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ENVIRONMENTAL SCIENCES

Terrestrial fauna surveys for the Balla Balla Railway Project

Prepared for Preston Consulting on behalf of Rutila Resources Ltd

November 2014

Final Report

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Final Report

Authors: Nicholas Dight, Ryan Ellis & Anna Leung

Reviewers: Volker Framenau, Karen Crews

Date: 4 November 2014

Submitted to: Gavin Edwards (Preston Consulting)

Chain of authorship and review			
Name	Task	Version	Date
N. Dight, R. Ellis & A. Leung	Draft for technical review	0.1	8 October 2014
V. Framenau	Technical review	0.2	10 October 2014
K. Crews	Editorial review	0.3	13 October 2014
R. Ellis	Draft submitted to client	0.4	24 October 2014
K. Crews	Final to client	1.0	4 November 2014

Phoenix Environmental Sciences Pty Ltd

1/511 Wanneroo Rd BALCATTA WA 6021

P: 08 9345 1608

F: 08 6313 0680

E: admin@phoenixenv.com.au

Project code: 1050-MN-MI-FAU

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EXECUTIVE SUMMARY

Rutila Resources is investigating the potential for further development of its export facilities at the Balla Balla Project in the Pilbara to accommodate third party ore (haematite DSO). A key factor in the viability of this expansion is a connection to the central Pilbara mining region via a new rail line and infrastructure, the Balla Balla Railway (the Project). Rutila plans to seek environmental approval to develop the Project.

In May 2014, Preston Consulting (on behalf of Rutila Resources Ltd) commissioned Phoenix Environmental Sciences Pty Ltd to undertake terrestrial fauna surveys for the Project comprising:

- Level 1 vertebrate fauna and Level 2 short range endemic (SRE) invertebrate fauna survey (referred to collectively in this report as 'terrestrial fauna survey')
- targeted vertebrate fauna survey for several conservation significant species identified as requiring further investigation ('targeted fauna survey').

The study area was approximately 200 km long and predominantly 2 km wide connecting Flinders Pilbara Iron Ore Project 60 km north-west of Tom Price to the stockpile area at the Balla Balla Port midway between Port Hedland and Karratha. Some previous alignment options were also surveyed during the initial field trip, but the respective corridors are not considered part of the current study area.

The objective of the surveys was to define the terrestrial fauna values of the study area to inform an environmental impact assessment for the Project. Survey scoping was undertaken with input from the Office of the Environmental Protection Authority (OEPA) Terrestrial Ecosystems Branch. The surveys were undertaken in compliance with several guidance documents, including Environmental Protection Authority's (EPA's) Position Statement No. 3: *Terrestrial biological surveys as an element of biodiversity protection*; Guidance Statement No. 56*: Terrestrial fauna surveys for environmental impact assessment in Western Australia*; Guidance Statement No. 20, *Sampling of short range endemic invertebrate fauna for environmental impact assessment in Western Australia* and EPBC Act Policy Statement 3.25: *Referral guidelines for the endangered Northern Quoll, Dasyurus hallucatus.*

A desktop review of relevant databases, literature and spatial data was initially undertaken to assess the potential for presence of conservation significant vertebrate and SRE invertebrate fauna species and habitats in the study area. The terrestrial fauna survey was conducted from 2–9 June and 14–20 July 2014. The targeted vertebrate fauna survey was undertaken from 26 August–4 September 2014. The latter focussed on species identified as requiring follow up from the terrestrial fauna survey – Northern Quoll (*Dasyurus hallucatus*), Bilby (*Macrotis lagotis*), Mulgara (*Dasycercus blythi*), Pilbara Olive Python (*Liasis olivaceus*), Northern Marsupial Mole (*Notoryctes caurinus*) and potential new *Lerista* species – and in areas where potential for impact from the Project was identified.

Survey methods included detailed habitat assessments and active searches for vertebrate and invertebrate fauna. Direct sightings and indirect evidence of vertebrate fauna were recorded. Targeted survey techniques included cage and Elliot trapping for Northern Quoll, trenching for Northern Marsupial Mole, SongMeter recording for bats, raking for *Lerista* species, and deployment of infra-red motion camera traps for several species. Survey techniques for SREs comprised targeted foraging in sheltered habitats such as under logs, bark and rocks, and leaf litter sieving.

Fifty seven sites were surveyed during the terrestrial fauna survey, 40 of which were located in the study area and 17 in the previous alignment options. The targeted fauna survey included five Northern Quoll sites, refinement of Bilby and Mulgara habitat in a large section of the study area and targeted searches at four sites; and two sand dune sites for Northern Marsupial Mole and new species of *Lerista*.

From the desktop review, 425 vertebrate fauna species, including 62 species of conservation significance and 142 SRE invertebrates were identified. The large number of desktop records of vertebrates reflects the large search area for the desktop review. Limited survey effort in the vicinity of the central section of the study area, through the Chichester subregion and north of these, was evident from the desktop review.

Five conservation significant vertebrate species were recorded in the study area during the surveys; Northern Quoll, Rainbow Bee-eater, Lined Soil-crevice Skink, Australian Bustard and Western Pebble-mound Mouse. Northern Quoll was recorded from trapping, camera trapping, scats and bones. During the targeted survey, 21 Northern Quoll individuals were recorded at three sites and based on population estimates this reflects the number of animals in the trapping area. Approximately 640 ha of suitable denning and shelter habitat for Northern Quoll was mapped as scattered 'patches' within the study area, spanning several land systems and is considered significant habitat for the species. All of the land systems containing suitable habitat are well represented in the study area surrounds and it is likely that Northern Quoll occur more broadly in suitable habitat in these areas, including within the Chichester and Hamersley Ranges which extend widely east and west of the study area.

