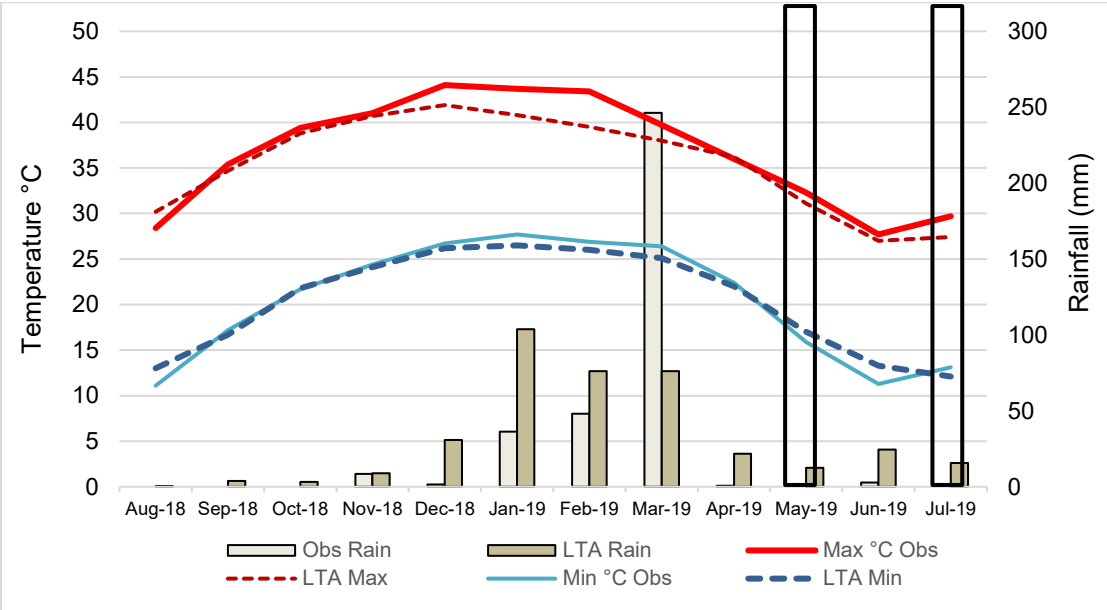


Figure 3.2: Long term average (LTA) and current (2018-2019) climatic data at Marble Bar (Station 004106), (data from BoM 2019*)*Note: Data includes total monthly rainfall (mm) and average monthly maximum and minimum temperatures (°C). Approximate survey timing is indicated by black boxes.

Table 3.3: Weather conditions recorded at Marble Bar during the survey (BoM, 2019)

Date	Rainfall	Temperature	
		Minimum	Maximum
Phase 1			
09/05/2019	0.0	18.8	30.1
10/05/2019	0.0	16.9	26.9
11/05/2019	0.0	14.8	27.1
12/05/2019	0.0	11.3	28.0
13/05/2019	0.0	13.1	29.2
14/05/2019	0.0	14.0	30.4
15/05/2019	0.0	12.0	32.4
16/05/2019	0.0	12.6	33.4
17/05/2019	0.0	12.6	34.4
18/05/2019	0.0	13.6	30.8
19/05/2019	0.0	12.2	32.4
20/05/2019	0.0	12.1	34.3
Total/Mean	**0.0**	**13.7**	**30.8**
Phase 2			
11/07/2019	0.0	15.3	28.0
12/07/2019	0.0	17.7	29.9
13/07/2019	0.0	15.4	28.8
14/07/2019	0.0	15.1	27.1
15/07/2019	0.0	9.7	26.0
16/07/2019	0.0	8.9	26.7
17/07/2019	0.0	12.2	27.2
18/07/2019	0.0	8.4	28.9
19/07/2019	0.0	10.9	31.7
20/07/2019	0.0	13.4	30.6
21/07/2019	0.0	12.4	27.5
Total/Mean	**0.0**	**12.6**	**28.4**

3.3.3 Vertebrate Fauna Methodology

Habitat Assessments

Habitat assessments were undertaken in the field to characterise and define habitats and their attributed relevance to vertebrate fauna. Habitat assessments were undertaken at 152 locations across the Study Area, comprising all systematic and targeted sampling sites (Figure 3.3). Habitat assessments were conducted using methodology and terminology modified from the *Australian Soil and Land Survey Field Handbook* (National Committee on Soil and Terrain, 2009). The characteristics recorded during the habitat assessments were:

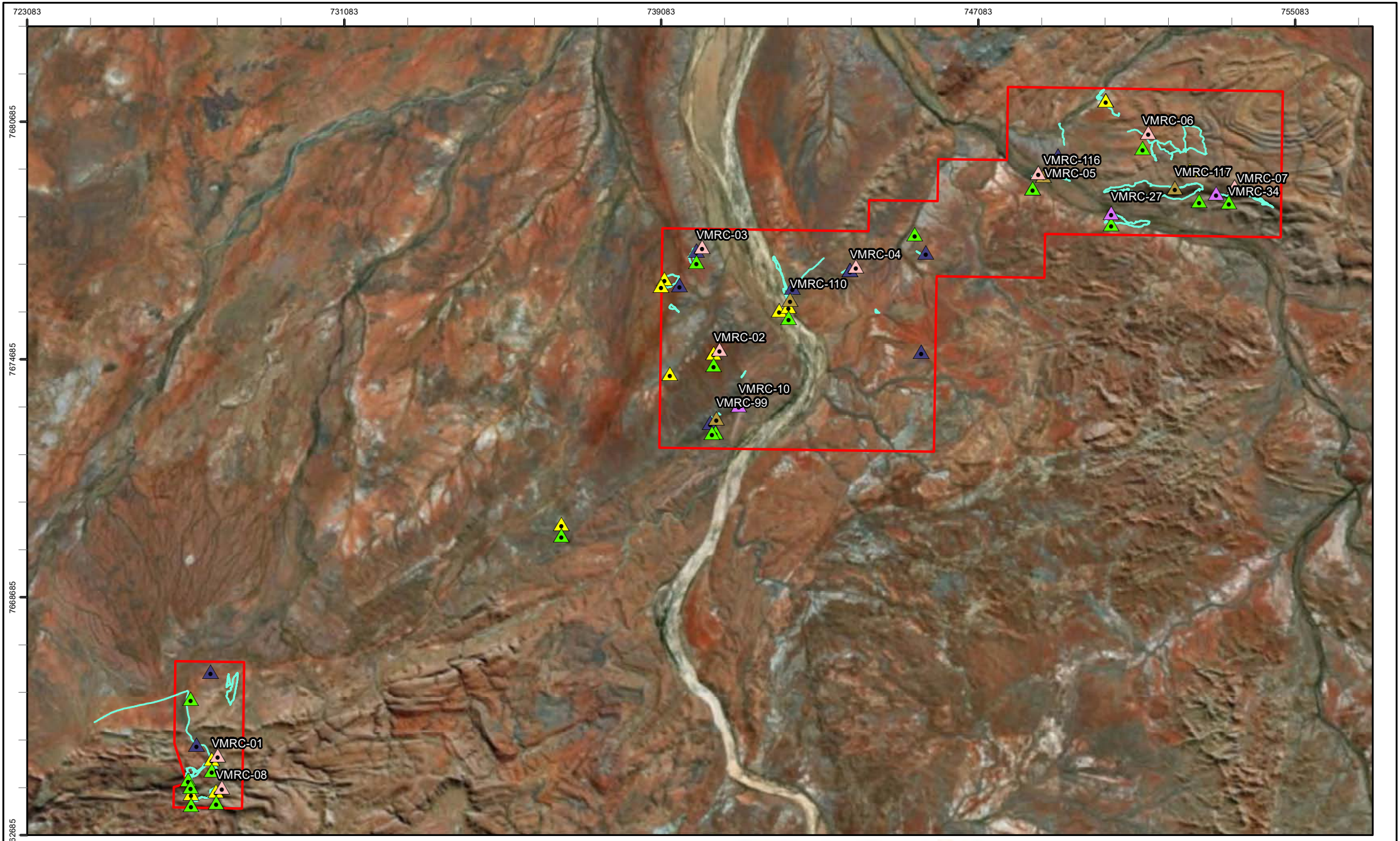
- site information, photo and location;
- landform: slope, relative inclination of slope, morphological type and landform type;
- vegetation: leaf litter %, wood litter, hollow bearing trees, broad floristic formation, vegetation structure (tall, mid and low), and dominant species;
- land surface: micro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

Systematic Trapping Sites

A total of eight systematic trapping sites were established and sampled during the Phase 1 field survey (Figure 3.4), with sites representing most fauna habitats present within the Study Area. The sites were setup to sample the most common and significant habitats, while ensuring adequate coverage across the entire Study Area. Each trapping site was open for seven consecutive nights and checked daily within three hours of sunrise. Each site comprised the following:

- Pit traps – Ten pit traps comprising five 20 Litre (L) buckets and five PVC pipes (16 centimetres [cm] diameter and 50 cm deep) were installed at each site. Traps were installed approximately 10–20 metres (m) apart along a single transect with a 5 m long by 0.3 m high aluminium drift fence bisecting each pit trap. Traps were placed in locations deemed most likely to catch fauna (i.e. areas with dense ground cover, litter, rocks etc.) and most representative of broad fauna habitats occurring within the Study Area. Styrofoam trays were placed within all pits to provide refuge for any captured fauna from exposure to environmental conditions (i.e. heat and wind) and predators.
- Funnel traps – Two funnel traps were placed at either end of the drift fence bisecting each pit trap. A total of 20 funnel traps were deployed at each systematic trapping site)
- Elliott traps – Twenty medium (Type B) Elliott style box traps were placed at each site. Traps were placed along two parallel transects adjacent to pit traps and positioned approximately 10–20 m apart. Each trap was positioned in habitat niches likely to be attractive to small non-volant mammals and reptiles (i.e. areas of cover and shade).
- Cage Traps – Two cage traps (20 x 20 x 56 cm) were located at each site, with once placed at each end of the trap site transect.

Shade covers were used over funnel, cage and Elliott traps to reduce the likelihood of exposure related trap death. Elliott and cage traps were baited with a universal bait mix comprising oats, peanut butter and sardines, and rebaited every 2–3 days.



Legend

- Study Area
- Targeted search transect

Sampling Method

- Acoustic recorder
- Motion camera (individual)
- Ultrasonic recorder
- Systematic trapping
- Targeted camera trapping
- Targeted trapping

biologic Environmental Survey

N

1:120,000

0 1.25 2.5 5 km

Atlas Iron Limited

Miralga Creek Project Level 2 Terrestrial Fauna and SRE Assessment

Figure 3.3: Vertebrate fauna sampling in the Study Area

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

Size A4, Created 12/11/2019

Figure 3.4: Layout of traps at a systematic sampling site

Table 3.4: Survey effort by vertebrate fauna sampling sites

Site	Site Type	Pits (nights)	Funnels (nights)	Elliott's (nights)	Cages (nights)	Total Trap Nights	Bird Census (min)	SongMeter (ultrasonic) (nights)	SongMeter (acoustic) (nights)	Motion Cameras (nights)
Phase 1										
VMRC-01	Systematic	70	140	140	14	364	140	1		6
VMRC-02	Systematic	70	140	140	14	364	140	2		5
VMRC-03	Systematic	70	140	140	14	364	140	2	6	
VMRC-04	Systematic	70	140	140	14	364	140		12	
VMRC-05	Systematic	70	140	140	14	364	140	7		
VMRC-06	Systematic	70	140	140	14	364	140	3		
VMRC-07	Systematic	70	140	140	14	364	140	2		
VMRC-08	Systematic	-	140	140	14	294	140	3		2
VMRC-09	SongMeter (acoustic)								8	
VMRC-10	Northern Quoll Camera Transect									40
VMRC-11	SongMeter (ultrasonic)							2		
VMRC-15	Motion Camera (individual)									3
VMRC-16	Motion Camera (individual)									3
VMRC-22	Motion Camera (individual)									3
VMRC-22	SongMeter (ultrasonic)							3		
VMRC-24	Motion Camera (individual)									3
VMRC-24	SongMeter (ultrasonic)							3		
VMRC-26	Motion Camera (individual)									2
VMRC-27	Northern Quoll Camera Transect									40
VMRC-27	SongMeter (ultrasonic)							4		
VMRC-30	SongMeter (ultrasonic)							2		
VMRC-31	SongMeter (acoustic)								5	
VMRC-33	SongMeter (acoustic)								5	

Site	Site Type	Pits (nights)	Funnels (nights)	Elliott's (nights)	Cages (nights)	Total Trap Nights	Bird Census (min)	SongMeter (ultrasonic) (nights)	SongMeter (acoustic) (nights)	Motion Cameras (nights)
VMRC-34	Northern Quoll Camera Transect									570
VMRC-39	SongMeter (acoustic)								7	
VMRC-39	Motion Camera (individual)									3
Phase 1 Total		**490**	**1,120**	**1,120**	**112**	**2,842**	**1,120**	**34**	**43**	**680**
Phase 2										
VMRC-99	Targeted Northern Quoll				200	200				
VMRC-101	SongMeter (acoustic)								7	
VMRC-103	Motion Camera (individual)									6
VMRC-104	Motion Camera (individual)									18
VMRC-106	SongMeter (ultrasonic)							3		
VMRC-107	SongMeter (acoustic)								4	
VMRC-108	SongMeter (acoustic)								5	
VMRC-110	Targeted Northern Quoll				200	200				
VMRC-111	SongMeter (ultrasonic)							3		
VMRC-115	SongMeter (acoustic)								6	
VMRC-116	Targeted Northern Quoll				250	250				
VMRC-117	Targeted Northern Quoll				350	350				
VMRC-120	SongMeter (ultrasonic)							2		
VMRC-122	SongMeter (ultrasonic)							2		
VMRC-123	SongMeter (ultrasonic)							2		
VMRC-125	SongMeter (acoustic)								7	
VABY-12	Targeted Northern Quoll (Abydos Monitoring Site L)			100						
Phase 2 Total		**-**	**-**	**-**	**1,100**	**1,100**	**-**	**12**	**29**	**24**
Survey Total		**490**	**1,120**	**1,220**	**1,212**	**3,942**	**1,120**	**46**	**72**	**704**

Avifauna Sampling

Twenty-minute avifauna census were undertaken daily at all systematic trapping sites during the Phase 1 survey, comprising record of any avifauna directly observed, recorded from call or other signs of presence (i.e. nests, tracks). Each avifauna census was conducted between 6:30 am and 11:00 am whilst undertaking trap clearing activities. The order of site visitation was staggered to reduce bias due to timing of arrival at sites and the recorders were rotated where possible to reduce observers' bias (Lindenmayer *et al.*, 2009). A total of seven 20-minute avifauna surveys was undertaken at each site for a total of approximately 18.7 hours (Table 3.4). Additional 5–10-minute opportunistic avifauna sampling was undertaken at selected habitat assessment sites.

Targeted Northern Quoll Trapping

Four targeted Northern Quoll trapping sites were established during the Phase 2 survey (Table 3.4). Each site comprised two parallel lines of 25 cage traps (20 x 20 x 56 cm) spaced approximately 10–30 m apart to ensure protection from adverse environmental conditions. Traps were baited with a universal bait mix (comprising peanut butter, rolled oats and sardines) and re-baited every 2–3 days. All trap sites remained open for between four and seven consecutive nights with trapping effort at each site ranging between 200–350 trap nights, for a total of 1,100 trap nights during the Phase 2 survey (Table 3.4). Two sites (VMRC-99 and VMRC-110) were closed after four nights due to two or more individuals being caught twice, in accordance with referral guidelines for the species (DoE, 2016).

Trapping results for a Northern Quoll monitoring site located within the Study Area (VABY-12, Abydos Northern Quoll Monitoring Site L) for the Abydos DSO Project (Biologic, 2019) were also incorporated into Northern Quoll trapping results for the current survey. The monitoring site is located near the Sandtrax deposit and trapping occurred concurrently with Targeted Northern Quoll trapping undertaken during the Phase 2 survey. A total of 20 traps were deployed at the monitoring site, comprising a combination of 18 large Elliot traps (15 x 15 x 45 cm) and two cage traps (20 x 20 x 56 cm) placed approximately 10 m apart. Traps remained open for five consecutive nights, before the site was closed due to two or more individuals being caught twice, in accordance with referral guidelines for the species (DoE, 2016). Survey effort at the site totalled 100 trap nights, for a total of 1,200 trap nights targeting Northern Quoll achieved during the Phase 2 survey.

Demographic and meristic data was recorded for all captured individuals in accordance with DoE (2016). The following parameters were measured and recorded for each individual captured:

- Sex – male or female;
- Age – juvenile, sub-adult or adult;
- General condition – body and fur condition, markings or scarring, behaviour and/or presence of parasites;
- Reproductive condition – distended pouch, extended teats/lactating, pouch young or prominent/enlarged testes;
- Weight – in grams (g);
- Head length – from snout tip to crown, in millimetres (mm);
- Body/rump length – from crown to base of tail, in mm;
- Tail diameter – at base of tail, in mm; and
- Pez length – length of hind foot from the heel to the extended toe, excluding the nail, in mm.

To allow identification of re-captured individuals, all captured individuals were implanted with a Passive Integrated Transponder (PIT) tag following first capture. These were implanted subcutaneously in the loose skin between the shoulders. All captures were scanned for an existing PIT tag on capture to determine if the individual's status as a recapture or new individual. Where possible, photographs of the spot patterning of captured Northern Quolls were taken to assist in identifying PIT tagged individuals also recorded on motion sensor camera traps deployed at targeted Northern Quoll motion camera transects (see below).

A tissue sample (ear biopsy) was collected from each individual captured during the survey to provide genetic material for current and future DNA analysis projects. Tissue samples were preserved in 100% ethanol and submitted to the Western Australian Museum (WAM).

Targeted Northern Quoll Motion Camera Transects

Three targeted Northern Quoll motion camera transects were sampled within the Study Area during Phase 1 and Phase 2 of the filed survey (Table 3.4; Figure 3.3). Each targeted transect comprised ten motion cameras placed approximately 100 m apart along a linear transect within suitable Northern Quoll habitat in accordance with referral guidelines for the species (DoE, 2016). Camera traps were baited with a universal bait mix. Each trap was set to record 5 seconds of video footage when triggered, continuously during their deployment.

Two camera transects (VMRC-10 and VMRC-27) were deployed for four consecutive nights during Phase 1 and the third (VMRC-14) was deployed over 57 consecutive nights between the Phase 1 and Phase 2 surveys, for a total of 650 trap nights.

Northern Quoll - Spot Patterning Analysis

In acknowledgement that one individual may be detected at a location on multiple occasions, it was important to determine whether each capture event recorded on motion camera was a new or a previously recorded individual. If trapping equipment is setup appropriately, individual animals can be distinguished based on the timing of photos, general size and shape, spot patterning and other physical characteristics of individuals (i.e. scars) (Hohnen *et al.*, 2012). Where photos were of suitable quality (i.e. clear image of specimen showing spot

configuration), spot patterning was used as the primary method for distinguishing individuals between each Northern Quoll capture event. A single capture event was defined for this study as an obviously different Northern Quoll captured on camera and/or a capture of an individual separated by a 60-minute interval between another Northern Quoll capture. The capture success was then determined by dividing the total number of captures by the total number of sample nights for each site. Where an individual could not be accurately identified, the record was considered a new individual.

Where possible, left and right lateral images of Northern Quoll were screen captured from video data using VLC media player (VideoLAN, 2001). Each image was cropped to eliminate the background and focus the Northern Quoll from nose to tail. The image contrast was then adjusted to highlight spot patterns. Wild-ID (Dartmouth University, 2011- Hanover, New Hampshire) was used to compare all edited captures of Northern Quoll against one another. The program assigned each pair of images with a similarity rating (score) based on spot patterns between 0 and 1, whereby 0 equates to no similarity, and 1 suggests a perfect match. Biologic personnel manually accepted or rejected the similarity between each pair of images. An output from Wild-ID is then generated grouping images based on matches whereby each group represents an individual Northern Quoll.

Ultrasonic Bat Recording

SongMeter (SM; Wildlife Acoustics Inc.) ultrasonic bat recorders were deployed at 18 locations within the Study Area during the Phase 1 and Phase 2 surveys, including all systematic trapping sites (Table 3.4; Figure 3.3; Appendix B). Locations were representative of all habitats occurring with the Study Area and focused primarily on suitable habitat for Pilbara Leaf-nosed Bat and Ghost Bat. At each location, recorders were placed in areas of prospective foraging and/or roosting habitats and features most likely to be utilised by bats, such as natural or artificial waterbodies and caves. Recorders were deployed between one and four nights at each location for a total of 46 recording nights (Table 3.4).

A single SM was also deployed at a known permanent Pilbara Leaf-nosed Bat and Ghost Bat Roost, Lalla Rookh (VLRM-01), located approximately 3 km southwest of the Miralga deposits (Miralga East and Miralga West) and 9 km northeast of the Sandtrax deposit (Table 3.4; Figure 3.3). Recording at this location was undertaken to determine whether detections of these species within the Study Area were likely to have originated from this roost or elsewhere, such as from within the Study Area. Four nights were analysed during the Phase 1 survey from 14/05/2019-17/05/2019 and 11 nights through the Phase 2 survey from the 10/07/2019.

The jumper and audio settings used for all the SM units followed the manufacturer's recommendations contained in the user manual (Wildlife Acoustics, 2011, 2017). Selectable filters and triggers were also set using the manufacturer's recommendations. Bat calls were analysed by Robert Bullen of Bat Call WA.

Acoustic Recording

SongMeter (SM; Wildlife Acoustics Inc.) acoustic recorders were deployed at 12 locations during both phases of the field survey targeting Night Parrot, including three at systematic trapping sites (one at VMRC-03 and two at VMRC-04) where suitable habitat was present (Table 3.4; Figure 3.3; Appendix B). The SM4 acoustic recorders were deployed in potential habitat recommended within the *Interim Guideline for Preliminary Surveys of Night Parrot (Pezoporus occidentalis) in Western Australia* (DPaW, 2017) – "stands of large, old clumps of spinifex (*Triodia*)... especially so if the identified area is part of a paleo-drainage system or contains healthy stands of samphire." SongMeters were deployed between four and seven nights for a total of 72 recording nights (Table 3.4).

Acoustic recordings were analysed for Night Parrot (*Pezoporus occidentalis*) calls by ornithologist Nigel Jackett.

Motion Cameras

Individual motion cameras were deployed at 12 locations within the Study Area to survey for larger and/or cryptic species (i.e. conservation significant and introduced species) which may not be recorded by other sampling methods (Table 3.4; Figure 3.3; Appendix B). The locations chosen were considered prospective for detecting fauna of conservation significance, including at rocky outcrops and water features. Camera traps were baited with a universal bait mix.

Each trap was set to record 5 seconds of video footage when triggered. Individual cameras were deployed between two and six nights for a total of 52 trapping nights over the duration of the Phase 1 and Phase 2 surveys (Figure 3.3).

Targeted Searches

Targeted searches were undertaken throughout the Study Area within habitats considered likely to support species of conservation significance. Targeted searches comprised searching for occurrence of conservation significant species (i.e. direct observation and/or secondary evidence such as tracks, scats and nests) and habitats and/or habitat features of significance (i.e. dens, caves and water features) likely to be utilised by particular species.

During the course of the two survey phases, targeted searches were undertaken at various locations for Northern Quoll, Pilbara Leaf-nosed Bat and Ghost Bat, Greater Bilby, Spectacled Hare-wallaby and Pilbara Olive Python where suitable habitat was present. Targeted searches were undertaken at each site for approximately 1–3 person hours per location.

Any non-target fauna species recorded, from direct observation or secondary evidence, during the targeted searches were recorded.

Nocturnal Surveys

Spotlighting was undertaken to detect the presence of any nocturnal fauna species within the Study Area. Nocturnal surveys were undertaken between sunset and 10 pm. Each survey consisted of searches using head torches and, where possible, road spotting to detect fauna

from movement, eye shine and other evidence of species presence. Searches primarily focused on nocturnal reptiles and mammals but also included nocturnal birds.

Two evenings of spotlighting were undertaken during each phase of the survey at various locations representative of all broad fauna habitats occurring within the Study Area. Specifically, at systematic trapping sites VMRC-03, VMRC-04 and VMRC-05 and road driving at night time.

Opportunistic Records

At all times while surveying, all records pertaining to species not previously recorded during the survey, rare species, species of conservation significance or other fauna of interest were documented. These records include those from primary (i.e. direct observation of species) or secondary (e.g. burrows, scratching's, diggings and scats) evidence. Efforts were made to target likely microhabitats by turning rocks, logs and anthropogenic debris where present.

Taxonomy and Nomenclature

The latest checklist of mammal, reptile and amphibian names published by the WAM (2019b) used as a guide to the current taxonomy and nomenclature of these groups. For birds, the current checklist of Australian birds maintained by Birdlife Australia (based on Christidis & Boles, 2008) was used in conjunction with the WAM (2019b) species list. While compiling a list of fauna potentially occurring in the Study Area, all records were checked to ensure the latest taxonomy, using recent papers and lists, was used.

3.3.4 SRE Invertebrate Methodology

Sites were chosen to align with recommendations by the EPA (2016c) technical guidance, although habitats considered suitable for SRE terrestrial invertebrates were targeted. To provide adequate geographical coverage and local context, several reference sites in less suitable habitat types were also assessed. Invertebrate specimens were also opportunistically collected during the vertebrate fauna trapping in dry pitfall traps, totalling 350 pitfall trapping nights (Section 3.3.3).

Habitat Assessments

Habitat assessments used to characterise and define microhabitat features available for SRE invertebrates were undertaken at 61 locations in the Study Area (Figure 3.5). SRE habitat assessments were aimed at determining the likelihood that the site would be suitable for SRE fauna. The assessments were based on three major factors influencing the significance of habitats for SRE species: isolation, protection and complexity (see Figure 3.6).

Active Foraging

Active foraging was undertaken at 33 sampling sites for a total of 24.5 person hours and involved various techniques relevant to the following microhabitats:

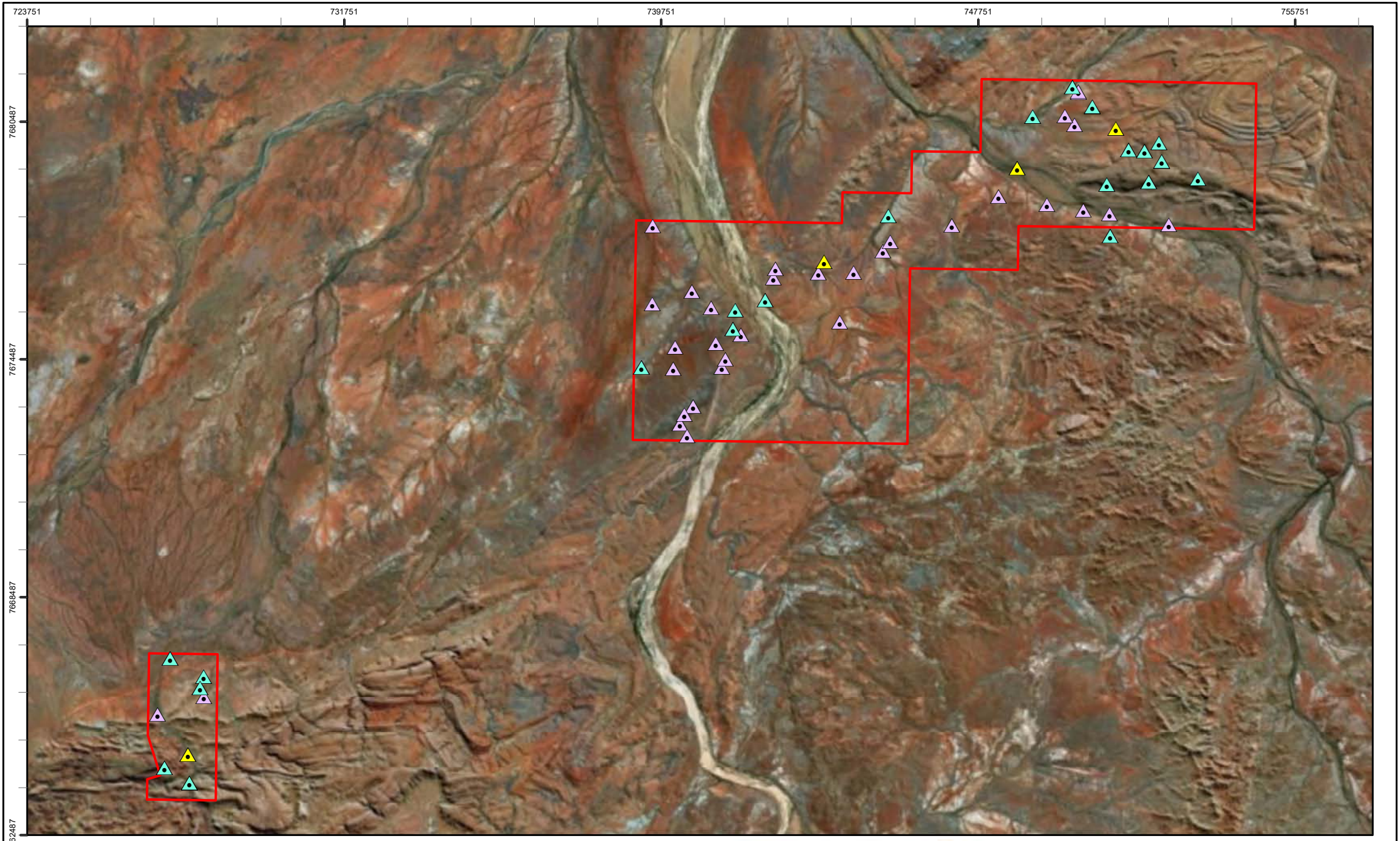
- Under rocks, within cracks and crevices: suitably sized rocks were overturned, and rocky microhabitats were actively searched for rock dwelling species;
- Woody debris: larger logs and woody debris were investigated and overturned searching for detritivores;
- Vegetation and tree bark: significant vegetation (e.g. Mulga,) were actively searched, including underneath sheets of bark; and
- Burrow searching: active searches were undertaken for Mygalomorph spiders and scorpion burrows within suitable habitats. Note: searches for burrows were undertaken during foraging time and also whilst walking through the Study Area.

Leaf Litter Searching

Leaf litter searching was undertaken at all sampling sites where leaf litter was present. Leaf litter, humus and topsoil (to approximately 5 cm below surface) was placed in a sieve at the site and agitated to divide the sample into three grades (>7 mm, >3 mm, >1.4 mm, <1.4 mm). Each grade was thoroughly searched for target SRE species such as pseudoscorpions, millipedes, snails, and small scorpions. The maximum volume of litter in the sieve was approximately 4808 cm^3, and up to two sifts were conducted at each site, providing sufficient leaf litter and humus was available.

Specimen Preservation and Identification

All specimens were euthanised in 100% ethanol to preserve DNA for sequencing. Isopods were identified by isopod specialist Dr Simon Judd. Spiders, scorpions, snails and myriapods were identified by Dr Erich Volschenk.



Legend

Study Area

Sampling Method

- SRE sampling
- SRE habitat assessment only
- Pitfall trapping

biologic Environmental Survey

N

1:120,000

0 1.25 2.5 5 km

Atlas Iron Limited

Miralga Creek Project Level 2 Terrestrial Fauna and SRE Assessment

Figure 3.5: SRE invertebrate sampling in the Study Area

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

Size A4, Created 2/09/2019

3.4 Fauna Habitat Mapping and Significance

Fauna habitat mapping was completed using the vertebrate and SRE invertebrate fauna habitat assessments conducted during the field surveys, as well as high-resolution aerial imagery, vegetation, topographical, land system and drainage mapping. Habitats were delineated and mapped across the Study Area at a scale of approximately 1:20,000.

3.4.1 Significance to Vertebrate Fauna

Fauna habitats were also assessed for the likelihood that they may support fauna of conservation significance. All major fauna habitats present within the Study Area were scored for significance (High, Moderate or Low) according to the criteria shown below in Table 3.5.

Table 3.5: Fauna habitat significance assessment criteria

Score	Possible criteria (score results from any possible criterion being met)
High	Fauna listed as threatened under the EPBC Act or BC Act have been recorded from this habitat type within the Assessment Areas.
	Habitat known to be suitable core habitat[1] for EPBC Act and/or BC Act listed threatened fauna, and there are records of this species within 40 km^2.
	Habitat is regionally uncommon or limited in extent and known to support species listed as: • Threatened fauna under the EPBC Act and/or BC Act, but it is not their core habitat (e.g., may be used periodically/ seasonally or for dispersal). • Species of Special Conservation Interest or Other Specially Protected Species under the BC Act. • DBCA listed Priority fauna, which are known to be solely reliant on this habitat.
Moderate	Habitat known to support EPBC Act and/or BC Act listed Migratory fauna.
	Habitat that is regionally uncommon (e.g., occurs in small and isolated areas) and supports a particularly diverse and uncommon faunal assemblage.
	Habitat is common and widespread and known to support species listed as: • Threatened fauna under the EPBC Act and/or BC Act, but it is not their core habitat (e.g., may be used periodically/ seasonally or for dispersal). • Species of Special Conservation Interest or Other Specially Protected Species under the BC Act • DBCA listed Priority fauna, which are known to be solely reliant on this habitat.
Low	Habitat is widespread/common and does not solely support any DBCA listed Priority fauna.

3.4.2 Significance for SRE Invertebrates

The significance of each fauna habitat was assessed for likelihood to provide suitable habitat for SRE invertebrates, based on a five-tier system ranging from Highly Unlikely to Highly Likely. The assessment was based on three major factors influencing the significance of habitats for SRE species: isolation, protection and complexity (Figure 3.6).

***Isolation*:** based on the level of connectivity between sites, which share similar habitat characteristics. Isolation is the most important factor when it comes to the level of risk, as any fauna with limited dispersal characteristics, regardless of the habitat preference, will likely be, at least, an isolated population. Examples include islands and mountaintops.

***Protection*:** this primarily covers protection from exposure. With respect to the arid-zone region however, protection from disturbance is also very important for the long-term viability of SRE habitats and communities, i.e. protection from fire, flood and invasive species. Protection is provided at two levels; the site level where the structural composition of the site (aspect, slope etc.) can provide protection from exposure and disturbance by providing physical barriers (e.g. gorges and gullies); and the habitat level where certain microhabitat characteristics, associated with habitat complexity, provide more direct protection, particularly from exposure (i.e. leaf litter, rocky substrates, canopy cover and soil depth).

***Complexity*:** this factor drives species richness and often abundance at a site, i.e. the more complex a site is, the more species and individuals it is likely to contain. This is particularly important, as a number of SRE groups are predators; therefore, the richness and abundance of prey species are critical to their survival. Complexity, with respect to SREs, is based around a number of microhabitat types:

- Leaf litter: both depth and structural variation;
- Rocky substrates: loose rocks and crevices;
- Vegetation variation: flora richness and structural variation; and
- Soil: depth and structural variation.

Likewise, the complexity of the habitat is important to detritivore SRE taxa, such as isopods, millipedes and some snails, which rely upon decaying leaf litter, woody debris and organic matter for survival.

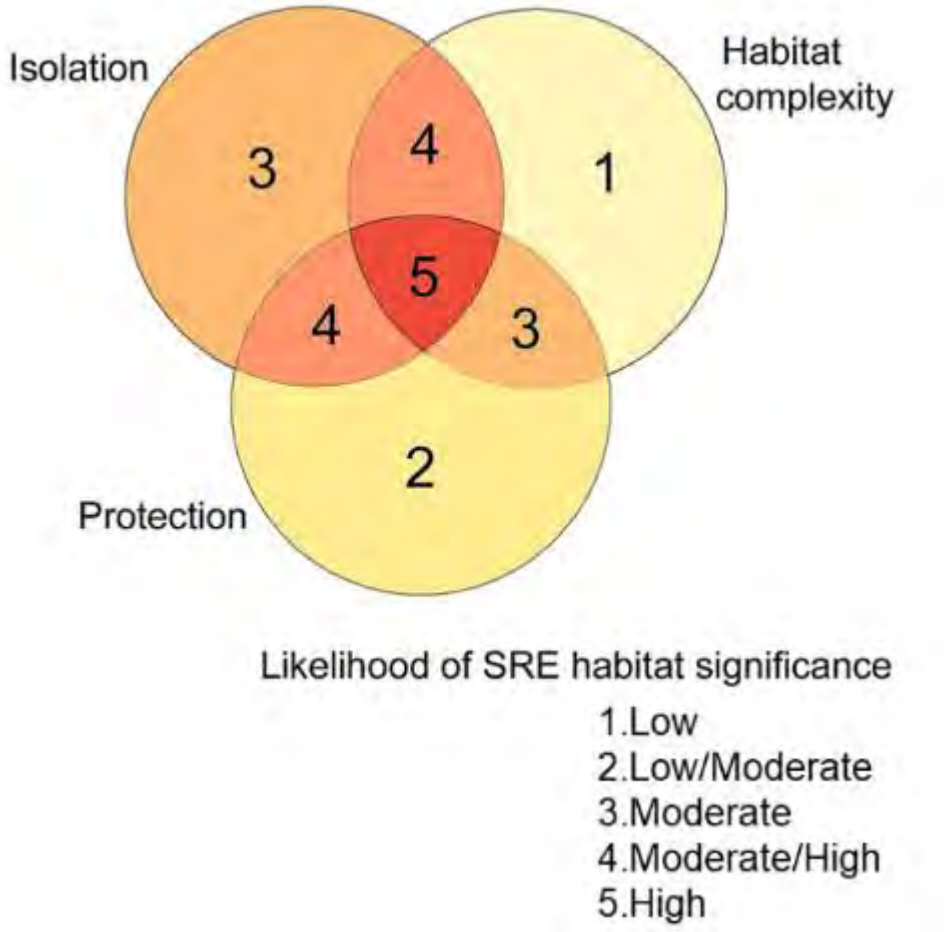


Figure 3.6: Factors influencing the suitability of habitats for SRE invertebrate fauna

3.5 Likelihood of Occurrence for Vertebrate Fauna

Fauna species of conservation significance identified during the desktop component were assessed for their likelihood to occur within the Study Area using the decision matrix below (Table 3.6).

Table 3.6: Species likelihood of occurrence decision matrix

Range/occurrence categories (records <50 years only)	Habitat Categories (within Study Area)			
	Core/critical habitat present	Foraging/dispersal habitat present	Marginal/intermittent habitat present	No suitable habitat present
Recorded in Study Area	Confirmed	Confirmed	Confirmed	Confirmed
Recorded within 10 km	Highly Likely	Likely	Possible	Possible
Recorded within 10–50km	Likely	Possible	Possible	Unlikely
Recorded within 50–100 km	Possible	Possible	Unlikely	Unlikely
Recorded >100 km	Possible	Unlikely	Unlikely	Highly Unlikely
Species considered locally/regionally extinct	Unlikely	Unlikely	Highly Unlikely	Highly Unlikely

The likelihood of occurrence within the Study Area for species of conservation significance identified in the desktop assessment was assessed using the decision matrix shown in Table 3.6. The occurrence assessment was based on known information relating to species' distribution, habitat preferences (landforms, substrates and vegetation associations), locality records from database searches and previous studies within and/or in the vicinity of the Study Area and results of the current survey pertaining to species records and/or habitats occurring within the Study Area. The fauna assessments assigned each species to one of six ratings, ranging from Confirmed to Highly Unlikely.

Due to several factors influencing species occurrence (i.e. known distribution, habitat preferences, ecology and/or dispersal capabilities), interpretation of occurrence assessment criteria may vary between species (i.e. a small species with limited dispersal capabilities previously recorded close to the Study Area may not necessarily occur within the Study Area,

whereas larger species with greater dispersal and/or foraging capabilities may have an increased likelihood of occurring).

Where a species determined likelihood of occurrence differs from the assessment criteria in Table 3.5, detailed justification for the determined assessment will be provided in the discussion of that species. For example, historic or presumed erroneous records which may not be representative of species' current known distribution (i.e. locally/regionally extinct species) or limited sampling within or in the vicinity of the Study Area resulting in lack of contextual records which may influence a higher or lower determined likelihood of occurrence to criteria.

4 RESULTS AND DISCUSSION

4.1 Desktop Assessment

4.1.1 Vertebrate Fauna

A total of 343 vertebrate fauna species were identified as having the potential to occur within the Study Area in the desktop assessment (Table 4.1; Appendix C). This comprises 40 native and 12 introduced mammal species, 176 bird species, 105 reptile species, and ten amphibian species (Table 4.1; Appendix C). Note that some of these species are unlikely to occur in the Study Area due to the large search extent of the desktop assessment, which is likely to include habitats that do not necessarily occur within the Study Area. Additionally, many species tend to be patchily distributed even where appropriate habitats are present, and many species of birds can occur as regular migrants, occasional visitors or vagrants.

A total of 36 species of conservation significance were identified in the desktop assessment as potentially occurring within the Study Area, including 10 mammals, 23 birds and four reptiles (Table 4.2). This comprised 11 species listed as Threatened or Specially Protected (four mammals, six birds and one reptile) and 17 listed as Migratory (all birds) under the under the EPBC Act and/or BC Act, including two species are listed as both Threatened and Migratory under the EBPC Act and BC Act (Curlew Sandpiper and Eastern Curlew). A further 9 species are listed as Priority by the DBCA.

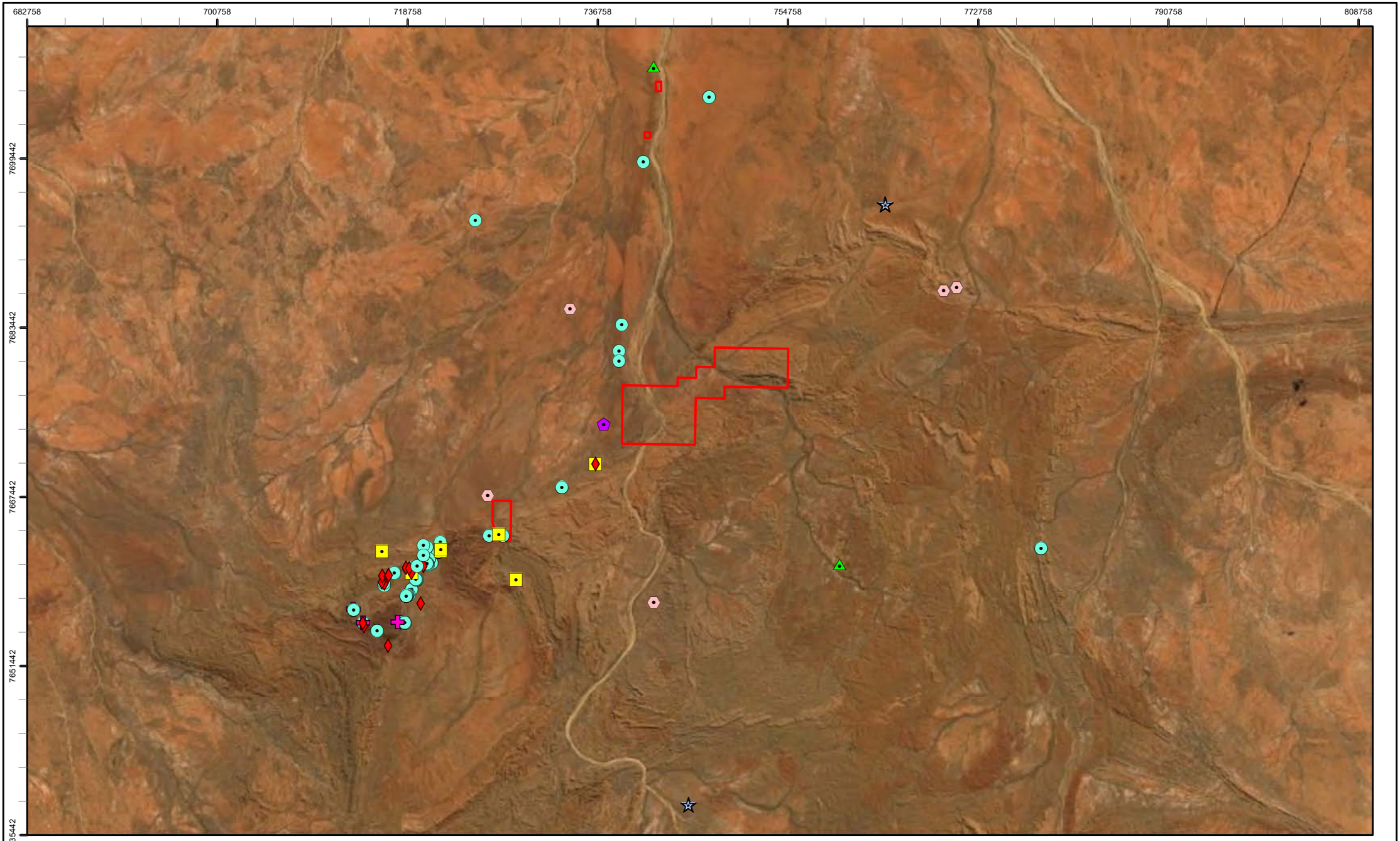
Table 4.1: Summary of fauna species recorded within the vicinity of the Study Area

Source	Reference	Mammals (native)	Mammals (introduced)	Birds	Reptiles	Amphibians	Total
Literature Sources							
Abydos DSO Project Northern Quoll (Stantec, 2018a)	A	9	2	0	0	0	**11**
Abydos DSO Project PLNB and Ghost Bat Monitoring Survey (Stantec, 2017)	B	8	1	0	0	0	**9**
Corunna Downs Project Terrestrial Vertebrate Fauna Survey (Outback, 2014)	C	27	4	68	64	4	**167**
McPhee Creek Haul Road Project Terrestrial Vertebrate Fauna Survey (Outback Ecology, 2014)	D	32	5	85	68	7	**197**
Mt Webber DSO Project Terrestrial Vertebrate Fauna Impact Assessment (Outback Ecology, 2013)	E	19	3	64	57	6	**149**
McPhee Creek Project Terrestrial Vertebrate Fauna Baseline Survey (Outback Ecology, 2012)	F	24	5	68	57	3	**157**
North Star Project Level 2 Terrestrial Vertebrate Fauna Assessment (ecologia, 2012)	G	22	3	80	72	7	**184**
Atlas Iron Limited Mt Dove DSO Vertebrate Fauna Assessment (Outback Ecology, 2011b)	H	14	5	39	27	1	**86**

Source	Reference	Mammals (native)	Mammals (introduced)	Birds	Reptiles	Amphibians	Total
Abydos DSO Project Terrestrial Vertebrate Fauna Baseline Survey (Outback Ecology, 2011a)	I	16	3	39	41	3	**102**
Fauna Assessment of the Pardoo 3 Mtpa DSO Project (Bamford Consulting, 2010)	J	9	3	39	21	3	**75**
Fauna Assessment of the Abydos DSO Project (Bamford Consulting, 2009)	K	15	4	72	30	4	**125**
Wodgina DSO Project, Terrestrial Vertebrate Fauna Assessment (Outback Ecology, 2009)	L	16	2	43	22	2	**85**
Fauna Assessment of the Pardoo Direct Shipping Ore Project (Bamford Consulting, 2007a)	M	11	2	48	18	4	**83**
Panorama Project Mine Site and Haul Road Corridor Targeted Fauna Survey (Biota, 2007)	N	17	2	43	18	2	**82**
Panorama Project Area Baseline Fauna Study As Part Of The Sulphur Springs Feasibility Study (Bamford Consulting, 2007b)	O	18	4	83	28	2	**135**
Ecological Survey of Abydos-Woodstock Reserve, Pilbara Region, Western Australia (How *et al.*, 1991a)	P	24	7	104	67	5	**207**
Database Searches							
DBCA (2019a) NatureMap		24	1	112	50	3	**190**
DBCA (2019e) Threatened and Priority Fauna Database		7	-	-	-	-	**7**
DoEE (2019) Protected Matters Search Tool		10	7	15	2	-	**34**
Birdlife Australia (2019) Birdata		-	-	130	-	-	**130**
Total species recorded		**40**	**12**	**176**	**105**	**10**	**343**
Conservation Significant species		**10**	**0**	**23**	**4**	**0**	**36**

Table 4.2: Fauna of conservation significance identified in the desktop assessment

Common Name	Species	Conservation Status		
		EPBC Act	BC Act	DBCA
Mammals				
Brush-tailed Mulgara	*Dasycercus blythi*			P4
Northern Quoll	*Dasyurus hallucatus*	EN	EN	
Long-tailed Dunnart	*Sminthopsis longicaudata*			P4
Pilbara Leaf-nosed Bat	*Rhinonicteris aurantius* 'Pilbara form'	VU	VU	P4
Spectacled Hare-wallaby	*Lagorchestes conspicillatus leichardti*			P4
Northern Brushtail Possum	*Trichosurus vulpecula arnhemensis*		VU	
Ghost Bat	*Macroderma gigas*	VU	VU	
Short-tailed Mouse	*Leggadina lakedownensis*			P4
Western Pebble-mound Mouse	*Pseudomys chapmani*			P4
Greater Bilby	*Macrotis lagotis*	VU	VU	
Birds				
Osprey	*Pandion haliaetus*	MIG	MIG	
Fork-tailed Swift	*Apus pacificus*	MIG	MIG	
Oriental Plover	*Charadrius veredus*	MIG	MIG	
Grey Falcon	*Falco hypoleucos*	VU	VU	
Peregrine Falcon	*Falco peregrinus*		OS	
Oriental Pratincole	*Glareola maldivarum*	MIG	MIG	
Barn Swallow	*Hirundo rustica*	MIG	MIG	
Gull-billed Tern	*Gelochelidon nilotica*	MIG	MIG	
Caspian Tern	*Hydroprogne caspia*	MIG	MIG	
Grey Wagtail	*Motacilla cinereal*	MIG	MIG	
Yellow Wagtail	*Motacilla flava*	MIG	MIG	
Night Parrot	*Pezoporus occidentalis*	EN	CR	
Australian Painted Snipe	*Rostratula australis*	EN	EN	
Sharp-tailed Sandpiper	*Calidris acuminate*	MIG	MIG	
Curlew Sandpiper	*Calidris ferruginea*	CR/MIG	CR/ MIG	
Pectoral Sandpiper	*Calidris melanotos*	MIG	MIG	
Black-tailed Godwit	*Limosa Limosa*	MIG	MIG	
Eastern Curlew	*Numenius madagascariensis*	CR/MIG	CR/MIG	
Wood Sandpaper	*Tringa glareola*	MIG	MIG	
Common Sandpiper	*Tringa hypoleucos*	MIG	MIG	
Common Greenshank	*Tringa nebularia*	MIG	MIG	
Marsh Sandpiper	*Tringa stagnatilis*	MIG	MIG	
Glossy Ibis	*Plegadis falcinellus*	MIG	MIG	
Reptiles				
Pilbara Olive Python	*Liasis olivaceus barroni*	VU	VU	
Gane's Blind Snake	*Anilios ganei*			P1
Black-lined Ctenotus	*Ctenotus nigrilineatus*			P1
Spotted Ctenotus	*Ctenotus uber johnstonei*			P2



Legend

Study Area

Significant Fauna

- Bilby (VU - EPBC/BC Act)
- Ghost Bat (VU - EPBC/BC Act)
- Northern Quoll (EN - EPBC/BC Act)
- Northern Short-tailed Mouse (P4 - DBCA)
- Pilbara Leaf-nosed Bat (VU - EPBC/BC Act)
- Pilbara Olive Python (VU - EPBC/BC Act)
- Spectacled Hare-wallaby (P4 - DBCA)
- Western Pebble-mound Mouse (P4 - DBCA)

biologic Environmental Survey

N

1:450,000

0 5 10 20 km

Atlas Iron Limited

Miralga Creek Project Level 2 Terrestrial Fauna and SRE Assessment

Figure 4.1: Fauna of conservation significance recorded in the desktop assessment

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

Size A4, Created 2/09/2019

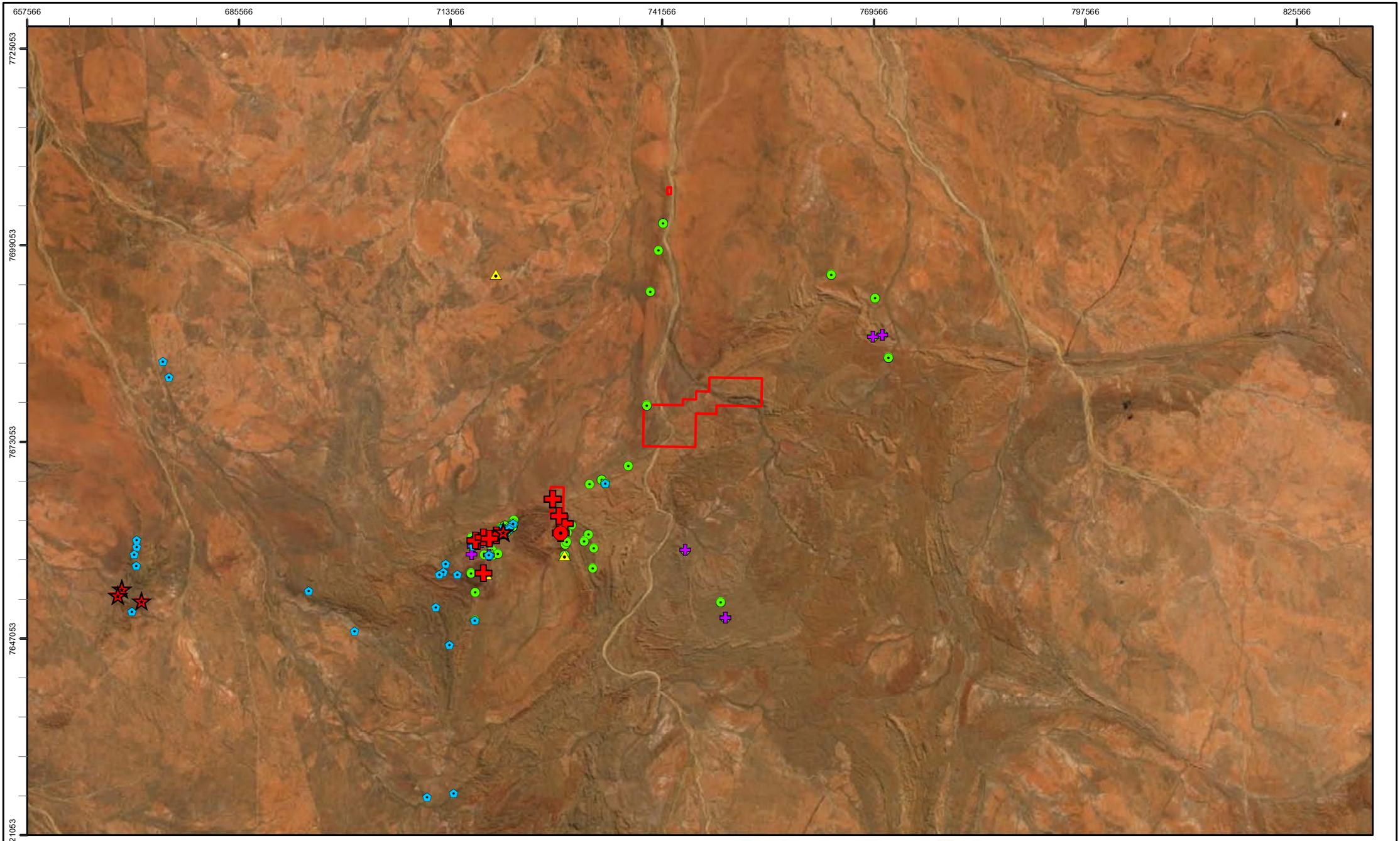
4.1.2 SRE Invertebrate Fauna

The database searches identified 705 records belonging to taxonomic groups prone to short-range endemism. The total included 27 mygalomorph spiders, 1 selenopid spider, 294 pseudoscorpions, 187 scorpions, 67 myriapods, 9 gastropods and 120 isopods (Figure 4.2; Appendix F). While the SRE status for many of the recorded taxa is difficult to determine due to lack of taxonomic or distributional data, they do provide some context into the sampling effort in the local area and the availability of regional specimens for comparison.