The Rainbow Bee-eater (*Merops ornatus*) and Lined Soil-crevice Skink (*Notoscincus butleri*) were directly sighted. Tracks of the Australian Bustard (*Ardeotis australis*) and an inactive mound of the Western Pebble-mound Mouse (*Pseudomys chapmani*) were also recorded. The records of the Lined Soil-crevice Skink from the survey represent an easterly range extension of approximately 40 km and may be considered significant in this regard. The survey records from within spinifex grassland habitat are consistent with the majority of previous records for the species. This habitat is well represented both within the study area and more broadly outside of the study area and it may occur more commonly in the broader region. The Rainbow Bee-eater, Australian Bustard and Western Pebble-mound Mouse are common and widespread throughout the Pilbara bioregion and the records of these species from the surveys are not considered to be significant.

Based on habitats present in the study area, known distributions and nearby records, a further 23 conservation significant species may potentially occur in the study area. No evidence of Bilby, Mulgara, Northern Marsupial Mole, Pilbara Olive Python or any new Leristas was recorded during the targeted fauna survey. Approximately 3,600 ha of habitat characterised by burrowing substrate and adequate vegetation structure suitable to support Bilby and Mulgara was mapped within the study area, although habitat quality was variable within the mapped areas. Land system mapping indicates the potential habitat within the study area extends well beyond it both east and west of the proposed alignment.

The sand dune habitats are considered suitable to support the Northern Marsupial Mole. Because of the limited information available on the species distribution and biology, as well as sampling difficulties, its presence in this habitat cannot be conclusively ruled out based on the field survey results. Additional survey effort could be employed to conclusively rule out the species presence in the sand dune habitat within the study area.

The Pilbara Olive Python is considered likely to occur in an approximately 40 km section of the study area containing creekline habitat which was identified as very suitable for the species. This habitat is situated within the Rocklea land system which extends well outside the study area and minor creeklines, permanent waterholes and rocky refuges suitable for this species were evident in this system from aerial observations beyond the study area boundaries.

Thirteen likely or potential SRE invertebrates were collected from the study area comprising three arachnids, two centipedes, seven isopods and one snail. Eleven of these were collected from the field survey and two species were identified in the desktop review inside the study area, but were not collected in the present field survey. With the exception of slaters, all SREs were only recorded

as higher taxonomic ranks (sp. indet.), morphological identification was not possible. Molecular tools could be employed to explore distribution ranges of most species. Two slaters, *Buddelundia* '92' and *Buddelundia* '95' are currently only known from the study area, but are likely to occur more widely based on their apparent habitat preferences for rocky hill slopes and gullies, respectively.

1 INTRODUCTION

In May 2014, Phoenix Environmental Sciences Pty Ltd (Phoenix) was commissioned by Preston Consulting Pty Ltd (Preston) on behalf of Rutila Resources Ltd (Rutila) to undertake terrestrial fauna surveys for the Balla Balla Railway (the Project) following an initial gap analysis (Phoenix 2014). The field surveys included:

- Level 1 vertebrate fauna and Level 2 short range endemic (SRE) invertebrate fauna survey (referred to collectively in this report as 'terrestrial fauna survey')
- targeted vertebrate fauna survey for several conservation significant species ('targeted fauna survey').

The proposed railway is approximately 200 km long connecting Flinders Pilbara Iron Ore Project (PIOP) 60 km north-west of Tom Price to the stockpile area at the Rutila Balla Balla export facility.

1.1 BACKGROUND

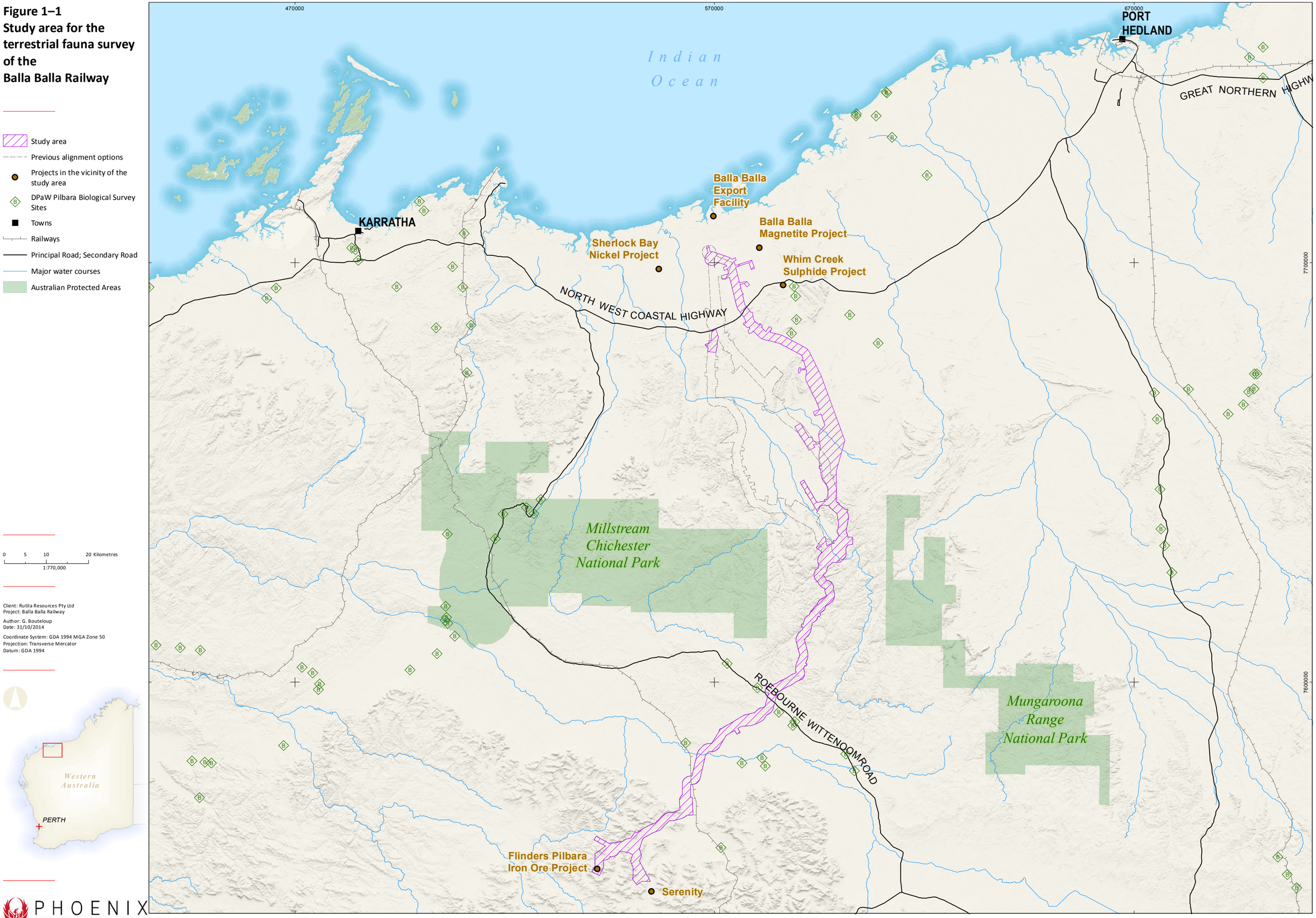
Rutila Resources is developing the Balla Balla Mine and associated port comprising stockpiles and transhipment port with an initial 6 Mtpa output from the mine (Balla Balla Project) (Forge Resources 2013). The Balla Balla Project is located midway between Port Hedland and Karratha, northwest of Whim Creek in the Pilbara Region of Western Australia (WA). Approval has been granted under State environmental legislation for the mine and the port (EPA 2013).