Four taxa recorded in the database searches are regarded as Confirmed SRE, although none are currently known from within the Study Area (Table 4.3).

Table 4.3: Confirmed SRE Taxa known within 40 km of the Study Area

Class	Order	Family	Genus	Species
Arachnida	Pseudoscorpiones	Feaellidae	*Feaella*	*tealei*
Diplopoda	Polydesmida	Paradoxosomatidae	*Antichiropus*	*apricus*
Diplopoda	Polydesmida	Paradoxosomatidae	*Antichiropus*	*forcipatus*
Gastropoda		Camaenidae	Gen. nov.	cf. `Z` n.sp.



Legend

Study Area

WAM DB records

- Arachnida
- Chilopoda
- Crustacea
- Diplopoda
- Gastropoda

Confirmed SRE

- Feaella tealei
- Camaenidae gen. nov. cf. 'Z' n.sp.
- Antichiropus apricus
- Antichiropus forcipatus

biologic Environmental Survey

N

1:629,072

0 5 10 20 km

Atlas Iron Limited

Miralga Creek Project Level 2 Terrestrial Fauna and SRE Assessment

Figure 4.2: SRE invertebrate WAM database search

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

Size A4, Created 2/09/2019

4.2 Habitat Mapping

4.2.1 Broad Fauna Habitats

A total of six broad fauna habitat types were recorded and mapped within the Study Area. These comprised, in decreasing order of extent, Low Stony Hills, Stony Plain, Sandy Plain, Major Drainage Line, Hillcrest/Hillslope and Gorge/Gully habitats (Figure 4.3). Additionally, a small portion of the Study Area comprised cleared areas from previous clearing and tracks. Descriptions of the distinguishing characteristics and the occurrence inside and outside of the Study Area for each of these habitat types is presented in Table 4.4. Habitat mapping is characterised slightly differently for vertebrate fauna and SRE invertebrate fauna, so the extent of habitat coverage discussed here and in Figure 4.3 refers to vertebrate fauna habitat only. SRE invertebrate habitat mapping is discussed below and in further detail in the SRE Invertebrate Fauna Impact Assessment (Biologic, in prep.). Habitat assessments, which formed the basis of the mapping, are detailed in Appendix D for vertebrate fauna and Appendix E for SRE invertebrate fauna.

Low Stony Hills and Stony Plains were the dominant broad fauna habitats within the Study Area, each covering approximately 33.0% (2,586.20 ha) and 29.1% (2,282.43 ha) respectively, followed by Sandy Plain (19.6%) and Major Drainage (12.7%) habitats. The remaining two broad fauna habitats, Hilcrest/Hillslope and Gorge/Gully, each covered only 5.5% and 0.1% respectively.

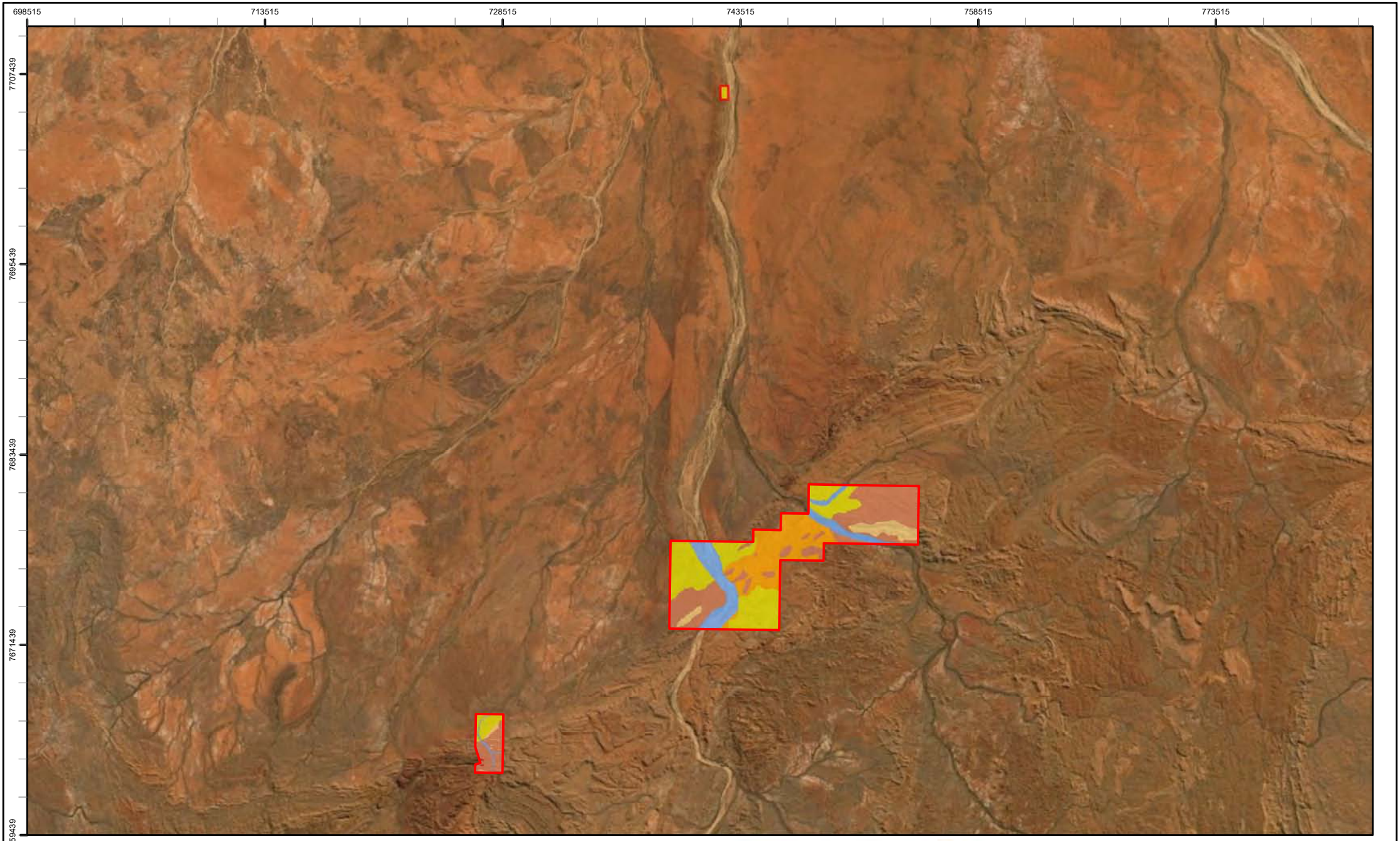
Some habitats showed evidence of disturbance in the form of selective clearing for tracks and drill pads from contemporary exploration activities, particularly within Hilcrest/Hillslope habitat where iron ore deposits are primarily located. A large portion of the Study Area was also subject to recent largescale fires, resulting in reduced vegetation cover and fauna habitat availability throughout most of these areas.

Table 4.4: Fauna habitat descriptions

Habitat Type	Description	Extent	Representative Photo
Low Stony Hills **Vertebrate Fauna Significance:** Low **SRE Invertebrate Fauna Suitability:** Low	Low undulating stony hills often dominated by *Triodia* spp. grassland and/or sparse open shrubland understory with sparsely scattered *Corymbia* species on gravelly clay loam substrate. Large recently burnt areas with little to no vegetation remaining.	Low Stony Hills is a common habitat throughout the Study Area and is broadly distributed across the Pilbara region.	
Stony Plain **Vertebrate Fauna Significance:** Low **SRE Invertebrate Fauna Suitability:** Low	Stony Plain habitat comprises areas with vegetation dominated by *Triodia* hummock grasses of various life stages and scattered patches of various small to medium shrub species on gravelly clay loam substrates. Large patches of recently burnt areas with little to no vegetation remaining.	Stony Plain habitat is common and widespread within the Study Area and more broadly across the Pilbara region.	

Habitat Type	Description	Extent	Representative Photo
Sandy Plain **Vertebrate Fauna Significance:** Moderate **SRE Invertebrate Fauna Suitability:** Low/Moderate	Vegetation within Sandy Plain habitat is variable, often comprising a mosaic of open *Eucalyptus* woodland or sparsely scattered individual trees over an understory dominated by small to medium *Acacia* shrubs and/or *Triodia* hummock grasses.	Sandy Plain is common and widespread in parts of the Study Area. The habitat is also regionally common throughout the Pilbara region.	
Major Drainage **Vertebrate Fauna Significance:** High **SRE Invertebrate Fauna Suitability:** Moderate	Large permanently or seasonally fed drainage lines with fringing riparian vegetation comprising scattered *Eucalyptus* species over a patchy understory often dominated by *Acacia* spp. and small ephemerals grasses and herbs. Water present in large pools following recent rainfall; however, some drainage lines seasonally dry and dependent on large rainfall events.	Major Drainage habitats occurs within the Study Area from two major drainage lines dissecting sections of the Study Area, Shaw River and Miralga Creek. The two drainage lines are continuous for some distance outside of the Study Area and are representative of Major Drainage habitat occurring across the Pilbara region.	

Habitat Type	Description	Extent	Representative Photo
Gorge/Gully **Vertebrate Fauna Significance:** High **SRE Invertebrate Fauna Suitability:** High	Gorges/Gully habitat comprises rugged, steep-sided rocky valleys incised into the surrounding landscape forming shallow gullies and gorges. Gorges tend to be deeply incised, with vertical cliff faces, while gullies are more open (but not as open as Major Drainage Line). Caves and rock pools are most often encountered in this habitat type. Vegetation can be dense and complex in areas of soil deposition or sparse and simple where erosion has occurred.	This habitat type occurs in small areas in the study area, occurring within the Sandtrax area. This habitat is a common habitat associated with the ranges.	
Hillcrest/Hillslope **Vertebrate Fauna Significance:** High **SRE Invertebrate Fauna Suitability:** Moderate/High	Hillcrest/Hillslope habitat tends to be more open and structurally simple due to their position in the landscape than other fauna habitats and are dominated by varying species of hummock grasses. A common feature of these habitats is a rocky substrate, often with exposed bedrock, and skeletal red soils. These are usually dominated by open scattered *Eucalyptus* woodlands, *Acacia* and *Grevillea* scrublands and *Triodia* low hummock grasslands.	Hillcrest/Hillslope habitat makes up most of the elevated areas within the Study Area and is distributed across each of the deposits. This habitat is broadly represented across the Pilbara region.	



Legend

Study Area

Habitat

- Gorge/Gully
- Hillcrest/ Hillslope
- Low Stony Hills
- Major Drainage Line
- Sandy Plain
- Stony Plain

biologic Environmental Survey

N

1:300,000

0 3.5 7 14 km

Atlas Iron Limited

Miralga Creek Project Level 2 Terrestrial Fauna and SRE Assessment

Figure 4.3: Fauna habitats of the Study Area

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

Size A4, Created 2/09/2019

4.2.2 Habitats of Significance

Vertebrate Fauna

Of the six broad fauna habitats recorded within the Study Area, three were deemed to be of relatively high significance for vertebrate fauna due to the potential to provide habitat for species of conservation significance, Gorge/Gully, Hillcrest/Hillslope and Major Drainage habitats (Table 4.5). One was deemed to be of moderate significance (Sandy Plain) and the remaining two (Low Stony Hills and Stony Plain) were deemed to be of low significance as species of conservation significance are not dependent on these habitats at the broad-scale (Table 4.5). Furthermore, these habitats are widely distributed within the Study Area and more broadly within the Pilbara region (McKenzie *et al.*, 2002).

Table 4.5: Habitat significance for vertebrate fauna

Fauna habitat	Significance rating	Rationale
Gorge/Gully	High	Gorge/Gully habitat within the Study Area (occurring within the Sandtrax area) represent potential habitat for numerous species listed under the EPBC Act and BC Act, such as potential denning and foraging for Northern Quolls, Pilbara Olive Python and Northern Brushtail Possum. This habitat is considered critical to the survival of a number of conservation significant species, including particular habitat features such as caves and overhangs, some of which may provide roosting opportunities for the conservation significant bat species, such as the Ghost Bat and may provide a nocturnal refuge for the Pilbara Leaf-nosed Bat. Additionally, the habitat also provides primary foraging habitat for both of these species.
Hillcrest/Hillslope	High	Hillcrest/Hillslope habitat provides breeding habitat as well as supporting habitat (such as foraging) for the Northern Quoll and Pilbara Olive Python. Cliff areas within the Ridge or Cliff may also provide potential breeding areas for Peregrine Falcons. Similarly, to Gorge/Gully habitat, this habitat also provides habitat or habitat features (i.e. caves) that can be considered critical to the survival of a number of conservation significant species, such as the Ghost Bat and Pilbara Leaf-nosed Bat.
Major Drainage	High	This habitat provides suitable dispersal and foraging habitat for a number of EPBC Act and BC Act listed species, including the Northern Quoll, Ghost Bat, Pilbara Leaf-nosed Bat, Pilbara Olive Python and Northern Brushtail Possum. The habitat provides additional foraging habitat for the Grey Falcon and Peregrine Falcon, and dispersal habitat for a range of conservation significant species. This habitat may also occasionally provide

Fauna habitat	Significance rating	Rationale
		potential habitat for migratory water birds where spring fed or long-standing pools occur following rainfall events.
Sand Plain	Moderate	Sandy Plain habitat provides primary foraging habitat for Ghost Bats, Pilbara Leaf-nosed Bat, Grey Falcon and Peregrine Falcon; however, it is not critical to the survival of any of these species. The occurrence of the habitat within the Study Area is confined to a single large area but occurs more broadly in the vicinity and across the Pilbara region.
Stony Plain	Low	There are few species of conservation significance that could occur within this habitat. The Western Pebble-mound Mouse does utilise this habitat, and it is potential foraging habitat for Peregrine Falcon; however, these species are not restricted to this habitat type and the habitat is broadly represented within and in the broader vicinity of the Study Area.
Low Stony Hills	Low	This habitat is utilised by several species listed under the DBCA Priority List but does not support a significant population. Likewise, these species are not restricted to this habitat type. This habitat is common and widespread within the Study Area and more broadly across the Pilbara region.

SRE Invertebrates Habitats

Based on the SRE habitat assessments undertaken, the Study Area was characterised into six (6) broad habitat types; Low Stony Hills, Stony Plain, Sandy Plain, Major Drainage, Gorge/Gully and Hillcrest/ Hillslope (Table 4.4). All the habitats present are known to extend beyond the Study Area into the immediate surrounding area, and more broadly across the Pilbara region. As stated above, SRE invertebrate habitat extents are mapped slightly differently to vertebrate fauna, though the habitat types are the same, due to the scale of habitat connectivity differing between the larger vertebrate fauna and the smaller invertebrate fauna. Mapping of the habitat and further discussion will be covered in the SRE Invertebrate Fauna Impact Assessment (Biologic, in prep.).

The habitat regarded as most suitable for SRE invertebrate fauna within the Study Area is the Gorge/Gully habitat (high suitability) due to the steep rocky landforms which provide consistent shade and complex microhabitats. The high level of shelter and complexity of these habitats also offers some protection from fire, and areas where water can be retained long after rainfall resulting in dense pockets of vegetation with stable detrital microhabitats. Where these landform and vegetation factors combine, particularly when highly fragmented or isolated, they often provide the most suitable habitats for SRE invertebrate fauna.

Hillcrest/ Hillslope are regarded as being moderate to high suitability for SRE invertebrate fauna, comprising open (exposed) slopes and hill crests that often feature rocky substrate, with exposed bedrock, and skeletal red soils. These habitats are generally dominated by sparse open vegetation (scattered *Eucalyptus* woodlands, *Acacia* and *Grevillea* scrublands and *Triodia* low hummock grasslands) that can provide pockets of protection from exposure, particularly where hill slopes are south facing. Whilst Hillcrest/ Hillslope habitats are not usually highly complex, landform or vegetation features can provide more complex microhabitats that are highly suitable for SRE fauna, such as confirmed SRE millipede species (genus *Antichiropus)* which use pockets of soil at the base of *Corymbia hamersleyana* (usually mallee form) on hillcrests and upper slopes (Biologic, 2016).

Major drainage habitats can be densely vegetated and extensive but tend to be prone to disturbances from flooding. These areas are dominated by dense shrubland and groves/ thickets of *Acacia* (Mulga and other *Acacia* species) and *Eucalyptus*/ *Corymbia* species. Slope and aspect are largely irrelevant to SRE suitability here; instead, the density and structure of vegetation influences complexity of detrital microhabitats and the amount of shelter available. Isolation is generally low, as the groves and drainage line habitats form an interconnected network of vegetation-based habitats along the course of the drainage line and flood plains. These types of habitats are generally considered to provide dispersal opportunities for some SRE invertebrate fauna, and the suitability of this habitat is considered moderate.

Sandy plains tend to provide very little protection and are often widespread and continuous. However, they provide suitable habitat for trapdoor spiders and scorpions, and contain patches of detrital microhabitats and deep soils which are suitable substrate for burrowing taxa. Therefore, Sandy plains are regarded as providing low to moderate suitability for SRE fauna.

The remaining broad habitats; Low Stony Hills and Stony Plain, are regarded as providing low suitability for SRE fauna. These habitats comprise low undulating stony hills and open, flat habitats on detrital or alluvial plains. They typically do not feature significant vegetation groves/ thickets, drainage features, or rocky outcrops. Moderately dense shrubland on the plains can provide patches of detrital microhabitats throughout; however, the low levels of habitat complexity, shelter, and isolation generally make these areas unsuitable for SRE species. The SRE suitability of these habitat zones is low; however, they can contain patches of suitable microhabitat.

4.2.3 Habitat Features

Caves

Caves can be particularly important features within a landscape, particularly in arid zone systems, often providing stable microclimates, shelter and protection (Medellin *et al.*, 2017). A total of 16 caves were recorded across the Study Area (Table 4.6; Figure 4.3; Appendix G). Of the 16 caves recorded, Ghost Bat occurrence, or evidence of occurrence, was recorded at ten. Occurrence records comprised direct observations of Ghost Bats at four separate caves, nine caves with Ghost Bat scats (ranging in quantity from ~3–4,000) and one record of foraging evidence by the species (Table 4.6).

Thirteen caves were confirmed or identified as potential roost caves for Ghost Bat, comprising one possible night roost, seven identified as night roosts, four as confirmed day roosts (including one also identified as a possible maternity roost) and one potential day roosts (Table 4.6). Cave CMRC-14 was initially classified as a night roost as 20 scats were recorded from the Phase 1 trip. During Phase 2, six Ghost Bats were flushed from CMRC-14 into the larger day roost/ possible maternity roost CMRC-15. CMRC-14 was investigated and 800 scats were recorded since the Phase 1 trip. Four caves (CMRC-03, CMRC-04, CMRC-06 and CMRC-15) were recorded as Nocturnal Refuges for the PLNB, but not all caves were sampled with an ultrasonic recorder. The most significant cave recorded for the PLNB was cave CMRC-15, recording 1160 PLNB calls over three nights. One unsurveyed cave was located by the Heritage group and recorded Ghost Bats, this cave was not surveyed by Biologic at the time, due to earthquake activity in the area.

Table 4.6: Caves recorded in the Study Area

Name	Latitude	Longitude	Significance		Comments
			Ghost Category	Pilbara Leaf-nosed Bat	
CMRC-01	-20.9718	119.4351	Night Roost	• Unknown	• No Ghost Bats observed • ~3 recent (1–6 months) Ghost Bat scats
CMRC-02	-21.0245	119.3175	Potential Night Roost	• Unknown	• No Ghost Bats or scats observed, although entire extent of cave could not be accessed for safety reasons
CMRC-03	-21.1096	119.1875	Night Roost	• Nocturnal Refuge • 5 calls	• No Ghost Bats observed • ~20 recent (1–6 months) Ghost Bat scats
CMRC-04	-21.027	119.3137	Night Roost	• Nocturnal Refuge • 30 calls 19th July • 3 calls 20th July • Earliest call 18:50 • Latest 04:42	• No Ghost Bats or scats observed, but suitable size and depth for night roosting
CMRC-06	-21.027	119.313	Day Roost	• Nocturnal Refuge • 6 calls	• 1 Ghost Bat observed • ~4 recent (1–6 months) Ghost Bat scats

Name	Latitude	Longitude	Significance		Comments
			Ghost Category	Pilbara Leaf-nosed Bat	
CMRC-07	-21.1094	119.1864	Day Roost	• Unknown	• 1 Ghost Bat observed (Phase 1) • No Ghost Bat scats recorded
CMRC-08	-21.0273	119.3123	Night Roost	• Unknown	• No Ghost Bats observed • ~50 fresh (<1 month) Ghost Bat scats
CMRC-10	-21.0269	119.3133	Night Roost	• Unknown	• No Ghost Bats or scats observed, but suitable size and depth for night roosting
CMRC-12	-21.0262	119.3127	No usage for Ghost Bat	• Unknown	• No Ghost Bats or scats observed • Possible slits/crevices in the back of cave
CMRC-13	-20.9731	119.4334	Night Roost	• Unknown	• No Ghost Bats observed • ~70 fresh (<1 month) Ghost Bat scats
CMRC-14	-20.9731	119.4327	Day Roost	• Unknown	• Originally recorded as a Night Roost, 20 scats recorded (Phase 1) • Six Ghost Bats observed (flushed into CMRC-15) (Phase 2), 800 scats recorded (Phase 2) • ~20 old (6 months–3 years) Ghost Bat scats

Name	Latitude	Longitude	Significance		Comments
			Ghost Category	Pilbara Leaf-nosed Bat	
CMRC-15	-20.9727	119.4299	Potential Maternity Roost	• Nocturnal Refuge • 70 calls 19th July • 265 calls 20th July • 825 calls 21st July Earliest 19:32 Latest 02:09	• Six Ghost Bats observed (flushed from CMRC-14 into cave) (Phase 2) • Foraging evidence of Ghost Bat recorded • ~4,000 fresh (<1 month) Ghost Bat scats • Calls each night
CMRC-16	-20.9729	119.4118	No usage for Ghost Bat	• Unknown	• No Ghost Bats or scats observed • Slits/crevice's in that back can't see into
CMRC-17	-20.9729	119.413	No usage for Ghost Bat	• Unknown	• No Ghost Bats or scats observed • Large cave
CMRC-18	-20.9736	119.4139	Potential Day Roost	• Unknown	• No Ghost Bats observed • ~40 recent (1–6 months) Ghost Bat scats
CMRC-19	-21.1078	119.1863	Night Roost	• Nil	• No Ghost Bats observed • ~100 fresh (<1 month) Ghost Bat scat
Unsurveyed Cave	-20.974	119.4379	Potential Day Roost	• Unknown	• Heritage group found GB in cave

Water Features

Water sources are a limiting factor for many ecosystems (James *et al.*, 1995), particularly within arid-zone ecosystems such as the Pilbara (Burbidge *et al.*, 2010; Doughty *et al.*, 2011) and often represent areas of comparatively high ecological productivity (Murray *et al.*, 2003). Mammals and birds have endothermic metabolisms and therefore require relatively continuous sources of food and moisture, while water for amphibians provides opportunities to forage (i.e. suitably wet periods) and breed (i.e. when water pools for long enough for them to complete the life cycle) (James *et al.*, 1995). These features are highlighted because they may provide

important sources food and water for species of conservation significance as well as the general faunal assemblage.

Fifteen water features were recorded within the Study Area (Figure 4.3, Table 4.7). Significant rainfall was recorded prior to the Phase 1 survey in March 2019 due to Cyclone Veronica (246.2 mm; 324% above the long-term average). Such conditions may have influenced the dimension of these water features; however, some of these water features are likely to represent intermediate to permanent water sources due to characteristics, such as groundwater dependent and/ or aquatic vegetation.

Systematic trapping sites were established at sites WMRC-01 and WMRC-02 during Phase 1 to determine species utilising the area. Additionally, an ultrasonic recorder was deployed at WMRC-01 during Phase 1 and Phase 2 while an ultrasonic recorder and a motion camera was deployed at WMRC-02 during Phase 1 of the current survey. Ghost Bat and Pilbara Leaf-nosed Bats were recorded at WMRC-01, via ultrasonic recorder during Phase 1 (comprising 14 Ghost Bat calls over all three sampling nights and four Pilbara leaf nosed Bat calls over two nights) and Phase 2 (comprising three Ghost Bat calls on the 19th of July and 83 Pilbara leaf nosed Bat calls over all four sampling nights). Northern Quoll tracks were observed at WMRC-02 on the 12th of May 2019 (approximately 237 metres from WMRC-03). Additionally, Pilbara Leaf-nosed Bats were recorded via ultrasonic recorder (a total of 16 calls over three sampling nights) at WMRC-02. Gorges with pools represent priority foraging habitat for this species attributable to the species' limited ability to conserve heat and water (Baudinette *et al.*, 2000). Therefore, all water sources within the Study Area (including WMRC-03 – located approximately 272 m from WMRC-02) provide priority foraging habitat for the Pilbara Leaf-nosed Bat particularly at other times of the year, such as when water is scarce in the landscape and/or conditions are generally hotter and drier.

One ultrasonic recorder was also placed at an artificial water source (Turkeys Nest) for 2 sampling nights during Phase 1 (VMRC-11). A total of 416 Pilbara Leaf-nosed Bat calls over two sampling nights. Additionally, four Ghost Bat calls were recorded on the 12th of May. For water feature details see Table 4.7, Appendix H.

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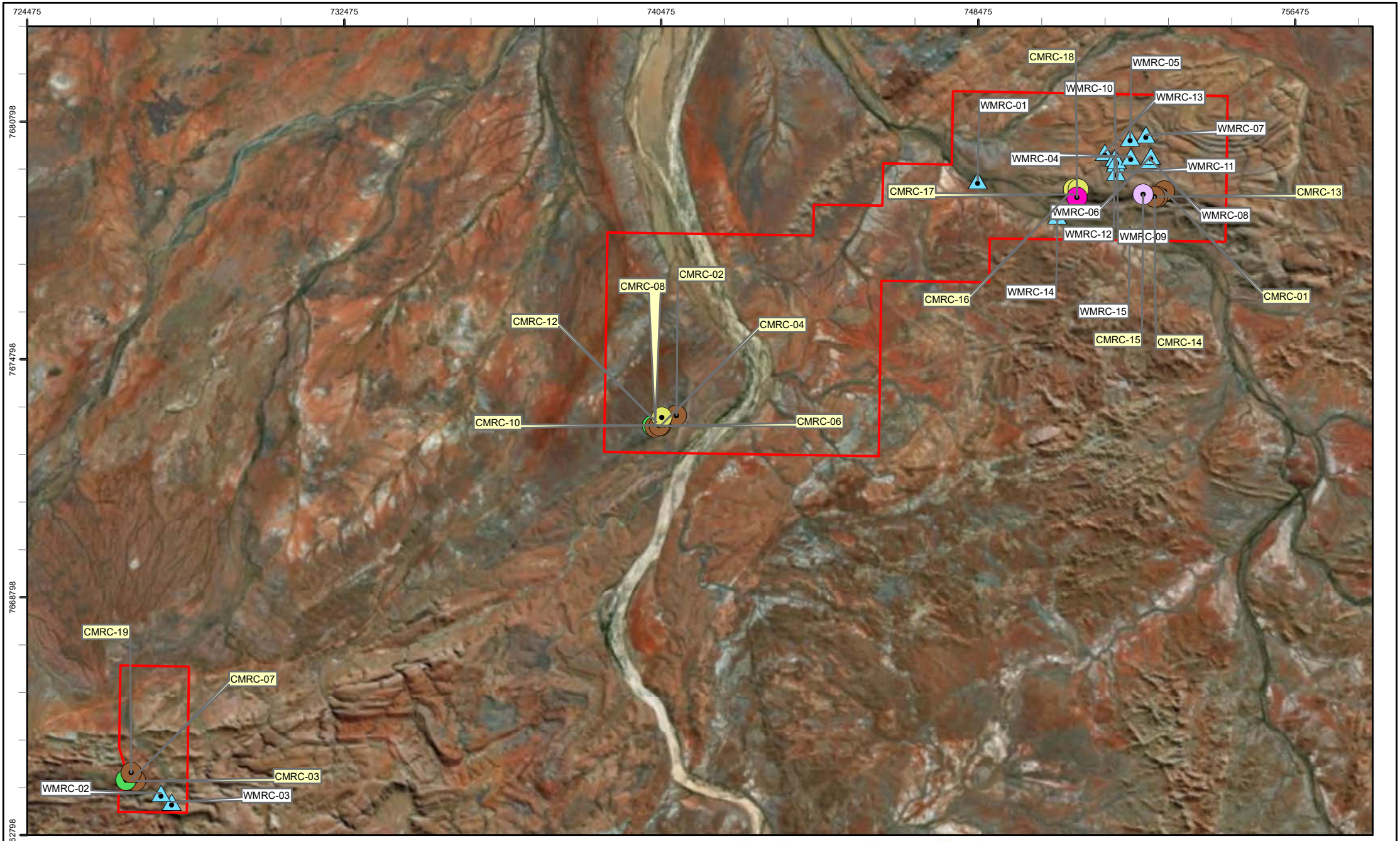
Table 4.7: Water Features recorded in the Study Area

Name	Permanent Water	Conservation Significant species recorded
WMRC-01	permanent	Ghost Bat, PLNB, Northern Brushtail Possum
WMRC-02	permanent	PLBN, Northern Quoll
WMRC-03	No	PLNB
WMRC-04	No	
WMRC-05	No	Northern Quoll scat (nearby)
WMRC-06	No	
WMRC-07	No	
WMRC-08	No	
WMRC-09	No	
WMRC-10	No	
WMRC-11	No	
WMRC-12	No	
WMRC-13	No	
WMRC-14	permanent	PLNB
WMRC-15	permanent	
VMRC-11	Man-made- permanent	PLNB, Ghost Bat



Legend

- Study Area
- water features

Roost Type

- Day Roost
- Day Roost/ poss materinity
- Night Roost
- No Usage
- Potential Day Roost

biologic Environmental Survey

N

1:120,000

0 1.25 2.5 5 km

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Figure 4.4: Habitat features in the Study Area

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

Size A4, Created 12/11/2019

4.3 Vertebrate Fauna Survey Results

4.3.1 Species Richness of Study Area

A total of 154 vertebrate fauna species comprising 24 native and four introduced mammal species, 84 bird species, 39 reptile species, and three amphibian species, were recorded during the current survey (Appendix I). This comprises approximately 45% of the total number of species identified by the desktop assessment (*n* = 343) (see Section 4.1.1).

The number of species recorded is comparable to other the majority of surveys of equivalent scope and size conducted within the vicinity of the Study Area (Table 4.1). Similar species diversity and abundance were recorded in other surveys in the vicinity of the Study Area, such as Bamford Consulting (2007b) (136 species), Outback (2014)(167 species), Outback Ecology (2013) (149 species) and Outback Ecology (2012) (159 species).

Overall, How *et al.* (1991a) recorded the highest species diversity from the literature review (207 species); however, this is likely to be attributed to the greater sampling effort that was conducted over multiple years and broader sampling area covering a broader range of fauna habitats compared to the current survey. Outback Ecology (2014) also recorded a high species diversity from the literature review during a similar two-phase Level 2 survey for the McPhee Creek haul road (207 species); however, the higher diversity is likely to be attributed to systematic trapping sites being used over both survey seasons as opposed to systematic trapping being undertaken over a single season followed by species specific targeted trapping undertaken during the second season of the current survey. Also, this survey covered a linear infrastructure corridor, thus covered a larger geographic area.

Of the 38 species of conservation significance identified in the desktop review as potentially occurring within the Study Area (Table 4.2), seven species were recorded during the current survey. This comprised five mammals (Northern Quoll, Pilbara Leaf-nosed Bat, Ghost Bat, Northern Brushtail Possum, Western Pebble-mound Mouse) and two birds (Grey Falcon and Peregrine Falcon).

4.3.2 Fauna Assemblages

Sampling

Locations of systematic trapping sites were situated in areas considered to give a good representation of broad fauna habitats occurring within the Study Area. Three systematic trapping sites were located in Low Stony Hills habitat VMRC-01, VMRC-02 and VMRC-06), two in Major Drainage (VMRC-05 and VMRC-05) and one in Hillcrest/Hillslope (VMRC-07), Sandy Plain (VMRC-04) and Stony Plain (VMRC-03) habitats. No systematic trapping was undertaken in Gorge/Gully habitat; however, this habitat was subject to greater survey effort using alternative sampling methods, including active foraging, targeted trapping for Northern Quoll and SongMeter ultrasonic recordings targeting Pilbara Leaf-nosed Bat and Ghost Bat. The assemblage of species recorded in the Study Area is typical for the Pilbara, with no unusual or

unexpected species being recorded and all species having been recorded in the area by at least two previous surveys considered in the literature review

Terrestrial Mammals

A total of 28 mammal species from 12 families were recorded within the Study Area from 573 individual records. Bats were the most commonly recorded mammal group with 244 records, followed by rodents (*n* = 157) and dasyurids (*n* = 103). Only four introduced mammal species were recorded within the Study Area, from a total of 22 records. The most abundantly recorded species was Common Rock Rat (*Zyzomys argurus*), with138 records, followed by Northern Quoll with 89 records. This is largely attributed to the targeted sampling (trapping and motion camera trap transects) for Northern Quoll, during which Common Rock Rat was frequently recorded as bycatch. Trapped mammal numbers were quite low during the survey with only six species trapped at systematic trapping sites and five from direct observation and/or secondary evidence at each site. A further ten bat species were recorded from ultrasonic bat call recordings.

Five conservation significant mammal species were recorded within the Study Area during the survey; Northern Quoll (89 records from 15 locations), Pilbara Leaf-nosed Bat (n = 35 records from 14 locations), Ghost Bat (11 records from six locations), Western Pebble-mound Mouse (n = 15 records from 15 locations) and Northern Brushtail Possum (2 records from one location) (Table 4.8; Figure 4.5).

Birds

A total of 84 bird species representing 42 families were recorded within the Study Area from a total 641 individual records (Appendix I). The honeyeaters and allies (family Meliphagidae) were the most abundant and diverse family with 11 species recorded from a total of 97 individual records, followed by the families Accipitridae (hawks and eagles) and Artamidae (woodswallows, butcherbirds), both with five species from 16 and 28 individual records respectively. Corvidae was the second most commonly recorded family with 64 individual records; however, was represented by a single species, Torresian Crow (*Corvus orru*). Torresian Crow was the most commonly recorded species during the survey, recorded on 60 occasion and from 11 locations.

Species diversity, abundance and complexity was highly variable throughout the Study Area. While many common and widespread species were shared between sites, a number of species were recorded at only one or few sites, particularly due to the variable presence and abundance of vegetation between sites.

The number of individual records from each systematic trapping site varied, with VMRC-05 recording the highest with 49 individual records, followed by VMRC-01 (47 records), VMRC-03 (45 records) and VMRC-08 (44 records) (Appendix I). The number of records at the remaining sites was no greater than 31 (VMRC-02), with VMRC-07 the lowest with only 14 records. In contrast, species diversity vastly differed with VMRC-03 having the greatest species diversity, with 27 different species recorded at the site. With the exception of VMRC-06 and VMRC-07,

the species diversity at the other sites ranged between 15–24 species. A total of nine and eight species were recorded from sites VMRC-06 and VMRC-07 respectively.

Many species were recorded from opportunistic records within the Study Area, with 70 species recorded from 143 records, many of which were not recorded at the systematic sampling sites.

Two conservation significant birds were recorded during the current survey; Grey Falcon and Peregrine Falcon (Table 4.8; Figure 4.5). Grey Falcon was recorded once during the Phase 1 from direct observation of a group of four individuals (two adults and two young) and twice during the Phase 2 survey from direct observation of a single individual. Peregrine Falcon was recorded once during both Phases of the survey, both from direct observation of a single individual.

Amphibians

Three amphibian species from two families were recorded within the Study Area from 13 individual records (Appendix I). Amphibians were only recorded from two sites (VMRC-05 and VMRC-08) and four opportunistic locations, all of which had water present in varying capacities at the time of the record. The greatest number of individual species and individual records recorded at VMRC-08, with three species recorded from seven individual records.

The most commonly recorded amphibian during the survey was the Little Red Tree Frog (*Litoria rubella*), recorded a total of seven times.

No frog species of conservation significance were recorded during the survey, nor are any known to occur within the Pilbara bioregion.

Reptiles

A total of 39 reptile species representing 11 families were recorded from 117 individual records (Appendix I). Skinks were the most abundant group with 55 individual records, representing 14 species. Three agamids (dragon lizards) species were recorded from 16 records; however, a greater species diversity of varanids (monitor lizards) was observed compared to the number of individuals observed, with 7 species recorded from 8 individual records. The most commonly recorded species were the Inornate Ctenotus (*Ctenotus inornatus*), recorded 20 times from seven sites, including all but one systematic trapping site (VMRC-05). No conservation significant reptile species were recorded within the Study Area during the current survey.

Species diversity and abundance was variable between sites, with the number of individual records ranging from five (VMRC-05) to 14 (VMRC-04). Sites VMRC-03, VMRC-05 and VMRC-07 each recorded six, five and six individual reptiles respectively, while VMRC-02 recorded 11, VMRC-01 12, VMRC-06 AND VMRC-08 both 13 and VMRC-04 14. In comparison, the number of species recorded at each site was no more than seven at any given site, with total species diversity ranging from four to seven. Species composition was variable between sites with many sharing species but also having species not recorded elsewhere during the survey. A broader range of species was recorded opportunistically during the field survey with 19 species recorded.

Three species of gecko, *Gehyra macra*, *Gehyra media*, and *Gehyra montium* were recorded for the first time this survey that have not previously been recorded in the area. This is due to revision of the *Gehyra punctata* species complex, where *G. macra* and *G. media* were previously known as *G. punctata* (Doughty *et al.*, 2018). Whereas the *Gehyra variegata* species complex in the Pilbara was also revised and *G. montium* distribution was redefined (Kealley *et al.*, 2018).

4.3.3 Species of Conservation Significance

Seven species of conservation significance were recorded within the Study Area during the current survey (Table 4.8; Figure 4.5). This comprised five mammals (Northern Quoll, Pilbara Leaf-nosed Bat, Ghost Bat, Northern Brushtail Possum and Western Pebble-mound Mouse) and two birds (Grey Falcon and Peregrine Falcon), recorded from 149 individual records at 21 sites and 28 opportunistic locations (Table 4.8; Figure 4.5). All conservation significant species were recorded within the main Study Area encompassing the Miralga East, Miralga West and Sandtrax orebodies. No conservation significant species were recorded within the stockyard areas.

Of the five conservation significant mammal species recorded within the Study Area, Northern Quoll was the most commonly recorded species, with 89 records from 15 sites, including nine opportunistic locations (Table 4.8). Of the remaining four species, Pilbara Leaf-nosed Bat were recorded from 35 individual records (from 14 sites), Ghost Bat from 11 (from six sites, including one opportunistic location), Western Pebble-mound Mouse from 15 records (from 15 sites, including 14 opportunistic locations) and Northern Brushtail Possum from 2 records (from one site) (Table 4.8; Figure 4.5).

Of the two conservation significant birds recorded, Grey Falcon was recorded once during Phase 1 from direct observation of a group of four individuals (two adults and two young) and twice during the Phase 2 survey from direct observation of a single individual. Peregrine Falcon was recorded once during both Phases of the survey, both from direct observation of a single individual (Table 4.8; Figure 4.5).

Based on the occurrence of nearby records and the habitats present, a further three species identified in the desktop review are considered Likely to occur within the Study Area, 18 as Possible, seven as Rarely, two as Unlikely and one as Highly Unlikely (Table 4.9). Of the 18 species considered Possible, this mostly comprised Migratory shorebirds and waterbirds whose occurrence within the Study Area is likely to be infrequent and largely dependent on the presence of intermittent or longstanding pools of water following large rainfall events. Consideration for some species as Unlikely or Highly Unlikely to occur within the Study Area is based on the absence of suitable habitat for the species and/or the Study Area occurring outside the known distribution for the species.

The occurrence of conservation significant species Confirmed within the Study Area during the current survey or considered Likely to occur are discussed in detail below. Species considered Possible, Rarely, Unlikely or Highly Unlikely are discussed more briefly. Due to ecological similarities and shared habitat preferences, particularly where species' occurrence within the

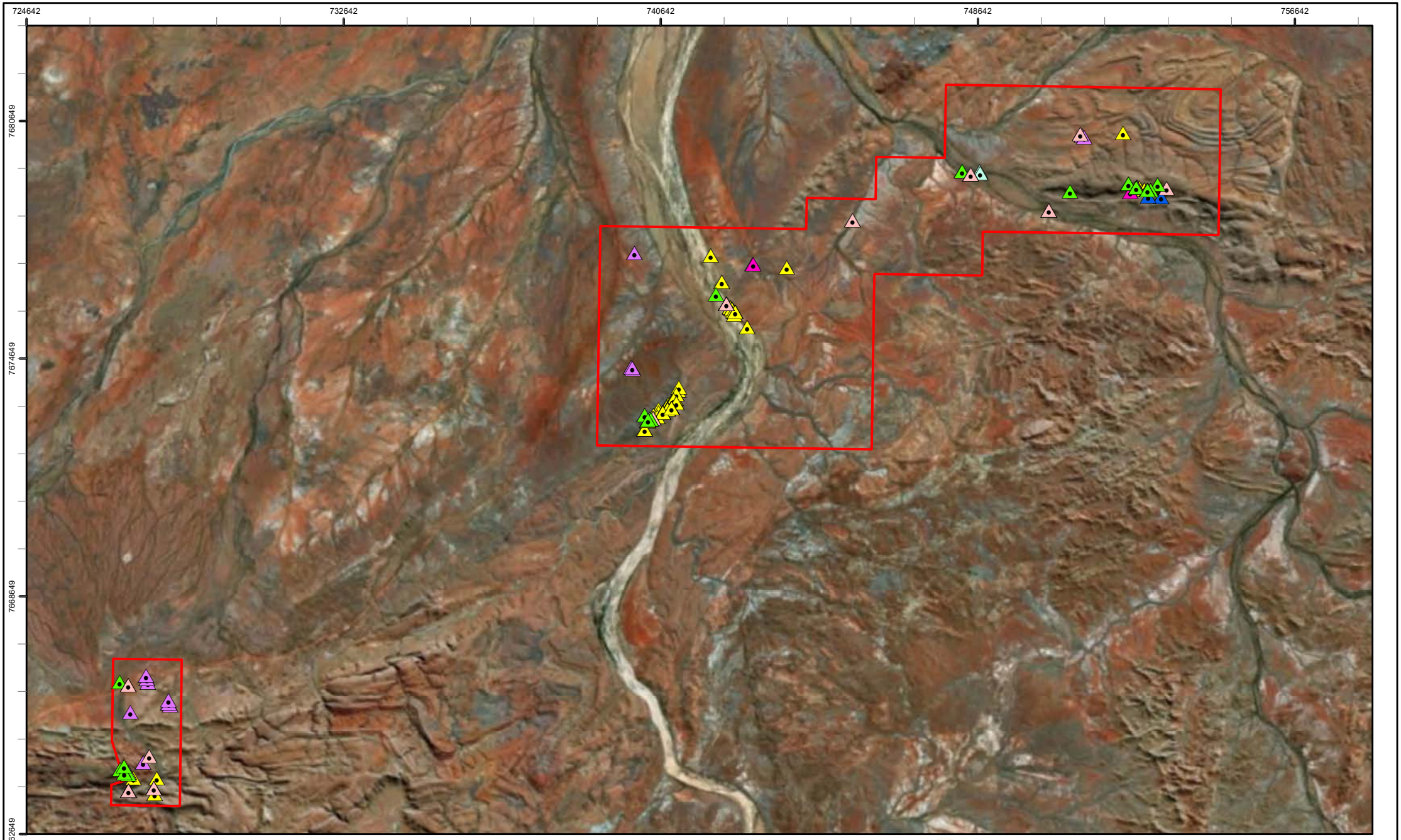
Study Area is similar, some species are discussed together rather than individually (i.e. Migratory shorebirds and waterbirds).

Table 4.8: Fauna of conservation significance recorded during the survey

Common Name (Scientific name)	Site	Location		Habitat	Record Type	No. Records
		Latitude	Longitude			
Northern Quoll (*Dasyurus hallucatus*)	VABY-12	-21.1141	119.1922	Low Stony Hills	Cage Trap	7 capture events
	VMRC-02	-21.01150308	119.3129591	Low Stony Hills	Cage Trap	1 capture event
	VMRC-04	-20.9920598	119.345692	Sandy Plain	Cage Trap	1 capture event
	VMRC-08	-21.11397809	119.1939264	Major Drainage Line	Track	1
	VMRC-10	-21.02741867	119.3122483	Low Stony Hills	Motion Camera	32 captures events
	VMRC-34	-20.97262771	119.4306336	Hillcrest/ Hillslope	Motion Camera	3 capture events
	VMRC-99	-21.0262883	119.3137986	Hillcrest/ Hillslope	Cage Trap	25 capture events
	VMRC-110	-20.99898574	119.3312253	Major Drainage Line	Cage Trap	10 capture events
	Opp	-21.11045371	119.1944024	Low Stony Hills	Scat	1
	Opp	-21.1104015	119.1887359	Low Stony Hills	Scat	1
	Opp	-20.97311262	119.4334282	Hillcrest/ Hillslope	Scat	1
	Opp	-20.97296394	119.4326017	Hillcrest/ Hillslope	Scat	1
	Opp	-20.96016847	119.4265382	Low Stony Hills	Track	1
	Opp	-21.00581325	119.3361119	Major Drainage Line	Track	1
	Opp	-20.9955568	119.3297942	Major Drainage Line	Track	1
	Opp	-20.98950976	119.326961	Major Drainage Line	Track	1
Pilbara Leaf-nosed Bat (*Rhinonicteris aurantia*)	VMRC-01	-21.1055	119.1925	Low Stony Hills	Ultrasonic	1 night Phase 1
	VMRC-05	-20.9702	119.3897	Major Drainage Line	Ultrasonic	2 nights Phase 1 4 nights Phase 2
	VMRC-06	-20.9606	119.4162	Low Stony Hills	Ultrasonic	3 nights Phase 1
	VMRC-07	-20.9727	119.4373	Hillcrest/ Hillslope	Ultrasonic	1 night Phase 1
	VMRC-08	-21.1128	119.1937	Major Drainage Line	Ultrasonic	3 nights Phase 1
	VMRC-11	-21.0893	119.1871	Stony Plain	Ultrasonic	2 nights Phase 1
	VMRC-22	-21.0006	119.3309	Major Drainage Line	Ultrasonic	3 nights Phase 1
	VMRC-24	-21.1134	119.1875	Low Stony Hills	Ultrasonic	3 nights Phase 1

Common Name (Scientific name)	Site	Location		Habitat	Record Type	No. Records
		Latitude	Longitude			
	VMRC-27	-20.9782	119.4088	Major Drainage Line	Ultrasonic	2 nights Phase 1
	VMRC-30	-21.0270	119.3127	Hillcrest/ Hillslope	Ultrasonic	1 night Phase 1
	VMRC-106	-20.9725	119.4301	Hillcrest/ Hillslope	Ultrasonic	3 nights Phase 2
	VMRC-111	-20.9810	119.3613	Sandy Plain	Ultrasonic	3 nights Phase 2
	VMRC-120	-21.0269	119.3136	Hillcrest/ Hillslope	Ultrasonic	2 nights Phase 2
	VMRC-123	-21.1093	119.1874	Gorge/Gully	Ultrasonic	2 nights Phase 2
Ghost Bat (*Macroderma gigas*)	CMRC-01	-20.9718	119.4351	Cave	Scats	3 scats
	CMRC-03	-21.1096	119.1875	Cave	Scats	20 scats
	CMRC-06	-21.0270	119.3130	Cave	Scats, Individual (alive)	4 scats 1 Individual
	CMRC-07	-21.1094	119.1864	Cave	Individual (alive)	1 individual
	CMRC-08	-21.0273	119.3123	Cave	Scats	50 scats
	CMRC-13	-20.9731	119.4334	Cave	Scats	70 scats
	CMRC-14	-20.9731	119.4327	Cave	Scats, Individuals (alive). Flushed into CRMC-15	20 scats Phase 1, 800 scats Phase 2, 6 Individuals Phase 2
	CMRC-15	-20.9727	119.4299	Cave	Scats, Individual (alive). Flushed from CRMC-14	4000 scats Phase 1, 6 Individuals Phase 2
	CMRC-18	-20.9736	119.4139	Cave	Scats	40 scats
	CMRC-19	-21.1078	119.1863	Cave	Scats	100 scats
	Opp	-20.9991	119.3304	Major Drainage Line	Nocturnal Search	1 Individual
	VMRC-05	-20.9702	119.3897	Major Drainage Line	Ultrasonic	3 nights Phase 1 1 night Phase 2
	VMRC-11	-21.0893	119.1871	Stony Plain	Ultrasonic	1 night Phase 1
	VMRC-106	-20.9725	119.4301	Hillcrest/ Hillslope	Ultrasonic	3 nights Phase 2
	VMRC-120	-21.0269	119.3136	Hillcrest/ Hillslope	Ultrasonic	1 nights Phase 2
	VMRC-123	-21.1093	119.1874	Gorge/Gully	Ultrasonic	1 nights Phase 2

Common Name (Scientific name)	Site	Location		Habitat	Record Type	No. Records
		Latitude	Longitude			
Northern Brushtail Possum (*Trichosurus vulpecula arnhemensis*)	VMRC-116	-20.9694	119.3919	Major Drainage Line	Cage Trap	2 capture events
Western Pebble-mound Mouse (*Pseudomys chapmani*)	VMRC-03	-20.9892	119.3085	Stony Plain	Mound (recently inactive)	1
	Opp	-21.1069	119.1910	Low Stony Hills	Mound (inactive)	1
	Opp	-21.0933	119.1968	Low Stony Hills	Mound (inactive)	1
	Opp	-21.0937	119.1973	Low Stony Hills	Mound (recently inactive)	1
	Opp	-21.0932	119.1970	Low Stony Hills	Mound (active)	1
	Opp	-21.0886	119.1918	Stony Plain	Mound (inactive)	1
	Opp	-21.0878	119.1916	Stony Plain	Mound (recently inactive)	1
	Opp	-21.0871	119.1914	Stony Plain	Mound (recently inactive)	1
	Opp	-21.0926	119.1969	Low Stony Hills	Mound (inactive)	1
	Opp	-21.0954	119.1877	Stony Plain	Mound (inactive)	1
	Opp	-21.0153	119.3081	Low Stony Hills	Mound (inactive)	1
	Opp	-21.0156	119.3085	Low Stony Hills	Mound (active)	1
	Opp	-21.0154	119.3083	Low Stony Hills	Mound (active)	1
	Opp	-20.9609	119.4166	Low Stony Hills	Mound (inactive)	1
	Opp	-20.9613	119.4171	Low Stony Hills	Mound (inactive)	1
Grey Falcon (*Falco hypoleucos*)	Opp	-20.9914	119.3372	Stony Plain	Individual (alive)	4 individuals
	Opp	-20.9737	119.4285	Hillcrest/ Hillslope	Individual (alive)	1 individual
	Opp	-20.9913	119.3373	Stony Plain	Individual (alive)	1 individual
Peregrine Falcon (*Falco peregrinus*)	VMRC-07	-20.9732	119.4368	Hillcrest/ Hillslope	Individual (alive)	1 individual
	Opp	-20.9731	119.4336	Hillcrest/ Hillslope	Individual (alive)	1 individual



Legend

Study Area

Significant

- Northern Brushtail Possum
- Western Pebble-mound Mouse
- Northern Quoll
- Grey Falcon
- Peregrine Falcon
- Ghost Bat
- Pilbara Leaf-nosed Bat

biologic Environmental Survey

N

1:120,000

0 1.25 2.5 5 km

Atlas Iron Limited

Miralga Creek Project Level 2 Terrestrial Fauna and SRE Assessment

Figure 4.5: Fauna of conservation significance recorded in the Study Area

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

Size A4, Created 2/09/2019

Table 4.9: Likelihood of occurrence for fauna of conservation significance

Species	Conservation Status				Preferred Broad Habitats Within Region	Potential Habitat Within Study Area	Within Current Known Distribution	Distance to Nearest Record - Year	Recorded Within Study Area	Likelihood of Occurrence
	EPBC Act	BC Act	DBCA	IUCN						
Mammals										
Brush-tailed Mulgara (*Dasycercus blythi*)			P4		Prefers spinifex *Triodia* spp. grasslands on sand plains and the swales between low dunes (Pavey *et al.*, 2012; Woolley, 2006). Mature spinifex hummocks appear to be important for protection from introduced predators (Körtner *et al.*, 2007).	Yes Sandy Plain, Stony Plain	Yes	~33 km west (2010) (DBCA, 2019a)	No	Likely
Northern Quoll (*Dasyurus hallucatus*)	EN	EN			The species tends to inhabit rocky habitats which offer protection from predators and are generally more productive in terms of availability of resources (Braithwaite & Griffiths, 1994; Oakwood, 2000). Other microhabitat features important to the species include: rock cover; proximity to permanent water and time-since last fire (Woinarski *et al.*, 2008).	Yes Hillcrest/Hillslope, Gorge/Gully, Major Drainage	Yes	Recorded within Study Area (2014) (DBCA, 2019d) Also recorded at Abydos monitoring site located within the Study Area.	Yes	Confirmed
Long-tailed Dunnart (*Sminthopsis longicaudata*)			P4		Typically occurs on plateaus near breakaways and scree slopes, and on rugged boulder-strewn scree slopes (Burbidge *et al.*, 2008). Once considered rare but now shown to be relatively common and widespread in rocky habitats (Burbidge *et al.*, 2008).	Yes Hillcrest/Hillslope, Gorge/Gully, Low Stony Hills, Stony Plain	Yes	~27 km southwest (2011) (DBCA, 2019a)	No	Possible

Species	Conservation Status				Preferred Broad Habitats Within Region	Potential Habitat Within Study Area	Within Current Known Distribution	Distance to Nearest Record - Year	Recorded Within Study Area	Likelihood of Occurrence
	EPBC Act	BC Act	DBCA	IUCN						
Pilbara Leaf nosed Bat (*Rhinonicteris aurantia*)	VU	VU			Species roosts within caves and abandoned mines with high humidity (95%) and temperature (32 °C) (Armstrong, 2001). Species forages in caves and along waterbodies with fringing vegetation (TSSC, 2016).	Yes All habitats	Yes	~3 km southwest (2017) DBCA, 2019d)	Yes	Confirmed
Spectacled Hare-wallaby (*Lagorchestes conspicillatus leichardti*)			P4		Within the Pilbara the Spectacled Hare-wallaby is known to occur in tussock and hummock grasslands and Acacia shrublands (Ingleby & Westoby, 1992).	Yes Sandy Plain, Stony Plain	Yes	~2 km west (2001) (DBCA, 2019d)	No	Likely
Northern Brushtail Possum (*Trichosurus vulpecula arnhemensis*)		VU			Within the Pilbara region generally exhibit flexibility in their habitat preferences and occupy an array of habitat types provided enough tree hollows and ground refuges (such as hollow logs, rockpiles and the burrows of other animals) are available (Kerle *et al.*, 1992).	Yes	Yes	~80 km southwest (1993) (DBCA, 2019a)	Yes	Confirmed
Ghost Bat (*Macroderma gigas*)	VU	VU			Ghost Bats roost in deep, complex caves beneath bluffs of low, rounded hills, granite rock piles and abandoned mines (Armstrong & Anstee, 2000). These features often occur within habitats including gorge/gully, hill crest/hill slope and low hills (Armstrong & Anstee, 2000).	Yes All habitats	Yes	~3km southwest (2017) DBCA, 2019d)	Yes	Confirmed

Species	Conservation Status				Preferred Broad Habitats Within Region	Potential Habitat Within Study Area	Within Current Known Distribution	Distance to Nearest Record - Year	Recorded Within Study Area	Likelihood of Occurrence
	EPBC Act	BC Act	DBCA	IUCN						
Short-tailed Mouse (*Leggadina lakedownensis*)			P4		The species occupies a diverse range of habitats from the monsoon tropical coast to semiarid climates, including spinifex and tussock grasslands, samphire and sedgelands, *Acacia* shrublands, tropical eucalypt and Melaleuca woodlands and stony ranges; however, the species is usually found in seasonally inundated habitats on red or white sandy-clay soils (Moro & Kutt, 2008).	Marginal Sandy Plain, cracking clay	Yes	8 records ~16 km northeast (2006) (DBCA, 2019d)	No	Possible
Western Pebble-mound Mouse (*Pseudomys chapmani*)			P4		This species occurs on the gentler slopes of rocky ranges where the ground is covered with a stony mantle and vegetated by hard spinifex, often with a sparse overstorey of eucalypts and scattered shrubs (Anstee, 1996; Start *et al.*, 2000).	Yes Low Stony Hills	Yes	~9 km northwest (1994) (DBCA, 2019d)	Yes	Confirmed
Greater Bilby (*Macrotis lagotis*)	VU	VU			Variety of habitats including spinifex hummock grassland and Acacia shrubland, on soft soils (Burrows *et al.*, 2012). In the Pilbara often associated with major drainage line sandy terraces (How *et al.*, 1991b).	Yes Sandy Plain, Stony Plain	Yes	~18 km southeast (1963) and ~27 km north (2014) (DBCA, 2019d)	No	Possible

Species	Conservation Status				Preferred Broad Habitats Within Region	Potential Habitat Within Study Area	Within Current Known Distribution	Distance to Nearest Record - Year	Recorded Within Study Area	Likelihood of Occurrence
	EPBC Act	BC Act	DBCA	IUCN						
Birds										
Osprey (*Pandion haliaetus*)	MI	MI			Occurs mainly in sheltered seas around islands, tidal creeks, estuaries and saltwork ponds, also large river pools (Johnstone *et al.*, 2013)	Yes Major Drainage	Yes	~31 km east (2000) (DBCA, 2019a)	No	Possible
Fork-tailed Swift (*Apus pacificus*)	MI	MI			Inhabits dry/open habitats, inclusive of riparian woodlands and tea-tree swamps, low scrub, heathland or saltmarsh, as well as treeless grassland and sandplains covered with spinifex, open farmland and inland and coastal sand-dunes (Johnstone & Storr, 1998).	Yes All habitats	Yes	~29 km west (2011) (DBCA, 2019a)	No	Possible
Oriental Plover (*Charadrius veredus*)	MI	MI			A variety of habitats, including coastal habitats, such as estuarine mudflats and sandbanks, on sandy or rocky ocean beaches as well as open inland environments such as, semi-arid or arid grasslands, where the grass is short and sparse (Johnstone & Storr, 2004).	Yes Sandy Plain, Major Drainage	Yes	~31 km west (1999) (DBCA, 2019a)	No	Possible
Grey Falcon (*Falco hypoleucos*)		VU			Timbered lowlands, particularly Acacia shrubland and along inland drainage systems. Also frequent spinifex and tussock grassland (Burbidge *et al.*, 2010; Olsen & Olsen, 1986)	Yes All habitats	Yes	~33 km east (2006) (DBCA, 2019a)	Yes	Confirmed

Species	Conservation Status				Preferred Broad Habitats Within Region	Potential Habitat Within Study Area	Within Current Known Distribution	Distance to Nearest Record - Year	Recorded Within Study Area	Likelihood of Occurrence
	EPBC Act	BC Act	DBCA	IUCN						
Peregrine Falcon (*Falco peregrinus*)		OS			In arid areas, it is most often encountered along cliffs above rivers, ranges and wooded watercourses where it hunts birds (Johnstone & Storr, 1998). It typically nests on rocky ledges occurring on tall, vertical cliff faces between 25 m and 50 m high (Olsen *et al.*, 2004; Olsen & Olsen, 1989).	Yes All habitats	Yes	~30 km west (2002) (DBCA, 2019a)	Yes	Confirmed
Oriental Pratincole *(Glareola maldivarum)*	MI	MI			Prefers open plains, floodplains or short grasslands, often with extensive bare areas. They often occur near terrestrial wetlands (such as billabongs, lakes or creeks), and artificial wetlands (such as reservoirs, saltworks and sewage farms) (Johnstone & Storr, 1998).	Yes Sandy Plain, Major Drainage	Yes	~50 km north (1980) (DBCA, 2019a)	No	Rarely
Barn Swallow (*Hirundo rustica*)		MI			The Barn Swallow is recorded in open country in coastal lowlands, often near water, towns and cities. Found near freshwater wetlands, paperbark *Melaleuca* woodland, mesophyll shrub thickets and tussock grassland (Schodde & Mason, 1999). The Barn Swallow is a non-breeding summer visitor to the Pilbara. It favours areas near water (Johnstone *et al.*, 2013)	Yes All habitats	Yes	~74 km north (2001) (DBCA, 2019a)	No	Rarely
Gull-billed Tern *(Gelochelidon nilotica*)	MI	MI			Shallow sheltered seas close to land, estuaries, tidal creeks; and inundated samphire flats, flooded salt lakes, claypans and watercourses in the interior (Johnstone & Storr, 1998)	Yes Major Drainage	No	~67 km north (2001) (DBCA, 2019a)	No	Rarely

Species	Conservation Status				Preferred Broad Habitats Within Region	Potential Habitat Within Study Area	Within Current Known Distribution	Distance to Nearest Record - Year	Recorded Within Study Area	Likelihood of Occurrence
	EPBC Act	BC Act	DBCA	IUCN						
Caspian Tern *(Hydroprogne caspia)*	MI	MI			Mainly sheltered seas, estuaries and tidal creeks; occasionally near-coastal salt lakes (including saltwork ponds) and brackish pools in lower courses of rivers; rarely fresh water (Johnstone & Storr, 1998)	Yes Major Drainage	No	~75 km northwest (1979) (DBCA, 2019a)	No	Rarely
Grey Wagtail (*Motacilla cinereal*)	MI	MI			A rare vagrant to Western Australia where it has been recorded within various habitats with open waterbodies (Johnstone & Storr, 2004).	Yes Major Drainage	Yes	~128 km south (2012) (DBCA, 2019a)	No	Unlikely
Yellow Wagtail (*Motacilla flava)*	MI	MI			An uncommon but regular visitor to the Pilbara region (Johnstone *et al.*, 2013). Occupies a range of damp or wet habitats with low vegetation although favours edges of fresh water, especially sewage ponds (Oakwood, 2000)	Yes Major Drainage	Yes	~449 km northeast (2003) (DBCA, 2019a)	No	Unlikely
Night Parrot (*Pezoporus occidentalis*)	EN	EN			The Night Parrot prefers sandy/stony plain habitat with old-growth spinifex (*Triodia*) for roosting and nesting in conjunction with native grasses and herbs for foraging (DPaW, 2017).	Possible Sandy Plain, Stony plain	Yes	~103 km east (2010) (DBCA, 2019a)	No	Possible
Australian Painted Snipe *(Rostratula australis)*	EN	EN		EN	Generally, occupies shallow terrestrial freshwater wetlands (i.e. temporary and permanent lakes, swamps and claypans) with rank emergent tussocks of grass, sedges, rushes or reeds, or samphire (Johnstone & Storr, 1998).	No	No	~184 km south (2012) (DBCA, 2019a)	No	Unlikely

Species	Conservation Status				Preferred Broad Habitats Within Region	Potential Habitat Within Study Area	Within Current Known Distribution	Distance to Nearest Record - Year	Recorded Within Study Area	Likelihood of Occurrence
	EPBC Act	BC Act	DBCA	IUCN						
Sharp-tailed Sandpiper (*Calidris acuminata*)	MI	MI			Favours flooded samphire flats and grasslands, mangrove creeks mudflats, beaches, river pools, saltwork ponds, sewage ponds and freshwater soaks (Johnstone *et al.*, 2013).	Yes Major Drainage	No	~40 km southeast (2001) (DBCA, 2019a)	No	Possible
Curlew Sandpiper (*Calidris ferruginea*)	CR/MI	VU/MI			Inhabits intertidal mudflats in sheltered coastal areas (i.e. estuaries, bays, inlets and lagoons) (Geering *et al.*, 2007). This rare species generally roosts on bare dry shingle, shell or sand beaches, sandspits and islets in or around coastal or near-coastal lagoons and other wetlands (Geering *et al.*, 2007).	Yes Major Drainage	No	~100 km northwest (2010) (DBCA, 2019a)	No	Rarely
Pectoral Sandpiper (*Calidris melanotos*)	MI	MI			Coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands (Johnstone & Storr, 2004; Johnstone *et al.*, 2013). It prefers wetlands with open fringing mudflats and low, emergent or fringing vegetation (Geering *et al.*, 2007).	Yes Major Drainage	Yes	~92 km north (1998) (DBCA, 2019a)	No	Possible

Species	Conservation Status				Preferred Broad Habitats Within Region	Potential Habitat Within Study Area	Within Current Known Distribution	Distance to Nearest Record - Year	Recorded Within Study Area	Likelihood of Occurrence
	EPBC Act	BC Act	DBCA	IUCN						
Black-tailed Godwit *(Limosa limosa)*	MI	MI		NT	Primarily found in coastal habitats, sheltered bays, estuaries and lagoons with intertidal mudflats or sandflats. Has been found in inland areas around dams, bore-overflows, and saline, freshwater and shallow lakes. Claypans may be used for roosting in non-breeding season (DoE, 2019).	Yes Major Drainage	No	~72 km north (2012) (DBCA, 2019a)	No	Possible
Eastern Curlew *(Numenius madagascariensis)*	CR/MI	MI/T		EN	Mainly tidal mudflats, also reef flats, sandy beaches and rarely near-coastal lakes including saltwork ponds (Johnstone & Storr, 1998).	Yes Major Drainage	No	~87 km north (1999) (DBCA, 2019a)	No	Rarely
Wood Sandpiper *(Tringa glareola)*	MI	Mi			Species occurs as a non-breeding summer migrant which occurs throughout the region. Occurs mainly in river pools, sewage ponds, flooded claypans, freshwater lagoons and bore overflows (Johnstone *et al.*, 2013).	Yes Major Drainage	No	~30 km north (2008) (DBCA, 2019a)	No	Possible
Common Sandpiper *(Tringa hypoleucos)*	MI	MI			Estuaries and deltas of streams, as well as banks farther upstream; around lakes, pools, billabongs, reservoirs, dams and claypans (Johnstone & Storr, 1998).	Yes Major Drainage	Yes	~28 km east (2005) (DBCA, 2019a)	No	Possible

Species	Conservation Status				Preferred Broad Habitats Within Region	Potential Habitat Within Study Area	Within Current Known Distribution	Distance to Nearest Record - Year	Recorded Within Study Area	Likelihood of Occurrence
	EPBC Act	BC Act	DBCA	IUCN						
Common Greenshank *(Tringa nebularia)*	MI	MI			Species occurs as a non-breeding summer Migrant which occurs throughout the region. Occurs mainly in Tidal mudflats, mangrove creeks, flooded samphire flats, beaches, river pools, and saltwork and sewage ponds (Johnstone et al., 2013).	Yes Major Drainage	No	~36 km east (2005) (DBCA, 2019a)	No	Possible
Marsh Sandpiper *(Tringa stagnatilis)*	MI	MI			Lives in permanent or ephemeral wetlands of varying salinity, and also regularly at sewage farms and saltworks. They are recorded less often at reservoirs, waterholes, soaks, bore-drain swamps and flooded inland lakes. In Western Australia they prefer freshwater to marine environments. The species usually forages in shallow water at the edge of wetlands and roost or loaf on tidal mudflats, near low saltmarsh, and around inland swamps (Johnstone & Storr, 1998a).	Yes Major Drainage	No	~72 km north (2005) (DBCA, 2019a)	No	Possible
Glossy Ibis *(Plegadis falcinellus)*	MI	MI			Freshwater wetlands, irrigated areas, margins of dams, floodplains, brackish and saline wetlands, tidal mudflats, pastures, lawns and public gardens (Johnstone et al., 2013).	Yes Major Drainage	No	~25 km northeast (2008) (DBCA, 2019a)	No	Possible

Species	Conservation Status				Preferred Broad Habitats Within Region	Potential Habitat Within Study Area	Within Current Known Distribution	Distance to Nearest Record - Year	Recorded Within Study Area	Likelihood of Occurrence
	EPBC Act	BC Act	DBCA	IUCN						
Reptiles										
Pilbara Olive Python (*Liasis olivaceus barroni*)	VU	VU			Associated with drainage systems, including areas with localised drainage and watercourses (Pearson, 1993). In the inland Pilbara the species is most often encountered near permanent waterholes in rocky ranges or among riverine vegetation (Pearson, 1993).	Yes Gorge/Gully, Hillcrest/Hillslope; Major Drainage	Yes	5 records ~11 km southwest (2015) (DBCA, 2019d)	No	Likely
Gane's Blind Snake (*Anilios ganei*)			P1		Little is known of the species' ecology but this species is often associated with moist soils and leaf litter within gorges and gullies (Wilson & Swan, 2014), and potentially within a wide range of other stony habitats. The species has been recorded from numerous habitats but is most likely to be present in rocky terrain and along drainage lines (DBCA, 2019d) such as that found in the Study Area.	Yes Gorge/Gully, Major Drainage, Low Stony Hills	Yes	~16 km southwest (2018) (DBCA, 2019a)	No	Likely
Black-lined Ctenotus *(Ctenotus nigrilineatus)*			P1		Little is known about the habitat preferences of the species. Previous records have however been collected from spinifex plains at the base of granite outcrops (How & Dell, 2004); (How *et al.*, 1991a).	Yes Sandy Plain, Stony Plain	Yes	~15 km southwest (2018) (DBCA, 2019a)	No	Likely

Species	Conservation Status				Preferred Broad Habitats Within Region	Potential Habitat Within Study Area	Within Current Known Distribution	Distance to Nearest Record - Year	Recorded Within Study Area	Likelihood of Occurrence
	EPBC Act	BC Act	DBCA	IUCN						
Spotted Ctenotus *(Ctenotus uber johnstonei)*			P2		Within the Pilbara, the taxon is known from Triodia on hillslopes, *Acacia xiphophylla* over chenopods, and *Acacia xiphophylla* scattered tall shrubs to high open shrubland (Cogger, 2014).	Yes Sandy Plain	No	~80 km southeast (DBCA, 2019a)	No	Possible

Species Confirmed in Study Area

Northern Quoll (Dasyurus hallucatus) (Endangered – EPBC/BC Act)

Northern Quoll was recorded a total of 89 times during the current survey; 44 times from trapped individuals (comprising 28 unique individuals), 35 times from motion camera captures (comprising 10–11 unique individuals) and ten times from secondary evidence (six scats and four tracks) (Table 4.8; Figure 4.5).

A total of 28 Northern Quolls were trapped within the Study Area during the Phase 1 and Phase 2 surveys (Table 4.10; Appendix J). The species was recorded from a total 44 captures of 28 individuals (Table 4.10). Capture data for all Northern Quoll trapped within the Study Area is shown in Appendix J.

Two quolls were captured during the Phase 1 survey at systematic trapping sites VMRC-08 and VMRC-04. Both individuals were young males whose occurrence within habitats such as those represented by the sites, is likely to indicate dispersing individuals, particularly as the timing of their capture coinciding with the early stages of the breeding season for the species when males are most active and mobile (Hernandez-Santin *et al.*, 2019).

Table 4.10: Summary of Northern Quoll trapped within the Study Area

Site	Site type	Habitat	Phase	Total captures	Number of unique individuals			
					Males	Females	Indet	Total
VMRC-02	Systematic trapping	Low Stony Hills	Phase 1	1	1	-	-	**1**
VMRC-04	Systematic trapping	Sand Plain	Phase 1	1	1	-	-	**1**
VMRC-99	Targeted trapping	Hillcrest/ Hillslope	Phase 2	25	7	11	-	**18**
VMRC-110	Targeted trapping	Major Drainage	Phase 2	10	2	2	1	**5**
VMRC-116	Targeted trapping	Major Drainage	Phase 2	-	-	-	-	**0**
VMRC-117	Targeted trapping	Hillcrest/ Hillslope	Phase 2	-	-	-	-	**0**
VABY-12 (Abydos monitoring site L)	Targeted trapping	Gorge/ Gully	Phase 2/ Concurrent Abydos monitoring survey	7	1	2	-	**3**
Total				**44**	**12**	**15**	**1**	**28**

During the Phase 2 survey, a total of 35 Northern Quoll captures were recorded, comprising 23 unique individuals (Table 4.10). The greatest number of captures were recorded at VMRC-99 where 18 individuals were recorded a total of 25 times. Of the 18 individuals captured, 11 were female and seven were male. The high number of females captured at VMRC-99 highlights the high value of denning/shelter habitat for the species occurring at and within the vicinity of this site. The Hillcrest/Hillslope habitat present at this site is likely to provide suitable denning/shelter and foraging habitat for breeding females of the population occurring within the

Study Area, making it of high value for the species locally. The ratio of known males to females was equal at site VMRC-110; however, a single individual of indeterminate sex was also recorded at the site. Occurrence of the species within Major Drainage habitat at this site is indicative of foraging individuals or dispersing individuals possibly moving between areas providing more suitable denning/shelter habitat. This site had been recently burnt (~6mths prior to the survey), habitat is good quality with plenty of cracks and crevices and is also in proximity the highly productive Shaw River. This population meets the DoE (2016) definition of a high density population- 'A high density population may be characterised by numerous camera triggers of multiple individuals across multiple cameras and or traps on the site. A low density population may be characterised by infrequent captures of one or two individuals confined to one or two traps or where no trapping has identified a northern quoll but latrine evidence remains'.

Additionally, four individuals were also trapped within the Sandtrax deposit during Northern Quoll monitoring undertaken for the Abydos DSO Project concurrently with the Phase 2 survey. Four unique individuals were trapped a total of seven times. The four individuals comprised two adult females, one trapped three times and one once, and one adult male trapped three times.

A total of 35 Northern Quoll sightings were recorded at targeted Northern Quoll motion camera transects deployed within the Study Area (Table 4.8; Figure 4.5). Of the 35 sightings, 32 occurred at site VMRC-10, with a total of nine suspected unique individuals identified by individual spot recognition, while only 2 sightings occurred at VMRC-34, with only 1–2 suspected unique individuals recorded.

Northern Quoll were also recorded ten times from secondary evidence (scats and tracks) within the Study Area, six times from tracks and four from scats at ten opportunistic locations (Table 4.8; Figure 4.5).

Prior to the current survey, Northern Quoll have previous been recorded both within and in close proximity to the Study Area, including multiple times within Gorge/Gully and Major Drainage habitats mapped within the Sandtrax deposit (DBCA, 2019d; Stantec, 2018a). These records are associated individuals captured during Northern Quoll monitoring surveys undertaken for the Abydos DSO Project in 2014 and 2014 (Stantec, 2018a), the same monitoring site where targeted Northern Quoll trapping was undertaken concurrently with the Phase 2 survey where three individuals were trapped.

Within the Study Area, the species was recorded within a range of fauna habitats, including Gorge/Gully, Hillcrest/Hillslope, Low Stony Hills and Sandy Plain habitats (Table 4.8; Figure 4.5). The species showed a strong association with Hillcrest/Hillslope and Gully/Gorge habitats, where available of suitable denning and/or foraging habitat is higher. The species was only recorded once from both Low Stony Hills and Sandy Plain habitats, with a single individual trapped at each of these locations. Both individuals trapped at these sites were young males, suggesting they were dispersing individuals traversing the habitat while migrating from other areas of more suitable habitat within the vicinity.

Northern Quoll are known to occur within a range of habitats, including ironstone and sandstone ridges, scree slopes, granite boulders and outcrops, drainage lines, riverine habitats dissected rocky escarpments, open forest of lowland savannah and woodland (Braithwaite & Griffiths, 1994; Oakwood, 1997, 2002, 2008). Rocky habitats tend to support higher densities, as they offer protection from predators and are generally more productive in terms of availability of resources (Braithwaite & Griffiths, 1994; Oakwood, 2000).

Northern Quoll are likely to occur throughout the Study Area, particularly within Gorge/Gully and Hillcrest/Hillslope habitats where suitable denning/shelter and/or foraging habitat is present, in addition to Major Drainage habitat for foraging and/or dispersal. These habitats form part of the core habitats critical to the survival of Northern Quoll (DoE, 2016). To a lesser extent, all habitats occurring within the Study Area may be utilised by the species to forage and or during dispersal activities; however, their significance to the species will vary depending on resource availability and connectivity. Foraging habitat within the Study Area is likely to vary depending on resource availability and recent fires with large sections of the Study Area.

Ghost Bat (Macroderma gigas) (Vulnerable – EPBC/BC Act)

Ghost Bat was recorded a total of 25 times within the Study Area during the current survey (Table 4.8; Figure 4.5). The species was recorded five times from direct observation (individuals observed at night and within or flushed from caves), ten times from ultrasonic call recordings and ten times from secondary evidence (scats) (Table 4.8; Figure 4.5; Table 4.11). The species was recorded within Major Drainage, Hillcrest/Hillslope, Gorge/Gully and Stony Plain habitat within the Study Area (Table 4.8; Table 4.11).

The species was recorded at five sites by ultrasonic call recorders, with the number of calls ranging between one and 20, with the (Table 4.12). Based on the frequency and timing of calls at VMRC-106 (located near cave CMRC-15), results indicate that cave CMRC-15 was used as a diurnal roost, at least during the period the ultrasonic recorder was deployed at the site. The timing of calls at VMRC-123 suggested Ghost Bat may have roosted at one of the caves within the vicinity of the recorder (CMRC-03, CMRC-07 or CMRC-19), of which the species was observed at one (VMRC-07) and secondary evidence (scats) was recorded at all three (Table 4.6; Table 4.12).

Timing of calls from the remaining sites could not conclusively indicate the source roosting site (i.e. calls were recorded too late in the night), although it is most likely that bats originated from the roost near VMRC-106 (likely CMRC-15) or Lalla Rookh. Lalla Rookh, an abandoned mine shaft, located approximately 3 km southwest of the Miralga deposits (Miralga East and Miralga West) and 9 km northeast of the Sandtrax deposit, regarded as a permanent maternity roost for Ghost Bat (Table 4.12).

Table 4.11: Summary of Ghost Bat ultrasonic call recording results within the Study Area

Site	Habitat	Deployment	Sampling nights	Number of calls (total)	Earliest call	Latest call
VMRC-05	Major Drainage	11–13/05/2019	3	14		
VMRC-05	Major Drainage	17–20/07/2019	4	3 (0, 0, 3, 0)	1853	
VMRC-11	Stony Plain (Artificial watering point/ Turkey's Nest)	12–13/05/2019	2	4 (4, 0)		
VMRC-106	Hillcrest/Hillslope (nr. cave CMRC-15)	15–17/07/2019	3	(20,10,10)	1803	0524
VMRC-120	Hillcrest/Hillslope (nr. caves CMRC-04, CMRC-11)	19–20/07/2019	2	1 (1, 0)	0504	
VMRC-123	Gorge/Gully (nr. caves CMRC-03, CMRC-07, CMRC-19)	19–20/07/2019	2	11 (11, 0)	0146	0557

Ghost Bats roost in deep, complex caves beneath bluffs of low, rounded hills, granite rock piles and abandoned mines (Armstrong & Anstee, 2000). These features often occur within habitats including gorge/gully, hill crest/hill slope and low hills (Armstrong & Anstee, 2000). Ghost Bats are known to require a number of suitable caves throughout their home ranges; both due to temporal factors (i.e. night/ feeding roosts for feeding throughout the duration of the night, as well as day roosts for resting), and seasonal factors (use of certain caves as maternity roosts, depending on the right environmental conditions). The presence of day roosts and/ or maternity roosts in an area is the most important indicator of suitable habitat for Ghost Bats, and these caves are generally the primary focus of conservation and/or monitoring (DBCA, 2019d).

Ghost Bat occurrence or evidence of occurrence was recorded at ten caves within the Study Area, comprising four direct observations of individuals within caves and ten records of secondary evidence, nine scats (ranging in quantity from ~3–4,000) and one of foraging evidence by the species (Table 4.6). Thirteen caves were confirmed or identified as potential roost caves for Ghost Bat, comprising one, possible night roost, seven identified as night roosts, four as confirmed day roosts (including one also identified as a possible maternity roost) and one potential day roosts (Table 4.6).

Within the Study Area, Ghost Bat are likely to occur within all broad fauna habitats mapped to forage, with roosting more likely to be concentrated to areas where suitable caves are present in Hillcrest/Hillslope and Gorge/Gully Habitats. The species occurrence is likely to be regular, particularly when roosting occurs within the Study Area. Gorge or Gully represent significant habitat for the Ghost Bats as caves are often formed within this habitat type which can be utilised for roosting and foraging. Drainage Area provides suitable foraging habitat for Ghost Bats in the Study Area. Water features are also important for the species as foraging and drinking sources.

Ghost Bat have previously been recorded within the Study Area, near Sulphur Springs within the Sandtrax deposit (DBCA, 2019d) (Figure 4.1). The species has also been recorded on numerous occasions within 10 km of the Study Area, including at the Lalla Rookh roost site and

in the vicinity of the Abydos DSO Project during annual monitoring of the species at the site (DBCA, 2019d) (Figure 4.1).

Pilbara Leaf-nosed Bat (Rhinonicteris aurantia) Pilbara Form (Vulnerable – EPBC/BC Act)

Pilbara Leaf-nosed Bat were recorded a total of 35 times from 14 sites within the Study Area during the current survey (Table 4.8; Figure 4.5). All records of the species were identified from ultrasonic call recorders. The species was recorded within all broad fauna habitats mapped within the Study Area. Call recordings suggest the species forages widely throughout the Study Area and is likely to occur within the Study Area nightly to forage (Figure 4.5).

The number of Pilbara Leaf-nosed Bat calls recorded at each site the species was detected ranged between two and 1,160 calls, with the greatest number of calls recorded at VMRC-106, within Hillcrest/Hillslope habitat (Table 4.12).

Table 4.12: Summary of Pilbara Leaf-nosed Bat ultrasonic call recording results within the Study Area

Site	Habitat	Deployment	Sampling nights	Number of calls (total)	Earliest call	Latest call
VMRC-01	Stony Plain	09/07/2019	1	6		
VMRC-03	Stony plain	10–11/05/2019	2	6		
VMRC-05	Major Drainage	11–13/05/2019	3	4		
VMRC-05	Major Drainage	17–20/07/2019	4	83 (4, 3, 39, 37)	1936	0242
WMRC-06	Hillcrest/Hillslope	15–17/05/2019	3	8		
VMRC-07	Hillcrest/Hillslope	14–15/05/2019	2	2 (2, 0)		
VMRC-08	Gorge/Gully	12–14/07/2019	3	16		
VMRC-11	Stony Plain (Turkey's Nest)	12–13/05/2019	2	416		
VMRC-18	Stony Plain	30/05/2019	1	11		
VMRC-22	Major Drainage	16–18/05/2019	3	15		
VMRC-24	Gorge/Gully	15–17/07/2019	3	73		
VMRC-27	Major Drainage	14–15/05/2019	2	3		
VMRC-106	Hillcrest/Hillslope (nr. cave CMRC-15)	15–17/07/2019	3	1,160 (70, 265, 825)	1932	0209
VMRC-111	Major Drainage	17–19/07/2019	3	15 (6, 2, 7)	1903	0252
VMRC-120	Hillcrest/Hillslope (nr. caves CMRC-04, CMRC-11)	19–20/07/2019	2	33 (30, 3)	1850	0442
VMRC-123	Gorge/Gully (nr. caves CMRC-03, CMRC-07, CMRC-19)	19–20/07/2019	2	5 (5, 0)	2009	0003

Pilbara Leaf-nosed Bats roost in undisturbed caves, deep fissures or abandoned mine shafts. The Pilbara Leaf-nosed Bat's limited ability to conserve heat and water (Armstrong, 2001) means it requires warm (28–32ºC) and very humid (85–100%) roost sites in caves (Armstrong, 2001; Churchill, 1991) and/or mine shafts as these enable the individuals to persist in arid climates by limiting water loss and energy expenditure (van Dyck & Strahan, 2008). Such caves are relatively uncommon in the Pilbara (Armstrong, 2000; Armstrong & Anstee, 2000), which limits the availability of diurnal roosts for this species. Although several caves were recorded within the Study Area, no evidence of diurnal roosting was observed within or indicated via ultrasonic call recordings.

Based on the analysis of call recording data, timing of all the calls recorded within the Study Area during the current survey are consistent with bats originating from the Lalla Rookh roost located approximately 3 km southwest of the Miralga deposits (Miralga East and Miralga West) and 9 km northeast of the Sandtrax deposit (R. Bullen pers. comm. 13 June 2019 and 24 August 2019; Table 4.12), although this was confirmed and the possibility of other diurnal roosting sites in the area should not be excluded.

During the dry season, approximately March to August, Pilbara Leaf-nosed Bats aggregate in colonies within caves that provide a suitably warm, humid microclimate; however, the species disperses from these main colonies during the wet season, approximately September to February, when suitably humid caves are more widely available (TSSC, 2016). The level of dispersal in the wet season may also be influenced by the seasonal availability of food resources (Churchill, 1994).

Prior to this survey, the nearest records of the species were located approximately 3 km southwest of the Miralga deposits at the known Lalla Rookh roost site (Figure 4.1). Additionally, the species has also been recorded numerous times in the vicinity of the Abydos DSO Project during annual monitoring of the species at the site (Figure 4.1).

Northern Brush-tail Possum (Trichosurus vulpecula arnhemensis) (Vulnerable – BC Act)

A single adult female individual Northern Brushtail Possum was trapped twice in cage traps deployed at site VMRC-116, located along Miralga Creek (Plate 4.1; Table 4.8; Figure 4.5; Table 4.13). The individual was first captured on 20/07/2019 and re-captured on 21/07/2019 (Table 4.13). The individual was PIT-tagged following the first capture to allow for identification of the individual during subsequent captures and future surveys within the Study Area.

It is largely known from gorges and major drainage lines with Eucalypt woodland (DBCA, undated; van Dyck & Strahan, 2008); however, within the Pilbara region, the species is sparsely distributed and often only encountered in low abundance (DBCA, 2019a). The nearest record of the species to the Study Area is located approximately 80 km southwest (DBCA, 2019a).

The individual was trapped in riparian vegetation within Major Drainage habitat with scattered *Eucalyptus* and *Melaleuca* species over a varied understory, often dominated by tussock grasses. Suitable habitat for the species is present within all Major Drainage habitat within the Study Area, in addition to suitable rocky habitat being present within Gorge/Gully habitat. It is

unknown if the species occurrence within the Study Area represents a resident individual or population, or a transient individual which may be utilising Major Drainage habitat which dissects the Study Area.

Plate 4.1: Female possum recorded during the July/August survey period

Table 4.13: Summary of trapping data for Northern Brushtail Possum

Microchip number	Date	Site	Capture/ Recapture	Sex	Condition	Weight (g)	PES (mm)	Head (m)
953010001269001	20/07/2019	VMRC-116	Capture	F	Excellent	1,490	49.9	87.2
	21/07/2019	VMRC-116	Recapture					

Western Pebble-mound Mouse (Pseudomys chapmani) (Priority 4 – DBCA)

The Western Pebble-mound Mouse occurs almost exclusively on low undulating stony hills and the gentler slopes of rocky ranges where the ground is covered with a stony mantle and vegetated by hard spinifex, often with a sparse overstorey of eucalypts and scattered shrubs (Anstee & Armstrong, 2001).

Western Pebble-mound Mouse was recorded 15 times from secondary evidence (pebble mounds) during the current survey, from one site (VMRC-03) and 14 opportunistic locations (Table 4.8; Figure 4.5), all within Low Stony Hill or Stony Plain habitats. Of the 15 pebble mounds recorded, three were active mounds and four were considered inactive. The remaining eight mounds were deemed inactive.

The species is likely to commonly occur throughout the Study Area in Stony Plain and Low Stony Hill habitats where suitable burrowing substrate and mount materials (pebbles and small

rocks) are present. Recent fires within a large portion of these habitats may have temporarily reduced the suitability of these habitats slightly; however, the species is often recorded in areas of varying vegetation conditions and degradation and is likely to persist, particularly as these habitats recover.

Grey Falcon (Falco hypoleucos) (Vulnerable – BC Act)

Grey Falcon were recorded three times during the survey, once from direct observation of a group of four individuals (two adults and two young) during the Phase 1 survey and twice during the Phase 2 survey, both from direct observation of a single individual (Table 4.8; Figure 4.5).

The species commonly nests in timbered areas, particularly tall trees along watercourses, and forages in open or more sparsely vegetated habitats (Garnett *et al.*, 2011). Within the Study Area, all records of Grey Falcon were recorded within or in close proximity to Major Drainage habitat.

The observation of the two adults with young during the Phase 1 survey suggests the species may be nesting within the Study Area, most likely within riparian vegetation along Miralga Creek. The four individuals were first observed flying overhead before landing in a tree together where they remained for a short period before flying off again. Both observations of the species during the Phase 2 survey were of single individuals flying overhead, both within the vicinity of the Major Drainage habitat.

The species is likely to occur as a resident within or within a broader area encompassing the Study Area, with nesting potentially occurring within the continuous Major Drainage habitat occurring within the Study Area. Due to the large foraging range of the species, the species is likely to occur within the Study Area to forage, particularly within Sand Plain, Stony Plain and Major Drainage habitats.

Plate 4.2. Grey Falcon in flight recorded in the Study Area. Photo: Brighton Downing

Peregrine Falcon (Falco peregrinus) (Specially Protected – BC Act)

The Peregrine Falcon was recorded twice during the current survey near the Miralga Creek deposit, once from direct observation of a single individual during both survey phase (Table 4.8; Figure 4.5). The individuals were seen resting on a rocky ledge within the area and could possibly nesting in the area. The species is considered to occur within the Study Area as a resident due to the availability of suitable nesting and foraging habitat throughout the Study Area.

The species typically nests on rocky ledges occurring on tall, vertical cliff faces or occasionally within tall trees occurring along major drainage lines and has occasionally been recorded nesting in human made structures providing high vantage points, such as radio-towers (Olsen & Olsen, 1989). Suitable nesting sites was observed within most Hillcrest/Hillslope and Gorge/Gully habitat mapped within the Study Area, particularly in areas where large steep rock faces and ledges were present, and Major Drainage habitat where tall trees are present. Due to the species large foraging range, foraging may occur within all broad fauna habitats mapped within the Study Area, with foraging range likely to fluctuate with resources availability.

Species Likely to Occur in the Study Area

Pilbara Olive Python (Liasis olivaceus barroni) (Vulnerable – EPBC/BC Act)

This species is often associated with drainage systems, including areas with localised drainage and watercourses (Pearson, 1993). In the inland Pilbara the species is most often encountered near permanent waterholes in rocky ranges or among riverine vegetation (Pearson, 1993).

No evidence of Pilbara Olive Python was recorded within the Study Area during the current survey; however, the species is considered likely to occur due to presence of habitats known to support the species in Gorge/Gully, Hillcrest/Hillslope and Major Drainage habitats mapped within the Study Area and the species scattered but widespread distribution within the Pilbara region.

Within the Study Area, the species is likely to occur as a resident, but may also disperse into and from the area via dispersal corridors. Occurrence is likely to be associated with waterbodies, particularly permanent or long-standing waterbodies such as spring-fed systems which occur within Gorge/Gully and Major Drainage habitats. The species may also utilise these habitats as dispersal corridors to other areas within and outside of the Study Area.

The species has previously been recorded multiple times within approximately 11 km southwest of the Study Area (DBCA, 2019a).

Brush-tailed Mulgara (Dasycercus blythi) (Priority 4 – DBCA)

The Brush-tailed Mulgara is often recorded from a range of sandy and stony plain habitats (Pavey *et al.*, 2012) and its likelihood of occurrence within the Study Area is Possible due to the presence of suitable habitat. No evidence of the species was recorded during the current survey; however, it is most likely to occur as a resident within Sandy Plain and Stony Plain

habitats within the Study Area, particularly where suitable vegetation cover is also present. The nearest record of the species to the Study Area is located approximately 33 km west (DBCA, 2019a).

Spectacled Hare-wallaby (Lagorchestes conspicillatus) (Priority 4 – DBCA)

Within the Pilbara region, Spectacled Hare-wallaby is known to occur in mixed tussock and *Triodia* hummock grasslands and *Acacia* shrublands (Ingleby & Westoby, 1992). Recent fires over large sections of the Study Area are likely to have temporarily decreased the suitability of habitat for the species, particularly within Sandy Plain and Stony plain habitat; however, the species may persist within remaining remnants and/or migrate into the Study Area as these habitats recover and expand. The species has previously been recorded approximately 2 km west of the Study Area (DBCA, 2019a), within an area of apparent continuous habitat with connectivity to habitat within the Study Area.

Gane's Blind Snake (Anilios ganei) (Priority 1 – DBCA)

Little is known of the ecology or habitat preferences of Gane's Blind Snake. Limited information available from previous records of the species indicated a preference towards moist soils and leaf litter with gorges. Within the Study Area, the species occurrence as a resident is likely to be associated Gorge/Gully and possibly Major Drainage habitats, where these habitat characteristics occur. The nearest record of the species to the Study Area is located approximately 16 km southwest (DBCA, 2019a).

Black-lined Ctenotus (Ctenotus nigrilineatus) (Priority 1 – DBCA)

Little is known about the habitat preferences or distribution extent of the Black-lined Ctenotus; however, based on the proximity of the nearest record of the species (~15 km) and presence of spinifex plains habitat representative of previous collection localities occurring within the Study Area, the species is considered likely to occur. The species is likely to occur within the Study Area as a resident, within suitable vegetated areas in Sandy Plain and Stony Plain habitats.

Species Possibly Occurring in the Study Area

Night Parrot (Pezoporus occidentalis) (Endangered – EPBC Act; Critically Endangered BC Act)

Very little is known of the habitat preferences or distribution extent of the Night Parrot, with the limited knowledge of the species habitat preferences based on few observations.

This highly cryptic species is known to inhabit arid and semi-arid areas that comprise dense, low vegetation. Based on accepted records, the habitat of the Night Parrot consists of *Triodia* grasslands in stony or sandy environments (McGilp, 1931; North, 1898; Whitlock, 1924; Wilson, 1937)), and of samphire and chenopod shrublands, including genera such as *Atriplex*, *Bassia* and *Maireana*, on floodplains and claypans, and on the margins of saltlakes, creeks or other sources of water (McGilp, 1931; Parker, 1980; Wilson, 1937). The current interim guidelines for preliminary surveys of Night Parrot suggest this species requires old-growth (often more than

50 years unburnt) spinifex (*Triodia*) for roosting and nesting and habitats that comprise various grasses and herbs for foraging, although little is known about foraging sites (DPaW, 2017). Foraging habitat is not necessarily within or adjacent to roosting habitat as the Night Parrot has been known to fly up to 40 km in a single night to forage. *Triodia* is likely to provide a good food resource at least in times of mass flowering and seeding. The succulent *Sclerolaena* has been shown to be a source of food and moisture; other succulent chenopods are also likely to be important. Foraging habitat is likely to be more important if it is adjacent to or within about 10 km of patches of *Triodia* deemed suitable as roosting habitat (DPaW, 2017).

Occurrence of Night Parrot within the Pilbara region is known from limited records, with the nearest contemporary record from 2005 at Minga Well, approximately within the Pilbara region from April 2005 was located at Minga Well approximately 125 km south of the Study Area (Davis & Metcalf, 2008).

Targeted sampling for the species using acoustic recorders did not record any evidence within areas of suitable habitat in the Study Area; however, based on the limited knowledge of the species and the presence of suitable aged *Triodia* grasses which it is known to utilise, the species occurrence is considered Possible. Recent fires throughout the Study Area has resulted in a large portion of Sandy Plain and Stony Plain habitat mapped within the Study Area which previously comprised of larger areas of mature *Triodia* grasses now being considered unsuitable for the species. The species occurrence within the Study Area would largely be confined to remaining patches of unburnt spinifex grassland vegetation within Sandy Plain and Stony Plain habitats; however, the likelihood of these areas supporting the species as a resident is difficult to determine.

Greater Bilby (Macrotis lagotis) (Vulnerable – EPBC/BC Act)

No evidence of Greater Bilby was recorded during the current survey; however, the species likelihood of occurrence is Possible based on the presence of suitable habitat and records in the vicinity of the Study Area. Within the Pilbara region the species is often sparsely distributed and occurs in relatively low abundance, often also making detection difficult (Southgate *et al.*, 2019).

Within the Study Area, Greater Bilby may occur in Sandy Plain and to a lesser extent Stony Plain habitat where suitable substrates permitting burrow excavation are present. Recent fires within these habitats in the Study Area is likely to have reduced suitability for the species, particularly the loss of prey items which are associated with particular shrub species. Due to the species' large foraging range and dispersal capabilities, it may occur within the Study Area as a visitor to forage or resident, particularly in areas where suitable burrowing substrates occur.

The nearest recent record of the species is located approximately 27 km north of the Study Area in 2014 (DBCA, 2019a). The species has previously been recorded within 18 km southeast of the Study Area; however, this record dates back to 1963 and may not be accurate (DBCA, 2019a).

Migratory Shorebirds and Waterbirds (Migratory – EPBC/BC Act)

Due to the ecological similarities and shared habitat preferences for a number of the Migratory shorebird and waterbird species, the likelihood of occurrence within the Study Area and similarities in habitats they may occur, some species are discussed together here. For species with vastly differing ecology or habitat preferences which may influence occurrence within the Study Area different to these species, they are discussed separately below.