Subsequently, Rutila has investigated the potential for the further development of the port to accommodate third party ore (haematite DSO). A key factor in the viability of this expansion is a connection to the central Pilbara mining region via a new rail line and infrastructure. Rutila plans to seek approval under Part IV of the *Environmental Protection Act 1986* (EP Act) for the Project. An indicative alignment provided by Rutila, with a number of options, was refined during the surveys (Figure 1-1). Previous alignment options were also surveyed during the initial field trip (Figure 1-1), but the respective corridors are not considered part of the study area.

The Project is expected to include:

- rail lineand conveyor from mine to port
- rail loops
- car unloader and conveyor at the port
- ore stockyard
- rail loading area and associated facilities at mine
- borrow pits
- ballast quarry
- access roads
- communication facilities
- water bores and pipelines
- accommodation camps
- workshop areas.

Figure 1–1
Study area for the terrestrial fauna survey of the Balla Balla Railway



Client: Rutila Resources Pty Ltd
Project: Balla Balla Railway

Author: G. Bouteloup
Date: 31/10/2014

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

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1.2 SURVEY OBJECTIVES AND SCOPE OF WORK

The objective of the terrestrial fauna survey was to define the fauna values of the study area which will be used to inform an environmental impact assessment for the Project. The scope of works to achieve this objective was as follows:

- undertake a desktop review of relevant databases, literature and spatial data to assess the potential for presence of conservation significant vertebrate and SRE invertebrate fauna species and habitats in the study area
- undertake detailed terrestrial vertebrate fauna habitat assessment, including fauna habitat mapping of the study area
- conduct a Level 1 vertebrate fauna and Level 2 SRE invertebrate fauna field survey in the study area to further characterise the fauna habitats present and potential for conservation significant species presence
- provide recommendations for targeted species surveys if required
- conduct a targeted field survey in areas identified to potentially contain conservation significant vertebrates
- undertake data analyses, sample processing and species identifications for samples collected during the field survey
- prepare maps showing significant species records and habitats in the study area
- prepare a comprehensive technical report and supporting raw and digital data.

The objective of the targeted fauna survey was to further investigate the presence and distribution of several conservation significant species in parts of the study area where potential for direct impact was identified. The scope of work for each of the target species was as follows (for definitions of conservation ratings see section 2):

- Northern Quoll *(Dasyurus hallucatus)* (EN - EPBC Act; S1 - WC Act) – targeted survey in accordance with species survey guidelines (DSEWPaC 2011b, e) in mapped critical habitat that may be impacted
- Bilby (*Notoryctes caurinus*) (EN – EPBC Act; S1 – WC Act) – refine broad-scale habitat mapping undertaken in the Level 1 survey
- Mulgara (*Dasycercus* spp.)[1] – scope as for Bilby
- Pilbara Olive Python (*Liasis olivaceus barroni*) (VU – EPBC Act; S1 – WC Act) – targeted survey in accordance with species survey guidelines (DSEWPaC 2011f) in suitable habitat identified during the Level 1 survey
- Northern Marsupial Mole (*Notoryctes caurinus*) (EN – EPBC Act; S1 – WC Act) – targeted survey in accordance with species survey guidelines (DSEWPaC 2011e) in suitable dune habitat identified during the Level 1 survey

[1] most likely to record *Dasycercus blythi* (P4 – DPaW) as there are no confirmed *D. cristicauda* (VU – EPBC; S1 – WC Act) records from the Pilbara region.

- *Lerista* sp. – targeted survey included at the request of the OEPA because of the potential for discovery of new species in isolated sandplain and sand dune habitats identified in the Level 1 survey
- other potentially occurring significant fauna – collect data for other significant fauna during the targeted fauna survey.

Survey design, methodology and report-writing adhered to relevant principles and guidelines in:

- Environmental Protection Authority (EPA) Position Statement No. 3: *Terrestrial biological surveys as an element of biodiversity protection* (EPA 2002)
- Environmental Protection Authority (EPA) Guidance for the assessment of environmental factors. *Terrestrial fauna surveys for environmental impact assessment in Western Australia*. No. 56 (EPA 2004)
- Environmental Protection Authority (EPA). Guidance for the assessment of environmental factors. *Sampling of short range endemic invertebrate fauna for environmental impact assessment in Western Australia*. No. 20 (EPA 2009).

2 LEGISLATIVE CONTEXT

The protection of fauna in Western Australia is principally governed by three acts:

- Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act)
- *Wildlife Conservation Act 1950* (WC Act)
- *Environmental Protection Act 1986* (EP Act).

2.1 COMMONWEALTH

Under the EPBC Act, actions that have, or are likely to have, a significant impact on a matter of national environmental significance (NES), require approval from the Australian Government Minister for the Environment. The EPBC Act provides for the listing of threatened native fauna as matters of NES.

Conservation categories applicable to threatened fauna species under the EPBC Act are as follows:

- Extinct (EX)[2] – there is no reasonable doubt that the last individual has died
- Extinct in the Wild (EW) – taxa known to survive only in captivity
- Critically Endangered (CR) – taxa facing an extremely high risk of extinction in the wild in the immediate future
- Endangered (EN) – taxa facing a very high risk of extinction in the wild in the near future
- Vulnerable (VU) – taxa facing a high risk of extinction in the wild in the medium-term
- Conservation Dependent[2] – taxa whose survival depends upon ongoing conservation measures; without these measures, a conservation dependent taxon would be classified as Vulnerable or more severely threatened.

Few invertebrate taxa from WA are listed as matters of NES and those that are mostly include species that have experienced significant range contractions and population declines due to habitat loss, for example the Margaret River Marron (*Cherax tenuimanus*) (Critically Endangered) and the Shield-backed Trapdoor Spider (*Idiosoma nigrum*) (Vulnerable) (Department of the Environment 2014c).

The EPBC Act is also the enabling legislation for protection of migratory species (Mig.) under a number of international agreements:

- Japan-Australia Migratory Bird Agreement (JAMBA)
- China-Australia Migratory Bird Agreement (CAMBA)
- Convention on the Conservation of Migratory Species of Wild Animals (Bonn)
- Agreement between the Government of Australia and the Government of the Republic of Korea on the Protection of Migratory Birds (ROKAMBA).

[2] Species listed as Extinct and Conservation Dependent are not matters of NES and therefore do not trigger the EPBC Act.

2.2 STATE

In Western Australia, the WC Act provides for the listing of native fauna (Threatened Fauna) species which are under identifiable threat of extinction. Threatened Fauna are assigned to one of four categories under the WC Act:

- Schedule 1 (S1) – fauna that is rare or is likely to become extinct
- Schedule 2 (S2) – fauna presumed to be extinct
- Schedule 3 (S3) – Migratory birds protected under an international agreement
- Schedule 4 (S4) – other specially protected fauna.

Assessments for listing of fauna are based on the International Union for Conservation of Nature (IUCN) threat categories.

The Department of Parks and Wildlife (DPaW) administers the WC Act and also maintains a non-statutory list of Priority fauna species, most recently updated on 17 September 2013 (DPaW 2013). Priority species are still considered to be of conservation significance – that is they may be rare or threatened – but cannot be considered for listing under the WC Act until there is adequate understanding of their threat levels. Species on the Priority fauna lists are assigned to one of five priority (P) categories, P1 (highest) – P5 (lowest), based on level of knowledge/concern.

Any activities that are deemed to have a significant impact on listed fauna species can trigger referral to the EPA for assessment under the EP Act.

3 EXISTING ENVIRONMENT

3.1 INTERIM BIOGEOGRAPHIC REGIONALISATION OF AUSTRALIA

The Interim Biogeographic Regionalisation of Australia (IBRA) defines 'bioregions' as large land areas characterised by broad, landscape-scale natural features and environmental processes that influence the functions of entire ecosystems (Department of the Environment 2014d; Thackway & Cresswell 1995). They categorise the large-scale geophysical patterns that occur across the Australian continent that are linked to fauna and flora assemblages and processes at the ecosystem scale (Thackway & Cresswell 1995).

Western Australia contains 26 IBRA bioregions and 53 subregions. The study area falls within the Pilbara bioregion, which covers an area of 178,060 km^2 (Thackway & Cresswell 1995) and is divided into four subregions (Department of the Environment 2014d): Chichester (PIL 1), Fortescue Plains (PIL 2), Hamersley (PIL 3) and Roebourne (PIL 4). The study area traverses all four of these subregions (Figure 3-1).

The Roebourne subregion is characterised by (Kendrick & Stanley 2001):

- quaternary alluvial and older colluvial coastal and sub-coastal plains with a grass savannah of mixed bunch and hummock grasses, and dwarf shrub steppe of *Acacia* spp.
- uplands dominated by *Triodia* hummock grasslands
- ephemeral drainage lines supporting *Eucalyptus victrix* or *Corymbia hamersleyana* woodlands
- samphire, *Sporobolus* and mangal occurring on marine alluvial flats and river deltas
- resistant linear ranges of basalts on the coastal plains, with minor exposures of granite
- islands of either Quaternary sand accumulations, and/or composed of basalt or limestone.

The Chichester subregion is characterised by (Kendrick & McKenzie 2001):

- undulating Archaean granite and basalt plains including significant areas of basaltic ranges
- plains supporting a shrub steppe characterised by *Acacia inaequilatera* over *Triodia wiseana* hummock grasslands, while *Eucalyptus leucophloia* tree steppes occur on ranges.