Nine Migratory shorebirds or waterbirds identified in the desktop assessment are likely to occupy similar habitats within the Study Area based on the broad fauna habitats mapped; these are Oriental Plover, Sharp-tailed Sandpiper, Pectoral Sandpiper, Black-tailed Godwit, Wood Sandpiper, Common Sandpiper, Common Greenshank, Marsh Sandpiper and Glossy Ibis.

The likelihood of occurrence for these nine migratory shorebirds and/or waterbirds is considered Possible; however, the species are likely to only occur as infrequent visitors. Species' occurrence within the Study Area is most likely to occur following rainfall events and cyclonic activity when water and potential foraging habitat is more abundant and high winds may blow some individuals into the broader area. During drier periods, the occurrence of any of these species is likely to be associated with areas of permanent or long-standing water, particularly within Major Drainage habitat, or at artificial watering points such as Turkey's nest located near the Sandtrax deposit.

Osprey (Pandion haliaetus) (Migratory – EPBC/BC Act)

The Osprey was not recorded during the current survey; however, based on the presence of suitable habitats and the nearest record of the species located approximately 31 km east of the Study Area (DBCA, 2019a), it's likelihood of occurrence within the Study Area is Possible. Within the Study Area, the species occurrence is likely to be confined to Major Drainage habitat which provides suitable foraging and nesting habitat for the species, particularly in sections where permanent or long-standing water following rainfall events is present. The species may occasionally occur as an infrequent visitor to forage, particularly when water is abundant in Major Drainage habitat.

Fork-tailed Swift (Apus pacificus) (Migratory – EPBC/BC Act)

The Fork-tailed Swift forages in a variety of habitats, including all broad fauna habitats mapped within the Study Area, and may occasionally occur within the Study Area as an infrequent visitor. Due to the species being almost exclusively aerial, it is unlikely to land or nest within the Study Area (DoE, 2018).The nearest record of the species is located approximately 29 km west of the Study Area (DBCA, 2019a).

Long-tailed Dunnart (Sminthopsis longicaudata) (Priority 4 – DBCA)

Although Long-tailed Dunnart has a relatively widespread distribution, it is often sparsely distributed and locally uncommon within the Pilbara region. No evidence of the species was recorded during the current survey; however, based on the presence of suitable habitat for the species and the species previously being recorded approximately 27 km southwest of the Study

Area (DBCA, 2019a), its likelihood of occurrence is Possible. Within the Study Area, the species may occur as a resident in several mapped habitats, in particular Hillcrest/Hillslope, Gorge/Gully habitats.

Short-tailed Mouse (Leggadina lakedownensis) (Priority 4 – DBCA)

The Short-tailed Mouse has a discontinuous distribution within the Pilbara region, occurring in a diverse range of habitats, though often associated with areas of open tussock and hummock grassland, *Acacia* scrubland, and savanna woodland, on alluvial clay or sandy soils (Lee, 1995; Moro & Kutt, 2008).

The species was not recorded within the Study Area; however, suitable habitat for the species was recorded within Sandy Plain habitat mapped and the species has been recorded multiple times within approximately 16 km northeast of the Study Area (DBCA, 2019a) and its likelihood of occurrence is considered Possible. The species occurrence within the Study Area is most likely to be within Sandy Plain and cracking clay habitats and may fluctuate depending on resource availability, particularly following rainfall events when recourses will be most abundant.

Spotted Ctenotus (Ctenotus uber johnstonei) (Priority 2 – DBCA)

Potential habitat was recorded for the Spotted Ctenotus within the Study Area. The species' likelihood of occurrence within the Study Area is considered Possible, particularly within Sandy Plain and Stony Plain habitat, which are most similar to habitats the species has previously been recorded in the Pilbara. Records of the species are sparsely distributed in the vicinity of the Study Area, with the nearest record located approximately 80 km southeast (DBCA, 2019a). It should be noted that there is taxonomic uncertainty in regard to this subspecies occurrence within the Pilbara region and the population occurring in the region may in fact represent an unnamed species.

Species Unlikely or Highly Unlikely Occurring in the Study Area

Nine species are considered Rarely, Unlikely or Highly Unlikely to occur within the Study Area due to their rare occurrence in the Pilbara region, the absence of suitable habitat within the Study Area and/or the occurrence of the Study Area well outside the species' known or expected distribution; Australian Painted Snipe, Oriental Pratincole, Barn Swallow, Gull-billed tern, Caspian Tern, Grey Wagtail, Yellow Wagtail, Curlew Sandpiper and Eastern Curlew. The occurrence of these species is likely to be infrequent and limited only to rare occasions, such rare vagrants and/or migrating individuals blown off course by cyclonic activity.

4.4 SRE Invertebrate Fauna Survey Results

Sixty-one sites were visited for SRE assessment. Of these, 31 were sampled for SRE invertebrates. Invertebrate samples were collected from microhabitats in leaf litter, topsoil, under rocks, and woody debris at 29 of the 32 sampling sites. A total of 184 invertebrate

specimens were collected (Appendix K), including one mygalomorph spider, seven selenopid spiders, 48 pseudoscorpions, eight scorpions, 90 snails and 29 isopods.

From these specimens, 27 taxa were identified of which eighteen are currently regarded as Potential SREs (see below and Table 4.14) and the remaining nine as Widespread. Of the 18 Potential SRE taxa, all are regarded as 'data deficient' due to taxonomic constraints but all taxa satisfy other requirements to be regarded as Potential SRE. No Confirmed SRE taxa were recorded.

4.4.1 Mygalomorphae: Nemesiidae

Aname sp. indet.

A single specimen of this taxon was collected from site SMRC-019 from a Sand Plain habitat type. This individual was collected from a pitfall trap and does not morphologically resemble known species collected from the area (*Aname* 'MYG001' and *Aname* 'MYG099'). As this specimen was collected in the Sand Plain habitat, and this habitat extends beyond the Study Area, it is possible that the taxon could be found in other Sand Plain areas and would not be restricted to the Study Area.

This taxon is regarded as a Potential SRE (WAM Categories 'A' Data deficient, 'B' Habitat Indicators, 'C' Morphology Indicators and 'E' Research and Expertise). Molecular analysis may align this taxon with other Nemesiidae in the local area (10 specimens) including the widespread *Aname mellosa* (Figure 4.6).

4.4.2 Araneomorphae: Selenopidae

Selenopid spiders (typically genus *Karaops*) are generally considered to have a reasonable likelihood of being SRE, due to their habitat specialisation within the cracks and crevices of rocky outcrops. Selenopid spiders were collected from four sites within the Study Area, predominantly from Gorge/ Gully sites and Hillcrest/ Hillslope habitats. All of the specimens collected were classified as WAM categories A (Juvenile) and E (Research and Expertise), and hence the taxon is regarded as a Potential SRE.

Karaops sp. indet.

Seven specimens of this taxon were recorded from four sites (SMRC-001, SMRC-020, SMRC-036 and SMRC-105) the former two being Gorge/ Gully habitats and the latter two being Hillcrest/ Hillslope habitats. The database searches yielded only one record of *Karaops* sp. indet from one location in the database search. Molecular analysis would be required to align the specimen from the Study Area with this record (Figure 4.6). Molecular analysis would also be helpful in relating the seven specimens with each other as the sites where they occurred are spread throughout the Study Area indicating they may be spread beyond the Study Area as well. This taxon is regarded as a Potential SRE (WAM Categories 'A' Data deficient and 'E' Research and Expertise) but molecular analysis is required to define this specimen further.

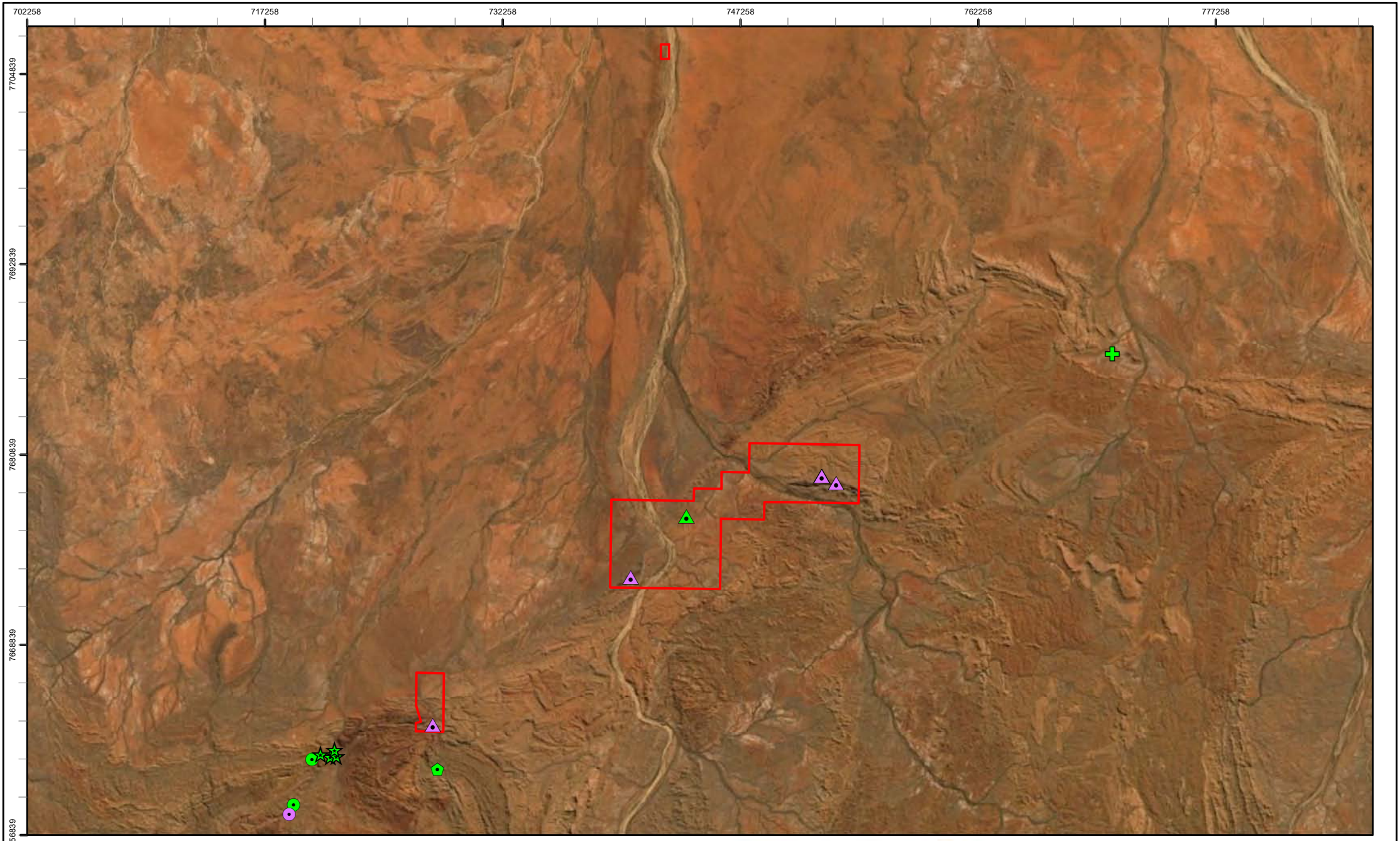
4.4.3 Pseudoscorpiones: Garypidae

Synsphyronus '8/2 wide pilbara'

Two specimens (one male and one female) of this taxon were collected from SMRC-016, a Sandy/ Stony Plain habitat type (Figure 4.7: Potential SRE invertebrates recorded within, and within the vicinity of, the Study Area (Pseudoscorpiones and Scorpiones). The taxonomy of this specimen suggests that it might be different from the other specimens of *S.* '8/2'; however, the Study Area specimens are from a habitat type that is found throughout the Study Area and beyond. This taxon is regarded as a Potential SRE (WAM Categories 'A' Data deficient 'and 'E' Research and Expertise) but molecular analysis is required to define these specimens further.

Table 4.14: Potential SRE specimens collected during the survey

Class	Order	Family	Lowest ID	Gorge/ Gully	Hillcrest/ Hillslope	Major Drainage Line	Sandy/ Stony Plain	Low Stony Hills	Grand Total
Arachnida	Araneae	Nemesiidae	*Aname* sp. indet.				1		1
		Selenopidae	*Karaops* sp. indet.	5	2				7
	Pseudoscorpiones	Garypidae	*Synsphyronus* '8/2 wide pilbara'				2		2
		Hyidae	*Indohya* sp. indet.		1				1
		Olpiidae	*Beierolpium* '8/4'		1				1
			Genus 7/4' sp.		9				9
			Indolpium sp. indet.	3			1		4
			Olpiidae sp. indet.	2	5	1		1	9
			Xenolpium sp. indet.	2	1				3
	Scorpiones	Buthidae	*Lychas 'bituberculatus* complex'	2					2
Gastropoda	Eupulmonata	Charopidae	Charopidae sp. A	5	2				7
			Charopidae sp. B	2		1			3
		Succineidae	Australosuccinea sp.			9			9
Malacostraca	Isopoda	Armadillidae	*Buddelundia* sp. 10				3		3
			Buddelundia sp. 11	1	1				2
			Buddelundia sp. indet.	1					1
			Buddelundia sp. indet. `1848`				14		14
		Philosciidae	Philosciidae sp. indet.		1				1
Grand Total				**23**	**23**	**11**	**21**	**1**	**79**



Legend

Study Area

Current survey

- Aname, 'sp. indet'
- Karaops, 'sp. indet'

WAM records

- Aname, `MYG001 group`
- Aname, `MYG099`
- Aname, `sp. indet. (female?)`
- Aname, mellosa
- Karaops, `sp. indet. (juvenile)`

N

1:300,000

0 3.5 7 14 km

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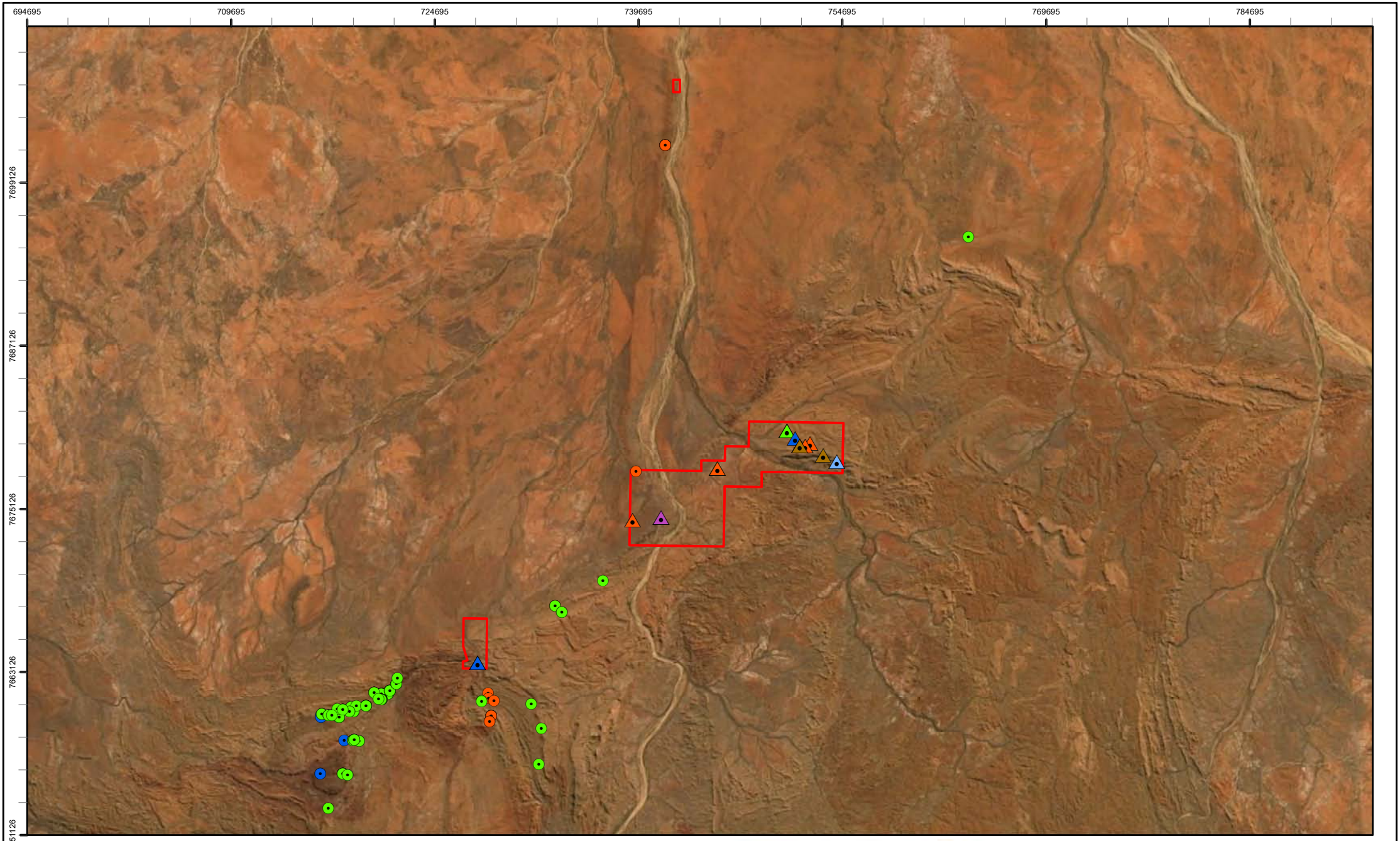
Figure 4.6: Potential SRE invertebrates recorded within the Study Area (Mygalomorphae and Araneomorphae) and corresponding database records

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

Size A4, Created 2/09/2019



Legend

Study Area

Current survey

- Genus 7/4, 'sp. indet'
- Beierolpium, 'sp. indet'
- Indohya, 'sp. indet'
- Indolpium, 'sp. indet'
- Synsphyronus, 'sp. indet'
- Xenolpium, 'sp. indet'
- Lychas, 'bituberculatus complex'

WAM records

- Beierolpium, 'sp. 8/3'
- Indohya, 'PSE002'
- Indolpium, 'sp. indet'
- Synsphyronus, 'PSE093, 8/1 Pilbara'
- Lychas, `bituberculatus complex`

biologic Environmental Survey

N

1:350,000

0 4 8 16 km

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Miralga Creek Project Level 2 Terrestrial Fauna and SRE Assessment

Figure 4.7: Potential SRE invertebrates recorded within the Study Area (Pseudoscorpiones and Scorpiones) and corresponding database records

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

Size A4, Created 2/09/2019

4.4.4 Pseudoscorpiones: Hyidae

Indohya sp. indet.

A single specimen of this taxon was collected from a Hillcrest/ Hillslope habitat (Figure 4.7). The male specimen was collected through sieving leaf litter at a seep located in the middle of the hillslope. *Indohya* is not commonly collected in SRE invertebrate surveys, the genus is more often encountered in subterranean fauna surveys where it is generally considered a SRE. In the Pilbara, only one species is known from epigean habitats, *Indohya* 'PSE002'. *Indohya* 'PSE002' occurs within 40 km area of the Study Area; however, the morphology of the specimen from the Study Area indicates that it may be different to *I*. 'PSE002', due to its longer pedipalps. Sequencing would be required to confirm this.

This taxon is regarded as a Potential SRE (WAM Categories 'A' Data deficient, 'B' Habitat Indicators, and 'E' Research and Expertise) but molecular analysis is required to define these specimens further.

4.4.5 Pseudoscorpiones: Olpiidae

Twenty-six specimens of Olpiidae were collected in the Study Area all of which were considered as representing potential SRE species. In the past, *Euryolpium* and most *Beierolpium* have been considered to be widespread but recent molecular sequencing data suggests these genera are more diverse and may contain SRE species. *Euryolpium* can look very similar to *Indolpium* and relies on the presence of adult females to confirm identifications and even then, no recent taxonomic revisions have been carried out in Australia. Recent sequencing of another olpiid genus *Xenolpium*, has also illustrated that this group contains a number of species with the potential to be SRE.

Beierolpium '8/4

A single female specimen from this taxon was collected from leaf litter at SMRC-032, comprising Hillcrest/ Hillslope habitat (Figure 4.7). While *Beierolpium* species used to be considered generally widespread, recent molecular evidence suggest a more cautious approach is required for Pilbara specimens. It is possible that this specimen may be the same as one other *B*. 8/4 specimen identified in the WAM database outside of the Study Area, however, molecular sequencing would be required to confirm this.

This taxon is regarded as a Potential SRE (WAM Categories 'A' Data deficient, 'B' Habitat Indicators, and 'E' Research and Expertise) but molecular analysis is required to define this specimen further.

'Genus 7/4'

Nine specimens (6 males, 1 female, 2 juveniles) were collected also from SMRC-032. All specimens were collected from leaf litter at this Hillcrest/ Hillslope habitat (Figure 4.7).

This taxon is regarded as a Potential SRE (WAM Categories 'A' Data deficient, 'B' Habitat Indicators, and 'E' Research and Expertise) but molecular analysis is required to define these specimens further.

Indolpium sp. indet.

Three specimens of this taxon were recorded at two Gorge/Gully and one Sandy/Stony Plain habitat type sites (SMRC-020, SMRC-106 and SMRC-101 respectively) within leaf litter and rocks. The genus *Indolpium* is found throughout the Pilbara and is poorly known taxonomically; however, it is regarded as likely to contain SRE species. Molecular work would be required to determine if all three specimens represent the one taxon and/or if they align with other *Indolpium* records in the local area (190 records from a variety of locations to the south of the Study Area) (Figure 4.7).

This taxon is regarded as a Potential SRE (WAM Category 'A' Data Deficient and 'E' Research and Expertise) but molecular analysis is required to define these specimens further.

Xenolpium sp. indet.

Three specimens of this taxon were recorded from two sites, SMRC-021 a Gorge/ Gully habitat and SMRC-105, a Hillcrest/ Hillslope habitat. The genus *Xenolpium* is found throughout the Pilbara and is poorly known taxonomically; however, it is regarded as likely to contain SRE species. Molecular work would be required to determine if these specimens align with other Olpiidae records within the local area (Figure 4.7).

This taxon is regarded as a Potential SRE (WAM Category 'A' Data Deficient and 'E' Research and Expertise) but molecular analysis is required to define these specimens further.

Olpiidae sp. indet.

Nine specimens from this family were recorded from seven sites representing a variety of habitat types (Figure 4.7). These specimens most likely represent multiple species of either *Indolpium* or *Euryolpium* both of which contain Potential SRE taxa.

This taxon is regarded as a Potential SRE (WAM Category 'A' Data Deficient and 'E' Research and Expertise) but molecular analysis is required to define these specimens further.

4.4.6 Scorpiones: Buthidae

Lychas 'bituberculatus complex'

Two specimens (one female and one juvenile) of this taxon were collected from a single site, SMRC-001 within Gorge/ Gully habitat. This taxon is currently regarded as part of a large species complex found throughout the Pilbara and is considered likely to contain SRE species. Eight records from this species group occur in the WAM database, all located to the south of the Study Area (Figure 4.7). It is possible that some of these records could be the same as the species recorded within the Study Area; however, molecular sequencing would be required to confirm this.

This taxon is regarded as a Potential SRE (WAM Category 'A' Data Deficient and 'E' Research and Expertise) but molecular analysis is required to define these specimens further.

4.4.7 Gastropoda: Charopidae

Charopidae are not usually encountered in Pilbara surveys and little is known about the family in Western Australia. Stanisic *et al.* (2017) identified numerous species with small distributions in Queensland, hence the WA Museum considers this group as potentially containing SRE species in WA as well. Sequencing would most likely be required for taxonomic understanding of this group and live individuals would be required for sequencing. Only dry shells were collected in this current survey.

Charopidae sp. A

Seven shells of this snail group were collected from two Hillcrest/ Hillslope sites, SMRC-034 and SMRC-102 and one Gorge/ Gully site SMRC-001.

This taxon is regarded as a Potential SRE (WAM Categories 'A' Data deficient, 'B' Habitat Indicators, 'C' Morphology Indicators and 'E' Research and Expertise) and further specimens are required to define this specimen further.

Charopidae sp. B

Three shells of this snail group were collected from two sites, SMRC 001 (Gorge/ Gully) and SMRC-004 (Major Drainage Line) (Figure 4.8).

This taxon is regarded as a Potential SRE (WAM Categories 'A' Data deficient, 'B' Habitat Indicators, 'C' Morphology Indicators and 'E' Research and Expertise) and further specimens are required to define this specimen further.

4.4.8 Gastopoda: Succineidae

Australosuccinea sp. indet.

Nine shells of this snail family were collected from three Major Drainage sites SMRC-004, SMRC010 and SMRC-023. This family is poorly known in the Pilbara, hence very little can be said about the group and their potential to contain SRE species. However, their predominant occurrence in Major Drainage habitat would indicate that they may be able to disperse further beyond the Study Area.

This taxon is regarded as a Potential SRE (WAM Categories 'A' Data deficient, 'B' Habitat Indicators, 'C' Morphology Indicators and 'E' Research and Expertise) and further specimens are required to define this specimen further.

4.4.9 Isopoda: Armadillidae

Buddelundia '10'

Three specimens (one male and two female) of this taxon were recorded from SMRC-019 in a pitfall trap within Sand/ Stony Plain habitat (Figure 4.8). *Buddelundia* '10' is regarded as a species complex likely to contain species with restricted distributions (S. Judd pers. comm.).

This taxon is regarded as a Potential SRE (WAM Categories 'A' Data deficient and 'E' Research and Expertise).

Buddelundia '11'

Two female specimens of this taxon were recorded from sites SMRC-001 and SMRC-105 in leaf litter and under rocks respectively within Gorge/ Gully and Hillcrest/ Hillslope habitats (Figure 4.8). *Buddelundia* '11' is regarded as a species complex containing species with restricted distributions (S. Judd pers. comm.). Thirty-six records of this species complex occur in the WAM database and were collected to the south of the Study Area. This indicates that while this species is a potential SRE, its distribution likely extends beyond the Study Area.

This taxon is regarded as a Potential SRE (WAM Categories 'A' Data deficient, 'B' Habitat Indicators and 'E' Research and Expertise).

Buddelundia sp. indet. '1848'

Fourteen specimens (seven male and seven female) of this taxon were recorded at site SMRC-019 in a pitfall trap within Sandy/ Stony Plain (Figure 4.8). This taxon does not appear to have been recorded before and further taxonomic resolution is ongoing. This taxon is regarded as a Potential SRE (WAM Categories 'A' Data deficient and 'E' Research and Expertise).

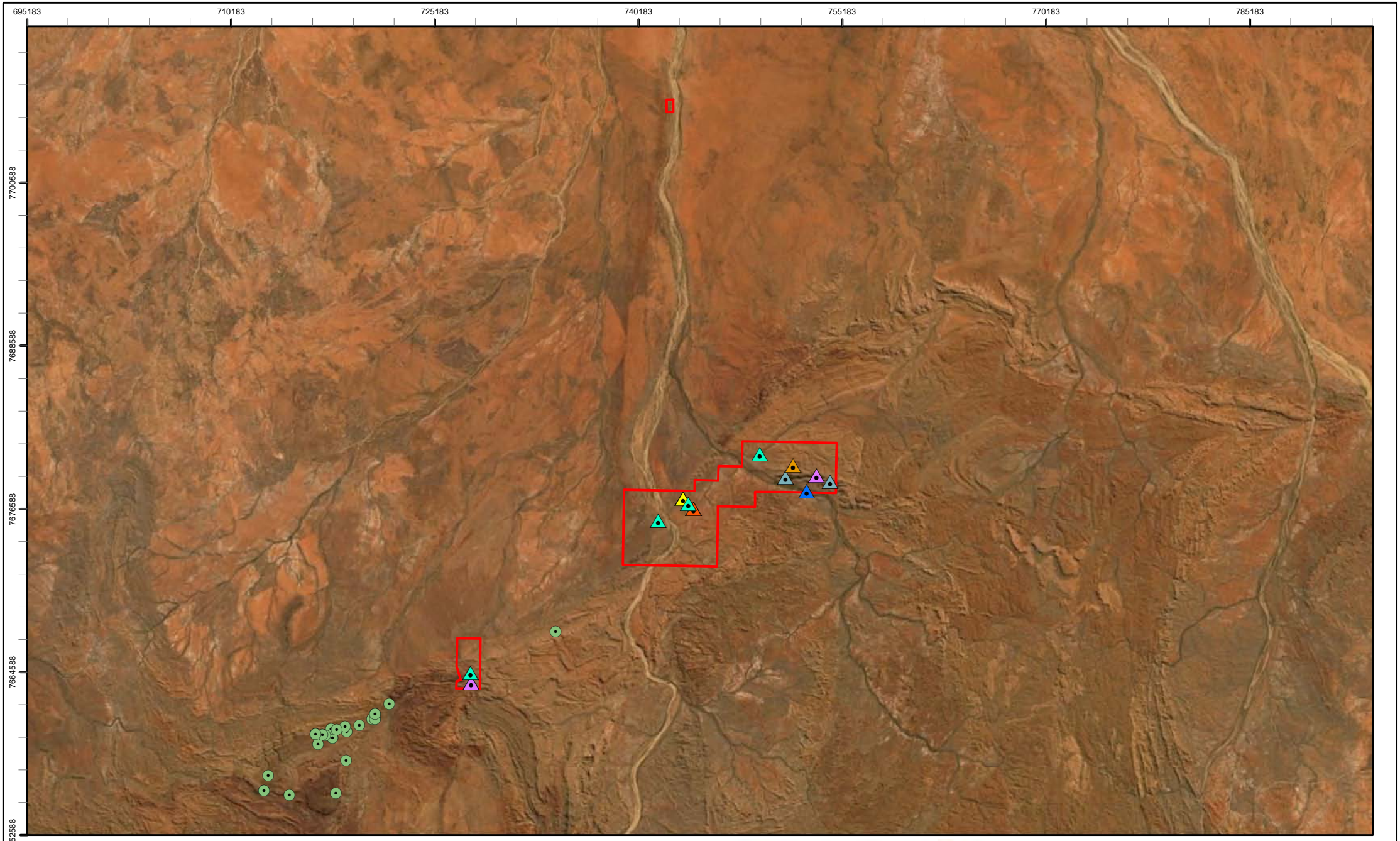
Buddelundia sp. indet.

A single, very small, juvenile specimen of *Buddelundia* was recorded from site SMRC-022, a Gorge/ Gully site. It was not possible to identify to species due to age. This taxon is regarded as a Potential SRE (WAM Categories 'A' Data deficient and 'E' Research and Expertise).

Philosciidae sp. indet.

One specimen of this taxon was recorded from site SMRC-034 under rocks within Hillcrest/ Hillslope habitat (Figure 4.8). This individual was regarded as unusual as it shows troglobitic (subterranean) characteristics, including elongated body, lacking pigment, reduced eyes and conspicuous scale-setae (S. Judd *pers. comm*.). While this taxon is likely to have a restricted distribution, the specimen is similar to Philosciidae specimens collected during the subterranean fauna surveys undertaken within the Study Area (Biologic 2019) which are likely to occupy the interstitial spaces just below the ground surface. Further work to confirm if it represents the same species is continuing.

This taxon is regarded as a Potential SRE (WAM Categories 'A' Data deficient, 'B' Habitat Indicators, 'C' Morphology Indicators and 'E' Research and Expertise).



Legend

- Study Area

Current Survey

- Buddelundia sp. 10
- Buddelundia sp. 11
- Buddelundia sp. indet.
- Buddelundia sp. indet. 1848
- Buddelundia sp. mw
- Charopidae sp. A
- Charopidae sp. B

WAM records

- Buddelundia, 11

biologic Environmental Survey

N

1:350,000

0 4 8 16 km

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Miralga Creek Project Level 2 Terrestrial Fauna and SRE Assessment

Figure 4.8: Potential SRE invertebrates recorded within the Study Area (Isopoda and Gastropoda) and corresponding database records

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

Size A4, Created 2/09/2019

4.5 Fauna Survey Adequacy

4.5.1 Potential Limitations and Constraints

EPA Guidance Statement No. 56 (EPA, 2016d) outlines several potential limitations that may be encountered during terrestrial fauna surveys. These aspects are assessed and discussed in Table 4.15 below. With respect to EPA (2016d), no major limitations were identified for the survey.

Table 4.15: Survey limitations and constraints

Potential limitation or constraint	Limitation to current survey	Applicability to this survey
Experience of personnel	No	The field personnel involved in the survey collectively had over 40 years of fauna survey experience in the Pilbara region and more broadly throughout Western Australia.
Scope (faunal groups sampled and whether any constraints affect this)	No	The scope was a Level 2 survey and was conducted within that framework. All trapping methods were able to be undertaken as expected to sample all target fauna groups. One baseline trapping season was undertaken, followed by a targeted survey.
Proportion of fauna identified or collected	No	Approximately 49% of vertebrate fauna identified in the desktop assessment were recorded during the field survey. Although the desktop assessment is likely to overestimate the number of species occurring within the Study Area, appropriate sampling was undertaken to adequately sample all fauna groups, particularly regarding species of conservation significance. Apart SRE specimens, all observed fauna was identified at the point of observation during the field surveys. All recorded bat calls were analysed, and species identified by an external expert. Consultation with external taxonomists was undertaken to confirm species identifications for SRE groups collected during the field surveys.
Sources of information (recent or historic) and availability of contextual information	No	Numerous other surveys of similar scope providing contextual information have been undertaken within close proximity to the Study Area and more broadly across the region dating back to 1991.
Proportion of the task achieved	No	A two-phase Level 2 (single-season pit trapping and targeted) survey of the Study Area was completed as planned. Additional targeted surveys may be undertaken at a later date where considered necessary.
Timing / weather / season / cycle	No	Climactic conditions in during and preceding the field surveys were consistent with long-term averages. Cyclonic activity in the broader region during March 2019 resulted in above average rainfall within the Study Area with water persisting in some areas during Phase 1 of the survey.
Disturbances (e.g. fire or flood)	No	No disturbance occurred during the survey; however, recent fires through large sections of the Study Area resulted in a decreased vegetation cover and habitat complexity in some areas. This is likely to have influenced the overall diversity and abundance of species at these sites; however, survey effort largely focused on unburnt representatives of these habitats where possible.

Potential limitation or constraint	Limitation to current survey	Applicability to this survey
Intensity of survey	No	A two-phase Level 2 (single-season pit trapping and targeted) survey was identified by Biologic as the requirement for this survey. The trapping intensity, targeted searches, acoustic recordings and avifauna censuses were assessed as sufficient to meet this Level of survey for the size of the Study Area.
Completeness of survey	No	The survey achieved enough coverage of the Study Area and associated habitats through the survey techniques employed and the habitat assessments undertaken for the two phases of the survey.
Resources (e.g. degree of expertise available)	No	All relevant resources and expertise required to complete the survey were available.
Remoteness or access issues	No	The Study Area was largely accessible either by vehicle or on foot, thus the sampling techniques used during this survey were unconstrained by accessibility or remoteness. No access across the Shaw River meant less time for targeted searches but did not affect the overall survey effort and recorded species assemblages. Access to more remote areas was facilitated by the use of a drone to undertake map the extent of fauna habitats and determine the requirement for targeted sampling within the Study Area.
Availability of contextual information on the region	No	Fauna assemblages of the Pilbara region are fairly well document, particularly for vertebrate fauna groups. All contextual resources required to complete the survey were available (previous surveys, database searches, environmental information, climate data etc.)

4.6 SRE Invertebrate Fauna Survey Assumptions and Limitations

There are several general limitations regarding the completeness of SRE fauna surveys, particularly with regard to the target fauna living in cryptic habitats, occurring in low numbers, and being difficult to detect. Despite this, it is not considered that the survey detailed herein suffered from any specific constraints in relation to the number of samples, the coverage of SRE habitat types or the sampling and preservation methods used to detect the target fauna.

The identification of SRE species, the interpretation of species' distributions and the resulting categorisation of their respective SRE status is dependent on the current state of taxonomic and ecological knowledge of the target groups at the time of survey. Owing to ongoing developments in regional sampling coverage and taxonomic information, the SRE status, distributions and habitat preferences of the taxa described herein may be subject to change over time. A number of SRE taxa comprising juvenile and female specimens (Selenopidae spiders and Olpiidae pseudoscorpions etc), were unable to be conclusively identified as they did not have the diagnostic features for identification which are only apparent on adult males.

5 SUMMARY

5.1 Vertebrate Fauna

Six broad fauna habitats were recorded and mapped within the Study Area, comprising, in decreasing order of extent, Low Stony Hills, Stony Plain, Sandy Plain, Major Drainage Line, Hillcrest/Hillslope and Gorge/Gully habitats. Low Stony Hills and Stony Plains were the dominant broad fauna habitats within the Study Area, equally occupying approximately 33.0% and 29.1% respectively, followed by Sandy Plain (19.6%), Major Drainage (12.7%), Hillcrest/Hillslope (5.5%) and Gorge/Gully (0.1%) habitats (Figure 4.3; Table 4.4).

Three habitats were deemed to be of relatively high significance for vertebrate fauna, Gorge/Gully, Hillcrest/Hillslope and Major Drainage. These habitats were considered to be of high significance due to their potential to provide habitat and/or resources for a range of species of conservation significance and relatively uncommon or sparsely distributed occurrence within the Study Area. The remaining three habitats were deemed to be of moderate to low significance, particularly due to their provision of suitable habitat to fewer conservation significant species and their relatively common and widespread distribution, both within the Study Area and more broadly within the Pilbara region.

A total of 154 vertebrate fauna species were recorded within the Study Area during the current survey, comprising 24 native and four introduced mammal species, 84 birds, 39 reptiles, and three amphibian species. This comprises approximately 45% of the 343 species identified in the desktop assessment as potentially occurring; however, the number of species recorded is comparable to other surveys of high dneequivalent scope in the vicinity of the Study Area. The number of species identified in the desktop review is likely to overestimate the number of species potentially occurring, based on the large search area of the desktop assessment, which is likely to encompass habitats not encountered within the Study Area.

Of the 38 species of conservation significance identified in the desktop assessment as potentially occurring within the Study Area, seven were recorded during the current survey (Table 4.8; Figure 4.5). This comprised five mammal species (Northern Quoll, Pilbara Leaf-nosed Bat, Ghost Bat, Northern Brushtail Possum, Western Pebble-mound Mouse) and two bird species (Grey Falcon and Peregrine Falcon), all of which were recorded within the main Study Area encompassing the Miralga East, Miralga West and Sandtrax orebodies.

A further three conservation significant species identified in the desktop review are considered Likely to occur and 18 as Possible (Table 4.9). Occurrence of the remaining ten species are considered as Rarely, Unlikely or Highly Unlikely, particularly due to absence of suitable habitat within the Study Area. Conservation significant species recorded or likely to occur in the Study Area are likely to reside in the study area on a permanent basis. It is considered that the Northern Quoll is a permanent high density population that resides within the Study Area. Ghost Bat is also likely to be permanent with potential maternity cave in the Study Area. PLNB may/ or may not be permanently roosting (CMRC-15) but is likely to utilise the Study Area most nights

for foraging. Northern Brushtail Possum and Grey Falcons are also considered to reside within the Study Area.

While all broad fauna habitat mapped within the Study Area have the potential to support species of conservation significance, the high number of records from Gorge/Gully, Hillcrest/Hillslope and Major Drainage habitats highlights their significance for any local populations of conservation significant species. These habitats are of particular importance for species such as Northern Quoll, Pilbara Leaf-nosed Bat and Ghost Bat, which were all recorded within these habitats in relatively high abundance locally compared to other habitats within the Study Area. The assemblage of species recorded in the Study Area is typical for the Pilbara, with no unusual or unexpected species being recorded and all species having been recorded in the area by at least two previous surveys considered in the literature review (Appendix C).

5.2 SRE Invertebrate Fauna

Of the same six broad fauna habitats recorded and mapped within the Study Area for the vertebrate fauna assessment, only one was deemed to be of high suitability for SRE invertebrate fauna; this was the Gorge/ Gully habitat. The Gorge or Gully habitats are the most restricted in the Study Area (covering <0.2%) and the most likely to contain SRE taxa due to the high level of protection and restricted nature. The next habitat type of significance was Hillcrest/ Hillslope, regarded as being moderate to high suitability for SRE invertebrate fauna. The Hilltop, Hillslope, Ridge or Cliff habitats generally appear largely unsuitable for SRE invertebrate fauna apart from the occasional smaller rocky gully, ridge or outcropping not captured within the Gorge/ Gully habitat. For this reason, these habitats are mapped slightly differently for SRE invertebrate (see SRE Invertebrate Fauna Impact Assessment, Biologic, in prep.). However, recent studies have shown that there appears to be a reliance on the upper slopes and hillcrests of these types of habitats by two Priority 1 millipede species (*Antichiropus* 'DIP006' and *Antichiropus*. 'DIP007') in other areas of the Pilbara. The database searches showed that confirmed SRE species *Antichiropus forcipatus* and *Antichiropus apricus* occur to the south-west of the Study Area. While no millipedes were collected in the current survey, it cannot be assumed that this group would not occur in the Study Area.

The remaining habitat types (Drainage Area, Sandy Plains, Stony Plains and Low Stony Hills) were moderate to low suitability for SRE invertebrates and covered more than 80% of the Study Area. These four habitat types extended well beyond the Study Area and more broadly within the Pilbara region as well. The connection of these habitats with each other will reduce the chance of any SRE fauna being restricted to the local area; hence while it is likely that this habitat will contain SRE invertebrate fauna, it is unlikely that any SRE fauna would be restricted to any individual patch of this habitat as dispersal between adjacent patches would be unhindered during the cooler times of the year.

The desktop assessment identified a total of 705 invertebrate records that belonged to taxonomic groups prone to short-range endemism: 27 mygalomorph spiders, one selenopid spider, 294 pseudoscorpions, 187 scorpions, 67 myriapods, nine gastropods and 120 isopods. Of these, four taxa are regarded as Confirmed SRE, although none are currently known from

within the Study Area: one pseudoscorpion (*Faella tealei*), two millipedes (*Antichiropus apricus* and *Antichiropus forcipatus*) and one gastropod (Camaenidae Gen. nov. cf. `Z` n. sp.).

A total of 184 invertebrate fauna specimens were collected within the Study Area during the current survey, including one mygalomorph spider, seven selenopid spiders, 48 pseudoscorpions, eight scorpions, 90 snails and 29 isopods. From these specimens, 27 taxa were identified, of which 18 are currently regarded as representing Potential SRE species. Two are currently regarded as likely to be significant with respect to the Study Area, i.e. they have a higher likelihood of being restricted to the Study Area or the local area; these are *Karaops* sp. indet. and *Indohya* sp. indet. A further two taxa could be of taxonomic interest based on the general data available on the genus for the Pilbara; these were *Aname* sp. indet. and *Xenolpium* sp. indet.

The seven *Karaops* specimens occurred in Gorge/ Gully and Hillcrest/ Hillslope habitats. If they are all representative of the same species, it could be extrapolated that the species is spread through the Study Area. The specimens could also potentially be aligned with the one indeterminate species known from the Abydos area to the southwest. Molecular analysis would be required to align the specimens from the Study Area with each other and to previous records

The *Indohya* sp. indet pseudoscorpion is of interest as it only one specimen was collected at one Hillcrest/ Hillslope site SMRC-034. This site had a seep coming directly from the cliff face and moisture was evident on the rocks and the leaf litter (Plate 3). Incidentally, this site also yielded the single specimen of the isopod Philiosciidae sp. indet., a potential troglobite. As *Indohya* is not commonly collected in SRE invertebrate surveys, and the closest record of the genus, *Indohya* ‘PSE002’ appears to be morphologically different, sequencing would be required to confirm its identity.

Plate 3: SMRC-034 SRE invertebrate fauna site had a seep coming from the rock face.

Aname sp. indet. is a morphologically distinctive species and does not appear to have been previously collected based on comparisons with WA Museum specimens. Given the relatively low number of Nemesiidae records within 40 km of the Study Area this may illustrate that this species could be locally restricted. Molecular analysis may align this taxon with other Nemesiidae in the local area (10 specimens) including the widespread *Aname mellosa.*

Currently, the olpiid pseudoscorpion genus *Xenolpium* is demonstrating high rates of cryptic species diversity in the Pilbara. As this genus was not recorded in the database searches, its occurrence in the highly suitable Gorge/Gully habitat could indicate its potential for being a SRE.

Taking into account the extent of the most suitable habitats for SRE invertebrate fauna in the Study Area (Gorge/Gully and Hillcrest/Hillslope), and the Potential SRE fauna recorded within these habitats, the Potential SRE taxa most likely to be wholly or largely restricted to the Study Area are the following:

- *Karaops* sp. indet.;
- *Xenolpium* sp. indet.;
- *Indolpium* sp. indet.;
- *Indohya* sp. indet.;
- Charopidae sp.A; and
- Charopidae sp.B.

All the other habitats within the Study Area are regarded as lower suitability for SRE fauna and appear to extend well beyond the Study Area, and hence any fauna that require these habitats

are highly likely to extend well throughout the local area. The Gorge/Gully and Hillcrest/Hillslope habitats do extend beyond the Study Area, but only for what appears to be a short distance, and connectivity with similar habitats in the local area appears restricted with major drainage lines to the west and south, and low hills and plains to the north and east. Those taxa recorded within the Gorge/Gully and Hillcrest/Hillslope, outlined above, can be regarded as likely to at least extend outside of the Study Area to the east, as far as the extent of the habitat; however, their extent beyond this is unclear. Further molecular work may help to align the first three of these taxa with specimens collected in the local area; however, the last three have no capacity to undertake this due to a lack of regional specimens (*Indohya* sp. indet.) or a lack of live specimens (Charopidae sp. and sp.B).

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7 APPENDICES

Appendix A: Conservation Status Codes

International Union for Conservation of Nature

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

Environment Protection and Biodiversity Conservation Act 1999

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

Biodiversity Conservation Act 2016

Category	Definition
CR	Rare or likely to become extinct, as *critically endangered* fauna.
EN	Rare or likely to become extinct, as *endangered* fauna.
VU	Rare or likely to become extinct, as *vulnerable* fauna.
EX	Being fauna that is presumed to be extinct.
MIG	Birds that are subject to international agreements relating to the protection of migratory birds.
CD	Special conservation need being species dependent on ongoing conservation intervention. (Conservation Dependant)
OS	In need of special protection, otherwise than for the reasons pertaining to Schedule 1 through to Schedule 6 Fauna. (Other specially protected species

Department of Biodiversity, Conservation and Attractions Priority codes

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

Appendix B: Locations of Vertebrate Fauna Sampling Sites

Site	Start Date	End Date	Method	Habitat	Latitude	Longitude
VLRM-01	21/07/2019	30/07/2019	Motion Camera (individual)	Stony Plain	-21.05086177	119.2765032
VLRM-01	14/05/2019	30/07/2019	Ultrasonic recorder	Stony Plain	-21.05086177	119.2765032
VLRM-01	14/05/2019	14/05/2019	Habitat Assessment	Stony Plain	-21.05086177	119.2765032
VMRC-01	09/05/2019	15/05/2019	Motion Camera (individual)	Low Stony Hills	-21.1055176	119.192479
VMRC-01	09/05/2019	10/05/2019	Ultrasonic recorder	Low Stony Hills	-21.1055176	119.192479
VMRC-01	09/05/2019	9/05/2019	Habitat Assessment	Low Stony Hills	-21.1055176	119.192479
VMRC-01	09/05/2019	16/05/2019	Bird census	Low Stony Hills	-21.1055176	119.192479
VMRC-01	09/05/2019	16/05/2019	Systematic trapping	Low Stony Hills	-21.1055176	119.192479
VMRC-02	10/05/2019	15/05/2019	Motion Camera (individual)	Low Stony Hills	-21.01150308	119.3129591
VMRC-02	10/05/2019	12/05/2019	Ultrasonic recorder	Low Stony Hills	-21.01150308	119.3129591
VMRC-02	10/05/2019	10/05/2019	Habitat Assessment	Low Stony Hills	-21.01150308	119.3129591
VMRC-02	10/05/2019	17/05/2019	Bird census	Low Stony Hills	-21.01150308	119.3129591
VMRC-02	10/05/2019	17/05/2019	Systematic trapping	Low Stony Hills	-21.01150308	119.3129591
VMRC-03	10/05/2019	16/05/2019	Acoustic recorder	Stony Plain	-20.98818	119.3083658
VMRC-03	10/05/2019	12/05/2019	Ultrasonic recorder	Stony Plain	-20.98818	119.3083658
VMRC-03	10/05/2019	10/05/2019	Habitat Assessment	Stony Plain	-20.98818	119.3083658
VMRC-03	10/05/2019	17/05/2019	Bird census	Stony Plain	-20.98818	119.3083658
VMRC-03	10/05/2019	17/05/2019	Systematic trapping	Stony Plain	-20.98818	119.3083658
VMRC-04	13/07/2019	20/07/2019	Acoustic recorder	Sandy Plain	-20.9920598	119.345692
VMRC-04	14/05/2019	19/05/2019	Acoustic recorder	Sandy Plain	-20.9920598	119.345692
VMRC-04	12/07/2019	19/05/2019	Systematic trapping	Sandy Plain	-20.9920598	119.345692
VMRC-04	10/05/2019	10/05/2019	Habitat Assessment	Sandy Plain	-20.9920598	119.345692
VMRC-04	12/05/2019	19/05/2019	Bird census	Sandy Plain	-20.9920598	119.345692
VMRC-05	11/05/2019	18/05/2019	Systematic trapping	Major Drainage Line	-20.9701679	119.389716
VMRC-05	11/05/2019	14/05/2019	Ultrasonic recorder	Major Drainage Line	-20.9701679	119.389716

Site	Start Date	End Date	Method	Habitat	Latitude	Longitude
VMRC-05	17/07/2019	21/07/2019	Ultrasonic recorder	Major Drainage Line	-20.9701679	119.389716
VMRC-05	11/05/2019	11/05/2019	Habitat Assessment	Major Drainage Line	-20.9701679	119.389716
VMRC-05	11/05/2019	18/05/2019	Bird census	Major Drainage Line	-20.9701679	119.389716
VMRC-06	11/05/2019	18/05/2019	Systematic trapping	Low Stony Hills	-20.9606419	119.4161792
VMRC-06	15/05/2019	18/05/2019	Ultrasonic recorder	Low Stony Hills	-20.9606419	119.4161792
VMRC-06	11/05/2019	11/05/2019	Habitat Assessment	Low Stony Hills	-20.9606419	119.4161792
VMRC-06	11/05/2019	18/05/2019	Bird census	Low Stony Hills	-20.9606419	119.4161792
VMRC-07	11/05/2019	18/05/2019	Systematic trapping	Hillcrest/ Hillslope	-20.9727165	119.4372781
VMRC-07	14/05/2019	16/05/2019	Ultrasonic recorder	Hillcrest/ Hillslope	-20.9727165	119.4372781
VMRC-07	11/05/2019	11/05/2019	Habitat Assessment	Hillcrest/ Hillslope	-20.9727165	119.4372781
VMRC-07	11/05/2019	18/05/2019	Bird census	Hillcrest/ Hillslope	-20.9727165	119.4372781
VMRC-08	12/05/2019	19/05/2019	Systematic trapping	Major Drainage Line	-21.11276531	119.1936621
VMRC-08	17/05/2019	19/05/2019	Motion Camera (individual)	Major Drainage Line	-21.11276531	119.1936621
VMRC-08	12/05/2019	15/05/2019	Ultrasonic recorder	Major Drainage Line	-21.11276531	119.1936621
VMRC-08	12/05/2019	12/05/2019	Habitat Assessment	Major Drainage Line	-21.11276531	119.1936621
VMRC-08	12/05/2019	19/05/2019	Bird census	Major Drainage Line	-21.11276531	119.1936621
VMRC-09	12/05/2019	20/05/2019	Acoustic recorder	Stony Plain	-21.08567232	119.1918921
VMRC-09	12/05/2019	12/05/2019	Habitat Assessment	Stony Plain	-21.08567232	119.1918921
VMRC-10	14/05/2019	18/05/2019	Targeted Camera Trapping - Northern Quoll	Low Stony Hills	-21.02323946	119.3191886
VMRC-10	14/05/2019	14/05/2019	Habitat Assessment	Low Stony Hills	-21.02323946	119.3191886
VMRC-11	12/05/2019	14/05/2019	Ultrasonic recorder	Stony Plain	-21.08930436	119.1870971
VMRC-11	12/05/2019	12/05/2019	Habitat Assessment	Stony Plain	-21.08930436	119.1870971
VMRC-12	15/05/2019	15/07/2019	Habitat Assessment	Low Stony Hills	-21.02255051	119.3007545
VMRC-13	12/05/2019	12/05/2019	Habitat Assessment	Major Drainage Line	-21.00261872	119.3253382
VMRC-14	15/05/2019	15/05/2019	Habitat Assessment	Low Stony Hills	-21.01640469	119.305695
VMRC-15	16/05/2019	19/05/2019	Motion Camera (individual)	Major Drainage Line	-21.00150841	119.3286566

Site	Start Date	End Date	Method	Habitat	Latitude	Longitude
VMRC-15	12/05/2019	12/05/2019	Habitat Assessment	Major Drainage Line	-21.00150841	119.3286566
VMRC-16	15/05/2019	18/05/2019	Motion Camera (individual)	Stony Plain	-21.01622796	119.3023758
VMRC-16	15/05/2019	15/05/2019	Habitat Assessment	Stony Plain	-21.01622796	119.3023758
VMRC-17	12/05/2019	12/05/2019	Habitat Assessment	Stony Plain	-21.08668083	119.1922766
VMRC-18	15/05/2019	15/05/2019	Habitat Assessment	Stony Plain	-20.99395762	119.3031478
VMRC-19	13/05/2019	13/05/2019	Habitat Assessment	Hillcrest/ Hillslope	-21.08846291	119.1967199
VMRC-20	15/05/2019	15/05/2019	Habitat Assessment	Stony Plain	-20.9961696	119.3003143
VMRC-21	13/05/2019	13/05/2019	Habitat Assessment	Major Drainage Line	-21.09958678	119.1872218
VMRC-22	16/05/2019	19/05/2019	Motion Camera (individual)	Major Drainage Line	-21.0005761	119.3309461
VMRC-22	16/05/2019	19/05/2019	Ultrasonic recorder	Major Drainage Line	-21.0005761	119.3309461
VMRC-22	16/05/2019	16/05/2019	Habitat Assessment	Major Drainage Line	-21.0005761	119.3309461
VMRC-23	13/05/2019	13/05/2019	Habitat Assessment	Gorge/ Gully	-21.10954531	119.1873388
VMRC-24	15/05/2019	18/05/2019	Motion Camera (individual)	Low Stony Hills	-21.11341181	119.1875315
VMRC-24	15/05/2019	18/05/2019	Ultrasonic recorder	Low Stony Hills	-21.11341181	119.1875315
VMRC-24	15/05/2019	15/05/2019	Habitat Assessment	Low Stony Hills	-21.11341181	119.1875315
VMRC-25	16/05/2019	13/05/2019	Habitat Assessment	Stony Plain	-20.99918202	119.3138617
VMRC-26	16/05/2019	18/05/2019	Motion Camera (individual)	Low Stony Hills	-20.96815355	119.4277737
VMRC-26	14/05/2019	16/05/2019	Habitat Assessment	Low Stony Hills	-20.96815355	119.4277737
VMRC-27	14/05/2019	18/05/2019	Targeted Camera Trapping - Northern Quoll	Major Drainage Line	-20.97815915	119.4088165
VMRC-27	14/05/2019	18/05/2019	Ultrasonic recorder	Major Drainage Line	-20.97815915	119.4088165
VMRC-27	17/05/2019	14/05/2019	Habitat Assessment	Major Drainage Line	-20.97815915	119.4088165
VMRC-28	14/05/2019	17/05/2019	Habitat Assessment	Hillcrest/ Hillslope	-21.09621197	119.1906722
VMRC-29	18/05/2019	14/05/2019	Habitat Assessment	Low Stony Hills	-20.97820329	119.3996488
VMRC-30	18/05/2019	20/05/2019	Ultrasonic recorder	Hillcrest/ Hillslope	-21.02703261	119.3127417
VMRC-30	14/05/2019	18/05/2019	Habitat Assessment	Hillcrest/ Hillslope	-21.02703261	119.3127417
VMRC-31	14/05/2019	19/05/2019	Acoustic recorder	Stony Plain	-20.96530769	119.3957584

Site	Start Date	End Date	Method	Habitat	Latitude	Longitude
VMRC-31	14/05/2019	14/05/2019	Habitat Assessment	Stony Plain	-20.96530769	119.3957584
VMRC-32	18/05/2019	18/05/2019	Habitat Assessment	Low Stony Hills	-21.01773601	119.3302526
VMRC-33	14/05/2019	19/05/2019	Acoustic recorder	Stony Plain	-21.01038221	119.3632744
VMRC-33	14/05/2019	14/05/2019	Habitat Assessment	Stony Plain	-21.01038221	119.3632744
VMRC-34	19/05/2019	15/05/2019	Targeted Camera Trapping - Northern Quoll	Hillcrest/ Hillslope	-20.9732457	119.4342533
VMRC-34	19/05/2019	19/05/2019	Habitat Assessment	Hillcrest/ Hillslope	-20.9732457	119.4342533
VMRC-35	14/05/2019	14/05/2019	Habitat Assessment	Stony Plain	-20.72603025	119.322506
VMRC-36	19/05/2019	19/05/2019	Habitat Assessment	Hillcrest/ Hillslope	-20.97610769	119.4477203
VMRC-37	14/05/2019	14/05/2019	Habitat Assessment	Stony Plain	-20.72883919	119.3242691
VMRC-39	13/05/2019	20/07/2019	Acoustic recorder	Stony Plain	-20.9526109	119.4071019
VMRC-39	15/05/2019	18/05/2019	Motion Camera (individual)	Stony Plain	-20.9526109	119.4071019
VMRC-39	15/05/2019	15/05/2019	Habitat Assessment	Stony Plain	-20.9526109	119.4071019
VMRC-41	15/05/2019	15/05/2019	Habitat Assessment	Stony Plain	-20.95979256	119.4041393
VMRC-43	15/05/2019	15/05/2019	Habitat Assessment	Stony Plain	-20.95785684	119.4042498
VMRC-45	15/05/2019	15/05/2019	Habitat Assessment	Sandy Plain	-20.97658636	119.3879044
VMRC-47	15/05/2019	15/05/2019	Habitat Assessment	Sandy Plain	-20.98326151	119.3763896
VMRC-49	15/05/2019	15/05/2019	Habitat Assessment	Sandy Plain	-20.98943927	119.3600919
VMRC-51	15/05/2019	15/05/2019	Habitat Assessment	Sandy Plain	-20.99465143	119.3445015
VMRC-53	15/05/2019	15/05/2019	Habitat Assessment	Sandy Plain	-20.99801102	119.3342746
VMRC-55	15/05/2019	15/05/2019	Habitat Assessment	Sandy Plain	-20.99433426	119.3530235
VMRC-57	15/05/2019	15/05/2019	Habitat Assessment	Stony Plain	-20.99379547	119.3341748
VMRC-59	16/05/2019	16/05/2019	Habitat Assessment	Stony Plain	-21.00350209	119.3246485
VMRC-61	16/05/2019	16/05/2019	Habitat Assessment	Low Stony Hills	-21.00886023	119.3259269
VMRC-63	16/05/2019	16/05/2019	Habitat Assessment	Low Stony Hills	-21.00763563	119.323985
VMRC-65	16/05/2019	16/05/2019	Habitat Assessment	Low Stony Hills	-21.01093408	119.3198564
VMRC-67	16/05/2019	16/05/2019	Habitat Assessment	Low Stony Hills	-21.01290596	119.3182552

Site	Start Date	End Date	Method	Habitat	Latitude	Longitude
VMRC-69	16/05/2019	16/05/2019	Habitat Assessment	Hillcrest/ Hillslope	-21.02537069	119.3145709
VMRC-71	16/05/2019	16/05/2019	Habitat Assessment	Low Stony Hills	-21.01632033	119.3213689
VMRC-73	16/05/2019	16/05/2019	Habitat Assessment	Stony Plain	-21.00285312	119.3185851
VMRC-75	16/05/2019	16/05/2019	Habitat Assessment	Stony Plain	-21.00098358	119.3153033
VMRC-77	19/05/2019	19/05/2019	Habitat Assessment	Hillcrest/ Hillslope	-20.975692	119.4458341
VMRC-79	16/05/2019	16/05/2019	Habitat Assessment	Stony Plain	-21.00207041	119.3042439
VMRC-81	16/05/2019	16/05/2019	Habitat Assessment	Low Stony Hills	-21.09309328	119.1967791
VMRC-83	16/05/2019	16/05/2019	Habitat Assessment	Hillcrest/ Hillslope	-21.09108108	119.1958367
VMRC-85	17/05/2019	17/05/2019	Habitat Assessment	Stony Plain	-20.99389768	119.3099104
VMRC-85	17/05/2019	17/05/2019	Habitat Assessment	Low Stony Hills	-21.01683903	119.3096362
VMRC-86	15/05/2019	15/05/2019	Habitat Assessment	Stony Plain	-20.99643707	119.3007019
VMRC-87	17/05/2019	17/05/2019	Habitat Assessment	Sandy Plain	-20.98762517	119.3618101
VMRC-88	17/05/2019	17/05/2019	Habitat Assessment	Sandy Plain	-21.00565779	119.3498595
VMRC-89	16/05/2019	16/05/2019	Habitat Assessment	Stony Plain	-20.98435845	119.3041564
VMRC-99	12/05/2019	16/07/2019	Targeted trapping - Northern Quoll	Hillcrest/ Hillslope	-21.0262883	119.3137986
VMRC-99	12/05/2019	12/07/2019	Habitat Assessment	Hillcrest/ Hillslope	-21.0262883	119.3137986
VMRC-101	13/07/2019	20/07/2019	Acoustic recorder	Stony Plain	-20.99622023	119.3318024
VMRC-101	13/07/2019	13/07/2019	Habitat Assessment	Stony Plain	-20.99622023	119.3318024
VMRC-103	14/07/2019	20/07/2019	Motion Camera (individual)	Stony Plain	-20.99463944	119.3007608
VMRC-103	14/07/2019	14/07/2019	Habitat Assessment	Stony Plain	-20.99463944	119.3007608
VMRC-104	14/07/2019	20/07/2019	Motion Camera (individual)	Stony Plain	-20.99623284	119.299951
VMRC-104	14/07/2019	14/07/2019	Habitat Assessment	Stony Plain	-20.99623284	119.299951
VMRC-106	15/07/2019	28/07/2019	Ultrasonic recorder	Hillcrest/ Hillslope	-20.97248902	119.4300999
VMRC-106	15/07/2019	25/07/2019	Habitat Assessment	Hillcrest/ Hillslope	-20.97248902	119.4300999
VMRC-107	15/07/2019	29/07/2019	Acoustic recorder	Hillcrest/ Hillslope	-21.02721369	119.3123459
VMRC-107	15/07/2019	25/07/2019	Habitat Assessment	Hillcrest/ Hillslope	-21.02721369	119.3123459

Site	Start Date	End Date	Method	Habitat	Latitude	Longitude
VMRC-108	15/07/2019	20/07/2019	Acoustic recorder	Stony Plain	-20.9960435	119.3044292
VMRC-108	15/07/2019	15/07/2019	Habitat Assessment	Stony Plain	-20.9960435	119.3044292
VMRC-109	17/07/2019	17/07/2019	Habitat Assessment	Low Stony Hills	-20.96454246	119.4314273
VMRC-110	12/07/2019	16/07/2019	Targeted trapping - Northern Quoll	Major Drainage Line	-20.99898574	119.3312253
VMRC-110	16/07/2019	16/07/2019	Habitat Assessment	Major Drainage Line	-20.99898574	119.3312253
VMRC-111	17/07/2019	20/07/2019	Ultrasonic recorder	Sandy Plain	-20.98103326	119.3612573
VMRC-111	17/07/2019	17/07/2019	Habitat Assessment	Sandy Plain	-20.98103326	119.3612573
VMRC-115	15/07/2019	21/07/2019	Acoustic recorder	Low Stony Hills	-21.10226524	119.1886809
VMRC-115	15/07/2019	15/07/2019	Habitat Assessment	Low Stony Hills	-21.10226524	119.1886809
VMRC-116	16/07/2019	21/07/2019	Targeted trapping - Northern Quoll	Major Drainage Line	-20.96997979	119.3923431
VMRC-116	16/07/2019	16/07/2019	Habitat Assessment	Major Drainage Line	-20.96997979	119.3923431
VMRC-117	14/07/2019	21/07/2019	Targeted trapping - Northern Quoll	Hillcrest/ Hillslope	-20.97222192	119.4242242
VMRC-117	18/07/2019	18/07/2019	Habitat Assessment	Hillcrest/ Hillslope	-20.97222192	119.4242242
VMRC-118	19/07/2019	19/07/2019	Habitat Assessment	Low Stony Hills	-20.9650029	119.4233995
VMRC-119	19/07/2019	29/07/2019	Habitat Assessment	Granite Outcrops/ Domes	-20.9395256	119.3965505
VMRC-120	19/07/2019	21/07/2019	Ultrasonic recorder	Hillcrest/ Hillslope	-21.02687235	119.3135955
VMRC-120	19/07/2019	19/07/2019	Habitat Assessment	Hillcrest/ Hillslope	-21.02687235	119.3135955
VMRC-122	19/07/2019	21/07/2019	Ultrasonic recorder	Low Stony Hills	-21.10763202	119.1867172
VMRC-122	19/07/2019	19/07/2019	Habitat Assessment	Low Stony Hills	-21.10876993	119.1872413
VMRC-123	19/07/2019	19/07/2019	Ultrasonic recorder	Gorge/Gully	-21.10927976	119.1874421
VMRC-123	21/07/2019	21/07/2019	Habitat Assessment	Gorge/Gully	-21.10927976	119.1874421
VMRC-125	13/07/2019	20/07/2019	Acoustic recorder	Sandy Plain	-20.98784528	119.3640373
VMRC-125	13/07/2019	13/05/2019	Habitat Assessment	Sandy Plain	-20.98784528	119.3640373

Appendix C: Vertebrate Fauna identified from the Desktop Assessment

Reference	Survey Title
A	Abydos DSO Project Northern Quoll (Stantec 2018)
B	Abydos DSO Project PLNB and Ghost Bat Monitoring Survey (Stantec 2017)
C	Corunna Downs Project Terrestrial Vertebrate Fauna Survey (Stantec, 2018)
D	McPhee Creek Haul Road Project Terrestrial Vertebrate Fauna Survey (Outback Ecology 2014)
E	Mt Webber DSO Project Terrestrial Vertebrate Fauna Impact Assessment (Outback Ecology 2013)
F	McPhee Creek Project Terrestrial Vertebrate Fauna Baseline Survey (Outback Ecology 2012B)
G	North Star Project Level 2 Terrestrial Vertebrate Fauna Assessment (ecologia 2012)
H	Atlas Iron Limited Mt Dove DSO Vertebrate Fauna Assessment (Outback Ecology 2011)
I	Abydos DSO Project Terrestrial Vertebrate Fauna Baseline Survey (Outback Ecology 2011)
J	Fauna Assessment of the Pardoo 3 Mtpa DSO Project (Bamford Consulting 2010)
K	Fauna Assessment of the Abydos DSO Project (Bamford Consulting Ecologists 2009a)
L	Wodgina DSO Project, Terrestrial Vertebrate Fauna Assessment (Outback 2009)
M	Fauna Assessment of the Pardoo Direct Shipping Ore Project Atlas Iron Limited (Bamford Consulting, 2007)
N	Panorama Project Mine Site and Haul Road Corridor Targeted Fauna Survey (Biota 2007)
O	Panorama Project Area Baseline Fauna Study As Part Of The Sulphur Springs Feasibility Study (Bamford Consulting Ecologists 2001)
P	Ecological Survey of Abydos-Woodstock Reserve, Pilbara Region, Western Australia (WAM 1991)

Mammals

Genus and Species	Common Name	Conservation Status				Protected Matters	Nature Map	DBCA	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Current Survey
		EPBC	BC	DBCA	IUCN																				
BOVIDAE																									
Bos taurus	*European Cattle										•	•	•	•	•	•	•		•	•		•		•	•
Bubalus bubalis	*Water Buffalo																								
Capra hircus	*Goat																								
Ovis aries	*Sheep																								
CAMELIDAE																									
Camelus dromedarius	*Camel					•					•	•		•	•				•				•	•	•
CANIDAE																									
Canis familiaris	*Dog/Dingo					•			•		•	•	•	•		•	•	•	•		•		•	•	•
Vulpes vulpes	*Red Fox					•										•								•	
DASYURIDAE																									
Dasycercus blythi	Brush-tailed Mulgara			P4								•										•		•	
Dasykaluta rosamondae	Little Red Kaluta						•				•	•	•	•	•	•								•	•
Dasyurus hallucatus	Northern Quoll	EN	EN		EN	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Ningaui timealeyi	Pilbara Ningaui						•				•	•	•	•	•							•	•	•	•
Planigale ingrami	Long-tailed Planigale										•	•	•	•			•			•					
Planigale maculata	Common Planigale																							•	
Planigale 'species 1'	Pilbara Planigale														•								•		•
Pseudantechinus macdonnellensis	Fat-tailed Pseudantechinus																							•	
Pseudantechinus roryi	Rory's Pseudantechinus																		•				•		

Genus and Species	Common Name	Conservation Status				Protected Matters	Nature Map	DBCA	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Current Survey
		EPBC	BC	DBCA	IUCN																				
Pseudantechinus woolleyae	Woolley's Pseudantechinus										•	•	•	•	•		•			•	•			•	•
Sminthopsis longicaudata	Long-tailed Dunnart			P4			•					•			•							•			
Sminthopsis macroura	Stripe-faced Dunnart						•						•			•						•		•	•
Sminthopsis youngsoni	Lesser Hairy-footed Dunnart						•					•			•									•	
EMBALLONURIDAE																									
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat						•				•	•	•	•		•	•		?	•					•
Taphozous georgianus	Common Sheathtail-bat					•	•		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
EQUIDAE																									
Equus asinus	*Donkey					•										•							•	•	
Equus caballus	*Horse					•						•		•											
FELIDAE																									
Felis catus	*Cat					•	•		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
HIPPOSIDERIDAE																									
Rhinonicteris aurantius 'Pilbara form'	Pilbara Leaf-nosed Bat	VU	VU			•	•	•		•	•	•	•	•	•		•		•	•		•	•		•
MACROPODIDAE																									
Lagorchestes conspicillatus leichardti	Spectacled Hare-wallaby			P4			•				•	•										•	•	•	
Osphranter robustus	Euro							•	•		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Osphranter rufus	Red Kangaroo										•	•	•	•										•	•
Petrogale rothschildi	Rothschild's Rock-wallaby						•				•	•	•	•	•		•		•	•			•	•	•
MEGADERMATIDAE																									
Macroderma gigas	Ghost Bat	VU	VU		VU	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
MOLOSSIDAE																									

Genus and Species	Common Name	Conservation Status				Protected Matters	Nature Map	DBCA	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Current Survey
		EPBC	BC	DBCA	IUCN																				
Austronomus australis	White-striped Freetail-bat											•							•	•			•		•
Chaerephon jobensis	Greater Northern Freetail-bat						•				•	•	•	•					•						•
Ozimops lumsdenae	Northern Free-tailed Bat										•	•		•											•
MURIDAE																									
Leggadina lakedownensis	Short-tailed Mouse			P4			•	•																	
Mus musculus	*House Mouse					•					•	•		•				•				•	•	•	
Notomys alexis	Spinifex Hopping-mouse											•				•					•				
Pseudomys chapmani	Western Pebble-mound Mouse			P4		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Pseudomys delicatulus	Delicate Mouse						•				•	•			•								•	•	
Pseudomys desertor	Desert Mouse						•				•	•		•	•						•	•	•		
Pseudomys hermannsburgensis	Sandy Inland Mouse						•				•	•		•	•		•					•		•	•
Pseudomys nanus	Western Chestnut Mouse											•													
Zyzomys argurus	Common Rock-rat						•		•		•	•		•	•	•	•		•	•		•	•	•	•
PHALANGERIDAE																									
Trichosurus vulpecula arnhemensis	Northern Brushtail Possum		VU								•	•													•
PTEROPODIDAE																									
Pteropus alecto	Black Flying-fox																							•	
SUIDAE																									
Sus scrofa	*Pig					•																			
TACHYGLOSSIDAE																									
Tachyglossus aculeatus	Short-beaked Echidna					•	•		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
THYLACOMYIDAE																									

Genus and Species	Common Name	Conservation Status				Protected Matters	Nature Map	DBCA	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Current Survey
		EPBC	BC	DBCA	IUCN																				
Macrotis lagotis	Greater Bilby	VU	VU		VU	•	•	•			•			•										•	
VESPERTILIONIDAE																									
Chalinolobus gouldii	Gould's Wattled Bat						•				•	•	•	•	•	•	•	•		•					•
Nyctophilus geoffroyi	Lesser Long-eared Bat										•	•		•	•										
Scotorepens greyii	Little Broad-nosed Bat					•	•		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Vespadelus finlaysoni	Finlayson's Cave Bat					•	•		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•

Birds

Genus and Species	Common Name	Conservation Status				Protected Matters	Nature Map	DBCA	Birdlife Australia	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Current Survey
		EPBC	BC	DBCA	IUCN																					
ACANTHIZIDAE																										
Acanthiza apicalis	Inland Thornbill												•													
Calamanthus campestris	Rufous Fieldwren																									•
Gerygone fusca	Western Gerygone						•						•											•	•	
Smicrornis brevirostris	Weebill						•		•			•	•	•	•	•		•						•	•	•
ACCIPITRIDAE																										
Accipiter cirrocephalus	Collared Sparrowhawk						•		•			•	•			•								•	•	
Accipiter fasciatus	Brown Goshawk						•		•			•	•	•	•			•	•	•	•	•	•	•	•	•
Aquila audax	Wedge-tailed Eagle						•		•			•	•	•	•	•	•	•	•	•		•	•	•	•	•
Circus approximans	Swamp Harrier						•		•				•													
Circus assimilis	Spotted Harrier						•		•			•	•	•	•					•		•		•	•	•
Elanus axillaris	Black-shouldered Kite						•		•			•	•									•		•	•	
Haliaeetus leucogaster	White-bellied Sea-Eagle						•		•																	
Haliastur sphenurus	Whistling Kite						•		•			•	•			•	•			•		•		•		•
Hamirostra isura	Square-tailed Kite															•										
Hamirostra melanosternon	Black-breasted Buzzard								•											•						
Hieraaetus morphnoides	Little Eagle						•		•													•		•	•	•
Milvus migrans	Black Kite						•		•			•	•			•				•	•				•	
Pandion haliaetus	Osprey, Eastern Osprey	MIG	MIG			•			•																	
ACROCEPHALIDAE																										
Acrocephalus australis	Australian Reed Warbler						•		•																	

Genus and Species	Common Name	Conservation Status				Protected Matters	Nature Map	DBCA	Birdlife Australia	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Current Survey
		EPBC	BC	DBCA	IUCN																					
AEGOTHELIDAE																										
Aegotheles cristatus	Australian Owlet-nightjar								•			•	•	•	•	•				•	•	•		•	•	•
ALAUDIDAE																										
Mirafra javanica	Horsfield's Bushlark						•		•							•			•			•				•
ALCEDINIDAE																										
Dacelo leachii	Blue-winged Kookaburra						•		•			•	•	•	•	•		•		•		•	•	•	•	•
Todiramphus pyrrhopygius	Red-backed Kingfisher						•		•			•	•	•	•	•	•	•		•		•	•	•	•	•
Todiramphus sanctus	Sacred Kingfisher						•		•				•	•	•	•	•	•		•	•	•		•	•	•
ANATIDAE																										
Anas gracilis	Grey Teal						•		•				•			•			•	•					•	•
Anas superciliosa	Pacific Black Duck						•		•				•			•			•	•				•	•	•
Aythya australis	Hardhead						•		•																	
Chenonetta jubata	Australian Wood Duck						•		•																	
Cygnus atratus	Black Swan						•		•							•										
Dendrocygna eytoni	Plumed Whistling Duck								•											•						
Malacorhynchus membranaceus	Pink-eared Duck						•		•																	•
ANHINGIDAE													•													
Anhinga novaehollandiae	Australasian Darter						•		•							•								•	•	•
APODIDAE																										
Apus pacificus	Fork-tailed Swift	MIG	MIG			•			•							•									•	
ARDEIDAE																										
Ardea garzetta	Little Egret								•																	•
Ardea intermedia	Intermediate Egret						•																			

Genus and Species	Common Name	Conservation Status				Protected Matters	Nature Map	DBCA	Birdlife Australia	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Current Survey
		EPBC	BC	DBCA	IUCN																					
Ardea modesta	Eastern Great Egret						•												•					•	•	•
Ardea novaehollandiae	White-faced Heron						•									•			•	•			•	•	•	•
Ardea pacifica	White-necked Heron						•													•		•		•	•	•
Nycticorax caledonicus	Rufous Night Heron						•																			•
Nycticorax nycticorax	Nankeen Night Heron								•														•	•	•	
ARTAMIDAE																										
Artamus cinereus	Black-faced Woodswallow						•		•			•	•	•	•	•	•	•		•	•	•	•	•	•	•
Artamus leucorynchus	White-breasted Woodswallow								•																	
Artamus minor	Little Woodswallow						•		•			•	•	•	•	•			•	•	•	•	•	•	•	•
Artamus personatus	Masked Woodswallow						•		•				•	•	•	•			•	•			•		•	•
Cracticus nigrogularis	Pied Butcherbird						•					•	•	•	•	•		•	•	•	•	•	•	•	•	•
Cracticus tibicen	Australian Magpie						•					•	•	•	•	•				•			•	•	•	•
Cracticus torquatus	Grey Butcherbird						•									•	•									
BURHINIDAE																										
Burhinus grallarius	Bush Stone-curlew						•		•			•	•	•	•	•				•			•	•	•	•
CACATUIDAE																										
Cacatua roseicapilla	Galah						•		•			•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Cacatua sanguinea	Little Corella						•		•			•	•	•	•	•	•	•		•	•			•	•	•
Nymphicus hollandicus	Cockatiel						•		•			•	•	•	•	•		•	•	•	•	•	•	•	•	•
CAMPEPHAGIDAE																										
Coracina maxima	Ground Cuckoo-shrike																								•	
Coracina novaehollandiae	Black-faced Cuckoo-shrike								•			•	•	•	•	•	•	•	•	•		•	•	•	•	•

Genus and Species	Common Name	Conservation Status				Protected Matters	Nature Map	DBCA	Birdlife Australia	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Current Survey
		EPBC	BC	DBCA	IUCN																					
Lalage tricolor	White-winged Triller								•			•	•	•	•	•			•	•	•	•	•	•	•	•
CAPRIMULGIDAE																										
Eurostopodus argus	Spotted Nightjar						•		•			•	•	•	•	•	•	•	•	•	•	•		•	•	•
CHARADRIIDAE																										
Charadrius melanops	Black-fronted Dotterel						•		•			•	•	•		•				•	•	•		•	•	•
Charadrius ruficapillus	Red-capped Plover								•																	•
Charadrius veredus	Oriental Plover	MIG	MIG			•																			•	
Erythrogonys cinctus	Red-kneed Dotterel						•		•																	•
Vanellus miles	Masked Lapwing						•		•																	
CICONIIDAE																										
Ephippiorhynchus asiaticus	Black-necked Stork				NT		•		•											•	•			•		
CISTICOLIDAE																										
Cisticola exilis	Golden-headed Cisticola													•												
CLIMACTERIDAE																										
Climacteris melanura	Black-tailed Treecreeper								•										•			•				•
COLUMBIDAE																										
Columba livia	*Domestic Pigeon					•																				
Geopelia cuneata	Diamond Dove						•		•			•	•	•	•	•			•	•	•	•	•	•	•	•
Geopelia humeralis	Bar-shouldered Dove								•																	
Geopelia striata	Zebra Dove						•		•			•	•		•	•		•	•	•		•		•	•	
Geophaps plumifera	Spinifex Pigeon						•		•			•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Ocyphaps lophotes	Crested Pigeon						•		•			•	•	•	•	•	•			•			•	•	•	•

Genus and Species	Common Name	Conservation Status				Protected Matters	Nature Map	DBCA	Birdlife Australia	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Current Survey
		EPBC	BC	DBCA	IUCN																					
Phaps chalcoptera	Common Bronzewing						•					•	•	•	•	•	•	•		•			•	•	•	•
CORVIDAE																										
Corvus bennetti	Little Crow						•		•			•	•												•	
Corvus coronoides	Australian Raven								•																	
Corvus orru	Torresian Crow						•		•			•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
CUCULIDAE																										
Cacomantis pallidus	Pallid Cuckoo						•		•			•	•	•	•	•			•	•	•	•	•	•	•	•
Centropus phasianinus	Pheasant Coucal						•		•				•		•	•				•			•	•	•	
Chrysococcyx basalis	Horsfield's Bronze Cuckoo						•		•			•	•	•	•	•	•			•		•	•	•		•
Chrysococcyx osculans	Black-eared Cuckoo								•				•												•	
DICAEIDAE																										
Dicaeum hirundinaceum	Mistletoebird						•		•			•	•		•					•				•	•	
DROMAIIDAE																										
Dromaius novaehollandiae	Emu																•		•						•	
ESTRILDIDAE																										
Emblema pictum	Painted Finch						•		•			•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Heteromunia pectoralis	Pictorella Mannikin								•																	
Neochmia ruficauda	Star Finch						•		•							•									•	
Taeniopygia guttata	Zebra Finch						•		•			•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
FALCONIDAE																										
Falco berigora	Brown Falcon						•		•			•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Falco cenchroides	Australian Kestrel						•		•			•	•	•	•	•	•	•	•	•	•	•		•	•	•

Genus and Species	Common Name	Conservation Status				Protected Matters	Nature Map	DBCA	Birdlife Australia	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Current Survey
		EPBC	BC	DBCA	IUCN																					
Falco hypoleucos	Grey Falcon		VU		V U		•									•										•
Falco longipennis	Australian Hobby								•				•		•						•	•			•	•
Falco peregrinus	Peregrine Falcon								•			•										•			•	•
GLAREOLIDAE																										
Glareola maldivarum	Oriental Pratincole	MIG	MIG			•			•																	
Stiltia isabella	Australian Pratincole								•																•	
GRUIDAE																										
Grus rubicunda	Brolga								•										•							
HIRUNDINIDAE																										
Cheramoeca leucosternus	White-backed Swallow								•																	
Hirundo neoxena	Welcome Swallow						•		•						•											
Hirundo rustica	Barn Swallow	MIG	MIG			•			•																	
Petrochelidon ariel	Fairy Martin						•		•			•	•	•		•				•	•			•	•	•
Petrochelidon nigricans	Tree Martin						•		•			•	•	•	•	•					•	•		•	•	•
LARIDAE																										
Cladorhynchus leucocephalus	Banded Stilt								•																	
Gelochelidon nilotica	Gull-billed Tern	MIG	MIG						•																	
Hydroprogne caspia	Caspian Tern	MIG	MIG						•																	
Sterna hybrida	Whiskered Tern															•									•	
LOCUSTELLIDAE																										
Poodytes carteri	Spinifex-bird						•		•			•	•	•	•	•	•	•	•	•	•			•	•	•
Cincloramphus cruralis	Brown Songlark								•					•	•	•	•							•	•	

Genus and Species	Common Name	Conservation Status				Protected Matters	Nature Map	DBCA	Birdlife Australia	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Current Survey
		EPBC	BC	DBCA	IUCN																					
Cincloramphus mathewsi	Rufous Songlark								•			•	•		•	•			•			•		•		
MALURIDAE																										
Amytornis striatus	Striated Grasswren						•					•	•	•	•	•		•		•	•			•	•	
Malurus lamberti	Variegated Fairy-wren								•			•	•	•	•	•	•	•		•	•		•	•	•	•
Malurus leucopterus	White-winged Fairy-wren						•		•				•	•			•			•		•			•	•
Stipiturus ruficeps	Rufous-crowned Emu-wren						•		•					•											•	•	
MELIPHAGIDAE																										
Acanthagenys rufogularis	Spiny-cheeked Honeyeater						•							•	•	•									•	•
Certhionyx variegatus	Pied Honeyeater						•						•		•			•			•			•	•	•
Epthianura tricolor	Crimson Chat						•		•			•	•	•	•	•	•							•	•	•
Gavicalis virescens	Singing Honeyeater						•		•			•	•	•	•	•	•	•		•	•		•	•	•	•
Lacustroica whitei	Grey Honeyeater																	•								
Lichmera indistincta	Brown Honeyeater						•		•			•	•	•	•	•		•	•	•	•		•	•	•	•
Manorina flavigula	Yellow-throated Miner						•		•			•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Melithreptus gularis	Black-chinned Honeyeater						•					•	•		•	•				•			•	•		•
Ptilotula keartlandi	Grey-headed Honeyeater						•		•			•	•	•	•	•		•		•	•		•	•	•	•
Ptilotula penicillata	White-plumed Honeyeater								•							•	•	•	•	•		•	•	•	•	•
Purnella albifrons	White-fronted Honeyeater												•												•	
Sugomel niger	Black Honeyeater												•		•						•				•	
MEROPIDAE																										
Merops ornatus	Rainbow Bee-eater						•		•			•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
MONARCHIDAE																										
Grallina cyanoleuca	Magpie-lark						•		•			•	•	•	•	•	•	•	•	•	•	•	•	•	•	•

Genus and Species	Common Name	Conservation Status				Protected Matters	Nature Map	DBCA	Birdlife Australia	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Current Survey
		EPBC	BC	DBCA	IUCN																					
MOTACILLIDAE																										
Anthus australis	Australian Pipit						•		•			•	•	•	•	•	•		•	•	•	•			•	•
Motacilla cinerea	Grey Wagtail	MIG	MIG			•																				
Motacilla flava	Yellow Wagtail	MIG	MIG			•																				
NEOSITTIDAE																										
Daphoenositta chrysoptera	Varied Sittella								•																	
OREOICIDAE																										
Oreoica gutturalis	Crested Bellbird						•		•			•	•	•	•	•	•	•		•				•	•	
OTIDIDAE																										
Ardeotis australis	Australian Bustard						•		•			•	•	•	•	•	•			•			•	•	•	•
PACHYCEPHALIDAE																										
Colluricincla harmonica	Grey Shrike-thrush						•		•			•	•	•	•	•		•		•	•		•	•	•	•
Pachycephala rufiventris	Rufous Whistler						•		•			•	•	•	•	•	•							•		•
PARDALOTIDAE																										
Pardalotus rubricatus	Red-browed Pardalote						•		•			•	•	•	•	•			•	•		•	•	•	•	•
Pardalotus striatus	Striated Pardalote						•		•				•	•	•					•	•			•		•
PELECANIDAE																										
Pelecanus conspicillatus	Australian Pelican						•		•															•	•	
PETROICIDAE																										
Melanodryas cucullata	Hooded Robin						•					•			•											•
Petroica goodenovii	Red-capped Robin								•																•	
PHALACROCORACIDAE																										
Phalacrocorax carbo	Great Cormorant						•																			

Genus and Species	Common Name	Conservation Status				Protected Matters	Nature Map	DBCA	Birdlife Australia	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Current Survey
		EPBC	BC	DBCA	IUCN																					
Phalacrocorax carbo novaehollandiae	Great Cormorant								•																	
Phalacrocorax melanoleucos	Little Pied Cormorant						•		•				•											•	•	•
Phalacrocorax sulcirostris	Little Black Cormorant						•																	•	•	
PHASIANIDAE																										
Coturnix pectoralis	Stubble Quail								•				•												•	
Coturnix ypsilophora	Brown Quail						•		•				•		•	•	•		•	•		•		•		•
PODARGIDAE																										
Podargus strigoides	Tawny Frogmouth						•		•					•	•	•		•		•		•	•	•	•	
PODICIPEDIDAE																										
Poliocephalus poliocephalus	Hoary-headed Grebe																									
Tachybaptus novaehollandiae	Australasian Grebe						•		•				•												•	
POMATOSTOMIDAE																										
Pomatostomus superciliosus	White-browed Babbler													•												
Pomatostomus temporalis	Grey-crowned Babbler						•		•			•	•	•		•				•		•				•
PSITTACIDAE																										
Melopsittacus undulatus	Budgerigar						•		•			•	•	•	•	•				•	•	•	•	•	•	•
Neophema bourkii	Bourke's Parrot						•																			
Pezoporus occidentalis	Night Parrot	EN	CR		EN	•																				
Platycercus zonarius	Australian Ringneck						•		•			•	•	•	•		•		•							•
Platycercus zonarius zonarius	Port Lincoln Parrot						•									•		•		•				•	•	
PTILONORHYNCHIDAE																										
Ptilonorhynchus maculatus guttatus	Western Bowerbird						•		•			•	•			•	•	•		•	•		•	•	•	•

Genus and Species	Common Name	Conservation Status				Protected Matters	Nature Map	DBCA	Birdlife Australia	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Current Survey
		EPBC	BC	DBCA	IUCN																					
RALLIDAE																										
Tribonyx ventralis	Black-tailed Native-hen						•		•																	
Gallirallus philippensis	Buff-banded Rail															•										
Gallinula tenebrosa	Dusky Moorhen						•		•																	
Fulica atra	Eurasian Coot						•		•																•	
RECURVIROSTRIDAE																										
Himantopus himantopus	Black-winged Stilt						•		•																•	
RHIPIDURIDAE																										
Rhipidura albiscapa	Grey Fantail								•			•												•		
Rhipidura leucophrys	Willie Wagtail						•		•			•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
ROSTRATULIDAE																										
Rostratula benghalensis australis	Australian Painted Snipe	EN	EN		EN	•																				
SCOLOPACIDAE																										
Calidris acuminata	Sharp-tailed Sandpiper	MIG	MIG			•																				
Calidris ferruginea	Curlew Sandpiper	CR/MIG	CR/MIG		NT	•																				
Calidris melanotos	Pectoral Sandpiper	MIG	MIG			•																				
Limosa limosa	Black-tailed Godwit	MIG	MIG		NT				•																	
Numenius madagascariensis	Eastern Curlew	CR/MIG	CR/MIG		EN	•																				
Tringa glareola	Wood Sandpiper	MIG	MIG				•																		•	
Tringa hypoleucos	Common Sandpiper	MIG	MIG			•	•		•																•	
Tringa nebularia	Common Greenshank	MIG	MIG						•																•	

Genus and Species	Common Name	Conservation Status				Protected Matters	Nature Map	DBCA	Birdlife Australia	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Current Survey
		EPBC	BC	DBCA	IUCN																					
Tringa stagnatilis	Marsh Sandpiper	MIG	MIG						•																	
STRIGIDAE																										
Ninox boobook	Boobook Owl						•		•			•	•	•	•	•	•			•				•	•	•
Ninox connivens	Barking Owl						•													•					•	
THRESKIORNITHIDAE																										
Platalea regia	Royal Spoonbill						•		•																	
Plegadis falcinellus	Glossy Ibis	MIG	MIG				•		•																	
Threskiornis moluccus	Australian White Ibis								•																	
Threskiornis spinicollis	Straw-necked Ibis						•		•															•	•	•
TURNICIDAE																										
Turnix velox	Little Button-quail						•		•			•	•	•	•	•				•	•	•		•	•	•
TYTONIDAE																										
Tyto alba	Barn Owl								•			•													•	
ZOSTEROPIDAE																										
Zosterops lateralis	Silvereye												•													

Reptiles

Genus and Species	Common Name	Conservation Status				Nature Map	DBCA	Protected Matters	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Current Survey
		EPBC	BC	DBCA	IUCN																				
AGAMIDAE																									
Ctenophorus caudicinctus	Ring-tailed Dragon					•					•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Ctenophorus isolepis	Military Dragon										•	•	•	•		•		•	•		•			•	•
Ctenophorus nuchalis	Central Netted Dragon					•					•	•		•	•									•	
Diporiphora valens	Southern Pilbara Tree Dragon											•			•										
Gowidon longirostris	Long-nosed Dragon					•					•	•	•	•	•		•	•	•	•	•		•	•	•
Pogona minor						•						•	•	•	•	•								•	
Diporiphora winneckei	Blue-lined Dragon																							•	
PYTHONIDAE																									
Antaresia perthensis	Pygmy Python					•					•	•	•	•	•			•			•		•	•	•
Antaresia stimsoni	Stimson's Python											•	•	•	•		•	•	•	•	•			•	
Aspidites melanocephalus	Black-headed Python																		•					•	
Liasis olivaceus barroni	Pilbara Olive Python	VU	VU			•		•			•	•	•	•	•		•	•	•	•	•			•	
CARPHODACTYLIDAE																									
Nephrurus levis						•									•									•	
CHELUIDAE																									
Chelodina steindachneri	Flat-shelled Turtle										•	•			•									•	•

Genus and Species	Common Name	Conservation Status				Nature Map	DBCA	Protected Matters	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Current Survey
		EPBC	BC	DBCA	IUCN																				
DIPLODACTYLIDAE																									
Crenadactylus ocellatus	Clawless Gecko														•								•		
Diplodactylus conspicillatus	Variable Fat-tailed Gecko					•					•	•	•	•	•	•					•			•	•
Diplodactylus galaxias	Northern Pilbara Beak-faced Gecko														•										
Diplodactylus mitchelli															•										
Diplodactylus savagei	Southern Pilbara Beak-faced Gecko					•					•	•	•	•	•		•		•	•		•	•		
Lucasium stenodactylum						•					•	•	•	•	•	•	•		•			•		•	•
Lucasium wombeyi						•					•	•	•	•	•		•		•			•			•
Oedura fimbria	Western Marbled Velvet Gecko										•		•	•	•	•	•		•					•	•
Rhynchoedura ornata	Western Beaked Gecko										•	•	•	•	•	•								•	•
Strophurus elderi						•					•		•	•	•							•	•	•	
Strophurus jeanae																								•	
ELAPIDAE																									
Acanthophis pyrrhus	Desert Death Adder										•							•			•			•	
Acanthophis wellsi	Pilbara Death Adder					•					•	•	•		•				•						
Brachyurophis approximans											•	•	•	•	•									•	
Demansia psammophis	Yellow-faced Whipsnake										•	•	•	•	•			•			•			•	
Demansia rufescens	Rufous Whipsnake					•					•	•		•	•		•			•			•		
Furina ornata	Moon Snake					•					•	•	•	•	•	•								•	

Genus and Species	Common Name	Conservation Status				Nature Map	DBCA	Protected Matters	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Current Survey
		EPBC	BC	DBCA	IUCN																				
Parasuta monachus															•										
Pseudechis australis	Mulga Snake					•					•	•		•	•									•	•
Pseudonaja mengdeni	Western Brown Snake												•	•	•			•			•			•	
Pseudonaja modesta	Ringed Brown Snake										•		•		•	•			•					•	
Suta fasciata	Rosen's Snake					•					•			•	•										
Suta punctata	Spotted Snake																	•						•	•
Vermicella snelli						•					•	•					•					•			
GEKKONIDAE																									
Gehyra macra																									•
Gehyra media																									•
Gehyra montium																									•
Gehyra pilbara						•						•	•	•		•	•							•	•
Gehyra punctata						•					•	•	•	•	•		•	•	•					•	•
Gehyra purpurascens												•				•									
Gehyra variegata						•					•	•	•	•	•	•	•	•	•		•	•	•	•	•
Heteronotia binoei	Bynoe's Gecko					•					•	•	•	•		•	•	•	•	•	•		•	•	•
Heteronotia spelea	Desert Cave Gecko					•					•	•	•	•	•		•			•					
PYGOPODIDAE																									
Delma haroldi	Neck-barred Delma												•												

Genus and Species	Common Name	Conservation Status				Nature Map	DBCA	Protected Matters	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Current Survey
		EPBC	BC	DBCA	IUCN																				
Delma butleri											•	•	•							•					
Delma elegans						•					•	•			•		•						•		•
Delma nasuta						•									•		•		•	•			•	•	
Delma pax						•					•	•	•	•	•		•			•		•	•	•	
Delma tincta						•					•			•	•		•	•			•			•	
Lialis burtonis						•					•	•		•	•	•		•					•	•	
Pygopus nigriceps											•				•										
SCINCIDAE																									
Carlia munda						•					•	•		•	•	•	•		•	•		•	•	•	•
Carlia triacantha											•	•		•	•	•				•					
Cryptoblepharus plagiocephalus															•								•	•	
Cryptoblepharus ustulatus											•		•	•	•		•		•						•
Ctenotus duricola						•					•	•	•	•	•	•	•					•		•	•
Ctenotus grandis											•	•	•		•	•	•							•	•
Ctenotus inornatus						•					•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Ctenotus leonhardii											•	•													
Ctenotus nigrilineatus				P1																				•	
Ctenotus pantherinus	Leopard Ctenotus					•					•	•	•	•	•	•	•	•	•		•		•	•	•
Ctenotus piankai						•						•			•										

Genus and Species	Common Name	Conservation Status				Nature Map	DBCA	Protected Matters	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Current Survey
		EPBC	BC	DBCA	IUCN																				
Ctenotus robustus						•																			
Ctenotus rubicundus						•					•	•	•	•	•		•		•	•			•		•
Ctenotus rutilans											•	•		•											
Ctenotus schomburgkii												•			•									•	
Ctenotus serventyi																								•	
Ctenotus uber												•													
Ctenotus uber johnstonei				P2								•													
Cyclodomorphus melanops	Slender Blue-tongue					•					•		•	•	•		•			•		•	•	•	
Egernia epsisolus	Eastern Pilbara Spiny-tailed Skink					•					•				•			•			•			•	•
Egernia formosa						•					•	•	•		•		•		•			•	•	•	•
Egernia pilbarensis	Pilbara Skink												•												
Eremiascincus richardsonii	Broad-banded Sand Swimmer											•												•	
Lerista bipes						•					•	•	•		•	•	•		•					•	
Lerista clara												•	•				•								
Lerista connivens																									
Lerista flammicauda														•											
Lerista jacksoni						•					•		•	•	•		•	•							
Lerista muelleri						•					•	•		•	•					•		•	•	•	•
Lerista timida						•																			

Genus and Species	Common Name	Conservation Status				Nature Map	DBCA	Protected Matters	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Current Survey
		EPBC	BC	DBCA	IUCN																				
Lerista verhmens						•						•	•	•	•										
Liopholis striata	Night Skink											•				•								•	
Menetia greyii						•					•	•	•	•	•		•							•	
Menetia surda						•																	•		
Morethia ruficauda						•					•	•	•	•	•	•	•		•	•		•	•	•	•
Notoscincus ornatus						•					•	•	•	•	•		•					•	•	•	•
Proablepharus reginae						•						•		•	•		•						•	•	
Tiliqua multifasciata	Central Blue-tongue					•					•	•	•	•	•									•	•
TYPHLOPIDAE																									
Anilios ammodytes											•	•	•	•	•	•	•		•						
Anilios diversus																								•	
Anilios ganei				P1								•	•												
Anilios grypus											•	•	•	•	•		•			•				•	•
Anilios hamatus											•			•										•	
Anilios pilbarensis													•			•									
Indotyphlops braminus	*Flowerpot Blind Snake							•																	
VARANIDAE																									
Varanus acanthurus	Spiny-tailed Monitor					•					•	•	•	•	•		•	•	•	•	•		•	•	•
Varanus brevicauda	Short-tailed Pygmy Monitor										•	•	•	•	•									•	•

Genus and Species	Common Name	Conservation Status				Nature Map	DBCA	Protected Matters	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Current Survey
		EPBC	BC	DBCA	IUCN																				
Varanus caudolineatus												●												●	
Varanus eremius	Pygmy Desert Monitor										●	●	●		●	●						●		●	●
Varanus giganteus	Perentie										●	●	●	●	●		●		●	●			●	●	●
Varanus gouldii	Sand Monitor											●	●	●	●	●			●					●	
Varanus panoptes	Yellow-spotted Monitor										●		●	●	●				●	●				●	●
Varanus pilbarensis	Northern Pilbara Rock Monitor										●	●	●		●		●	●			●			●	●
Varanus tristis	Racehorse Monitor										●	●	●	●	●		●		●			●		●	●

Amphibians

Genus and Species	Common Name	Conservation Status				Protected Matters	Nature Map	DBCA	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Current Survey
		EPBC	BC	DBCA	IUCN																				
PELODRYADIDAE																									
Cyclorana australis	Giant Frog														•		•	•			•				
Cyclorana maini	Sheep Frog										•	•	•	•	•	•		•		•	•			•	•
Litoria rubella	Little Red Tree Frog						•				•	•	•	•	•		•		•	•	•	•	•	•	•
LIMNODYNASTIDAE																									
Neobatrachus sutor	Shoemaker Frog											•	•												
Notaden nichollsi	Desert Spadefoot												•		•			•			•				
Platyplectrum spenceri	Centralian Burrowing Frog						•				•	•	•		•				•					•	
MYOBATRACHIDAE																									
Pseudophryne douglasi	Gorge Toadlet											•													
Uperoleia glandulosa	Glandular Toadlet						•					•			•				•					•	
Uperoleia russelli	Northwest Toadlet																•		•			•	•	•	
Uperoleia saxatilis	Pilbara Toadlet				N/A						•	•	•	•	•										•