The Fortescue subregion is characterised by (Kendrick 2001a):

- extensive salt marsh, mulga-bunch grass, and short grass communities on alluvial plains
- deeply incised gorge systems in the western (lower) part of the drainage
- river gum woodlands fringe the drainage lines and the northern limit of mulga (*A. aneura*)
- an extensive calcrete aquifer feeding numerous permanent springs in the central Fortescue, supporting large permanent wetlands with extensive stands of river gum and cajuput *Melaleuca* woodlands.

The Hamersley subregion is characterised by (Kendrick 2001b):

- mountainous areas of Proterozoic sedimentary ranges and plateaux dissected by gorges
- fine-textured soils in valley floors supporting Mulga (*Acacia aneura*) low woodland over bunch grasses
- skeletal soils of the ranges supporting *Eucalyptus leucophloia* over *Triodia brizoides*.

520000
570000
620000
7700000
7650000
7600000
7550000

Roebourne
PIL04

Chichester
PIL01

Fortescue
PIL02

Hamersley
PIL03

Figure 3–1

Location of the Balla Balla Railway in relation to IBRA subregions

Client: Rutila Resources Ltd
Project: Balla Balla Railway

Author: G. Bouteloup
Date: 31/10/2014

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

0 4 8 16 Kilometres
1:500,000

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Study area

Subregions (all parts of the Pilbara bioregion)

- Chichester
- Fortescue
- Hamersley
- Roebourne

3.2 LAND SYSTEMS

The Department of Agriculture and Food Western Australia has mapped the land systems of the Pilbara bioregion from aerial photography. Land systems are grouped according to landform, soils, vegetation and drainage patterns (Payne & Leighton 2004; van Vreeswyk *et al.* 2004). The study area intersects 23 land systems (Table 3-1; Figure 3-2):

- **Black (BLK):** linear ridges of dolerite or basalt supporting hard spinifex grasslands, with un-vegetated boulder slopes and rock piles along summits
- **Boolaloo (BOO):** granite hills, domes, tor fields and sandplains supporting spinifex grasslands with scattered shrubs
- **Boolgeeda (BGD):** stony lower slopes and plains below hill systems supporting hard and soft spinifex grasslands or mulga shrublands
- **Calcrete (CAL):** low calcrete platforms and plains supporting shrubby hard spinifex grasslands
- **Capricorn (CPN):** hills and ridges of sandstone and dolomite supporting low shrublands or shrubby spinifex grasslands
- **Coolibah (COB):** low calcrete platforms and plains supporting shrubby hard spinifex grasslands
- **Granitic (GRC):** rugged granitic hills supporting shrubby hard and soft spinifex grasslands
- **Gregory (GRG):** linear dunes and restricted sandplains supporting shrubby hard spinifex (and occasionally soft spinifex) grasslands
- **Hooley (HOY):** alluvial clay plains supporting a mosaic of snakewood shrublands and tussock grasslands
- **Horseflat (HOF):** gilgaied clay plains supporting Roebourne Plains grass grasslands and minor grassy snakewood shrublands
- **Jurrawarrina (JUR):** hardpan plains and alluvial tracts supporting mulga shrublands with tussock and spinifex grasses
- **Macroy (MAC):** stony plains and occasional tor fields based on granite supporting hard and soft spinifex shrubby grasslands
- **Mallina (MAL):** sandy surfaced alluvial plains supporting soft spinifex grasslands and minor hard spinifex and tussock grasslands
- **McKay (MCK):** hills, ridges, plateaux remnants and breakaways of meta sedimentary and sedimentary rocks supporting hard spinifex grasslands with acacias and occasional eucalypts
- **Newman (NEW):** rugged jaspilite plateaux, ridges and mountains supporting hard spinifex grasslands
- **River (RIV):** flood plains, major rivers and banks supporting grassy eucalypt woodlands, tussock grasslands and soft spinifex grasslands
- **Rocklea (ROC):** basalt hills, plateaux, lower slopes and minor stony plains supporting hard spinifex and occasionally soft spinifex grasslands with scattered shrubs
- **Ruth (RUT):** hills and ridges of volcanic and other rocks supporting shrubby hard spinifex and occasionally soft spinifex grasslands

- **Satirist (SAT):** stony plains and low rises supporting hard spinifex grasslands, and gilgai plains supporting tussock grasslands
- **Sherlock (SRK):** Stony plains and low rises supporting hard spinifex grasslands, and gilgai plains supporting tussock grasslands.
- **Uaroo (UAR):** broad sandplains, pebbly plains and drainage tracts supporting hard and soft spinifex hummock grasslands with scattered acacia shrubs
- **Urandy (URY):** stony plains, alluvial plains and drainage lines supporting shrubby soft spinifex grasslands
- **Wona (WON):** basalt upland gilgai plains supporting Roebourne Plains grass and Mitchell grass tussock grasslands, minor hard spinifex grasslands or annual grasslands/herbfields.

The study area is dominated by the Boolgeeda, Rocklea and Uaroo land systems which cover approximately 20%, 12% and 18% respectively (Table 3-1). Within the Pilbara bioregion the Boolgeeda land system covers 961,931 ha, the Rocklea land system covers 2,881,632 ha, and the Uaroo land system covers 987,046 ha.