Appendix D: Vertebrate Fauna Habitat Assessments

Site ID	Coord.	Date	Habitat Type	Landform	Aspect	Slope	Soil Type	Soil Avail.	Outcropping Rock Type	Rock Size	Veg Litter	Dominant Veg. Type	Rocky Cracks/ Crevices	Burrowing Suitability	Hollows <10cm	Hollows >10cm	Water Present	Disturbances	Last Fire	Notes
VLRM-01	-21.0509 119.277	14/05/19	Stony Plain	Undulating Low Hills	North	Low	Clay Loam	Scarce	Limited Outcropping Conglomerate	Large Rocks (21-60cm)	Few Small Patches	Acacia Shrubland, Spinifex Hummock Grassland	Low	Moderate	None	None	None	Frequent Fire, Road/ Access Track, Rubbish/ Litter	Recent (0 to 2 yr)	Recent fire. Second shaft over the back toward south less than 100m
VMRC-01	-21.1055 119.193	09/05/19	Low Stony Hills	Stony Plain	Flat	Low	Clay Loam	Few Small Patches	Negligible	Small Rocks (11-20cm)	Many Large Patches	Scattered Eucalypts, Spinifex Hummock Grassland	Nil	Low	None	None	None	Cattle Grazing, Road/ Access Track	Old (6+ yr)	
VMRC-02	-21.0115 119.313	10/05/19	Low Stony Hills	Stony Plain	North	Low	Clay Loam	Many Small Patches	Negligible	Gravel (1-4cm)	Scarce	Acacia Shrubland, Scattered *Acacia inequalatera*, Acacia spp. and *Grevillea wickhamii* shrubs over hummock grassland of *Triodia pungens*. Contains very minor drainage fingers with denser shrubs, Spinifex Hummock Grassland	Nil	Low	Scarce	None	None	Road/ Access Track	Moderate (3 to 5 yr)	
VMRC-03	-20.9882 119.308	10/05/19	Stony Plain	Sandy/ Stony Plain	Flat	Flat	Clay Loam	Few Large Patches	Negligible	Pebbles (5-10cm)	Few Large Patches	Acacia Shrubland, Spinifex Hummock Grassland	Nil	Moderate	None	None	None	Cattle Grazing	Old (6+ yr)	
VMRC-04	-20.9921 119.346	10/05/19	Sandy Plain	Sand Plain	Flat	Flat	Clayey Sand	Evenly Spread	Negligible	Negligible	Many Small Patches	Acacia Shrubland, Spinifex Hummock Grassland	Nil	Very High	None	None	Creek line (dry)	Cattle Grazing, recent fire immediately surrounding	Old (6+ yr)	
VMRC-05	-20.9702 119.390	11/05/19	Major Drainage Line	Major Drainage Line	North	Flat	Sand	Evenly Spread	Negligible	Small Rocks (11-20cm)	Many Small Patches	Melaleuca, Mulga Woodland, Tussock Grassland	Nil	High	Scarce	Moderate	Permanent	Cattle Grazing	Old (6+ yr)	
VMRC-06	-20.9606 119.416	11/05/19	Low Stony Hills	Hillslope	North	Low	Clay Loam	Scarce	Limited Outcropping BIF	Large Rocks (21-60cm)	Scarce	Acacia Shrubland, Scattered Eucalypts, Spinifex Hummock Grassland	Nil	Nil	None	None	None	Road/ Access Track	Old (6+ yr)	
VMRC-07	-20.9727 119.437	11/05/19	Hillcrest/ Hillslope	Hillcrest/ Upper Hillslope	South	Steep	Clayey Sand	Scarce	Moderate Outcropping BIF	Large Rocks (21-60cm)	Few Small Patches	Acacia Shrubland, Scattered Eucalypts, Spinifex Hummock Grassland	Moderate	Nil	None	None	None	None Discernible	Old (6+ yr)	
VMRC-08	-21.1128 119.194	12/05/19	Major Drainage Line	Gorge	Flat	Very Steep	Silty Loam	Few Large Patches	Extensive Outcropping BIF	Pebbles (5-10cm)	Few Large Patches	Dense *Eucalyptus camalduelensis* woodland over *Melaleuca sp*. shrubland with various tussock grasses dominated by *Cenchrus ciliaris* - on foot slopes of hills. Devoid of vegetation through main channel with comprises river pebbles; surrounding rocky hills comprise *Acacia sp*. shrublands (*A. tumida*) with dense understorey *of Triodia pungens*, Eucalypt Woodland, Spinifex Hummock Grassland, Tussock Grassland	High	Moderate	Very Common	Very Common	Prone to Pooling	Road/ Access Track, Weed Invasion	Old (6+ yr)	
VMRC-09	-21.0857 119.192	12/05/19	Stony Plain	Undulating Low Hills	East	Low	Clay Loam	Many Small Patches	Negligible	Gravel (1-4cm)	Scarce	Open Acacia shrubland over scattered patches of Triodia of various life stages., Spinifex Hummock Grassland	Nil	Low	None	None	None	Cattle Grazing, Road/ Access Track	Moderate (3 to 5 yr)	

Site ID	Coord.	Date	Habitat Type	Landform	Aspect	Slope	Soil Type	Soil Avail.	Outcropping Rock Type	Rock Size	Veg Litter	Dominant Veg. Type	Rocky Cracks/ Crevices	Burrowing Suitability	Hollows <10cm	Hollows >10cm	Water Present	Disturbances	Last Fire	Notes
VMRC-10	-21.0232 119.319	14/05/19	Low Stony Hills	Hillcrest/ Upper Hillslope	South/ East	Steep	Clay Loam	Few Small Patches	Major Outcropping BIF	Boulders (>61cm)	None Discernible	Scattered Eucalypts, Tussock Grassland	High	Nil	None	None	None	Frequent Fire	Recent (0 to 2 yr)	
VMRC-11	-21.0893 119.187	12/05/19	Stony Plain	Stony Plain	Flat	Flat	Clay Loam	Few Large Patches	Negligible	Gravel (1-4cm)	Scarce	Acacia Shrubland, Spinifex Hummock Grassland, Turkeys nest and associates clearing surrounded by open Acacia shrubland and patchy Triodia.	Nil	Nil	None	None	Turkeys nest full of water	Cattle Grazing, Large scale clearing, Road/ Access Track	Moderate (3 to 5 yr)	
VMRC-12	-21.0226 119.301	15/05/19	Low Stony Hills	Stony Plain	Flat	Flat	Clay Loam	Few Small Patches	Negligible	Gravel (1-4cm)	None Discernible	Acacia Shrubland, Tussock Grassland	Nil	Low	None	None	None	None Discernible	Recent (0 to 2 yr)	
VMRC-13	-21.0026 119.325	12/05/19	Major Drainage Line	Drainage Area/ Floodplain	Flat	Low	Sandy Loam	Many Large Patches	Negligible	Negligible	None Discernible	Eucalypt Woodland, Sparsely scattered corymbias over patchy cover of tussock grasses on edge of Shaw River, Tussock Grassland	Nil	Low	Scarce	None	None	Cattle Grazing, Road/ Access Track	Old (6+ yr)	
VMRC-14	-21.0164 119.306	15/05/19	Low Stony Hills	Stony Plain	Flat	Flat	Clay Loam	Few Small Patches	Negligible	Gravel (1-4cm)	None Discernible	Tussock Grassland	Nil	Low	None	None	None	Frequent Fire	Recent (0 to 2 yr)	Very recent fire- not much left
VMRC-15	-21.0015 119.329	12/05/19	Major Drainage Line	Major Drainage Line	Flat	Flat	Sand	Evenly Spread	Negligible	Pebbles (5-10cm)	None Discernible	Riverbed with sparsely scattered Melaleuca.	Nil	Nil	Scarce	Scarce	Prone to Pooling	None Discernible	Old (6+ yr)	Large pools and flowing water currently present.
VMRC-16	-21.0162 119.302	15/05/19	Stony Plain	Minor Drainage Line	Flat	Flat	Sandy Loam	Evenly Spread	Negligible	Gravel (1-4cm)	Many Small Patches	Scattered Eucalypts, Tussock Grassland	Nil	Moderate	Scarce	Scarce	Prone to Flooding	Cattle Grazing	Recent (0 to 2 yr)	Fire recent less than 6mths one side of creek, 2 years other side
VMRC-17	-21.0867 119.192	12/05/19	Stony Plain	Undulating Low Hills	North/ East	Low	Clay Loam	Many Large Patches	Moderate Outcropping BIF	Small Rocks (11-20cm)	Scarce	Acacia Shrubland, Post fire low shrub regrowth with sparsely scattered patches of small Triodia.	Nil	Nil	None	None	None	Cattle Grazing, Frequent Fire, Road/ Access Track	Recent (0 to 2 yr)	
VMRC-18	-20.9940 119.303	15/05/19	Stony Plain	Sandy/ Stony Plain	Flat	Flat	Clay Loam	Evenly Spread	Negligible	Gravel (1-4cm)	None Discernible	After fire emergent forbs and grasses	Nil	High	None	None	None	Cattle Grazing, Frequent Fire	Recent (0 to 2 yr)	Very recent fire
VMRC-19	-21.0885 119.197	13/05/19	Hillcrest/ Hillslope	Ironstone Outcrops	South/ East	Steep	Clay Loam	Scarce	Extensive Outcropping BIF	Large Rocks (21-60cm)	None Discernible	Post fire regroup Triodia with sparsely scattered corymbias, Scattered Eucalypts, Spinifex Hummock Grassland	Very High	Nil	None	None	None	Frequent Fire	Recent (0 to 2 yr)	
VMRC-20	-20.9962 119.300	15/05/19	Stony Plain	Sand Plain	Flat	Flat	Sandy Loam	Many Large Patches	Negligible	Gravel (1-4cm)	Many Small Patches	Acacia Shrubland, Spinifex Hummock Grassland	Nil	High	None	None	None	Cattle Grazing	Old (6+ yr)	
VMRC-21	-21.0996 119.187	13/05/19	Major Drainage Line	Medium Drainage Line	Flat	Flat	Sand	Evenly Spread	Limited Outcropping BIF	Gravel (1-4cm)	Few Small Patches	Drainage line with scattered corymbias over sparsely scattered small shrubs in creek bed with scattered shrubs and patchy hummock and tussock grasses, Scattered Eucalypts, Tussock Grassland	Nil	Low	Scarce	None	None	Cattle Grazing, Road/ Access Track	Old (6+ yr)	
VMRC-22	-21.0006 119.331	16/05/19	Major Drainage Line	Major Drainage Line	East	Flat	Sand	Evenly Spread	Negligible	Small Rocks (11-20cm)	Scarce	Melaleuca, Tussock Grassland	Nil	Moderate	Moderate	Moderate	Prone to Flooding	Cattle Grazing, Weed Invasion	Old (6+ yr)	
VMRC-23	-21.1095 119.187	13/05/19	Gorge/Gully	Gorge	South	Steep	Clay Loam	Scarce	Extensive Outcropping BIF	Large Rocks (21-60cm)	Few Small Patches	Scattered Eucalypts, Sparsely scattered corymbias over triodia and mixed small shrubs., Spinifex Hummock Grassland	Very High	Nil	None	None	None	None Discernible	Old (6+ yr)	

Site ID	Coord.	Date	Habitat Type	Landform	Aspect	Slope	Soil Type	Soil Avail.	Outcropping Rock Type	Rock Size	Veg Litter	Dominant Veg. Type	Rocky Cracks/ Crevices	Burrowing Suitability	Hollows <10cm	Hollows >10cm	Water Present	Disturbances	Last Fire	Notes
VMRC-24	-21.1134 119.188	15/05/19	Low Stony Hills	Gorge	Flat	Flat	Sand	Scarce	Moderate Outcropping Conglomerate	Small Rocks (11-20cm)	Few Small Patches	Native Orange? Spinifex Hummock Grassland	Very High	Low	Scarce	Scarce	Prone to Flooding	None Discernible	Moderate (3 to 5 yr)	
VMRC-25	-20.9992 119.314	13/05/19	Stony Plain	Drainage Area/ Floodplain	Flat	Flat	Clayey Sand	Evenly Spread	Negligible	Negligible	Scarce	Open Eucalypt woodland with sparsely scattered mixed shrubs over scattered hummock and tussock grasses	Nil	Moderate	None	None	None	Cattle Grazing, Road/ Access Track	Old (6+ yr)	
VMRC-26	-20.9682 119.428	16/05/19	Low Stony Hills	Gully	West	Low	Sand	Scarce	Major Outcropping Sandstone	Pebbles (5-10cm)	Many Small Patches	Acacia Shrubland, Orange tree?	High	Moderate	Scarce	Scarce	Prone to Pooling	None Discernible	Moderate (3 to 5 yr)	
VMRC-27	-20.9782 119.409	14/05/19	Major Drainage Line	Major Drainage Line	Flat	Flat	Sandy Loam	Many Small Patches	Negligible	Negligible	Few Large Patches	Riparian vegetation with scattered corymbias over scattered patches of sedges and tussock grasses.	Nil	Moderate	Scarce	None	Prone to Pooling	Cattle Grazing	Old (6+ yr)	
VMRC-28	-21.0962 119.191	17/05/19	Hillcrest/ Hillslope	Hillcrest/ Upper Hillslope	North	Moderate	Clay Loam	Scarce	Major Outcropping BIF	Large Rocks (21-60cm)	Scarce	Acacia Shrubland, Grevillea, Tussock Grassland	High	Nil	None	None	None	Fire	Recent (0 to 2 yr)	
VMRC-29	-20.9782 119.300	14/05/19	Low Stony Hills	Undulating Low Hills	North	Low	Clay Loam	Scarce	Minor Outcropping Ironstone	Gravel (1-4cm)	Scarce	Acacia Shrubland, Scattered acacias over low open Triodia.,	Nil	Nil	None	None	None	Road/ Access Track	Moderate (3 to 5 yr)	
VMRC-30	-21.0270 119.313	18/05/19	Hillcrest/ Hillslope	Gully	North/ East	Steep	Clay Loam	Many Small Patches	Extensive Outcropping BIF	Boulders (>61cm)	None Discernible	Scattered Eucalypts	High	Nil	None	None	None	Frequent Fire	Recent (0 to 2 yr)	
VMRC-31	-20.9653 119.396	14/05/19	Stony Plain	Undulating Low Hills	North/ West	Low	Clay Loam	Few Small Patches	Negligible	Gravel (1-4cm)	Scarce	Scattered Eucalypts, Sparsely scattered corymbias over scattered mixed shrubs and patchy Triodia of various life stages.	Nil	Low	None	None	None	Road/ Access Track	Old (6+ yr)	
VMRC-32	-21.0177 119.330	18/05/19	Low Stony Hills	Hillcrest/ Upper Hillslope	Flat	Flat	Clay Loam	Few Small Patches	Moderate Outcropping Sandstone	Gravel (1-4cm)	None Discernible	Scattered Eucalypts	Moderate	Nil	None	None	None	Frequent Fire	Recent (0 to 2 yr)	Burnt
VMRC-33	-21.0104 119.363	14/05/19	Stony Plain	Undulating Low Hills	East	Low	Clay Loam	Scarce	Negligible	Pebbles (5-10cm)	Scarce	Acacia Shrubland, Spinifex Hummock Grassland, Triodia grassland with scattered small shrubs. Larger acacia along minor drainage line.	Nil	Low	None	None	None	None Discernible	Moderate (3 to 5 yr)	Mature triodia very patchy, largely small immature throughout most of area.
VMRC-34	-20.9732 119.434	19/05/19	Hillcrest/ Hillslope	Gully	South	Very Steep	Clay Loam	Scarce	Extensive Outcropping Ironstone	Large Rocks (21-60cm)	Many Small Patches	Scattered Eucalypts, focus over patchy tussock grasses.	Very High	Nil	None	None	None	None Discernible	Old (6+ yr)	
VMRC-35	-20.7260 119.323	14/05/19		Drainage Area/ Floodplain	Flat	Flat	Sandy Loam	Evenly Spread	Negligible	Negligible	None Discernible	Sparsely scattered regrowth shrubs over sparse understory regrowth of mixed shrubs, herbs and hummock/tussock grasses.	Nil	Very High	None	None	None	Cattle Grazing, Frequent Fire, Road/ Access Track	Recent (0 to 2 yr)	Post fire regrowth.
VMRC-36	-20.9761 119.448	19/05/19	Hillcrest/ Hillslope	Hillslope	West	Moderate	Sandy Loam	Few Large Patches	Moderate Outcropping Siltstone/ Mudstone	Pebbles (5-10cm)	Evenly Spread	Eucalypt Woodland, Spinifex Hummock Grassland	Very High	Low	Moderate	Scarce	Scarce	None Discernible	Old (6+ yr)	
VMRC-37	-20.7288 119.324	14/05/19		Sandy/ Stony Plain	Flat	Flat	Sandy Loam	Evenly Spread	Negligible	Gravel (1-4cm)	None Discernible	None. Cleared area.	Nil	Nil	None	None	None	Large scale clearing., Road/ Access Track	Old (6+ yr)	Large cleared area/stockpile yard with no vegetation or fauna habitat.

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VMRC-39	-20.9526 119.407	15/05/19	Stony Plain	Sandy/ Stony Plain	Flat	Flat	Sandy Clay Loam	Many Large Patches	Negligible	Gravel (1-4cm)	Many Small Patches	Scattered Eucalypts, Scattered corymbias over scattered patches of small acacias and mature Triodia. , Spinifex Hummock Grassland	Nil	Very High	Scarce	None	None	None Discernible	Old (6+ yr)	
VMRC-41	-20.9598 119.404	15/05/19	Stony Plain	Stony Plain	Flat	Flat	Clay Loam	Many Small Patches	Negligible	Pebbles (5-10cm)	Few Small Patches	Acacia Shrubland, Scattered patches of acacia over Triodia of various life stages.	Nil	Nil	None	None	None	Road/ Access Track	Moderate (3 to 5 yr)	
VMRC-43	-20.9579 119.404	15/05/19	Stony Plain	Medium Drainage Line	South	Low	Sandy Loam	Few Large Patches	Negligible	Pebbles (5-10cm)	Scarce	Scattered Eucalypts, Sparsely scattered corymbias along creek banks over scattered small acacias and tussock grasses.	Nil	Low	None	None	Small drying pool of water.	Cattle Grazing, Road/ Access Track	Moderate (3 to 5 yr)	
VMRC-45	-20.9766 119.388	15/05/19	Sandy Plain	Undulating Low Hills	North	Low	Clay Loam	Scarce	Moderate Outcropping Quartz	Small Rocks (11-20cm)	Scarce	Acacia Shrubland, Scattered acacia and grevillea shrubs over Triodia of various life stages.	Moderate	Nil	None	None	None	None Discernible	Moderate (3 to 5 yr)	
VMRC-47	-20.9833 119.376	15/05/19	Sandy Plain	Drainage Area/ Floodplain	Flat	Low	Sandy Loam	Many Small Patches	Negligible	Gravel (1-4cm)	Few Small Patches	Acacia Shrubland, Scattered Eucalypts, Scattered corymbias over scattered acacias and grevilleas over tussock grasses.	Nil	Low	None	None	None	Cattle Grazing, Road/ Access Track	Moderate (3 to 5 yr)	Drainage area into dry minor drainage line.
VMRC-49	-20.9894 119.360	15/05/19	Sandy Plain	Drainage Area/ Floodplain	Flat	Flat	Sandy Loam	Evenly Spread	Negligible	Negligible	Scarce	Scattered Eucalypts, Scattered corymbias over even tussock grass cover.,	Nil	High	None	None	None	Cattle Grazing, Frequent Fire	Recent (0 to 2 yr)	
VMRC-51	-20.9947 119.345	15/05/19	Sandy Plain	Sand Plain	Flat	Flat	Sandy Clay Loam	Evenly Spread	Negligible	Negligible	None Discernible	Scattered corymbias over recent post fire regrowth. Scattered burnt acacia/grevillea shrubs.,	Nil	High	None	None	None	Cattle Grazing, Frequent Fire	Recent (0 to 2 yr)	
VMRC-53	-20.9980 119.334	15/05/19	Sandy Plain	Hillcrest/ Upper Hillslope	West	Moderate	Clay Loam	Few Small Patches	Limited Outcropping Ironstone	Gravel (1-4cm)	None Discernible	Acacia Shrubland, Sparsely scattered acacias/grevilleas over Triodia of various life stages.	Nil	Low	None	None	None	None Discernible	Moderate (3 to 5 yr)	
VMRC-55	-20.9943 119.353	15/05/19	Sandy Plain	Sandy/ Stony Plain	Flat	Flat	Clay Loam	Evenly Spread	Negligible	Gravel (1-4cm)	None Discernible	Sparsely scattered corymbias over sparsely scattered patches of Triodia of various life stages., Scattered Eucalypts, Spinifex Hummock Grassland	Nil	Moderate	None	None	None	Cattle Grazing, Frequent Fire	Recent (0 to 2 yr)	Large recently burnt with scattered patches of triodia and acacia/grevillea shrubs ranging in size.
VMRC-57	-20.9938 119.334	15/05/19	Stony Plain	Stony Plain	Flat	Flat	Clay Loam	Few Small Patches	Negligible	Gravel (1-4cm)	None Discernible	Acacia Shrubland, Sparsely scattered acacia/grevillea over patchy Triodia cover of various life stages.	Nil	Low	None	None	None	Frequent Fire	Moderate (3 to 5 yr)	Habitat patchy with large burnt areas though some mature triodia still occurring in area.
VMRC-59	-21.0035 119.325	16/05/19	Stony Plain	Undulating Low Hills	South	Low	Clay Loam	Scarce	Negligible	Gravel (1-4cm)	Few Small Patches	Sparsely scattered acacia/grevillea shrubs over Triodia of various life stages, inc large mature patches.	Nil	Low	None	None	None	Cattle Grazing, Frequent Fire, Road/ Access Track	Old (6+ yr)	Only small isolated patch of triodia surrounded by recently burnt areas.

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VMRC-61	-21.0089 119.326	16/05/19	Low Stony Hills	Hillcrest/ Upper Hillslope	South	Moderate	Clay Loam	None Discernible	Extensive Outcropping Granite	Small Rocks (11-20cm)	None Discernible	Recently burnt acacia shrubland over sparsely scattered Triodia., Spinifex Hummock Grassland	Low	Nil	None	None	None	Frequent Fire	Recent (0 to 2 yr)	Largely burnt area with sparsely scattered acacia shrubs and open patches of triodia.
VMRC-63	-21.0076 119.324	16/05/19	Low Stony Hills	Hillslope	North	Low	Clay Loam	Scarce	Major Outcropping Volcanic Rock	Small Rocks (11-20cm)	None Discernible	Little to no vegetation present.	Moderate	Nil	None	None	None	Frequent Fire	Recent (0 to 2 yr)	
VMRC-65	-21.0109 119.320	16/05/19	Low Stony Hills	Footslope	West	Low	Clay Loam	Scarce	Negligible	Pebbles (5-10cm)	None Discernible	Acacia Shrubland, acacia/grevillea over Triodia with sparse vegetation remaining or regrowth.,	Nil	Nil	None	None	None	Frequent Fire, Mining Exploration	Recent (0 to 2 yr)	
VMRC-67	-21.0129 119.318	16/05/19	Low Stony Hills	Stony Plain	Flat	Low	Clay Loam	Scarce	Negligible	Gravel (1-4cm)	None Discernible	Sparsely scattered grevillea over Triodia of various life stages.	Nil	Nil	None	None	None	Cattle Grazing	Moderate (3 to 5 yr)	Mature triodia scares
VMRC-69	-21.0254 119.315	16/05/19	Hillcrest/ Hillslope	Hillcrest/ Upper Hillslope	South	Very Steep	Clay Loam	None Discernible	Extensive Outcropping BIF	Small Rocks (11-20cm)	None Discernible	Recently burnt grevillea/acacia over Triodia. Sparsely scattered patches of Triodia on hilltop/slope.	Low	Nil	None	None	None	Frequent Fire, Mining Exploration	Recent (0 to 2 yr)	
VMRC-71	-21.0163 119.321	16/05/19	Low Stony Hills	Hillcrest/ Upper Hillslope	North/ East	Steep	Clay Loam	None Discernible	Major Outcropping BIF	Pebbles (5-10cm)	None Discernible	Acacia Shrubland, Upper hillslope with sparsely scattered grevillea over Triodia., Spinifex Hummock Grassland	Moderate	Nil	None	None	None	Frequent Fire, Mining Exploration, Road/ Access Track	Recent (0 to 2 yr)	
VMRC-73	-21.0029 119.319	16/05/19	Stony Plain	Sandy/ Stony Plain	Flat	Flat	Sandy Clay Loam	Many Small Patches	Negligible	Gravel (1-4cm)	Scarce	Acacia Shrubland, Scattered acacia/grevillea over Triodia of various life stages.,	Nil	Moderate	None	None	None	Cattle Grazing, Road/ Access Track	Old (6+ yr)	Scattered patches of unburnt mature triodia within larger burnt area.
VMRC-75	-21.0010 119.315	16/05/19	Stony Plain	Sandy/ Stony Plain	Flat	Flat	Sandy Clay Loam	Evenly Spread	Negligible	Gravel (1-4cm)	None Discernible	Scattered corymbias over regrowth acacia shrubs and patches of hommock and tussock grasses.	Nil	Moderate	None	None	None	Cattle Grazing, Frequent Fire, Road/ Access Track	Recent (0 to 2 yr)	
VMRC-77	-20.9757 119.446	19/05/19	Hillcrest/ Hillslope	Gorge	North	Cliff	Clay Loam	None Discernible	Extensive Outcropping BIF	Large Rocks (21-60cm)	Scarce	Acacia Shrubland, Spinifex Hummock Grassland, Tussock Grassland	Very High	Nil	None	None	Seep through rock	None Discernible	Old (6+ yr)	Seep at roots of three small figs tress
VMRC-79	-21.0021 119.304	16/05/19	Stony Plain	Stony Plain	Flat	Flat	Clay Loam	Few Small Patches	Negligible	Gravel (1-4cm)	Scarce	Sparsely scattered corymbias over scattered acacia and Triodia regrowth.	Nil	Low	Scarce	None	None	Cattle Grazing, Frequent Fire	Recent (0 to 2 yr)	
VMRC-81	-21.0931 119.197	16/05/19	Low Stony Hills	Hillslope	North/ West	Low	Clay Loam	Scarce	Limited Outcropping Ironstone	Pebbles (5-10cm)	None Discernible	Scattered grevilleas over Triodia of various life stages., Spinifex Hummock Grassland	Low	Nil	None	None	None	Frequent Fire	Moderate (3 to 5 yr)	
VMRC-83	-21.0911 119.196	16/05/19	Hillcrest/ Hillslope	Hillslope	South/ East	Moderate	Clay Loam	Scarce	Major Outcropping Ironstone	Small Rocks (11-20cm)	Scarce	Sparsely scattered corymbias over scattered post fire regrowth acacias/grevilleas and Triodia. Scattered patches of lather mature Triodia in unburnt patches.	Moderate	Nil	None	None	None	Frequent Fire	Moderate (3 to 5 yr)	
VMRC-85	-20.9939 119.400	17/05/19	Stony Plain	Stony Plain	Flat	Flat	Clay Loam	Few Small Patches	Negligible	Gravel (1-4cm)	None Discernible	Acacia Shrubland, Scattered acacia/grevillea over patchy Triodia of various life stages.	Nil	Low	None	None	None	Road/ Access Track	Old (6+ yr)	Triodia cover patchy, includes some larger mature hummocks.

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VMRC -85	-21.0168 119.400	17/05/ 19	Stony Plain	Undulating Low Hills	North/ West	Low	Clay Loam	Scarce	Negligible	Pebbles (5-10cm)	None Discernible	Acacia Shrubland, Scattered acacia/grevillea shrubs over scattered patches of Triodia.	Nil	Nil	None	None	None	Frequent Fire	Moderate (3 to 5 yr)	
VMRC -86	-20.9964 119.301	15/05/ 19	Sandy Plain	Gilgai Plain	Flat	Flat	Clay Loam	Evenly Spread	Negligible	Gravel (1-4cm)	Few Small Patches	Acacia Shrubland, Tussock Grassland	Nil	High	None	None	None	Cattle Grazing	Recent (0 to 2 yr)	Some cracks up to 4cm wide
VMRC -87	-20.9876 119.362	17/05/ 19	Sandy Plain	Sandstone outcrop	West	Low	Clay Loam	Scarce	Major Outcropping Sandstone	Large Rocks (21-60cm)	Scarce	Acacia Shrubland, Spinifex Hummock Grassland	Moderate	Nil	None	None	None	None Discernible	Moderate (3 to 5 yr)	Some recent fire in patches throughout
VMRC -88	-21.0057 119.350	17/05/ 19	Stony Plain	Drainage Area/ Floodplain	Flat	Flat	Sandy Loam	Evenly Spread	Negligible	Negligible	Few Small Patches	Acacia Shrubland, Scattered Eucalypts, Spinifex Hummock Grassland	Nil	High	None	None	None	None Discernible	Moderate (3 to 5 yr)	
VMRC -89	-20.9844 119.304	16/05/ 19	Hillcrest/ Hillslope	Sandy/ Stony Plain	Flat	Flat	Clay Loam	Many Small Patches	Negligible	Gravel (1-4cm)	Few Small Patches	Acacia Shrubland, Scattered patches of acacias over Triodia of various life stages, including larger mature patches.	Nil	High	None	None	None	Cattle Grazing	Old (6+ yr)	
VMRC -99	-21.0263 119.314	12/07/ 19	Stony Plain	Hillcrest/ Upper Hillslope	Flat	Low	Clay Loam	Few Large Patches	Extensive Outcropping BIF	Boulders (>61cm)	None Discernible	None	High	Nil	None	None	None	Frequent Fire	Recent (0 to 2 yr)	Completey burnt- lots of annual plants regrowth- trachymene, cleome,
VMRC -101	-20.9962 119.332	13/07/ 19	Stony Plain	Sand Plain	Flat	Flat	Loamy Sand	Evenly Spread	Negligible	Negligible	Few Large Patches	Acacia Shrubland, Scattered Eucalypts, Spinifex Hummock Grassland	Nil	Moderate	Scarce	Scarce	None	None Discernible	Old (6+ yr)	
VMRC -103	-20.9946 119.301	14/07/ 19		Cracking clay	Flat	Flat	Clayey Sand	Evenly Spread	Negligible	Negligible	Few Small Patches	Acacia Shrubland, Spinifex Hummock Grassland	Nil	Very High	None	None	None	Cattle Grazing	Old (6+ yr)	
VMRC -104	-20.9962 119.300	14/07/ 19	Hillcrest/ Hillslope	Sand Plain	Flat	Flat	Clayey Sand	Evenly Spread	Negligible	Negligible	Many Small Patches	Acacia Shrubland, Spinifex Hummock Grassland, Tussock Grassland	Nil	High	None	None	None	Cattle Grazing	Moderate (3 to 5 yr)	
VMRC -106	-20.9725 119.430	15/07/ 19	Hillcrest/ Hillslope	Cliff	South	Very Steep	Sandy Clay Loam	Few Small Patches	Extensive Outcropping BIF	Boulders (>61cm)	Few Small Patches	Scattered Eucalypts, Spinifex Hummock Grassland, Tussock Grassland	Very High	Low	None	None	None	None Discernible	Old (6+ yr)	
VMRC -107	-21.0272 119.312	15/07/ 19	Stony Plain	Cliff	North/ East	Steep	Clay Loam	Many Large Patches	Extensive Outcropping BIF	Boulders (>61cm)	Scarce	Scattered Eucalypts	High	Low	None	None	None	Frequent Fire	Recent (0 to 2 yr)	
VMRC -108	-20.9960 119.304	15/07/ 19	Low Stony Hills	Sandy/ Stony Plain	Flat	Flat	Clay Loam	Evenly Spread	Negligible	Gravel (1-4cm)	None Discernible	Acacia Shrubland, Spinifex Hummock Grassland	Nil	Moderate	None	None	None	Cattle Grazing, Frequent Fire, Road/ Access Track	Moderate (3 to 5 yr)	
VMRC -109	-20.9645 119.431	17/07/ 19	Major Drainage Line	Gully	North	Moderate	Clay Loam	Scarce	Extensive Outcropping Granite	Small Rocks (11-20cm)	Few Small Patches	Axillaris sp., Spinifex Hummock Grassland	High	Nil	None	None	Prone to Pooling	None Discernible	Moderate (3 to 5 yr)	
VMRC -110	-20.9990 119.331	16/07/ 19	Sandy Plain	Drainage Area/ Floodplain	Flat	Flat	Sand	Evenly Spread	Minor Outcropping BIF	Gravel (1-4cm)	Few Small Patches	Euc. camluensis; cyperus, Eucalypt Woodland	Low	Moderate	Common	Common	Prone to Flooding	Cattle Grazing	Old (6+ yr)	
VMRC -111	-20.9810 119.361	17/07/ 19	Low Stony Hills	Medium Drainage Line	North	Low	Loamy Sand	Many Large Patches	Minor Outcropping Granite	Small Rocks (11-20cm)	Few Small Patches	Acacia Shrubland, Scattered Eucalypts, Tussock Grassland	Nil	High	Scarce	Scarce	None	Cattle Grazing	Old (6+ yr)	
VMRC -115	-21.1023 119.189	15/07/ 19	Major Drainage Line	Stony Plain	North	Low	Clay Loam	Scarce	Limited Outcropping Ironstone	Pebbles (5-10cm)	Scarce	Acacia Shrubland, Scattered acacia and grevillea over Triodia hummock grasses of various life stages,	Nil	Low	None	None	None	Cattle Grazing, Road/ Access Track	Moderate (3 to 5 yr)	
VMRC -116	-20.9700 119.392	16/07/ 19	Hillcrest/ Hillslope	Drainage Area/ Floodplain	North/ West	Low	Sand	Evenly Spread	Negligible	Pebbles (5-10cm)	Many Small Patches	Eucalypt Woodland, Melaleuca, cyperus	Nil	Low	Common	Common	Prone to Flooding	Cattle Grazing	Old (6+ yr)	

Site ID	Coord.	Date	Habitat Type	Landform	Aspect	Slope	Soil Type	Soil Avail.	Outcropping Rock Type	Rock Size	Veg Litter	Dominant Veg. Type	Rocky Cracks/ Crevices	Burrowing Suitability	Hollows <10cm	Hollows >10cm	Water Present	Disturbances	Last Fire	Notes
VMRC -117	-20.9722 119.424	18/07/ 19	Low Stony Hills	Hillcrest/ Upper Hillslope	Flat	Flat	Clay Loam	Few Large Patches	Major Outcropping BIF	Large Rocks (21-60cm)	Few Small Patches	Acacia Shrubland, *Acacia spondylophylla, grevillea winiceki,, Acacia tumid*, Spinifex Hummock Grassland	Moderate	Nil	None	None	None	Mining Exploration	Old (6+ yr)	
VMRC -118	-20.9650 119.423	19/07/ 19		Gorge	North	Moder ate	Loamy Sand	Few Small Patches	Extensive Outcropping Granite	Boulders (>61cm)	Few Small Patches	Spinifex Hummock Grassland	High	Low	Scarce	Scarce	Prone to Pooling	None Discernible	Old (6+ yr)	
VMRC -119	-20.9395 119.397	19/07/ 19	Hillcrest/ Hillslope	Hillslope	South	Moder ate	Loamy Sand	Scarce	Extensive Outcropping Granite	Large Rocks (21-60cm)	Scarce	Acacia Shrubland, Spinifex Hummock Grassland	Moderate	Low	None	None	None	Cattle Grazing	Old (6+ yr)	
VMRC -120	-21.0269 119.314	19/07/ 19	Low Stony Hills	Hillcrest/ Upper Hillslope	South/ East	Steep	Clay Loam	Many Small Patches	Extensive Outcropping BIF	Large Rocks (21-60cm)	Scarce	Scattered Eucalypts, Spinifex Hummock Grassland	High	Nil	None	None	None	Frequent Fire	Recent (0 to 2 yr)	
VMRC -122	-21.1088 119.187	19/07/ 19	Gorge/Gull y	Hillcrest/ Upper Hillslope	North	Steep	Clay Loam	Many Small Patches	Moderate Outcropping BIF	Large Rocks (21-60cm)	Few Small Patches	Spinifex Hummock Grassland	Moderate	Moderate	None	None	None	None Discernible	Moderate (3 to 5 yr)	
VMRC -123	-21.1093 119.187	21/07/ 19	Sandy Plain	Gorge	South	Cliff	Sandy Clay Loam	Few Small Patches	Extensive Outcropping BIF	Boulders (>61cm)	Many Small Patches	Scattered Eucalypts, Tussock Grassland	Very High	Low	Scarce	None	Prone to Flooding	None Discernible	Old (6+ yr)	
VMRC -125	-20.9878 119.364	13/07/ 19	Low Stony Hills	Sandy/ Stony Plain	Flat	Flat	Clay Loam Sandy	Evenly Spread	Negligible	Gravel (1-4cm)	Scarce	Acacia Shrubland, Spinifex Hummock Grassland	Nil	Moderate	None	None	None	Road/ Access Track	Moderate (3 to 5 yr)	

Appendix E: SRE Invertebrate Fauna Habitat Assessments

Site ID	Latitude	Longitude	Date	Habitat Type	Drainage	Landform	Slope	Aspect	Rocky outcrop amount	Rocky outcrop type	Rock size	Vegetation type	Vegetation litter	Shade	Soil type	Soil availability	Burrow type	Last fire	Disturbance
SMRC-01	-21.1128	119.1936	12/05/2019	Major Drainage Line	Creek	Gorge	Very Steep	Flat	Extensive Outcropping	BIF	Pebbles (5-10cm)	Eucalyptus/ Corymbia Woodland,Other Acacia Open Shrubland,Ficus Tree/ Shrub,Triodia Grassland,Soft/ Tussock Grassland	Few Large Patches	Medium 40-60%	Silty Loam	Few Large Patches	Scorpion	Old (6+ yr)	Road/ Access Track, Mining Exploration, Weed Invasion
SMRC-02	-20.9852	119.4152	12/05/2019		Negligible	Undulating Low Hills	Moderate	Flat	Limited Outcropping	Other	Boulders (>61cm)	Open Mulga Shrubland,Open Eucalyptus/ Corymbia,Triodia Grassland	Few Small Patches	Negligible <5%	Silty Loam	Scarce	None	Old (6+ yr)	Road/ Access Track
SMRC-03	-21.0845	119.1885	12/05/2019	Major Drainage Line	Creek	Medium Drainage Line	Flat	Flat	Negligible	None Discernible	Small Rocks (11-20cm)	Other Acacia Open Shrubland,Open Eucalyptus/ Corymbia,Soft/ Tussock Grassland	Scarce	Low 5-20%	Clay Loam	Few Large Patches	None	Moderate (3 to 5 yr)	Cattle Grazing
SMRC-04	-20.9824	119.4293	12/05/2019	Major Drainage Line	River	Major Drainage Line	Flat	North/ East	Negligible	None Discernible	Pebbles (5-10cm)	Open Eucalyptus/ Corymbia,Soft/ Tussock Grassland	Few Large Patches	Low to Med 20-40%	Sand	Evenly Spread	None	Old (6+ yr)	Cattle Grazing
SMRC-05	-21.0972	119.1856	12/05/2019	Major Drainage Line	Creek	Medium Drainage Line	Flat	Flat	Limited Outcropping	BIF	Pebbles (5-10cm)	Soft/ Tussock Grassland,Other Acacia Open Shrubland,Open Eucalyptus/ Corymbia	Scarce	Low 5-20%	Clay Loam	Many Small Patches	None	Old (6+ yr)	Road/ Access Track,Cattle Grazing
SMRC-06	-20.9727	119.4243	13/05/2019	Hillcrest/ Hillslope	Gully	Hillcrest/ Upper Hillslope	Low	South/ West	Major Outcropping	BIF	Large Rocks (21-60cm)	Other Acacia Open Shrubland,Triodia Grassland	Many Small Patches	Low to Med 20-40%	Silty Loam	Many Small Patches	None	Old (6+ yr)	None Discernible
SMRC-07	-21.0033	119.3245	12/05/2019	Stony Plain	Negligible	Stony Plain	Low	South/ West	Negligible	None Discernible	Gravel (1-4cm)	Triodia Grassland	Few Small Patches	Negligible <5%	Clay Loam	Few Small Patches	None	Moderate (3 to 5 yr)	Road/ Access Track
SMRC-08	-20.9599	119.4061	13/05/2019	Stony Plain	Negligible	Sandy/ Stony Plain	Flat	Flat	Negligible	None Discernible	Gravel (1-4cm)	Other Acacia Open Shrubland,Triodia Grassland	Few Small Patches	Negligible <5%	Sandy Loam	Many Large Patches	None	Moderate (3 to 5 yr)	None Discernible
SMRC-09	-21.1063	119.1931	9/05/2019	Low Stony Hills	Negligible	Stony Plain	Low	Flat	Negligible	None Discernible	Small Rocks (11-20cm)	Open Eucalyptus/ Corymbia,Triodia Grassland	Many Large Patches	Low to Med 20-40%	Clay Loam	Few Small Patches	None	Old (6+ yr)	Cattle Grazing,Road/ Access Track
SMRC-10	-20.9514	119.4055	13/05/2019	Major Drainage Line	River	Drainage Area/ Floodplain	Flat	Flat	Negligible	None Discernible	Pebbles (5-10cm)	Open Eucalyptus/ Corymbia,Soft/ Tussock Grassland	Scarce	Low to Med 20-40%	Sandy Clay Loam	Few Large Patches	None	Old (6+ yr)	Cattle Grazing,Weed Invasion
SMRC-11	-21.0885	119.1967	13/05/2019	Hillcrest/ Hillslope	Negligible	Ironstone Outcropping	Steep	North/ East	Major Outcropping	BIF	Boulders (>61cm)	Open Eucalyptus/ Corymbia,Triodia Grassland	None Discernible	Negligible <5%	Clay Loam	None Discernible	None	Recent (0 to 2 yr)	None Discernible
SMRC-12	-21.0295	119.3114	14/05/2019	Hillcrest/ Hillslope	Negligible	Hillcrest/ Upper Hillslope	Steep	East	Major Outcropping	BIF	Boulders (>61cm)	Open Eucalyptus/ Corymbia	Scarce	Negligible <5%	Loamy Sand	Scarce	None	Recent (0 to 2 yr)	Frequent Fire
SMRC-13	-21.1095	119.1875	13/05/2019	Gorge/Gully	Gully	Gorge	Steep	South	Extensive Outcropping	BIF	Boulders (>61cm)	Open Eucalyptus/ Corymbia,Triodia Grassland,Soft/ Tussock Grassland	Few Small Patches	High 80-100%	Clay Loam	Scarce	None	Old (6+ yr)	None Discernible
SMRC-14	-21.0320	119.3132	14/05/2019	Low Stony Hills	Negligible	Hillcrest/ Upper Hillslope	Moderate	East	Major Outcropping	BIF	Small Rocks (11-20cm)	Soft/ Tussock Grassland	None Discernible	Negligible <5%	Loamy Sand	None Discernible	None	Recent (0 to 2 yr)	Frequent Fire
SMRC-15	-20.9992	119.3139	13/05/2019	Stony Plain	Sheet Flow	Drainage Area/ Floodplain	Flat	Flat	Negligible	None Discernible	Small Rocks (11-20cm)	Other Acacia Open Shrubland,Open Eucalyptus/ Corymbia,Triodia Grassland,Soft/ Tussock Grassland	Few Small Patches	Low 5-20%	Clayey Sand	Evenly Spread	None	Old (6+ yr)	Cattle Grazing,Road/ Access Track
SMRC-16	-21.0167	119.3019	15/05/2019	Low Stony Hills	Creek	Sandy/ Stony Plain	Flat	Flat	Negligible	None Discernible	Negligible	Open Eucalyptus/ Corymbia,Soft/ Tussock Grassland,Triodia Grassland	Few Small Patches	Low 5-20%	Loamy Sand	Many Large Patches	None	Recent (0 to 2 yr)	Cattle Grazing
SMRC-17	-20.9606	119.4161	11/05/2019	Low Stony Hills	Negligible	Hillcrest/ Upper Hillslope	Low	North	Limited Outcropping	BIF	Large Rocks (21-60cm)	Other Acacia Open Shrubland,Open Eucalyptus/ Corymbia,Triodia Grassland	Scarce	Negligible <5%	Clay Loam	Scarce	None	Old (6+ yr)	Road/ Access Track
SMRC-18	-21.0119	119.3100	15/05/2019	Low Stony Hills	Negligible	Stony Plain	Flat	Flat	Negligible	None Discernible	Gravel (1-4cm)	Triodia Grassland	Few Small Patches	Negligible <5%	Clay Loam	Few Large Patches	None	Recent (0 to 2 yr)	Cattle Grazing
SMRC-19	-20.9920	119.3458	10/05/2019	Sandy Plain	Negligible	Sand Plain	Flat	Flat	Negligible	None Discernible	Negligible	Other Acacia Open Shrubland,Open Eucalyptus/ Corymbia	Many Small Patches	Low 5-20%	Clayey Sand	Evenly Spread	None	Old (6+ yr)	Cattle Grazing
SMRC-20	-20.9680	119.4274	16/05/2019	Low Stony Hills	Gully	Gorge	Moderate	South	Extensive Outcropping	BIF	Boulders (>61cm)	Other Tree,Triodia Grassland,Soft/ Tussock Grassland	Scarce	Med to High 60-80%	Clay Loam	None Discernible	None	Old (6+ yr)	None Discernible
SMRC-21	-20.9700	119.3924	14/05/2019	Major Drainage Line	River	Major Drainage Line	Flat	North	Negligible	None Discernible	Small Rocks (11-20cm)	Other Acacia Open Shrubland,Eucalyptus/ Corymbia Woodland,Triodia Grassland,Soft/ Tussock Grassland	Many Small Patches	Med to High 60-80%	Sand	Evenly Spread	None	Old (6+ yr)	Cattle Grazing
SMRC-22	-20.9655	119.4193	16/05/2019	Low Stony Hills	Gully	Gorge	Steep	South	Extensive Outcropping	BIF	Large Rocks (21-60cm)	Other Tree,Soft/ Tussock Grassland	Scarce	Medium 40-60%	Clay Loam	Scarce	None	Old (6+ yr)	None Discernible

Site ID	Latitude	Longitude	Date	Habitat Type	Drainage	Landform	Slope	Aspect	Rocky outcrop amount	Rocky outcrop type	Rock size	Vegetation type	Vegetation litter	Shade	Soil type	Soil availability	Burrow type	Last fire	Disturbance
SMRC -23	-20.9801	119.4149	14/05/2019	Major Drainage Line	River	Major Drainage Line	Low	North	Negligible	None Discernible	Small Rocks (11-20cm)	Other Acacia Open Shrubland,Eucalyptus/ Corymbia Woodland,Triodia Grassland	Many Small Patches	Low 5-20%	Loamy Sand	Evenly Spread	None	Old (6+ yr)	Cattle Grazing
SMRC -24	-21.0010	119.3317	16/05/2019	Major Drainage Line	River	Major Drainage Line	Flat	Flat	Negligible	None Discernible	Pebbles (5-10cm)	Open Eucalyptus/ Corymbia	Scarce	Low 5-20%	Sand	Evenly Spread	None	Old (6+ yr)	Cattle Grazing,Weed Invasion
SMRC -25	-20.9782	119.3997	14/05/2019	Low Stony Hills	Negligible	Undulating Low Hills	Low	North	Limited Outcropping	Other	Pebbles (5-10cm)	Other Acacia Open Shrubland,Triodia Grassland	None Discernible	Negligible <5%	Clay Loam	None Discernible	None	Moderate (3 to 5 yr)	Road/ Access Track
SMRC -26	-20.9872	119.3618	17/05/2019	Sandy Plain	Sheet Flow		Low	South	Moderate Outcropping	Sandstone	Boulders (>61cm)	Open Mulga Shrubland,Triodia Grassland	Few Small Patches	Negligible <5%	Clay Loam	None Discernible	None	Recent (0 to 2 yr)	None Discernible
SMRC -27	-20.7261	119.3226	14/05/2019		Sheet Flow	Drainage Area/ Floodplain	Flat	Flat	Negligible	None Discernible	Negligible		None Discernible	Negligible <5%	Sandy Clay Loam	Evenly Spread	None	Recent (0 to 2 yr)	Cattle Grazing,Road/ Access Track
SMRC -28	-21.0056	119.3499	17/05/2019	Sandy Plain	Sheet Flow	Drainage Area/ Floodplain	Flat	South/ West	Negligible	None Discernible	Negligible	Other Acacia Open Shrubland,Open Eucalyptus/ Corymbia,Triodia Grassland	Many Small Patches	Negligible <5%	Sand	Evenly Spread	None	Old (6+ yr)	None Discernible
SMRC -29	-20.7288	119.3243	14/05/2019		Negligible	Sandy/ Stony Plain	Flat	Flat	Negligible	None Discernible	Gravel (1-4cm)		None Discernible	Negligible <5%	Sandy Clay Loam	Evenly Spread	None	Old (6+ yr)	Mining Exploration,Road/ Access Track
SMRC -30	-20.9794	119.4086	18/05/2019	Major Drainage Line	Sheet Flow	Drainage Area/ Floodplain	Low	Flat	Negligible	None Discernible	Pebbles (5-10cm)	Other Acacia Open Shrubland,Open Eucalyptus/ Corymbia,Soft/ Tussock Grassland	Many Small Patches	Negligible <5%	Sandy Clay Loam	Many Small Patches	None	Moderate (3 to 5 yr)	Cattle Grazing
SMRC -36	-21.0271	119.3125	18/05/2019	Stony Plain	Negligible	Hillcrest/ Upper Hillslope	Steep	South/East	Major Outcropping	BIF	Pebbles (5-10cm)		Scarce	High 80-100%	Clay Loam	Scarce	None	Recent (0 to 2 yr)	None Discernible
SMRC -31	-20.9526	119.4070	15/05/2019	Low Stony Hills	Sheet Flow	Sandy/ Stony Plain	Flat	Flat	Negligible	None Discernible	Pebbles (5-10cm)	Open Eucalyptus/ Corymbia,Triodia Grassland	Many Small Patches	Negligible <5%	Clayey Sand	Many Large Patches	None	Old (6+ yr)	Road/ Access Track
SMRC -32	-21.0146	119.3223	18/05/2019	Stony Plain	Negligible	Hillcrest/ Upper Hillslope	Very Steep	West	Major Outcropping	Conglomerate	Gravel (1-4cm)	Ficus Tree/ Shrub	Few Small Patches	Low to Med 20-40%	Clayey Sand	Scarce	None	Recent (0 to 2 yr)	None Discernible
SMRC -33	-20.9579	119.4037	15/05/2019	Sandy Plain	Creek	Medium Drainage Line	Low	South	Negligible	None Discernible	Small Rocks (11-20cm)	Other Acacia Open Shrubland,Open Eucalyptus/ Corymbia,Triodia Grassland,Soft/ Tussock Grassland	Scarce	Negligible <5%	Sandy Loam	Few Large Patches	None	Moderate (3 to 5 yr)	Road/ Access Track
SMRC -34	-20.9757	119.4458	19/05/2019	Hillcrest/ Hillslope	Seep	Gorge	Cliff	North	Extensive Outcropping	BIF	Large Rocks (21-60cm)	Other Acacia Open Shrubland,Soft/ Tussock Grassland,Triodia Grassland,Ficus	Scarce	High 80-100%	Clay Loam	None Discernible	None	Old (6+ yr)	None Discernible
SMRC -35	-20.9766	119.3879	15/05/2019	Sandy Plain	Negligible	Undulating Low Hills	Moderate	North	Moderate Outcropping	Quartz	Large Rocks (21-60cm)	Other Acacia Open Shrubland,Triodia Grassland	Few Small Patches	Negligible <5%	Clay Loam	Scarce	None	Moderate (3 to 5 yr)	None Discernible
SMRC -37	-20.9833	119.3767	15/05/2019	Sandy Plain	Sheet Flow	Drainage Area/ Floodplain	Flat	Flat	Negligible	None Discernible	Pebbles (5-10cm)	Other Acacia Open Shrubland,Open Eucalyptus/ Corymbia,Soft/ Tussock Grassland	Few Small Patches	Low 5-20%	Sandy Loam	Many Small Patches	None	Moderate (3 to 5 yr)	Cattle Grazing,Road/ Access Track
SMRC -39	-20.9943	119.3530	15/05/2019	Sandy Plain	Negligible	Sandy/ Stony Plain	Flat	Flat	Negligible	None Discernible	Pebbles (5-10cm)	Open Eucalyptus/ Corymbia,Triodia Grassland	None Discernible	Negligible <5%	Clay Loam	Evenly Spread	None	Recent (0 to 2 yr)	Road/ Access Track
SMRC -41	-20.9894	119.3601	15/05/2019	Sandy Plain	Sheet Flow	Drainage Area/ Floodplain	Flat	Flat	Negligible	None Discernible	Negligible	Open Eucalyptus/ Corymbia,Soft/ Tussock Grassland	Scarce	Negligible <5%	Sandy Loam	Evenly Spread	None	Recent (0 to 2 yr)	Cattle Grazing,Road/ Access Track
SMRC -43	-20.9946	119.3445	15/05/2019	Stony Plain	Sheet Flow	Sand Plain	Flat	Flat	Negligible	None Discernible	Gravel (1-4cm)	Open Eucalyptus/ Corymbia	None Discernible	Negligible <5%	Sandy Clay Loam	Evenly Spread	None	Recent (0 to 2 yr)	Cattle Grazing
SMRC -45	-20.9959	119.3336	15/05/2019	Stony Plain	Negligible	Hillcrest/ Upper Hillslope	Moderate	West	Limited Outcropping	BIF	Gravel (1-4cm)	Other Acacia Open Shrubland,Triodia Grassland	Few Small Patches	Negligible <5%	Clay Loam	Scarce	None	Moderate (3 to 5 yr)	None Discernible
SMRC -47	-20.9938	119.3341	15/05/2019	Low Stony Hills	Negligible	Stony Plain	Low	Flat	Negligible	None Discernible	Gravel (1-4cm)	Other Acacia Open Shrubland,Triodia Grassland	None Discernible	Negligible <5%	Clay Loam	Few Small Patches	None	Moderate (3 to 5 yr)	Road/ Access Track
SMRC -49	-21.0089	119.3259	16/05/2019	Low Stony Hills	Sheet Flow	Hillcrest/ Upper Hillslope	Moderate	South	Extensive Outcropping	Granite	Small Rocks (11-20cm)	Other Acacia Open Shrubland,Triodia Grassland	None Discernible	Negligible <5%	Clay Loam	None Discernible	None	Recent (0 to 2 yr)	Frequent Fire
SMRC -51	-21.0077	119.3240	16/05/2019	Low Stony Hills	Sheet Flow	Hillcrest/ Upper Hillslope	Low	North	Major Outcropping	Volcanic Rock	Small Rocks (11-20cm)		None Discernible	Negligible <5%	Clay Loam	Scarce	None	Recent (0 to 2 yr)	Frequent Fire
SMRC -53	-21.0109	119.3199	16/05/2019	Hillcrest/ Hillslope	Negligible	Footslope	Low	West	Negligible	None Discernible	Pebbles (5-10cm)	Other Acacia Open Shrubland,Triodia Grassland	None Discernible	Negligible <5%	Clay Loam	Scarce	None	Recent (0 to 2 yr)	Frequent Fire,Mining Exploration

Site ID	Latitude	Longitude	Date	Habitat Type	Drainage	Landform	Slope	Aspect	Rocky outcrop amount	Rocky outcrop type	Rock size	Vegetation type	Vegetation litter	Shade	Soil type	Soil availability	Burrow type	Last fire	Disturbance
SMRC -55	-21.0254	119.3146	16/05/2019	Low Stony Hills	Negligible	Hillcrest/ Upper Hillslope	Very Steep	South	Extensive Outcropping	BIF	Small Rocks (11-20cm)	Other Shrub,Triodia Grassland	None Discernible	Negligible <5%	Clay Loam	None Discernible	None	Recent (0 to 2 yr)	Mining Exploration,Frequent Fire
SMRC -57	-21.0163	119.3214	16/05/2019	Stony Plain	Negligible	Drainage Area/ Floodplain	Steep	North/ East	Major Outcropping	BIF	Small Rocks (11-20cm)	Other Shrub,Triodia Grassland	None Discernible	Negligible <5%	Clay Loam	None Discernible	None	Recent (0 to 2 yr)	Frequent Fire,Mining Exploration,Road/ Access Track
SMRC -59	-21.0029	119.3186	16/05/2019	Stony Plain	Sheet Flow	Sandy/ Stony Plain	Flat	Flat	Negligible	None Discernible	Gravel (1-4cm)	Other Acacia Open Shrubland,Triodia Grassland	Scarce	Low 5-20%	Sandy Clay Loam	Many Small Patches	None	Moderate (3 to 5 yr)	Cattle Grazing,Road/ Access Track
SMRC -61	-20.9843	119.3041	16/05/2019	Stony Plain	Sheet Flow	Sandy/ Stony Plain	Flat	Flat	Negligible	None Discernible	Gravel (1-4cm)	Triodia Grassland,Other Acacia Open Shrubland	Few Small Patches	Low to Med 20-40%	Clay Loam	Many Small Patches	None	Old (6+ yr)	Cattle Grazing
SMRC -63	-21.0021	119.3043	16/05/2019	Low Stony Hills	Sheet Flow	Stony Plain	Flat	Flat	Negligible	None Discernible	Gravel (1-4cm)	Triodia Grassland,Other Acacia Open Shrubland,Open Eucalyptus/ Corymbia	Scarce	Low 5-20%	Clay Loam	Few Large Patches	None	Recent (0 to 2 yr)	Cattle Grazing,Frequent Fire
SMRC -65	-21.0931	119.1968	16/05/2019	Hillcrest/ Hillslope	Negligible	Undulating Low Hills	Low	West	Limited Outcropping	Other	Pebbles (5-10cm)	Other Shrub,Triodia Grassland	None Discernible	Negligible <5%	Clay Loam	Scarce	None	Moderate (3 to 5 yr)	Frequent Fire
SMRC -67	-21.0911	119.1958	16/05/2019	Low Stony Hills	Negligible	Hillcrest/ Upper Hillslope	Moderate	South/East	Major Outcropping	Other	Small Rocks (11-20cm)	Other Acacia Open Shrubland,Open Eucalyptus/ Corymbia,Triodia Grassland	Scarce	Low to Med 20-40%	Clay Loam	Scarce	None	Moderate (3 to 5 yr)	Frequent Fire
SMRC -69	-21.0169	119.3096	17/05/2019	Low Stony Hills	Negligible	Undulating Low Hills	Low	North/ West	Negligible	None Discernible	Pebbles (5-10cm)	Other Acacia Open Shrubland,Other Shrub,Triodia Grassland	None Discernible	Negligible <5%	Clay Loam	Scarce	None	Moderate (3 to 5 yr)	Frequent Fire
SMRC -100	-20.9638	119.4267	17/07/2019	Sandy Plain	Gully	Sand Plain	Moderate	North	Major Outcropping	Granite	Small Rocks (11-20cm)	Other Tree	Few Large Patches	Low 5-20%	Clay Loam	Few Large Patches	None	Moderate (3 to 5 yr)	None Discernible
SMRC -101	-20.9813	119.3613	17/07/2019	Hillcrest/ Hillslope	Creek	Medium Drainage Line	Low	North	Negligible	None Discernible	Gravel (1-4cm)	Open Eucalyptus/ Corymbia,Soft/ Tussock Grassland	Few Small Patches	Low 5-20%	Clay Loam	Evenly Spread	None	Old (6+ yr)	None Discernible
SMRC -102	-20.9734	119.4142	18/07/2019	Low Stony Hills	Negligible	Cliff	Cliff	South	Extensive Outcropping	BIF	Boulders (>61cm)	Ficus Tree/ Shrub,Other Tree,Soft/ Tussock Grassland	Few Small Patches	Med to High 60-80%	Sandy Clay Loam	Few Small Patches	None	Old (6+ yr)	None Discernible
SMRC -103	-20.9657	119.4232	19/07/2019	Major Drainage Line	Gully	Gully	Low	North	Extensive Outcropping	Granite	Boulders (>61cm)	Other Tree	Many Small Patches	Low 5-20%	Clay Loam	Few Small Patches	None	Old (6+ yr)	None Discernible
SMRC -104	-20.9582	119.3959	19/07/2019	Hillcrest/ Hillslope	Creek	Medium Drainage Line	Low	North	Moderate Outcropping	Granite	Small Rocks (11-20cm)	Cyperus, buffet grass,Open Eucalyptus/ Corymbia,Soft/ Tussock Grassland	Few Small Patches	Low 5-20%	Sand	Evenly Spread	None	Old (6+ yr)	Cattle Grazing,Weed Invasion
SMRC -105	-20.9718	119.4362	20/07/2019	Low Stony Hills	Negligible	Hillcrest/ Upper Hillslope	Moderate	South	Major Outcropping	BIF	Boulders (>61cm)	Ficus Tree/ Shrub,Other Acacia Thicket,Triodia Grassland	Few Small Patches	Low to Med 20-40%	Sandy Clay Loam	Few Small Patches	None	Old (6+ yr)	Mining Exploration,Road/ Access Track
SMRC -106	-20.9558	119.4103	20/07/2019	Stony Plain	Creek	Gully	Moderate	South/ West	Extensive Outcropping	Granite	Boulders (>61cm)	Other Acacia Thicket	Scarce	Negligible <5%	Clay Loam	Scarce	None	Moderate (3 to 5 yr)	None Discernible
SMRC -107	-20.9524	119.4069	20/07/2019	Major Drainage Line	Negligible	Undulating Low Hills	Low	North	Limited Outcropping	Quartz	Pebbles (5-10cm)	Open Eucalyptus/ Corymbia,Other Acacia Thicket,Triodia Grassland	Many Small Patches	Low 5-20%	Loamy Sand	Many Large Patches	None	Old (6+ yr)	Cattle Grazing,Road/ Access Track

Appendix F: SRE Invertebrate Fauna Identified in the Database Searches

Phylum	Class	Order	Family	Genus	Species	Latitude	Longitude
Mollusca	Gastropoda	indet.	Camaenidae	*Gen. nov.*	cf. `Z` n.sp.	-21.2247	118.6640
Mollusca	Gastropoda	indet.	Camaenidae	*Gen. nov.*	cf. `Z` n.sp.	-21.2112	118.6390
Mollusca	Gastropoda	indet.	Camaenidae	*Gen. nov.*	cf. `Z` n.sp.	-21.2182	118.6340
Mollusca	Gastropoda	indet.	Camaenidae	*Gen. nov.*	cf. `Z` n.sp.	-21.2112	118.6390
Mollusca	Gastropoda	indet.	Camaenidae	*Gen. nov.*	cf. `Z` n.sp.	-21.2182	118.6340
Mollusca	Gastropoda	indet.	Camaenidae	*Gen. nov.*	cf. `Z` n.sp.	-21.6979	121.0590
Mollusca	Gastropoda	indet.	Camaenidae	*Gen. nov.*	cf. `Z` n.sp.	-21.1376	119.1240
Mollusca	Gastropoda	indet.	Camaenidae	*Gen. nov.*	cf. `Z` n.sp.	-21.1375	119.1240
Mollusca	Gastropoda	indet.	Camaenidae	*Gen. nov.*	cf. `Z` n.sp.	-21.1375	119.1240
Arthropoda	Arachnida	Araneae	Anamidae	*Aname*	`MYG001 group`	-21.1595	119.1097
Arthropoda	Arachnida	Araneae	Anamidae	*Aname*	`MYG001 group`	-21.1334	119.1206
Arthropoda	Arachnida	Araneae	Anamidae	*Aname*	`MYG099`	-20.8956	119.6025
Arthropoda	Arachnida	Araneae	Anamidae	*Aname*	`sp. indet. (female?)`	-21.1381	119.1969
Arthropoda	Arachnida	Araneae	Anamidae	*Aname*	mellosa	-21.1319	119.1317
Arthropoda	Arachnida	Araneae	Anamidae	*Aname*	mellosa	-21.1314	119.1353
Arthropoda	Arachnida	Araneae	Anamidae	*Aname*	mellosa	-21.1314	119.1353
Arthropoda	Arachnida	Araneae	Anamidae	*Aname*	mellosa	-21.1306	119.1257
Arthropoda	Arachnida	Araneae	Anamidae	*Aname*	mellosa	-21.1277	119.1342
Arthropoda	Arachnida	Araneae	Anamidae	indet.	indet.	-21.2367	119.4083
Arthropoda	Arachnida	Araneae	Barychelidae	*Aurecocrypta*	`chichester`	-21.1394	119.2317
Arthropoda	Arachnida	Araneae	Barychelidae	*Aurecocrypta*	`chichester`	-21.1650	119.2022
Arthropoda	Arachnida	Araneae	Barychelidae	*Aurecocrypta*	`chichester`	-21.1650	119.2022
Arthropoda	Arachnida	Araneae	Barychelidae	*Aurecocrypta*	`chichester`	-21.1650	119.2022
Arthropoda	Arachnida	Araneae	Barychelidae	*Aurecocrypta*	`chichester`	-21.1286	119.2106
Arthropoda	Arachnida	Araneae	Barychelidae	*Aurecocrypta*	`chichester`	-21.1394	119.2317
Arthropoda	Arachnida	Araneae	Barychelidae	*Aurecocrypta*	`chichester`	-21.1334	119.1206
Arthropoda	Arachnida	Araneae	Barychelidae	*Aurecocrypta*	`MYG318-DNA`	-21.1486	119.0886
Arthropoda	Arachnida	Araneae	Barychelidae	*Synothele*	`MYG127`	-21.1422	119.1150
Arthropoda	Arachnida	Araneae	Barychelidae	*Synothele*	`MYG334`	-21.1314	119.1353
Arthropoda	Arachnida	Araneae	Barychelidae	*Synothele*	`MYG334`	-21.1306	119.1257
Arthropoda	Arachnida	Araneae	Barychelidae	*Synothele*	`sp. indet. (juvenile)`	-21.1378	119.1260
Arthropoda	Arachnida	Araneae	Barychelidae	*Synothele*	`sp. indet. (juvenile)`	-21.1503	119.0961
Arthropoda	Arachnida	Araneae	Barychelidae	indet.	indet.	-21.1561	119.3558
Arthropoda	Arachnida	Araneae	Halonoproctidae	*Conothele*	`sp. indet. (juvenile)`	-21.1489	119.0909
Arthropoda	Arachnida	Araneae	Halonoproctidae	*Conothele*	`sp. indet. (juvenile)`	-21.1375	119.1239
Arthropoda	Arachnida	Araneae	Selenopidae	*Karaops*	`sp. indet. (juvenile)`	-21.1649	119.1071
Arthropoda	Arachnida	Pseudoscorpiones	Atemnidae	*Oratemnus*	sp. indet	-21.1503	119.0961
Arthropoda	Arachnida	Pseudoscorpiones	Cheiridiidae	`genus?`	sp. indet	-21.1550	119.0856
Arthropoda	Arachnida	Pseudoscorpiones	Chernetidae	*Haplochernes*	sp. indet	-21.1331	119.2014
Arthropoda	Arachnida	Pseudoscorpiones	Chernetidae	*Haplochernes*	sp. indet	-20.9842	119.3039
Arthropoda	Arachnida	Pseudoscorpiones	Chernetidae	*Haplochernes*	sp. indet	-20.9842	119.3039
Arthropoda	Arachnida	Pseudoscorpiones	Chernetidae	*Haplochernes*	sp. indet	-20.8483	119.3066
Arthropoda	Arachnida	Pseudoscorpiones	Chernetidae	*Haplochernes*	sp. indet	-20.7992	119.3161
Arthropoda	Arachnida	Pseudoscorpiones	Chthoniidae	*Austrochthonius*	sp. indet	-21.1489	119.0909
Arthropoda	Arachnida	Pseudoscorpiones	Chthoniidae	*Austrochthonius*	sp. indet	-21.1875	119.0992
Arthropoda	Arachnida	Pseudoscorpiones	Chthoniidae	*Austrochthonius*	sp. indet	-21.1503	119.0961
Arthropoda	Arachnida	Pseudoscorpiones	Chthoniidae	*Austrochthonius*	sp. indet	-21.1653	119.1061
Arthropoda	Arachnida	Pseudoscorpiones	Chthoniidae	*Austrochthonius*	sp. indet	-21.1450	119.0986
Arthropoda	Arachnida	Pseudoscorpiones	Chthoniidae	*Austrochthonius*	sp. indet	-21.1431	119.1045
Arthropoda	Arachnida	Pseudoscorpiones	Chthoniidae	*Tyrannochthonius*	`sp. AB A`	-21.1267	119.1346
Arthropoda	Arachnida	Pseudoscorpiones	Chthoniidae	*Tyrannochthonius*	`sp. AB B`	-21.1272	119.1358
Arthropoda	Arachnida	Pseudoscorpiones	Chthoniidae	*Tyrannochthonius*	`sp. AB`	-21.1267	119.1346
Arthropoda	Arachnida	Pseudoscorpiones	Chthoniidae	*Tyrannochthonius*	`sp. nov. near aridus`	-21.1550	119.0856

Phylum	Class	Order	Family	Genus	Species	Latitude	Longitude
Arthropoda	Arachnida	Pseudoscorpiones	Chthoniidae	*Tyrannochthonius*	`sp. nov. near aridus`	-21.1875	119.0992
Arthropoda	Arachnida	Pseudoscorpiones	Chthoniidae	*Tyrannochthonius*	`sp. nov. near aridus`	-21.1503	119.0961
Arthropoda	Arachnida	Pseudoscorpiones	Chthoniidae	*Tyrannochthonius*	`sp. nov. near aridus`	-21.1653	119.1061
Arthropoda	Arachnida	Pseudoscorpiones	Chthoniidae	*Tyrannochthonius*	`sp. nov. near aridus`	-21.1422	119.1150
Arthropoda	Arachnida	Pseudoscorpiones	Chthoniidae	*Tyrannochthonius*	`sp. nov. near aridus`	-21.1450	119.0986
Arthropoda	Arachnida	Pseudoscorpiones	Chthoniidae	*Tyrannochthonius*	`sp. nov. near aridus`	-21.1431	119.1045
Arthropoda	Arachnida	Pseudoscorpiones	Chthoniidae	*Tyrannochthonius*	`sp. nov. near aridus`	-21.1461	119.1064
Arthropoda	Arachnida	Pseudoscorpiones	Chthoniidae	*Tyrannochthonius*	`sp. nov. near aridus`	-21.1461	119.1064
Arthropoda	Arachnida	Pseudoscorpiones	Chthoniidae	*Tyrannochthonius*	`sp. nov. near aridus`	-21.1450	119.0986
Arthropoda	Arachnida	Pseudoscorpiones	Chthoniidae	*Tyrannochthonius*	`sp. nov. near aridus`	-21.1489	119.0909
Arthropoda	Arachnida	Pseudoscorpiones	Chthoniidae	*Tyrannochthonius*	`sp. nov. near aridus`	-21.1653	119.1061
Arthropoda	Arachnida	Pseudoscorpiones	Chthoniidae	*Tyrannochthonius*	`sp. nov. near aridus`	-21.1486	119.0886
Arthropoda	Arachnida	Pseudoscorpiones	Chthoniidae	*Tyrannochthonius*	`sp. nov. near aridus`	-21.1503	119.0961
Arthropoda	Arachnida	Pseudoscorpiones	Chthoniidae	*Tyrannochthonius*	`sp. nov. near aridus`	-21.1450	119.0986
Arthropoda	Arachnida	Pseudoscorpiones	Chthoniidae	*Tyrannochthonius*	`sp. nov. near aridus`	-21.1503	119.0961
Arthropoda	Arachnida	Pseudoscorpiones	Chthoniidae	*Tyrannochthonius*	sp. indet	-21.1481	119.0856
Arthropoda	Arachnida	Pseudoscorpiones	Chthoniidae	*Tyrannochthonius*	sp. indet	-21.1417	119.1133
Arthropoda	Arachnida	Pseudoscorpiones	Chthoniidae	*Tyrannochthonius*	sp. indet	-21.1411	119.1150
Arthropoda	Arachnida	Pseudoscorpiones	Feaellidae	*Feaella*	tealei	-21.1381	119.1969
Arthropoda	Arachnida	Pseudoscorpiones	Feaellidae	*Feaella*	tealei	-21.1381	119.1969
Arthropoda	Arachnida	Pseudoscorpiones	Garypidae	*Synsphyronus*	`PSE093, 8/1 Pilbara`	-21.1477	119.2038
Arthropoda	Arachnida	Pseudoscorpiones	Garypidae	*Synsphyronus*	`PSE093, 8/1 Pilbara`	-20.7669	119.3214
Arthropoda	Arachnida	Pseudoscorpiones	Garypidae	*Synsphyronus*	`PSE093, 8/1 Pilbara`	-21.0742	119.2481
Arthropoda	Arachnida	Pseudoscorpiones	Garypidae	*Synsphyronus*	`PSE093, 8/1 Pilbara`	-21.0742	119.2481
Arthropoda	Arachnida	Pseudoscorpiones	Garypidae	*Synsphyronus*	`PSE093, 8/1 Pilbara`	-20.7669	119.3214
Arthropoda	Arachnida	Pseudoscorpiones	Garypidae	*Synsphyronus*	`PSE093, 8/1 Pilbara`	-20.7669	119.3214
Arthropoda	Arachnida	Pseudoscorpiones	Garypidae	*Synsphyronus*	`PSE093, 8/1 Pilbara`	-20.7669	119.3214
Arthropoda	Arachnida	Pseudoscorpiones	Garypidae	*Synsphyronus*	`PSE093, 8/1 Pilbara`	-20.7669	119.3214
Arthropoda	Arachnida	Pseudoscorpiones	Garypidae	*Synsphyronus*	`PSE093, 8/1 Pilbara`	-20.7669	119.3214
Arthropoda	Arachnida	Pseudoscorpiones	Garypidae	*Synsphyronus*	`PSE093, 8/1 Pilbara`	-21.1477	119.2038
Arthropoda	Arachnida	Pseudoscorpiones	Garypidae	*Synsphyronus*	`PSE093, 8/1 Pilbara`	-21.1477	119.2038
Arthropoda	Arachnida	Pseudoscorpiones	Garypidae	*Synsphyronus*	`PSE093, 8/1 Pilbara`	-21.1477	119.2038
Arthropoda	Arachnida	Pseudoscorpiones	Garypidae	*Synsphyronus*	`PSE093, 8/1 Pilbara`	-21.1477	119.2038
Arthropoda	Arachnida	Pseudoscorpiones	Garypidae	*Synsphyronus*	`PSE093, 8/1 Pilbara`	-21.1477	119.2038
Arthropoda	Arachnida	Pseudoscorpiones	Garypidae	*Synsphyronus*	`PSE093, 8/1 Pilbara`	-20.7669	119.3214
Arthropoda	Arachnida	Pseudoscorpiones	Garypidae	*Synsphyronus*	`PSE093, 8/1 Pilbara`	-20.7669	119.3214
Arthropoda	Arachnida	Pseudoscorpiones	Garypidae	*Synsphyronus*	sp. indet	-20.7669	119.3214
Arthropoda	Arachnida	Pseudoscorpiones	Garypidae	*Synsphyronus*	sp. indet	-20.7669	119.3214
Arthropoda	Arachnida	Pseudoscorpiones	Garypidae	*Synsphyronus*	sp. indet	-21.1517	119.2028
Arthropoda	Arachnida	Pseudoscorpiones	Garypidae	*Synsphyronus*	sp. indet	-20.9842	119.3039
Arthropoda	Arachnida	Pseudoscorpiones	Garypidae	*Synsphyronus*	sp. indet	-21.1331	119.2014
Arthropoda	Arachnida	Pseudoscorpiones	Garypidae	*Synsphyronus*	sp. indet	-21.1361	119.2017
Arthropoda	Arachnida	Pseudoscorpiones	Garypidae	*Synsphyronus*	sp. indet	-21.1378	119.2056
Arthropoda	Arachnida	Pseudoscorpiones	Garypidae	*Synsphyronus*	sp. indet	-21.1517	119.2028
Arthropoda	Arachnida	Pseudoscorpiones	Hyidae	*Indohya*	`PSE002`	-21.1875	119.0992
Arthropoda	Arachnida	Pseudoscorpiones	Hyidae	*Indohya*	`PSE002`	-21.1503	119.0961
Arthropoda	Arachnida	Pseudoscorpiones	Hyidae	*Indohya*	`PSE002`	-21.1503	119.0961
Arthropoda	Arachnida	Pseudoscorpiones	Hyidae	*Indohya*	`PSE002`	-21.1653	119.1061
Arthropoda	Arachnida	Pseudoscorpiones	Hyidae	*Indohya*	`PSE002`	-21.1486	119.0886
Arthropoda	Arachnida	Pseudoscorpiones	Hyidae	*Indohya*	`PSE002`	-21.1486	119.0886
Arthropoda	Arachnida	Pseudoscorpiones	Hyidae	*Indohya*	`PSE002`	-21.1422	119.1150
Arthropoda	Arachnida	Pseudoscorpiones	Hyidae	*Indohya*	`PSE002`	-21.1334	119.1206
Arthropoda	Arachnida	Pseudoscorpiones	Hyidae	*Indohya*	`PSE002`	-21.1334	119.1206
Arthropoda	Arachnida	Pseudoscorpiones	Hyidae	*Indohya*	`PSE002`	-21.1653	119.1061

Phylum	Class	Order	Family	Genus	Species	Latitude	Longitude
Arthropoda	Arachnida	Pseudoscorpiones	Hyidae	*Indohya*	\`PSE002\`	-21.1486	119.0886
Arthropoda	Arachnida	Pseudoscorpiones	Hyidae	*Indohya*	\`PSE002\`	-21.1486	119.0886
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	\`Genus indet.\`	\`sp. indet. (juvenile)\`	-21.0742	119.2481
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	\`Genus indet.\`	\`sp. indet. (juvenile)\`	-21.1660	119.1104
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	\`Genus indet.\`	\`sp. indet. (juvenile)\`	-21.0570	119.2816
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	\`Genus indet.\`	\`sp. indet. (juvenile)\`	-21.2438	119.0894
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	\`PSEAAA\`	sp. indet	-21.0798	119.2328
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	\`PSEAAA\`	sp. indet	-21.2105	119.0892
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Austrohorus*	sp. indet	-21.1380	119.1256
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Austrohorus*	sp. indet	-21.1334	119.1206
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Austrohorus*	sp. indet	-21.1660	119.1104
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Austrohorus*	sp. indet	-21.0782	119.2528
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Beierolpium*	\`sp. 8/2\`	-21.1649	119.1071
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Beierolpium*	\`sp. 8/3\`	-21.1342	119.1305
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Beierolpium*	\`sp. 8/3\`	-21.1653	119.1061
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Beierolpium*	\`sp. 8/3\`	-21.1334	119.1206
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Beierolpium*	\`sp. 8/3\`	-21.1334	119.1206
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Beierolpium*	\`sp. 8/3\`	-21.1334	119.1206
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Beierolpium*	\`sp. 8/3\`	-21.1334	119.1206
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Beierolpium*	\`sp. 8/3\`	-21.1450	119.0986
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Beierolpium*	\`sp. 8/3\`	-21.1422	119.1150
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Beierolpium*	\`sp. 8/3\`	-21.1461	119.1064
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Beierolpium*	\`sp. 8/4 lge\`	-21.2105	119.0892
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Beierolpium*	sp. indet	-21.1649	119.1071
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1797	119.2381
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1342	119.1305
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1342	119.1305
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1342	119.1305
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1342	119.1305
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1342	119.1305
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1344	119.1259
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1344	119.1259
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1344	119.1259
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1344	119.1259
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1344	119.1259
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1344	119.1259
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1344	119.1259
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1344	119.1259
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1344	119.1259
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1344	119.1259
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1344	119.1259
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1344	119.1259
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1344	119.1259
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1344	119.1259
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1344	119.1259
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1344	119.1259
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1344	119.1259
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1344	119.1259
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1344	119.1259
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1344	119.1259
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1344	119.1259
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1344	119.1259
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1344	119.1259

Phylum	Class	Order	Family	Genus	Species	Latitude	Longitude
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1344	119.1259
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1344	119.1259
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1344	119.1259
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1344	119.1259
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1344	119.1259
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1344	119.1259
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1344	119.1259
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1344	119.1259
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1344	119.1259
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1344	119.1259
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1344	119.1259
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1344	119.1259
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1344	119.1259
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1344	119.1259
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1344	119.1259
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1344	119.1259
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1344	119.1259
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1344	119.1259
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1319	119.1317
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1319	119.1317
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1319	119.1317
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1319	119.1317
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1319	119.1317
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1319	119.1317
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1319	119.1317
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1319	119.1317
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1319	119.1317
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1319	119.1317
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1319	119.1317
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1319	119.1317
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1319	119.1317
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1319	119.1317
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1319	119.1317
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1319	119.1317
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1378	119.1260
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1378	119.1260
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1378	119.1260
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1378	119.1260
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1378	119.1260
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1380	119.1256
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1380	119.1256
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1380	119.1256
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1380	119.1256
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1380	119.1256
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1380	119.1256
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1380	119.1256
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1380	119.1256
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1380	119.1256
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1274	119.1364
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1274	119.1364
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1274	119.1364
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1274	119.1364
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1274	119.1364
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1274	119.1364

Phylum	Class	Order	Family	Genus	Species	Latitude	Longitude
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1274	119.1364
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1274	119.1364
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1274	119.1364
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1489	119.0909
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1489	119.0909
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1489	119.0909
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1489	119.0909
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1489	119.0909
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1489	119.0909
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1489	119.0909
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1489	119.0909
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1489	119.0909
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1489	119.0909
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1489	119.0909
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1489	119.0909
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1489	119.0909
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1489	119.0909
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1489	119.0909
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1489	119.0909
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1489	119.0909
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1489	119.0909
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1489	119.0909
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1489	119.0909
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1489	119.0909
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1875	119.0992
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1875	119.0992
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1875	119.0992
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1875	119.0992
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1875	119.0992
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1875	119.0992
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1875	119.0992
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1875	119.0992
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1875	119.0992
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1503	119.0961
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1503	119.0961
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1503	119.0961
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1503	119.0961
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1503	119.0961
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1503	119.0961
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1503	119.0961
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1503	119.0961
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1503	119.0961
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1653	119.1061
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1653	119.1061
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1653	119.1061
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1653	119.1061
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1653	119.1061
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1481	119.0839
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1481	119.0839
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1481	119.0839
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1481	119.0839
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1486	119.0886
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1486	119.0886
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1486	119.0886

Phylum	Class	Order	Family	Genus	Species	Latitude	Longitude
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1422	119.1150
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1422	119.1150
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1422	119.1150
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1422	119.1150
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1422	119.1150
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1422	119.1150
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1422	119.1150
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1422	119.1150
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1422	119.1150
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1422	119.1150
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1422	119.1150
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1422	119.1150
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1422	119.1150
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1334	119.1206
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1450	119.0986
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1450	119.0986
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1450	119.0986
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1431	119.1045
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1431	119.1045
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1461	119.1064
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1461	119.1064
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1461	119.1064
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1461	119.1064
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1461	119.1064
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1461	119.1064
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1461	119.1064
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1422	119.1081
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1447	119.0947
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1239	119.1370
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1464	119.1033
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1464	119.1033
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1450	119.0986
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1375	119.1239
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1489	119.0909
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1422	119.1150
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1556	119.2394
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1397	119.2322
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1381	119.1969
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-20.8250	119.5364
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.0570	119.2816
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.0742	119.2481
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.0782	119.2528
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1660	119.1104
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1660	119.1104
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1884	119.1027
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.0782	119.2528
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.2105	119.0892
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1649	119.1071
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1649	119.1071
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.2438	119.0894
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1649	119.1071
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp. indet	-21.1381	119.1969
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	indet.	sp. indet	-21.1487	119.2048
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	indet.	sp. indet	-21.1331	119.2014

Phylum	Class	Order	Family	Genus	Species	Latitude	Longitude
Arthropoda	Arachnida	Pseudoscorpiones	Olpiidae	indet.	sp. indet	-21.1381	119.1969
Arthropoda	Arachnida	Pseudoscorpiones		indet.	sp. indet	-21.1650	119.1069
Arthropoda	Arachnida	Pseudoscorpiones		indet.	sp. indet	-21.1650	119.1069
Arthropoda	Arachnida	Pseudoscorpiones		indet.	sp. indet	-21.1650	119.1069
Arthropoda	Arachnida	Pseudoscorpiones		indet.	sp. indet	-21.1642	119.1175
Arthropoda	Arachnida	Pseudoscorpiones		indet.	sp. indet	-21.1475	119.2269
Arthropoda	Arachnida	Pseudoscorpiones		indet.	sp. indet	-21.1475	119.2269
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	\`bituberculatus complex\`	-21.1877	119.0833
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	\`bituberculatus complex\`	-21.1877	119.0833
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	\`bituberculatus complex\`	-21.1489	119.0833
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	\`bituberculatus complex\`	-21.1489	119.0910
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	\`bituberculatus complex\`	-21.1504	119.0833
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	\`bituberculatus complex\`	-21.1489	119.0910
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	\`bituberculatus complex\`	-21.1655	119.1000
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	\`bituberculatus complex\`	-21.1884	119.1027
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	\`hairy tail complex\`	-21.1552	119.0833
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	\`hairy tail group\`	-21.1342	119.1305
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	\`hairy tail group\`	-21.1342	119.1305
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	\`hairy tail group\`	-21.1342	119.1305
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	\`hairy tail group\`	-21.1342	119.1305
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	\`hairy tail group\`	-21.1342	119.1305
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	\`hairy tail group\`	-21.1342	119.1305
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	\`hairy tail group\`	-21.1344	119.1259
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	\`hairy tail group\`	-21.1344	119.1259
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	\`hairy tail group\`	-21.1344	119.1259
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	\`hairy tail group\`	-21.1344	119.1259
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	\`hairy tail group\`	-21.1344	119.1259
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	\`hairy tail group\`	-21.1344	119.1259
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	\`hairy tail group\`	-21.1319	119.1317
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	\`hairy tail group\`	-21.1319	119.1317
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	\`hairy tail group\`	-21.1319	119.1317
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	\`hairy tail group\`	-21.1319	119.1317
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	\`hairy tail group\`	-21.1319	119.1317
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	\`hairy tail group\`	-21.1319	119.1317
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	\`hairy tail group\`	-21.1319	119.1317
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	\`hairy tail group\`	-21.1319	119.1317
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	\`hairy tail group\`	-21.1319	119.1317
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	\`hairy tail group\`	-21.1319	119.1317
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	\`hairy tail group\`	-21.1319	119.1317
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	\`hairy tail group\`	-21.1319	119.1317
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	\`hairy tail group\`	-21.1319	119.1317
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	\`hairy tail group\`	-21.1319	119.1317
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	\`hairy tail group\`	-21.1378	119.1260
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	\`hairy tail group\`	-21.1378	119.1260
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	\`hairy tail group\`	-21.1378	119.1260
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	\`hairy tail group\`	-21.1380	119.1256
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	\`hairy tail group\`	-21.1380	119.1256
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	\`hairy tail group\`	-21.1380	119.1256
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	\`hairy tail group\`	-21.1380	119.1256
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	\`hairy tail group\`	-21.1380	119.1256
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	\`hairy tail group\`	-21.1274	119.1364
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	\`hairy tail group\`	-21.1274	119.1364
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	\`hairy tail group\`	-21.1274	119.1364
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	\`hairy tail group\`	-21.1274	119.1364

Phylum	Class	Order	Family	Genus	Species	Latitude	Longitude
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	`hairy tail group`	-21.1274	119.1364
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	`hairy tail group`	-21.1274	119.1364
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	`hairy tail group`	-21.1274	119.1364
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	`hairy tail group`	-21.1274	119.1364
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	`hairy tail group`	-21.1306	119.1257
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	`hairy tail group`	-21.1488	119.0888
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	`hairy tail group`	-21.1504	119.0963
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	`hairy tail group`	-21.1488	119.0888
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	`hairy tail group`	-21.1483	119.0839
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	`hairy tail group`	-21.1483	119.0839
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	`hairy tail group`	-21.1552	119.0857
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	`hairy tail group`	-21.1431	119.1047
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	`hairy tail group`	-21.1877	119.0994
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	`hairy tail group`	-21.1877	119.0994
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	`hairy tail group`	-21.1877	119.0994
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	`hairy tail group`	-21.1877	119.0994
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	`hairy tail group`	-21.1489	119.0910
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	`hairy tail group`	-21.1240	119.1370
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	`hairy tail group`	-21.1431	119.1047
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	`hairy tail group`	-21.1431	119.1047
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	`hairy tail group`	-21.1336	119.1206
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	`hairy tail group`	-21.1552	119.0857
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	`hairy tail group`	-21.1464	119.1065
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	`hairy tail group`	-21.1431	119.1047
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	`hairy tail group`	-21.1488	119.0888
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	`hairy tail group`	-21.1504	119.0963
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	`hairy tail group`	-21.1489	119.0910
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	`hairy tail group`	-21.1489	119.0910
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	`hairy tail group`	-21.1489	119.0910
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	`hairy tail group`	-21.1422	119.1150
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	`hairy tail group`	-21.1489	119.0910
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	`hairy tail`	-21.1884	119.1027
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	`harveyi`	-21.0782	119.2528
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	`Pilbara 1`	-21.1319	119.1317
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	`pilbara 1`	-21.1422	119.1000
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	`pilbara1`	-21.1319	119.1317
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	`sp. 1`	-20.8522	119.5925
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	`sp. 1`	-20.8983	119.5906
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	`sp. 2`	-20.9230	119.6103
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	`sp. 2`	-21.2180	119.4019
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	`sp. 2`	-21.2366	119.4083
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	`sp. 2`	-20.8983	119.5906
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	`sp. 2`	-20.9230	119.6103
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	`sp. 2`	-20.8955	119.6025
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	`sp. 3`	-21.1561	119.3558
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	`sp. 6`	-21.1561	119.3558
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	`sp. 6`	-20.8250	119.5364
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	sp. indet	-20.8522	119.5925
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	bituberculatus	-21.1342	119.1305
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	bituberculatus	-21.1342	119.1305
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	bituberculatus	-21.1342	119.1305
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	bituberculatus	-21.1342	119.1305
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	bituberculatus	-21.1344	119.1259
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	bituberculatus	-21.1344	119.1259
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	bituberculatus	-21.1344	119.1259

Phylum	Class	Order	Family	Genus	Species	Latitude	Longitude
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	bituberculatus	-21.1344	119.1259
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	bituberculatus	-21.1344	119.1259
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	bituberculatus	-21.1344	119.1259
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	bituberculatus	-21.1344	119.1259
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	bituberculatus	-21.1344	119.1259
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	bituberculatus	-21.1319	119.1317
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	bituberculatus	-21.1319	119.1317
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	bituberculatus	-21.1319	119.1317
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	bituberculatus	-21.1319	119.1317
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	bituberculatus	-21.1319	119.1317
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	bituberculatus	-21.1378	119.1260
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	bituberculatus	-21.1378	119.1260
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	bituberculatus	-21.1378	119.1260
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	bituberculatus	-21.1378	119.1260
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	bituberculatus	-21.1378	119.1260
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	bituberculatus	-21.1378	119.1260
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	bituberculatus	-21.1378	119.1260
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	bituberculatus	-21.1378	119.1260
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	bituberculatus	-21.1378	119.1260
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	bituberculatus	-21.1378	119.1260
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	bituberculatus	-21.1378	119.1260
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	bituberculatus	-21.1380	119.1256
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	bituberculatus	-21.1380	119.1256
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	bituberculatus	-21.1380	119.1256
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	bituberculatus	-21.1380	119.1256
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	bituberculatus	-21.1380	119.1256
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	bituberculatus	-21.1380	119.1256
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	bituberculatus	-21.1380	119.1256
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	bituberculatus	-21.1380	119.1256
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	bituberculatus	-21.1380	119.1256
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	bituberculatus	-21.1380	119.1256
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	bituberculatus	-21.1380	119.1256
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	bituberculatus	-21.1380	119.1256
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	bituberculatus	-21.1380	119.1256
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	bituberculatus	-21.1380	119.1256
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	bituberculatus	-21.1380	119.1256
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	bituberculatus	-21.1380	119.1256
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	bituberculatus	-21.1380	119.1256
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	bituberculatus	-21.1380	119.1256
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	bituberculatus	-21.1380	119.1256
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	bituberculatus	-21.1380	119.1256
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	bituberculatus	-21.1380	119.1256
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	bituberculatus	-21.1274	119.1364
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	bituberculatus	-21.1552	119.0857
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	bituberculatus	-21.1422	119.1150
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	bituberculatus	-21.1877	119.0994
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	bituberculatus	-21.1464	119.1065
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	bituberculatus	-21.1452	119.0987
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	bituberculatus	-21.1504	119.0963
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	bituberculatus	-21.1424	119.1082
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	bituberculatus	-21.1877	119.0994
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	bituberculatus	-21.1488	119.0888
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	bituberculatus	-21.1336	119.1206
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	bituberculatus	-21.1489	119.0910

Phylum	Class	Order	Family	Genus	Species	Latitude	Longitude
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	bituberculatus	-21.1877	119.0994
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	bituberculatus	-21.1336	119.1206
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	bituberculatus	-21.1489	119.0910
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	bituberculatus	-21.1431	119.1047
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	bituberculatus	-21.1452	119.0987
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	bituberculatus	-21.1376	119.1240
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	bituberculatus	-21.1452	119.0987
Arthropoda	Arachnida	Scorpiones	Buthidae	*Lychas*	bituberculatus	-21.1489	119.0910
Arthropoda	Arachnida	Scorpiones	Urodacidae	*Urodacus*	`micros`	-21.1342	119.1305
Arthropoda	Arachnida	Scorpiones	Urodacidae	*Urodacus*	`micros`	-21.1342	119.1305
Arthropoda	Arachnida	Scorpiones	Urodacidae	*Urodacus*	`micros`	-21.1380	119.1256
Arthropoda	Arachnida	Scorpiones	Urodacidae	*Urodacus*	`micros`	-21.1380	119.1256
Arthropoda	Arachnida	Scorpiones	Urodacidae	*Urodacus*	`pilbara 8`	-21.1452	119.0833
Arthropoda	Arachnida	Scorpiones	Urodacidae	*Urodacus*	`pilbara 8`	-21.1552	119.0857
Arthropoda	Arachnida	Scorpiones	Urodacidae	*Urodacus*	`pilbara 8`	-21.1884	119.1027
Arthropoda	Arachnida	Scorpiones	Urodacidae	*Urodacus*	`sp. 5`	-20.8983	119.5906
Arthropoda	Arachnida	Scorpiones	Urodacidae	*Urodacus*	`sp. 5`	-21.2366	119.4083
Arthropoda	Arachnida	Scorpiones	Urodacidae	*Urodacus*	`sp. Pilbara 8`	-21.1561	119.3558
Arthropoda	Arachnida	Scorpiones	Urodacidae	*Urodacus*	`sp. Pilbara 8`	-21.2180	119.4019
Arthropoda	Arachnida	Scorpiones	Urodacidae	*Urodacus*	`sp. Pilbara 8`	-20.9230	119.6103
Arthropoda	Arachnida	Scorpiones	Urodacidae	*Urodacus*	`sp. Pilbara 8`	-20.9230	119.6103
Arthropoda	Arachnida	Scorpiones	Urodacidae	*Urodacus*	`sp. Pilbara 8`	-21.1314	119.1353
Arthropoda	Arachnida	Scorpiones	Urodacidae	*Urodacus*	`sp. Pilbara 8`	-21.1314	119.1353
Arthropoda	Arachnida	Scorpiones	Urodacidae	*Urodacus*	`sp. Pilbara 8`	-21.1314	119.1353
Arthropoda	Arachnida	Scorpiones	Urodacidae	*Urodacus*	`sp. Pilbara 8`	-21.1376	119.1283
Arthropoda	Arachnida	Scorpiones	Urodacidae	*Urodacus*	`sp. Pilbara 8`	-21.1376	119.1283
Arthropoda	Arachnida	Scorpiones	Urodacidae	*Urodacus*	`sp. Pilbara 8`	-21.1306	119.1257
Arthropoda	Arachnida	Scorpiones	Urodacidae	*Urodacus*	`sp. Pilbara 8`	-21.1452	119.0987
Arthropoda	Arachnida	Scorpiones	Urodacidae	*Urodacus*	`sp. Pilbara 8`	-21.1306	119.1257
Arthropoda	Arachnida	Scorpiones	Urodacidae	*Urodacus*	`sp. Pilbara 8`	-21.1452	119.0987
Arthropoda	Arachnida	Scorpiones	indet.	indet.	sp. indet	-21.1319	119.1317
Arthropoda	Arachnida	Scorpiones	indet.	indet.	sp. indet	-21.1319	119.1317
Arthropoda	Arachnida	Scorpiones	indet.	indet.	sp. indet	-21.1378	119.1260
Arthropoda	Arachnida	Scorpiones	indet.	indet.	sp. indet	-21.1380	119.1256
Arthropoda	Chilopoda	Geophilida	Geophilidae	indet.	sp. indet	-21.1884	119.1027
Arthropoda	Chilopoda	Scolopendrida	Cryptopidae	indet.	`sp. MN`	-20.8300	119.1100
Arthropoda	Chilopoda	Scolopendrida	Cryptopidae	indet.	sp. indet	-21.1884	119.1027
Arthropoda	Chilopoda	Scutigerida	Scutigeridae	*Pilbarascutigera*	sp. indet	-21.1650	119.2022
Arthropoda	Diplopoda	Polydesmida	Paradoxosomatidae	*Antichiropus*	forcipatus	-21.1489	119.0909
Arthropoda	Diplopoda	Polydesmida	Paradoxosomatidae	*Antichiropus*	forcipatus	-21.1875	119.0992
Arthropoda	Diplopoda	Polydesmida	Paradoxosomatidae	*Antichiropus*	forcipatus	-21.1875	119.0992
Arthropoda	Diplopoda	Polydesmida	Paradoxosomatidae	*Antichiropus*	forcipatus	-21.1486	119.0886
Arthropoda	Diplopoda	Polydesmida	Paradoxosomatidae	*Antichiropus*	forcipatus	-21.1486	119.0886
Arthropoda	Diplopoda	Polydesmida	Paradoxosomatidae	*Antichiropus*	forcipatus	-21.1422	119.1150
Arthropoda	Diplopoda	Polydesmida	Paradoxosomatidae	*Antichiropus*	forcipatus	-21.1422	119.1150
Arthropoda	Diplopoda	Polydesmida	Paradoxosomatidae	*Antichiropus*	forcipatus	-21.1422	119.1150
Arthropoda	Diplopoda	Polydesmida	Paradoxosomatidae	*Antichiropus*	forcipatus	-21.1450	119.0986
Arthropoda	Diplopoda	Polydesmida	Paradoxosomatidae	*Antichiropus*	forcipatus	-21.1450	119.0986
Arthropoda	Diplopoda	Polydesmida	Paradoxosomatidae	*Antichiropus*	forcipatus	-21.1461	119.1064
Arthropoda	Diplopoda	Polydesmida	Paradoxosomatidae	*Antichiropus*	forcipatus	-21.1461	119.1064
Arthropoda	Diplopoda	Polydesmida	Paradoxosomatidae	*Antichiropus*	forcipatus	-21.1422	119.1150
Arthropoda	Diplopoda	Polydesmida	Paradoxosomatidae	*Antichiropus*	`DIP005`	-21.1175	119.1947
Arthropoda	Diplopoda	Polydesmida	Paradoxosomatidae	*Antichiropus*	`DIP005`	-21.1381	119.1969
Arthropoda	Diplopoda	Polydesmida	Paradoxosomatidae	*Antichiropus*	`DIP005`	-21.1381	119.1969
Arthropoda	Diplopoda	Polydesmida	Paradoxosomatidae	*Antichiropus*	forcipatus	-21.1269	119.2020
Arthropoda	Diplopoda	Polydesmida	Paradoxosomatidae	*Antichiropus*	forcipatus	-21.1461	119.1064