Table 3-1 Extent of each land system present in the study area

Land system	Study area (ha)	Percentage of study area	Pilbara total (ha)	% of Pilbara total in study area
Black	479	<1%	17,023	2.8%
Boolaloo	2,038	4%	238,363	<1%
Boolgeeda	11,651	20%	961,931	1.2%
Calcrete	386	<1%	134,899	<1%
Capricorn	468	<1%	698,871	<1%
Coolibah	177	<1%	101,424	<1%
Granitic	1,592	3%	408,840	<1%
Gregory	526	<1%	15,575	3.4%
Hooley	15	<1%	59,081	<1%
Horseflat	1,420	3%	328,124	<1%
Jurrawarrina	368	<1%	66,475	<1%
Macroy	1,837	3%	1,333,394	<1%
Mallina	3,303	6%	335,753	1%
McKay	1,287	2%	426,302	<1%
Newman	3,741	7%	1,995,826	<1%
River	2,953	5%	497,421	<1%
Rocklea	6,813	12%	2,881,632	<1%
Ruth	4,652	8%	169,371	2.7%
Satirist	471	<1%	43,484	1.1%
Sherlock	34	<1%	38,638	<1%
Uaroo	10,172	18%	987,046	1%
Urandy	2,514	4%	132,479	1.9%
Wona	167	<1%	194,821	<1%
Total study area:	**57,064**	**100%**		

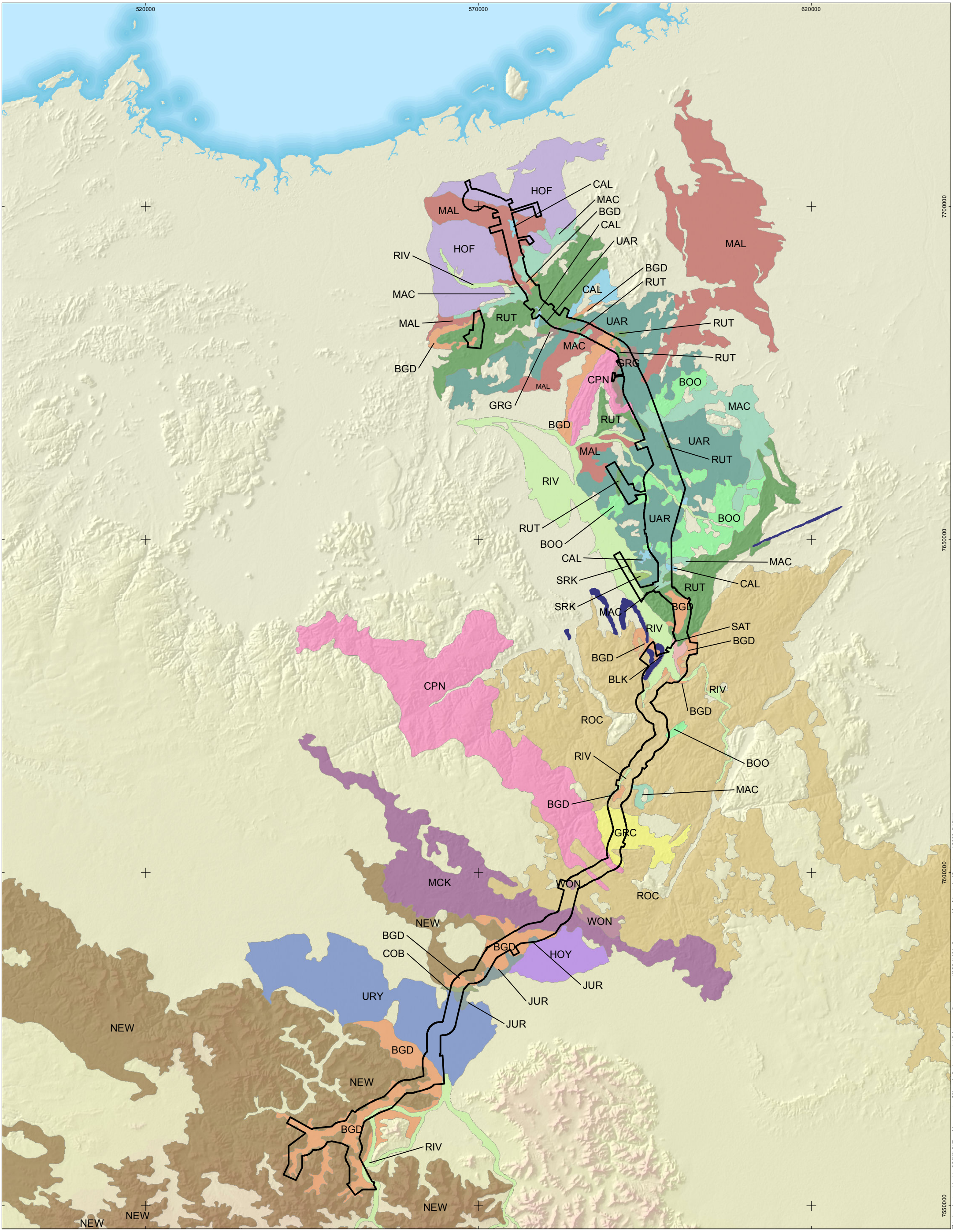

Figure 3–2

Land systems within the study area

Client: Rutila Resources Ltd
Project: Balla Balla Railway

Author: G. Bouteloup
Date: 31/10/2014

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

0 4 8 16 Kilometres
1:500,000

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- Study area
- Black System, BLK
- Boolaloo System, BOO
- Boolgeeda System, BGD
- Calcrete System, CAL
- Capricorn System, CPN
- Coolibah System, COB
- Granitic System, GRC
- Gregory System, GRG
- Hooley System, HOY
- Horseflat System, HOF
- Jurrawarrina System, JUR
- Macroy System, MAC
- Mallina System, MAL
- McKay System, MCK
- Newman System, NEW
- River System, RIV
- Rocklea System, ROC
- Ruth System, RUT
- Satirist System, SAT
- Sherlock System, SRK
- Uaroo System, UAR
- Urandy System, URY
- Wona System, WON

Important vertebrate fauna habitat contained within the dominant land systems of the study area includes:

- plain and plateau (grasslands, shrublands, woodlands, drainage and creek lines, wash-down flood plain) foraging habitat for conservation significant birds of prey and ground-dependant foraging birds such as the Australian Bustard within spinifex grasslands of the Urandy land system
- rocky slopes (hill, mesa, outcrop) of the Black, Boolaloo, Boolgeeda, Granitic, McKay, Rocklea and Ruth landsystems providing denning and foraging habitat for Northern Quoll
- river, large creek and associated vegetation in the Uaroo and Urandy land systems providing foraging and dispersal habitat for Northern Quoll, Bush-stone Curlew and Rainbow Bee-eater in addition to providing refuge for fauna species not listed as conservation significant.

Typical SRE habitats occurring in land systems of the study area include:

- south-facing bases of plateaus and ridgelines in the McKay and Newman land systems providing greater shelter from the sun throughout the day and creating cool moist microhabitats and protection from predation
- riparian vegetation along drainage lines in the Uaroo and Urandy land systems providing refuge habitats with abundant shade, moisture and dense leaf litter.

3.3 CLIMATE AND WEATHER

The Pilbara bioregion has a semi-desert to tropical climate with highly variable, mostly summer rainfall (Leighton 2004; McKenzie *et al.* 2009). The average rainfall over the broader Pilbara region is about 290 mm, ranging from a monthly average of approximately 2 mm in September to 66 mm in February. Rainfall patterns are driven by highly variable year-to-year cyclonic activity that accounts for half of the yearly precipitation (McKenzie *et al.* 2009). Average annual (pan) evaporation in the western Pilbara is approximately 3,400 mm per year (Department of Agriculture 2003), which greatly exceeds annual rainfall and consequently contributes to the arid environment.

The nearest Bureau of Meteorology (BOM) weather stations to the study area with complete climate datasets are Roebourne (no. 4035, 117.15°E, 20.78°S), approximately 50 km west of the most northern point of the study area and Wittenoom (no. 5026, 118.34°E, 22.24°S), approximately 85 km east of the most southern point of the study area.

Roebourne weather station records the highest maximum mean monthly temperature (39.2°C) in December and the lowest minimum mean monthly temperature (13.6°C) in July. The highest mean monthly rainfall is recorded in February (66.6 mm), lowest (1.4 mm) in September with an average annual rainfall of 314.6 mm (Figure 3-4; BOM 2014).

Wittenoom records its highest mean maximum monthly temperature (39.6°C) in December and lowest mean minimum temperature (11.5°C) in July. The highest mean monthly rainfall is recorded in February (115.6 mm), and the lowest (3.2 mm) in September, with an average annual rainfall of 463 mm (Figure 3-4; BOM 2014).

Rainfall was variable compared to long term averages at Roebourne and Wittenoom during the survey (June–August 2014) and in the four months preceding the first field survey. Roebourne received well below average rainfall between February and September, with the exception of May which received well above average rainfall (Figure 3-3). Wittenoom also recorded well below average rainfall from February to September, except in July which recorded well above average rainfall (Figure 3-4). These occurrences of higher than average rainfall suggest suitable collecting

conditions at northern sites during the initial field trip in June and southern sites in the subsequent field trip in July.

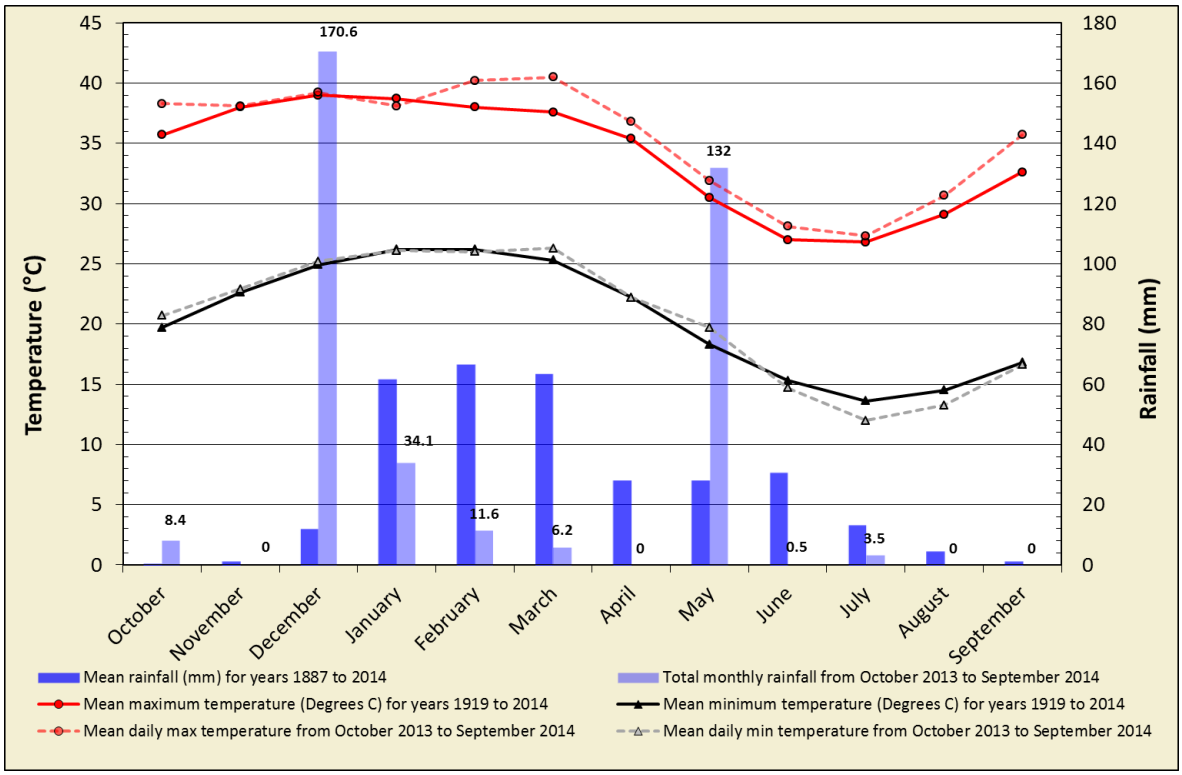

Figure 3-3 Temperature and rainfall records (long term averages and year preceding survey) for Roebourne (BOM 2014)