Phylum	Class	Order	Family	Genus	Species	Latitude	Longitude
Arthropoda	Diplopoda	Polydesmida	Paradoxosomatidae	*Antichiropus*	forcipatus	-21.1269	119.2020
Arthropoda	Diplopoda	Polydesmida	Paradoxosomatidae	*Antichiropus*	spathion	-20.8956	119.6025
Arthropoda	Diplopoda	Polydesmida	Paradoxosomatidae	*Antichiropus*	`DIP011`	-20.8956	119.6025
Arthropoda	Diplopoda	Polydesmida	Paradoxosomatidae	*Antichiropus*	`DIP037`	-21.1561	119.3558
Arthropoda	Diplopoda	Polydesmida	Paradoxosomatidae	*Antichiropus*	`DIP037`	-21.2367	119.4083
Arthropoda	Diplopoda	Polydesmida	Paradoxosomatidae	*Antichiropus*	`DIP037`	-20.8983	119.5906
Arthropoda	Diplopoda	Polydesmida	Paradoxosomatidae	*Antichiropus*	`DIP037`	-21.2367	119.4083
Arthropoda	Diplopoda	Polydesmida	Paradoxosomatidae	*Antichiropus*	`DIP037`	-21.2367	119.4083
Arthropoda	Diplopoda	Polydesmida	Paradoxosomatidae	*Antichiropus*	`sp. indet. (female)`	-21.1461	119.1064
Arthropoda	Diplopoda	Polydesmida	Paradoxosomatidae	*Antichiropus*	apricus	-21.0981	119.1864
Arthropoda	Diplopoda	Polydesmida	Paradoxosomatidae	*Antichiropus*	forcipatus	-21.1381	119.1969
Arthropoda	Diplopoda	Polydesmida	Paradoxosomatidae	*Antichiropus*	forcipatus	-21.1381	119.1969
Arthropoda	Diplopoda	Polydesmida	Paradoxosomatidae	*Antichiropus*	forcipatus	-21.1269	119.2020
Arthropoda	Diplopoda	Polydesmida	Paradoxosomatidae	*Antichiropus*	forcipatus	-21.1175	119.1947
Arthropoda	Diplopoda	Polydesmida	Paradoxosomatidae	*Antichiropus*	forcipatus	-21.0981	119.1864
Arthropoda	Diplopoda	Polydesmida	Paradoxosomatidae	*Antichiropus*	forcipatus	-21.1175	119.1947
Arthropoda	Diplopoda	Spirobolida	Trigoniulidae	*Austrostrophus*	`sp. indet. (female)`	-21.1550	119.0856
Arthropoda	Diplopoda	Spirobolida	Trigoniulidae	*Austrostrophus*	`sp. indet. (female)`	-21.1489	119.0909
Arthropoda	Diplopoda	Spirobolida	Trigoniulidae	*Austrostrophus*	`sp. indet. (female)`	-21.1489	119.0909
Arthropoda	Diplopoda	Spirobolida	Trigoniulidae	*Austrostrophus*	`sp. indet. (female)`	-21.1875	119.0992
Arthropoda	Diplopoda	Spirobolida	Trigoniulidae	*Austrostrophus*	`sp. indet. (female)`	-21.1875	119.0992
Arthropoda	Diplopoda	Spirobolida	Trigoniulidae	*Austrostrophus*	`sp. indet. (female)`	-21.1503	119.0961
Arthropoda	Diplopoda	Spirobolida	Trigoniulidae	*Austrostrophus*	`sp. indet. (female)`	-21.1503	119.0961
Arthropoda	Diplopoda	Spirobolida	Trigoniulidae	*Austrostrophus*	`sp. indet. (female)`	-21.1503	119.0961
Arthropoda	Diplopoda	Spirobolida	Trigoniulidae	*Austrostrophus*	`sp. indet. (female)`	-21.1486	119.0886
Arthropoda	Diplopoda	Spirobolida	Trigoniulidae	*Austrostrophus*	`sp. indet. (female)`	-21.1486	119.0886
Arthropoda	Diplopoda	Spirobolida	Trigoniulidae	*Austrostrophus*	`sp. indet. (juvenile)`	-21.1550	119.0856
Arthropoda	Diplopoda	Spirobolida	Trigoniulidae	*Austrostrophus*	`sp. indet. (juvenile)`	-21.1550	119.0856
Arthropoda	Diplopoda	Spirobolida	Trigoniulidae	*Austrostrophus*	`sp. indet. (juvenile)`	-21.1550	119.0856
Arthropoda	Diplopoda	Spirobolida	Trigoniulidae	*Austrostrophus*	`sp. indet. (juvenile)`	-21.1875	119.0992
Arthropoda	Diplopoda	Spirobolida	Trigoniulidae	*Austrostrophus*	`sp. indet. (juvenile)`	-21.1875	119.0992
Arthropoda	Diplopoda	Spirobolida	Trigoniulidae	*Austrostrophus*	`sp. indet. (juvenile)`	-21.1486	119.0886
Arthropoda	Diplopoda	Spirobolida	Trigoniulidae	*Austrostrophus*	`sp. indet. (juvenile)`	-21.1486	119.0886
Arthropoda	Diplopoda	Spirobolida	Trigoniulidae	*Austrostrophus*	`sp. indet. (juvenile)`	-21.1431	119.1045
Arthropoda	Diplopoda	Spirobolida	Trigoniulidae	*Austrostrophus*	stictopygus	-21.1550	119.0856
Arthropoda	Diplopoda	Spirobolida	Trigoniulidae	*Austrostrophus*	stictopygus	-21.1550	119.0856
Arthropoda	Diplopoda	Spirobolida	Trigoniulidae	*Austrostrophus*	stictopygus	-21.1489	119.0909
Arthropoda	Diplopoda	Spirobolida	Trigoniulidae	*Austrostrophus*	stictopygus	-21.1489	119.0909
Arthropoda	Diplopoda	Spirobolida	Trigoniulidae	*Austrostrophus*	stictopygus	-21.1489	119.0909
Arthropoda	Diplopoda	Spirobolida	Trigoniulidae	*Austrostrophus*	stictopygus	-21.1875	119.0992
Arthropoda	Diplopoda	Spirobolida	Trigoniulidae	*Austrostrophus*	stictopygus	-21.1875	119.0992
Arthropoda	Diplopoda	Spirobolida	Trigoniulidae	*Austrostrophus*	stictopygus	-21.1503	119.0961
Arthropoda	Diplopoda	Spirobolida	Trigoniulidae	*Austrostrophus*	stictopygus	-21.1653	119.1061
Arthropoda	Diplopoda	Spirobolida	Trigoniulidae	*Austrostrophus*	stictopygus	-21.1653	119.0839
Arthropoda	Diplopoda	Spirobolida	Trigoniulidae	*Austrostrophus*	stictopygus	-21.1486	119.0886
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundia*	11	-21.1504	119.0960
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundia*	11	-21.1504	119.0960
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundia*	11	-21.1488	119.0890
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundia*	11	-21.1274	119.1360
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundia*	11	-21.1876	119.0990
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundia*	11	-21.1483	119.0840
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundia*	11	-21.1483	119.0840
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundia*	11	-21.1343	119.1260
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundia*	11	-21.1463	119.1060

Phylum	Class	Order	Family	Genus	Species	Latitude	Longitude
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundia*	11	-21.1430	119.1050
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundia*	11	-21.1864	119.0480
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundia*	11	-21.1864	119.0480
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundia*	11	-21.1654	119.1060
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundia*	11	-21.1448	119.0950
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundia*	11	-21.1760	119.0510
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundia*	11	-21.5340	119.3100
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundia*	11	-21.5430	119.3000
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundia*	11	-21.1379	119.1260
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundia*	11	-21.1489	119.0910
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundia*	11	-21.1551	119.0860
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundia*	11	-21.1891	119.0660
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundia*	11	-21.1376	119.1240
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundia*	11	-21.5944	119.1610
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundia*	11	-21.4555	119.0310
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundia*	11	-21.0781	119.2530
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundia*	11	-21.1378	119.1260
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundia*	11	-21.5251	119.3280
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundia*	11	-21.5251	119.3280
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundia*	11	-21.2733	119.0570
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundia*	11	-21.1488	119.0890
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundia*	11	-21.4503	119.0650
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundia*	11	-21.1422	119.1150
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundia*	11	-21.1343	119.1260
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundia*	11	-21.1483	119.0840
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundia*	11	-21.5869	119.1650
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundia*	11	-21.1451	119.0990
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundia*	18	-21.1864	119.0480
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundia*	11	-21.1451	119.0990
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundia*	18	-21.1864	119.0480
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundia*	18	-21.1654	119.1060
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundia*	18	-21.1504	119.0960
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundia*	18	-21.1876	119.0990
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundia*	18	-21.1483	119.0840
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundia*	18	-21.5312	119.2970
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundia*	18	-21.1319	119.1320
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundia*	18	-21.1489	119.0910
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundia*	18	-21.1551	119.0860
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundia*	18	-21.1274	119.1360
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundia*	18	-21.1488	119.0890
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundia*	18	-21.1343	119.1260
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundia*	18	-21.1422	119.1150
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundia*	18	-21.1379	119.1260
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundia*	18	-21.5382	119.3020
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundia*	18	-21.1451	119.0990
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundia*	18	-21.1430	119.1050
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundia*	18	-21.1463	119.1060
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundia*	18	-21.1342	119.1310
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundia*	18	-21.2580	118.9360
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundia*	18	-21.5869	119.1650
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundia*	18	-21.2286	119.0390
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundia*	18	-21.2733	119.0570
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundia*	18	-21.2105	118.8770
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundia*	18	-21.1893	119.0430
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundia*	18	-21.2438	119.0890
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundia*	18	-21.1422	119.1150

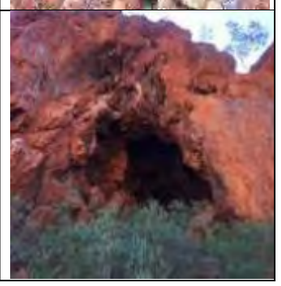
Phylum	Class	Order	Family	Genus	Species	Latitude	Longitude
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundia*	18	-21.5312	119.2970
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundia*	18	-21.5325	119.2960
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundia*	18	-21.5290	119.3120
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundia*	18	-21.5332	119.2930
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundia*	18	-21.5225	119.3120
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundia*	18	-21.5340	119.3100
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundia*	18	-21.5331	119.3060
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundia*	18	-21.5544	119.2950
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundia*	18	-21.1649	119.1070
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundia*	18	-21.5463	119.3000
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundia*	18	-21.5430	119.3000
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundia*	18	-21.5344	119.2950
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundia*	18	-21.5372	119.2920
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundia*	18	-21.5392	119.2900
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundia*	31	-21.2383	118.6520
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundia*	31	-21.2184	118.6340
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundia*	31	-21.2184	118.6340
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundia*	31	-21.1831	118.6570
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundia*	31	-21.1604	118.6570
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundia*	31	-21.1697	118.6540
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundia*	31	-21.1521	118.6570
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundia*	31	-20.9385	118.6880
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundia*	31	-21.1378	119.1260
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundia*	31	-20.9574	118.6960
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundiinae*	abydos	-21.5312	119.2970
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundiinae*	abydos	-21.5201	119.3260
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundiinae*	abydos	-21.5372	119.2920
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundiinae*	abydos	-21.5392	119.2900
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundiinae*	abydos	-21.5372	119.2920
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundiinae*	abydos	-21.5392	119.2900
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundiinae*	abydos	-21.5344	119.2950
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundiinae*	abydos	-21.5430	119.3000
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundiinae*	abydos	-21.5463	119.3000
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundiinae*	abydos	-21.5205	119.3160
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundiinae*	abydos	-21.5384	119.3310
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundiinae*	abydos	-21.5157	119.3160
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundiinae*	abydos	-21.5251	119.3280
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundiinae*	abydos	-21.5147	119.3180
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundiinae*	abydos	-21.5272	119.3140
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundiinae*	abydos	-21.5307	119.3330
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundiinae*	abydos	-21.1422	119.1150
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundiinae*	abydos	-21.5382	119.3020
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundiinae*	abydos	-21.5540	119.2860
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundiinae*	abydos	-21.1463	119.1060
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundiinae*	abydos	-21.5290	119.3120
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundiinae*	abydos	-21.5332	119.2930
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundiinae*	abydos	-21.5225	119.3120
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundiinae*	abydos	-21.5340	119.3100
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundiinae*	abydos	-21.1451	119.0990
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundiinae*	abydos	-21.1335	119.1210
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundiinae*	abydos	-21.5331	119.3060
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundiinae*	abydos	-21.1488	119.0890
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundiinae*	abydos	-21.1654	119.1060
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundiinae*	abydos	-21.1343	119.1260
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundiinae*	abydos	-21.1274	119.1360
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundiinae*	abydos	-21.1319	119.1320

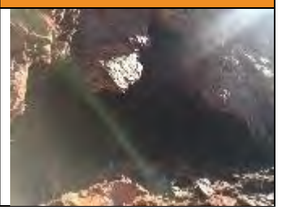
Phylum	Class	Order	Family	Genus	Species	Latitude	Longitude
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundiinae*	abydos	-21.1342	119.1310
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundiinae*	abydos	-21.1489	119.0910
Arthropoda	Crustacea	Isopoda	Armadillidae	*Buddelundiinae*	abydos	-21.1504	119.0960

Appendix G: Caves Recorded within the Study Area

Cave ID	Coordinates	Date Assessed	Roost Type	Cave Position	Floor Slope	Aspect	Cave Exposure	Entrance Type	Entrance Shape	Entrance Width (m)	Entrance Height (m)	Cave Depth (m)	No Chamber	Cham Height (m)	Water Present	Number of Ghost Bat Scats	Scat Count or Scat Estimate	Scat Age	Bats in cave	Photo
CMRC-01	-20.9718, 119.4351	12/05/19	Night Roost	Upper Slope	Flat	South	Semi Exposed	Overhang	Vertical	20	2.5	6	1	1	None	3	Count	Recent (1 to 6mths)	Nil	
CMRC-02	-21.0245, 119.3175	14/05/19	Possible Night Roost	Upper Slope	Flat	Flat	Exposed	Cavity	Round/Oval	2	2	3	1	1	None	0	Count		*Taphozous georgianus*	
CMRC-03	-21.1096, 119.1875	13/05/19	Night Roost	Upper Slope	Incline	South	Sheltered	Cavity	Round/Oval	1.5	1	6	1	1	None	20	Estimate	Recent (1 to 6mths)	*Taphozous georgianus*	
CMRC-04	-21.027, 119.3137	14/05/19	Night Roost	Upper Slope	Flat	South/East	Semi Exposed	Overhang	Round/Oval	3	2	4	1	1	None	0	Count		*Taphozous georgianus*	
CMRC-06	-21.027, 119.313	14/05/19	Day Roost	Mid Slope	Flat	East	Semi Exposed	Cavity	Round/Oval	2	2	8	2	2	None	4	Count	Recent (1 to 6mths)	*Macroderma gigas, Taphozous georgianus*	

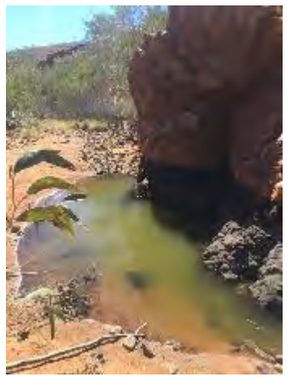
Cave ID	Coordinates	Date Assessed	Roost Type	Cave Position	Floor Slope	Aspect	Cave Exposure	Entrance Type	Entrance Shape	Entrance Width (m)	Entrance Height (m)	Cave Depth (m)	No Chamber	Cham Height (m)	Water Present	Number of Ghost Bat Scats	Scat Count or Scat Estimate	Scat Age	Bats in cave	Photo
CMRC-07	-21.1094, 119.1864	13/05/19	Day Roost	Upper Slope	Incline	South	Sheltered	Cavern	Round/Oval	7	3	14	1	1	None	0	Count		*Macroderma gigas*, *Taphozous georgianus*	
CMRC-08	-21.0273, 119.3123	14/05/19	Night Roost	Upper Slope	Flat	East	Semi Exposed	Overhang	Round/Oval	4	4	6	1	1	None	50	Count	Fresh (<1mth)	*Taphozous georgianus*	
CMRC-10	-21.0269, 119.3133	18/05/19	Night Roost	Upper Slope	Incline	South/East	Semi Exposed	Cavity	Round/Oval	3	2.5	5	2	2	None	0	Count		*Taphozous georgianus*	
CMRC-12	-21.0262, 119.3127	18/05/19	No Usage	Upper Slope	Flat	East	Semi Exposed	Cavity	Round/Oval	0.5	0.5	2.5	2	2	None	0	Count		Nil	
CMRC-13	-20.9731, 119.4334	19/05/19	Night Roost	Upper Slope	Incline	South	Semi Exposed	Overhang	Round/Oval	4	3	2.5	1	1	None	70	Estimate	Fresh (<1mth)	Nil	
CMRC-14	-20.9731, 119.4327	19/05/19	Night Roost	Mid Slope	Flat	South	Semi Exposed	Overhang	Round/Oval	1.5	1.5	1	1	1	None	20	Count	Old (6mths to 3yrs)	Nil	

Cave ID	Coordinates	Date Assessed	Roost Type	Cave Position	Floor Slope	Aspect	Cave Exposure	Entrance Type	Entrance Shape	Entrance Width (m)	Entrance Height (m)	Cave Depth (m)	No Chamber	Cham Height (m)	Water Present	Number of Ghost Bat Scats	Scat Count or Scat Estimate	Scat Age	Bats in cave	Photo
CMRC-15	-20.9727, 119.4299	19/05/19	Day Roost/ possible maternity roost	Upper Slope	Incline	South	Semi Exposed	Cavern	Round/Oval	10	5	20	1	1	None	4000	Estimate	Fresh (<1mth)	*Taphozous georgianus*	
CMRC-16	-20.9729, 119.4118	18/05/19	No Usage	Mid Slope	Flat	South	Semi Exposed	Cavity	Round/Oval	2	2	4	1	1	None	0	Count		*Taphozous georgianus*	
CMRC-17	-20.9729, 119.413	18/05/19	No Usage	Mid Slope	Incline	West	Semi Exposed	Overhang	Round/Oval	10	5	5	1	1	None	0	Count		*Taphozous georgianus*	
CMRC-18	-20.9736, 119.4139	18/05/19	Potential Day Roost	Upper Slope	Incline	South	Semi Exposed	Cavern	Round/Oval	15	20	25	1	1	None	40	Estimate	Recent (1 to 6mths)	*Taphozous georgianus*	

Cave ID	Coordinates	Date Assessed	Roost Type	Cave Position	Floor Slope	Aspect	Cave Exposure	Entrance Type	Entrance Shape	Entrance Width (m)	Entrance Height (m)	Cave Depth (m)	No Chamber	Cham Height (m)	Water Present	Number of Ghost Bat Scats	Scat Count or Scat Estimate	Scat Age	Bats in cave	Photo
CMRC-19	-21.1078, 119.1863	19/05/19	Night Roost	Mid Slope	Incline	North	Exposed	Overhang	Round/Oval	4	3.5	3	1	1	None	100	Estimate	Fresh (<1mth)	*Taphozous georgianus*	

Appendix H: Water Features recorded within the Study Area

Water Feature ID	Date	Latitude, Longitude	L (m)	W (m)	D (m)	Water present in intermediate zone	Groundwater Vegetation Present	Comments	Photo
WMRC-01	11/05/19	-20.9701, 119.3897	200	30	2	Yes	*Melaleuca argentea, Eucalyptus camaldulensis, Melaleuca bracteata*		
WMRC-02	12/05/19	-21.1123, 119.1937	400	10	0.5	Yes	*Eucalyptus camaldulensis, Melaleuca glomerata*	Flowing pools extending for 450m	
WMRC-03	12/05/19	-21.1142, 119.1962	3	2.5	0.5	No	No	Fed by seep	
WMRC-04	11/05/19	-20.9641, 119.42674	6	4	1.5	No	No		

Water Feature ID	Date	Latitude, Longitude	L (m)	W (m)	D (m)	Water present in intermediate zone	Groundwater Vegetation Present	Comments	Photo
WMRC-05	12/05/19	-20.95983, 119.42651	10	7	1	Yes	No		
WMRC-06	12/05/19	-20.96390, 119.43163	2	2.5	0.75	No	No		
WMRC-07	17/07/19	-20.95905, 119.43035	10	4	1.5	Yes	No		

Water Feature ID	Date	Latitude, Longitude	L (m)	W (m)	D (m)	Water present in intermediate zone	Groundwater Vegetation Present	Comments	Photo
WMRC-08	17/07/19	-20.96464, 119.43152	7	9	2	No	No		
WMRC-09	17/07/19	-20.96500, 119.42340	1	0.3	0.3	No	No		
WMRC-10	17/07/19	-20.96573, 119.42320	4	4	0.75	Yes	No		
WMRC-11	17/07/19	-20.96768, 119.4232	1	0.75	0.2	No	No		

Water Feature ID	Date	Latitude, Longitude	L (m)	W (m)	D (m)	Water present in intermediate zone	Groundwater Vegetation Present	Comments	Photo
WMRC-12	19/07/19	-20.9644, 119.42291	2	1.5	0.5	Yes	No		
WMRC-13	19/07/19	-20.96318, 119.42046	2.5	3	0.4	Yes	No		
WMRC-14	19/07/19	-20.97786, 119.40918	20	8	0.5	Yes	Yes		

Water Feature ID	Date	Latitude, Longitude	L (m)	W (m)	D (m)	Water present in intermediate zone	Groundwater Vegetation Present	Comments	Photo
WMRC-15	19/07/19	-20.98194, 119.42682	15	6	0.4	Yes	Yes		
VMRC-11	12/05/2019	-21.08930, 119.18709	60	20	0.75	No	No	Turkey's Nest near Sandtrax	

Appendix I: Vertebrate Fauna Recorded During the Survey

Mammals

Genus and Species	Common Name	Low Stony Hills			Stony Plain	Sandy Plain	Major Drainage Line				Hillcrest/ Hillslope			Number of sites	Total
		VMRC-01	VMRC-02	VMRC-06	VMRC-03	VMRC-04	VMRC-05	VMRC-08	VMRC-110	VMRC-116	VMRC-07	VMRC-99	VMRC-117		
BOVIDAE															
Bos taurus	*European Cattle	1			1	1		2						4	5
CAMELIDAE															
Camelus dromedarius	*Camel	1												1	1
CANIDAE															
Canis familiaris	*Dog/Dingo					1								1	1
DASYURIDAE															
Dasykaluta rosamondae	Little Red Kaluta		3		7									2	10
Dasyurus hallucatus	Northern Quoll		1			1		1	5			18		5	26
Ningaui timealeyi	Pilbara Ningaui	1		1	4									3	6
Planigale 'species 1'	Pilbara Planigale			1										1	1
Sminthopsis macroura	Stripe-faced Dunnart				1									1	1
EMBALLONURIDAE															
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat						4							1	4
Taphozous georgianus	Common Sheathtail-bat	1	1	36			7	3			2			6	50
HIPPOSIDERIDAE															
Rhinonicteris aurantius Pilbara form'	Pilbara Leaf-nosed Bat	1		33			6	3			1			5	44
MACROPODIDAE															
Osphranter robustus	Euro	1	1								1			3	3
Petrogale rothschildi	Rothschild's Rock-wallaby											3		1	3
MEGADERMATIDAE															
Macroderma gigas	Ghost Bat						4							1	4
MOLOSSIDAE															
Austronomus australis	White-striped Freetail-bat	1	1	24			7	3						5	36
Chaerephon jobensis	Greater Northern Freetail-bat	1	1	27			7	3			2			6	41
Ozimops lumsdenae	Northern Free-tailed Bat						4	3						2	7
MURIDAE															
Pseudomys chapmani	Western Pebble-mound Mouse				1									1	1
Pseudomys hermannsburgensis	Sandy Inland Mouse	1						1						2	2
Pseudomys nanus	Western Chestnut Mouse													0	0
Zyzomys argurus	Common Rock-rat							1			2	1	4	4	8
PHALANGERIDAE															
Trichosurus vulpecula arnhemensis	Northern Brushtail Possum									2				1	2
VESPERTILIONIDAE															
Chalinolobus gouldii	Gould's Wattled Bat	1	1	30			7	3			2			6	44
Scotorepens greyii	Little Broad-nosed Bat	1					4	3						3	8
Vespadelus finlaysoni	Finlayson's Cave Bat	1	1	39			7	3			2			6	53

Birds

Genus and Species	Common Name	Low Stony Hills			Stony Plain	Sandy Plain	Major Drainage Line				Hillcrest/ Hillslope			Number of sites	Total
		VMRC-01	VMRC-02	VMRC-06	VMRC-03	VMRC-04	VMRC-05	VMRC-08	VMRC-110	VMRC-116	VMRC-07	VMRC-99	VMRC-117		
ACANTHIZIDAE															
Smicrornis brevirostris	Weebill	3				6	1							3	10
ACCIPITRIDAE															
Circus assimilis	Spotted Harrier		1		2									2	3
Haliastur sphenurus	Whistling Kite						1							1	1
Hieraaetus morphnoides	Little Eagle							1						1	1
AEGOTHELIDAE															
Aegotheles cristatus	Australian Owlet-nightjar					1								1	1
ALAUDIDAE															
Mirafra javanica	Horsfield's Bushlark				1									1	1
ALCEDINIDAE															
Dacelo leachii	Blue-winged Kookaburra				1		3							2	4
ARDEIDAE															
Ardea novaehollandiae	White-faced Heron						1							1	1
ARTAMIDAE															
Artamus cinereus	Black-faced Woodswallow	7												1	7
Cracticus nigrogularis	Pied Butcherbird	3	4		1	3					1			5	12
Cracticus tibicen	Australian Magpie			1										1	1
BURHINIDAE															
Burhinus grallarius	Bush Stone-curlew				1									1	1
CACATUIDAE															
Cacatua roseicapilla	Galah	10	10		5	1		4						5	30
Cacatua sanguinea	Little Corella				1			3						2	4
Nymphicus hollandicus	Cockatiel			2	30			16						3	48
CAMPEPHAGIDAE															
Coracina maxima	Ground Cuckoo-shrike					1								1	1
Coracina novaehollandiae	Black-faced Cuckoo-shrike	3		5			3	1						4	12
Lalage tricolor	White-winged Triller		1				1							2	2
CAPRIMULGIDAE															
Eurostopodus argus	Spotted Nightjar				1	1								2	2
CLIMACTERIDAE															
Climacteris melanura	Black-tailed Treecreeper						1	1						2	2
COLUMBIDAE															
Corvus orru	Torresian Crow		2		3	4	2							4	11
Geopelia cuneata	Diamond Dove	6					5	6						3	17
Geopelia striata	Peaceful Dove		1											1	1
Geophaps plumifera	Spinifex Pigeon	4	1	1				5			8			5	19
Ocyphaps lophotes	Crested Pigeon							2						1	2
Phaps chalcoptera	Common Bronzewing				1	6								2	7
CUCULIDAE															

Genus and Species	Common Name	Low Stony Hills			Stony Plain	Sandy Plain	Major Drainage Line				Hillcrest/ Hillslope			Number of sites	Total
		VMRC-01	VMRC-02	VMRC-06	VMRC-03	VMRC-04	VMRC-05	VMRC-08	VMRC-110	VMRC-116	VMRC-07	VMRC-99	VMRC-117		
Cacomantis pallidus	Pallid Cuckoo				1	2	1							3	4
Chrysococcyx basalis	Horsfield's Bronze Cuckoo					1								1	1
ESTRILDIDAE															
Emblema pictum	Painted Finch	12	25	24	7			14			10			6	92
Taeniopygia guttata	Zebra Finch	15	31		22	31	2				3			6	104
FALCONIDAE															
Falco berigora	Brown Falcon		1					1						2	2
Falco cenchroides	Australian Kestrel	1			1									2	2
Falco longipennis	Australian Hobby				1									1	1
Falco peregrinus	Peregrine Falcon										1			1	1
LOCUSTELLIDAE															
Eremiornis carteri	Spinifex-bird	3	2		3	1					2			5	11
MALURIDAE															
Malurus lamberti	Variegated Fairy-wren				6									1	6
Malurus leucopterus	White-winged Fairy-wren				1									1	1
MELIPHAGIDAE															
Acanthagenys rufogularis	Spiny-cheeked Honeyeater					2								1	2
Certhionyx variegatus	Pied Honeyeater			5										1	5
Gavicalis virescens	Singing Honeyeater				1	1								2	2
Lichmera indistincta	Brown Honeyeater						1	1						2	2
Manorina flavigula	Yellow-throated Miner	3	17	2	1		2	7						6	32
Melithreptus gularis	Black-chinned Honeyeater	2												1	2
Ptilotula keartlandi	Grey-headed Honeyeater	8	9	16	2	1	2				5			7	43
Ptilotula penicillatus	White-plumed Honeyeater	21			30	6	18	17						5	92
MEROPIDAE															
Merops ornatus	Rainbow Bee-eater	4		1			12	6						4	23
MONARCHIDAE															
Grallina cyanoleuca	Magpie-lark	3					3	10						3	16
PACHYCEPHALIDAE															
Colluricincla harmonica	Grey Shrike-thrush	1						3						2	4
TURNICIDAE															
Turnix velox	Little Button-quail	1				2					2			3	5

Reptiles

Genus and Species	Common Name	Low Stony Hills			Stony Plain	Sandy Plain	Major Drainage Line				Hillcrest/ Hillslope			Number of sites	Total
		VMRC-01	VMRC-02	VMRC-06	VMRC-03	VMRC-04	VMRC-05	VMRC-08	VMRC-110	VMRC-116	VMRC-07	VMRC-99	VMRC-117		
AGAMIDAE															
Ctenophorus caudicinctus	Ring-tailed Dragon		2	5										2	7
Gowidon longirostris	Long-nosed Dragon						2	2						2	4
PYTHONIDAE															
Antaresia perthensis	Pygmy Python							1						1	1
DIPLODACTYLIDAE															
Diplodactylus conspicillatus	Variable Fat-tailed Gecko					8								1	8
Lucasium stenodactylum						2								1	2
ELAPIDAE															
Pseudechis australis	Mulga Snake				1									1	1
Suta punctata	Spotted Snake				1									1	1
GEKKONIDAE															
Gehyra montium							1							1	1
Gehyra variegata							1							1	1
Heteronotia binoei	Bynoe's Gecko	1	4		1	1		3						5	10
PYGOPODIDAE															
Delma elegans											1			1	1
SCINCIDAE															
Carlia munda		2						1						2	3
Ctenotus duricola				3										1	3
Ctenotus grandis		2		1		7								3	10
Ctenotus inornatus		5	5	7	1	1		5			1			7	25
Ctenotus pantherinus	Leopard Ctenotus	1	1		2									3	4
Ctenotus rubicundus											7			1	7
Egernia formosa		2												1	2
Lerista muelleri		1												1	1
Morethia ruficauda											1			1	1
Tiliqua multifasciata	Central Blue-tongue		1											1	1
TYPHLOPIDAE															
Anilios grypus		1		1										2	2
VARANIDAE															
Varanus acanthurus	Spiny-tailed Monitor										1			1	1
Varanus eremius	Pygmy Desert Monitor					2								1	2
Varanus tristis	Racehorse Monitor						1							1	1

Amphibians

Genus and Species	Common Name	Low Stony Hills			Stony Plain	Sandy Plain	Major Drainage Line				Hillcrest/ Hillslope			Number of sites	Total
		VMRC-01	VMRC-02	VMRC-06	VMRC-03	VMRC-04	VMRC-05	VMRC-08	VMRC-110	VMRC-116	VMRC-07	VMRC-99	VMRC-117		
PELODRYADIDAE															
Cyclorana maini	Sheep Frog						1	24						2	25
Litoria rubella	Little Red Tree Frog						1	4						2	5
MYOBATRACHIDAE															
Uperoleia saxatilis	Pilbara Toadlet							5						1	5

Appendix J: Northern Quoll capture data from the survey

PIT ID	First capture	Site	Trap	Coordinates		Weight (g)	Age	Sex	Pes (mm)	Tail diameter (mm)	Crown length (mm)	Condition	Markings and Parasites	Tissue Taken	Recaptures				
				Latitude	Longitude										Date	Site	Trap	Coordinate	
																		Latitude	Longitude
-	15/05/2019	VMRC-04	7	-20.9921	119.3455	-	Sub-adult	Male	-	-	-	Excellent	None	No					
-	13/05/2019	VMRC-02	9	-21.0114	119.3129	-	Sub-adult	Male	-	-	-	Excellent	None	Yes					
953010001064371	13/07/2019	VMRC-99	46	-29.8982	115.1728	225	Sub-adult	Female	31.1	12.3	61.1	Excellent	None	Yes	14/07/2019	VMRC-99	41	-28.7574	114.7038
															16/07/2019	VMRC-99	41	-23.2429	114.1832
953010001064858	13/07/2019	VMRC-99	20	-30.6654	115.4947	360	Sub-adult	Female	32.2	11.1	61.2	Excellent	None	Yes	15/07/2019	VMRC-99	36	-22.1652	114.0789
953010001064441	13/07/2019	VMRC-99	18	-31.1577	115.7035	760	Adult	Male	37.1	20	78.3	Excellent	None	Yes	14/07/2019	VMRC-99	30	-28.7574	114.7038
953010001064589	13/07/2019	VMRC-99	16	-31.9494	115.8243	320	Sub-adult	Female	32.7		61.5	Excellent	None	Yes					
953010001256321	13/07/2019	VMRC-99	36	-29.9795	115.2067	220	Sub-adult	Female	30.5	10.5	62.2	Excellent	None	Yes					
953010001269179	13/07/2019	VMRC-99	22	-30.2611	115.3203	310	Sub-adult	Female	32.3	13.3	60.6	Excellent	None	Yes					
953010001064816	14/07/2019	VMRC-99	9	-28.7574	114.7038	550	Sub-adult	Male	35.2	17.3	68.9	Excellent	None	Yes					
953010001064880	14/07/2019	VMRC-99	5	-28.7574	114.7038	320	Sub-adult	Female	32.1	13.8	63.3	Excellent	None	Yes					
953010001065815	14/07/2019	VMRC-99	5	-29.1133	114.8396	390	Adult	Female	31.6	13.3		Excellent	None	Yes	15/07/2019	VMRC-99	3	-22.1534	114.0784
953010001256195	14/07/2019	VMRC-99	16	-28.7574	114.7038	580	Adult	Male	38.3	19.4	62.3	Excellent	None	Yes					
900006000139713	14/07/2019	VMRC-99	32	-28.819	114.6797	790		Male	38.3	20.6	73.8	Excellent	None	Yes					
900006000139847	14/07/2019	VMRC-99	34	-28.7574	114.7038	440	Adult	Female	34.4	18	72.8	Excellent	None	Yes	16/07/2019	VMRC-99	33	-23.5714	114.2126
900006000137086	14/07/2019	VMRC-99	24	-28.7574	114.7038	380	Adult	Female	33.9	15.1	69.1	Excellent	None	Yes	16/07/2019	VMRC-99	32	-23.6727	114.2229
900006000137357	14/07/2019	VMRC-99	38	-28.7574	114.7038	260	Sub-adult	Female	31	12.2	60.1	Excellent	None	Yes					
900006000138543	15/07/2019	VMRC-99	33	-22.1579	114.0787	280	Sub-adult	Female	29.4	13.3	60.6	Excellent	None	Yes					
900006000137217	15/07/2019	VMRC-99	48	-24.4288	114.2915	710	Adult	Male	39.4	17.2	78.3	Excellent	None	Yes					
900006000134273	16/07/2019	VMRC-99	8	-24.1248	114.2638	580	Adult	Male	34.5	18.3	73.4	Excellent	None	Yes					
900006000144469	16/07/2019	VMRC-99	16	-23.8908	114.2426	700	Adult	Male	37.1	19.3	74.3	Excellent	None	Yes					
953010001064431	13/07/2019	VMRC-110	26	-22.7475	114.1397	770			38.3		80.1	Excellent	None	Yes					
953010001256229	13/07/2019	VMRC-110	27	-22.5802	114.1248	310	Sub-adult	Female	33.3	12.2	65.1	Excellent	None	Yes	14/07/2019	VMRC-110	26	-22.4171	114.1106
															15/07/2019	VMRC-110	23	-22.3022	114.1015
															16/07/2019	VMRC-110	23	-22.2189	114.0912
953010001256323	13/07/2019	VMRC-110	20	-22.9856	114.161	290	Sub-adult	Female	34.5	12.8	74.5	Excellent	None	Yes	15/07/2019	VMRC-110	19	-22.2089	114.1301
															16/07/2019	VMRC-110	22	-22.2396	114.0897
900006000140572	16/07/2019	VMRC-110	19	-22.1608	114.1193	810	Adult	Male	38.2	20.5	73.3	Excellent	None	Yes					
900006000137704	16/07/2019	VMRC-110	23	-22.2396	114.0929	750	Adult	Male	38.3	22.1	71.5	Excellent	None	Yes					
990000002520046	11/07/2019	VABY-12	19	-21.1141	119.1922	447	Adult	Female	28.8	12.5	56.9	Excellent	None	Yes				-21.1141	119.1922
990000002520047	12/07/2019	VABY-12	12	-21.1126	119.1924	397	Adult	Female	40.3	14.1	64.1	Excellent	None	Yes	12/07/2019	VABY-12	12	-21.1126	119.1924
		VABY-12													13/07/2019	VABY-12	15	-21.1133	119.1923
		VABY-12													15/07/2019	VABY-12	19	-21.1141	119.1922
990000002520048	12/07/2019	VABY-12	10	-21.1124	119.1927	497	Adult	Male	43.3	18.5	79.2	Excellent	None	Yes	12/07/2019	VABY-12	10	-21.1124	119.1927
		VABY-12													13/07/2019	VABY-12	12	-21.1132	119.1923
		VABY-12													14/07/2019	VABY-12	11	-21.1125	119.1924

Appendix K: Invertebrate Fauna Collected From the Survey

Site	Date	Latitude	Longitude	Habitat type	Sampling method	Class	Order	Family	Genus	Species	Infra rank	Infra name	No. specimens	SRE Status
SMRC-019	17/05/2019	-20.9920	119.3458	Sand Plain	Pitfall Trap	Arachnida	Araneae	Nemesiidae	Aname		sp.	indet.	1	Potential SRE
SMRC-105	20/07/2019	-20.9718	119.4362	Hillcrest/ Hillslope	Hand collected	Arachnida	Araneae	Selenopidae	Karaops		sp.	indet.	1	Potential SRE
SMRC-036	18/05/2019	-21.0271	119.3125	Hillslope in cave	Hand collected	Arachnida	Araneae	Selenopidae	Karaops		sp.	indet.	1F	Potential SRE
SMRC-020	16/05/2019	-20.9680	119.4274	Gorge/ Gully	Hand collected	Arachnida	Araneae	Selenopidae	Karaops		sp.	indet.	1	Potential SRE
SMRC-020	16/05/2019	-20.9680	119.4274	Gorge/ Gully	Hand collected	Arachnida	Araneae	Selenopidae	Karaops		sp.	indet.	1	Potential SRE
SMRC-020	16/05/2019	-20.9680	119.4274	Gorge/ Gully	Hand collected	Arachnida	Araneae	Selenopidae	Karaops		sp.	indet.	1	Potential SRE
SMRC-001	12/05/2019	-21.1128	119.1936	Gorge/ Gully	Hand collected	Arachnida	Araneae	Selenopidae	Karaops		sp.	indet.	1	Potential SRE
SMRC-020	16/05/2019	-20.9680	119.4274	Gorge/ Gully	Hand collected	Arachnida	Araneae	Selenopidae	Karaops		sp.	indet.	1	Potential SRE
SMRC-101	17/07/2019	-20.9813	119.3613	Medium Drainage Line	Hand collected	Arachnida	Pseudoscorpiones	Garypidae	Synsphyronus		sp.	'8/1 pilbara'	1M, 3J	Widespread
SMRC-103	19/07/2019	-20.9657	119.4232	Gorge/ Gully	Hand collected	Arachnida	Pseudoscorpiones	Garypidae	Synsphyronus		sp.	'8/2 Pilbara'	1M, 1F	Widespread
SMRC-100	17/07/2019	-20.9638	119.4267	Gorge/ Gully	Hand collected	Arachnida	Pseudoscorpiones	Garypidae	Synsphyronus		sp.	'8/2 Pilbara'	2M, 2F	Widespread
SMRC-019	16/05/2019	-20.9655	119.4193	Gorge/ Gully	Hand collected	Arachnida	Pseudoscorpiones	Garypidae	Synsphyronus		sp.	'8/2 Pilbara'	9F	Widespread
SMRC-016	15/05/2019	-21.0167	119.3019	Minor Drainage Line	Hand collected	Arachnida	Pseudoscorpiones	Garypidae	Synsphyronus		sp.	'8/2 wide pilbara'	1M, 1F	Potential SRE
SMRC-034	19/05/2019	-20.9757	119.4458	Breakaway/ Cliff	Leaf Sieving	Arachnida	Pseudoscorpiones	Hyidae	Indohya		sp.	indet.	1M	Potential SRE
SMRC-032	18/05/2019	-21.0146	119.3223	Hillcrest/ Hillslope	Leaf Sieving	Arachnida	Pseudoscorpiones	Olpiidae	Beierolpium		sp.	'8/4'	1F	Potential SRE
SMRC-032	18/05/2019	-21.0146	119.3223	Hillcrest/ Hillslope	Leaf Sieving	Arachnida	Pseudoscorpiones	Olpiidae	'Genus 7/4'		sp.	'Genus 7/4'	6M, 1F, 2J	Potential SRE
SMRC-106	20/07/2019	-20.9558	119.4103	Boulders/ Rockpiles	Leaf Sieving	Arachnida	Pseudoscorpiones	Olpiidae	Indolpium		sp.	indet.	1F	Potential SRE
SMRC-101	17/07/2019	-20.9813	119.3613	Medium Drainage Line	Leaf Sieving	Arachnida	Pseudoscorpiones	Olpiidae	Indolpium		sp.	indet.	1F	Potential SRE
SMRC-106	20/07/2019	-20.9558	119.4103	Boulders/ Rockpiles	Leaf Sieving	Arachnida	Pseudoscorpiones	Olpiidae	Indolpium		sp.	indet.	1J	Potential SRE
SMRC-020	16/05/2019	-20.9655	119.4193	Gorge/ Gully	Hand collected	Arachnida	Pseudoscorpiones	Olpiidae	Indolpium		sp.	indet.	1J	Potential SRE
SMRC-023	14/05/2019	-20.9801	119.4149	Major Drainage Line	Hand collected	Arachnida	Pseudoscorpiones	Olpiidae			sp.	indet.	1	Potential SRE
SMRC-020	16/05/2019	-20.9655	119.4193	Gorge/ Gully	Hand collected	Arachnida	Pseudoscorpiones	Olpiidae	Indolpium		sp.	indet.	1J	Potential SRE
SMRC-023	14/05/2019	-20.9801	119.4149	Major Drainage Line	Hand collected	Arachnida	Pseudoscorpiones	Olpiidae			sp.	indet.	1	Potential SRE
SMRC-011	13/05/2019	-21.0885	119.1967	Ironstone Outcrops	Leaf Sieving	Arachnida	Pseudoscorpiones	Olpiidae			sp.	indet.	1J	Potential SRE
SMRC-105	20/07/2019	-20.9718	119.4362	Hillcrest/ Hillslope	Leaf Sieving	Arachnida	Pseudoscorpiones	Olpiidae			sp.	indet.	3J	Potential SRE
SMRC-100	17/07/2019	-20.9638	119.4267	Gorge/ Gully	Leaf Sieving	Arachnida	Pseudoscorpiones	Olpiidae			sp.	indet.	1J	Potential SRE
SMRC-006	13/05/2019	-20.9727	119.4243	Hillcrest/ Hillslope	Leaf Sieving	Arachnida	Pseudoscorpiones	Olpiidae			sp.	indet.	1J	Potential SRE
SMRC-013	13/05/2019	-21.1095	119.1875	Gorge/ Gully	Leaf Sieving	Arachnida	Pseudoscorpiones	Olpiidae			sp.	indet.	1M	Potential SRE
SMRC-032	18/05/2019	-21.0146	119.3223	Hillcrest/ Hillslope	Hand collected	Arachnida	Pseudoscorpiones	Olpiidae			sp.	indet.	1J	Potential SRE
SMRC-021	16/05/2019	-20.9655	119.4193	Gorge/ Gully	Hand collected	Arachnida	Pseudoscorpiones	Olpiidae	Xenolpium		sp.	indet.	1M, 1F	Potential SRE
SMRC-105	20/07/2019	-20.9718	119.4362	Hillcrest/ Hillslope	Hand collected	Arachnida	Pseudoscorpiones	Olpiidae	Xenolpium		sp.	indet.	1M	Potential SRE
SMRC-001	19/05/2019	-21.1128	119.1936	Gorge/ Gully	Pitfall Trap	Arachnida	Scorpiones	Buthidae	Lychas		sp.	'bituberculatus complex'	1F	Potential SRE
SMRC-001	12/05/2019	-21.1128	119.1936	Gorge/ Gully	Leaf Sieving	Arachnida	Scorpiones	Buthidae	Lychas		sp.	'bituberculatus complex'	1J	Potential SRE
SMRC-017	14/05/2019	-20.9606	119.4161	Hillcrest/ Hillslope	Pitfall Trap	Arachnida	Scorpiones	Buthidae	Lychas		sp.	'harveyi complex'	1M	Widespread
SMRC-001	19/05/2019	-21.1128	119.1936	Gorge/ Gully	Pitfall Trap	Arachnida	Scorpiones	Urodacidae	Urodacus	'pearcei'			1J	Widespread
SMRC-001	15/05/2019	-21.1128	119.1936	Gorge/ Gully	Pitfall Trap	Arachnida	Scorpiones	Urodacidae	Urodacus	'pearcei'			1M	Widespread
SMRC-009	15/05/2019	-21.1063	119.1931	Stony Plain	Pitfall Trap	Arachnida	Scorpiones	Urodacidae	Urodacus	'pearcei'			1M	Widespread
SMRC-001	19/05/2019	-21.1128	119.1936	Gorge/ Gully	Pitfall Trap	Arachnida	Scorpiones	Urodacidae	Urodacus	'pearcei'			1M	Widespread
SMRC-001	13/05/2019	-21.1128	119.1936	Gorge/ Gully	Pitfall Trap	Arachnida	Scorpiones	Urodacidae	Urodacus	'pearcei'			1J	Widespread
SMRC-004	12/05/2019	-20.9824	119.4293	Major Drainage Line	Hand collected	Gastropoda	Eupulmonata	Camaenidae	Rhagada	cf. richardsonii			4	Widespread
SMRC-030	18/05/2019	-20.9794	119.4086	Drainage Area/ Floodplain	Hand collected	Gastropoda	Eupulmonata	Camaenidae	Rhagada	cf. richardsonii			1	Widespread
SMRC-035	15/05/2019	-20.9766	119.3879	Boulders/ Rockpiles	Hand collected	Gastropoda	Eupulmonata	Camaenidae	Rhagada	cf. richardsonii			1	Widespread
SMRC-023	14/05/2019	-20.9801	119.4149	Major Drainage Line	Hand collected	Gastropoda	Eupulmonata	Camaenidae	Rhagada	cf. richardsonii			4	Widespread
SMRC-021	15/05/2019	-20.9700	119.3924	Major Drainage Line	Hand collected	Gastropoda	Eupulmonata	Camaenidae	Rhagada	cf. richardsonii			1	Widespread

Site	Date	Latitude	Longitude	Habitat type	Sampling method	Class	Order	Family	Genus	Species	Infra rank	Infra name	No. specimens	SRE Status
SMRC-021	19/05/2019	-20.9700	119.3924	Major Drainage Line	Hand collected	Gastropoda	Eupulmonata	Camaenidae	Rhagada	cf. richardsonii			2	Widespread
SMRC-002	12/05/2019	-20.9852	119.4152	Ironstone Outcrops	Hand collected	Gastropoda	Eupulmonata	Camaenidae	Rhagada	cf. richardsonii			15	Widespread
SMRC-034	19/05/2019	-20.9757	119.4458	Breakaway/ Cliff	Hand collected	Gastropoda	Eupulmonata	Charopidae			sp.	A	1	Potential SRE
SMRC-102	18/07/2019	-20.9734	119.4142	Breakaway/ Cliff	Hand collected	Gastropoda	Eupulmonata	Charopidae			sp.	A	1	Potential SRE
SMRC-001	12/05/2019	-21.1128	119.1936	Gorge/ Gully	Leaf Sieving	Gastropoda	Eupulmonata	Charopidae			sp.	A	5	Potential SRE
SMRC-004	12/05/2019	-20.9824	119.4293	Major Drainage Line	Hand collected	Gastropoda	Eupulmonata	Charopidae			sp.	B	1	Potential SRE
SMRC-001	12/05/2019	-21.1128	119.1936	Gorge/ Gully	Leaf Sieving	Gastropoda	Eupulmonata	Charopidae			sp.	B	2	Potential SRE
SMRC-010	13/05/2019	-20.9514	119.4055	Major Drainage Line	Hand collected	Gastropoda	Eupulmonata	Lymnaeidae	Austropeplea		sp.	indet.	3	Widespread
SMRC-021	14/05/2019	-20.9700	119.3924	Major Drainage Line	Hand collected	Gastropoda	Eupulmonata	Lymnaeidae	Austropeplea		sp.	indet.	3	Widespread
SMRC-004	12/05/2019	-20.9824	119.4293	Major Drainage Line	Hand collected	Gastropoda	Eupulmonata	Lymnaeidae	Austropeplea		sp.	indet.	1	Widespread
SMRC-004	12/05/2019	-20.9824	119.4293	Major Drainage Line	Hand collected	Gastropoda	Eupulmonata	Lymnaeidae	Austropeplea		sp.	indet.	11	Widespread
SMRC-023	14/05/2019	-20.9801	119.4149	Major Drainage Line	Hand collected	Gastropoda	Eupulmonata	Lymnaeidae	Austropeplea		sp.	indet.	4	Widespread
SMRC-001	12/05/2019	-21.1128	119.1936	Gorge/ Gully	Leaf Sieving	Gastropoda	Eupulmonata	Pupillidae	Gastrocopta		sp.	indet.	1	Widespread
SMRC-001	12/05/2019	-21.1128	119.1936	Gorge/ Gully	Leaf Sieving	Gastropoda	Eupulmonata	Pupillidae	Pupoides		sp.	indet.	20	Widespread
SMRC-004	12/05/2019	-20.9824	119.4293	Major Drainage Line	Hand collected	Gastropoda	Eupulmonata	Succineidae			sp.	indet.	2	Potential SRE
SMRC-010	13/05/2019	-20.9514	119.4055	Major Drainage Line	Hand collected	Gastropoda	Eupulmonata	Succineidae	Australosuccinea		sp.	indet.	3	Potential SRE
SMRC-023	14/05/2019	-20.9801	119.4149	Major Drainage Line	Hand collected	Gastropoda	Eupulmonata	Succineidae	Australosuccinea		sp.	indet.	4	Potential SRE
SMRC-019	15/05/2019	-20.9920	119.3458	Sand Plain	Pitfall Trap	Malacostraca	Isopoda	Armadillidae	Buddelundia		sp.	10	1M	Potential SRE
SMRC-019	17/05/2019	-20.9920	119.3458	Sand Plain	Pitfall Trap	Malacostraca	Isopoda	Armadillidae	Buddelundia		sp.	10	2F	Potential SRE
SMRC-105	20/07/2019	-20.9718	119.4362	Hillcrest/ Hillslope	Hand collected	Malacostraca	Isopoda	Armadillidae	Buddelundia		sp.	11	1F	Potential SRE
SMRC-001	12/05/2019	-21.1128	119.1936	Gorge/ Gully	Leaf Sieving	Malacostraca	Isopoda	Armadillidae	Buddelundia		sp.	11	1F	Potential SRE
SMRC-022	16/05/2019	-20.9655	119.4193	Gorge/ Gully	Hand collected	Malacostraca	Isopoda	Armadillidae	Buddelundia		sp.	indet.	1J	Potential SRE
SMRC-019	15/05/2019	-20.9920	119.3458	Sand Plain	Pitfall Trap	Malacostraca	Isopoda	Armadillidae	Buddelundia		sp.	indet. `1848`	2M, 2F	Potential SRE
SMRC-019	14/05/2019	-20.9920	119.3458	Sand Plain	Pitfall Trap	Malacostraca	Isopoda	Armadillidae	Buddelundia		sp.	indet. `1848`	4M, 3F	Potential SRE
SMRC-019	17/05/2019	-20.9920	119.3458	Sand Plain	Pitfall Trap	Malacostraca	Isopoda	Armadillidae	Buddelundia		sp.	indet. `1848`	1M, 2F	Potential SRE
SMRC-104	19/07/2019	-20.9582	119.3959	Medium Drainage Line	Hand collected	Malacostraca	Isopoda	Armadillidae	Buddelundia		sp.	mw	2F, 1J	Widespread
SMRC-009	13/05/2019	-21.1063	119.1931	Stony Plain	Pitfall Trap	Malacostraca	Isopoda	Armadillidae	Buddelundia		sp.	mw	2F	Widespread
SMRC-007	12/05/2019	-21.0033	119.3245	Stony Plain	Hand collected	Malacostraca	Isopoda	Armadillidae	Buddelundia		sp.	mw	2F	Widespread
SMRC-019	14/05/2019	-20.9920	119.3458	Sand Plain	Pitfall Trap	Malacostraca	Isopoda	Armadillidae	Buddelundia		sp.	mw	1F	Widespread
SMRC-034	19/05/2019	-20.9757	119.4458	Breakaway/ Cliff	Hand collected	Malacostraca	Isopoda	Philosciidae			sp.	indet.	1F	Potential SRE

Note: F = Female; M = Male; J = Juvenile