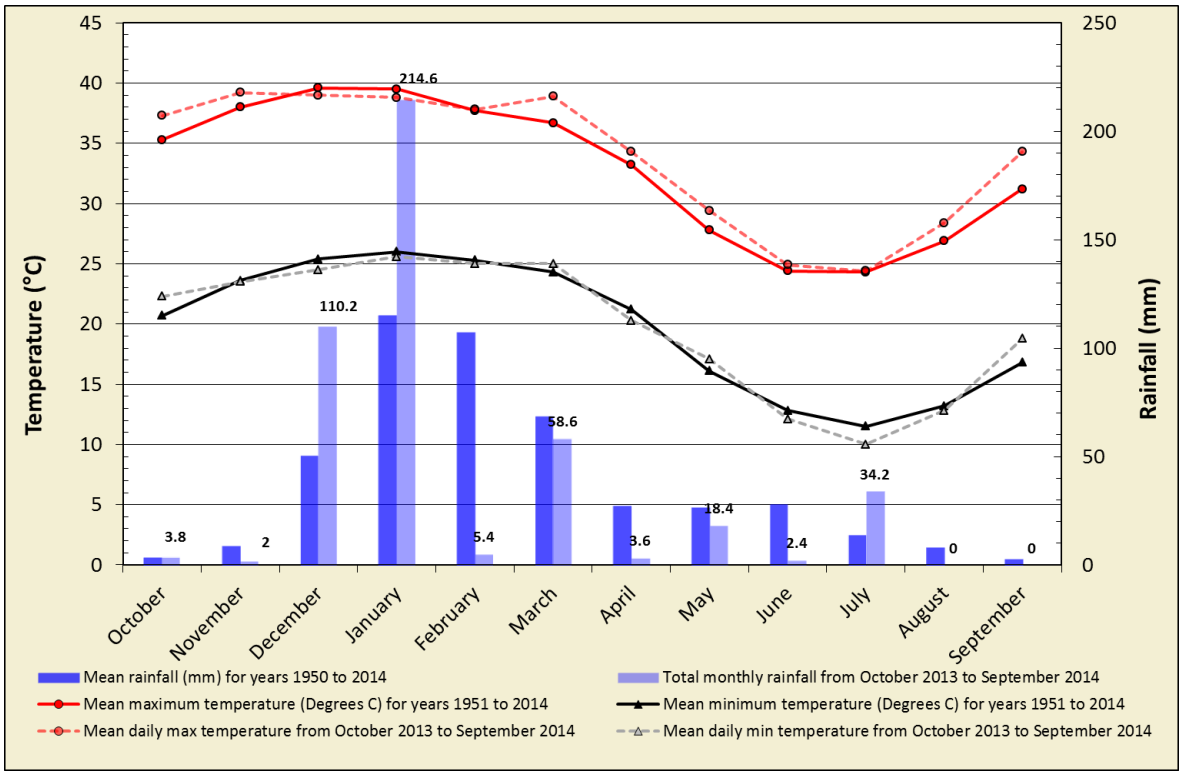

Figure 3-4 Temperature and rainfall records (long term averages and year preceding survey) for Wittenoom (BOM 2014)

3.4 LAND USE

The Pilbara region has been historically dominated by native grazing and pastoral activities (van Vreeswyk *et al.* 2004). Pastoral activity is still conducted in most areas together with tourism, mineral exploration and mining activities in many locations (van Vreeswyk *et al.* 2004). Other land uses include unallocated Vacant Crown Land, Crown Reserves such as the Jigalong Aboriginal Reserve and numerous conservation reserves such as Karijini National Park and Millstream Chichester National Park. Current land use is approximately 60% pastoral lease, 10% conservation reserve, 5% Aboriginal Reserve and 25% unallocated Crown land (UCL) (McKenzie *et al.* 2009).

Primary land use tenure within the study area is almost exclusively pastoral activities with minor areas of mining associated infrastructure.

3.4.1 Threatening processes

Several threatening processes affect the vertebrate and invertebrate fauna of the Pilbara region, including (Kendrick 2001a, b; Kendrick & McKenzie 2001; Kendrick & Stanley 2001):

- wildfire and alteration of fire regimes
- habitat alteration from grazing pressure
- spread of introduced fauna
- spread of weeds
- habitat destruction through mining and associated developments
- climate change.

3.4.2 Conservation reserves

There are two conservation reserves within close proximity to the study area; Millstream Chichester National Park, approximately 10 km west of the study area and Mungaroona Range National Park, approximately 15 km to the east (Figure 1-1).

Millstream Chichester National Park and Mungaroona Range National Park cover an area of 238,497 ha and 105,842 ha respectively, predominantly within the Chichester subregion. Both parks are regionally significant for their natural and cultural values. Millstream Chichester National Park contains unique wetlands which, largely due to the associated aquifer, support a high diversity of flora and fauna including several conservation significant species (Traditional Owners - Millstream Park Council *et al.* 2011). The Millstream Pools within the park are listed in the national Directory of Important Wetlands (Environment Australia 2001) and are proposed for nomination as a Wetland of International Importance under the Ramsar Convention.

There is limited understanding of the SRE invertebrate fauna of Millstream Chichester National Park and Mungaroona Range National Park. However extensive sampling within close proximity, particularly the Pilbara Biological Survey has indicated a rich diversity of invertebrates in the area (McKenzie *et al.* 2009; Traditional Owners - Millstream Park Council *et al.* 2011).

3.5 BIOLOGICAL CONTEXT

The Pilbara accommodates a rich species assemblage comprising of a diverse array of vertebrate and invertebrate fauna (van Vreeswyk *et al.* 2004). Fauna within the region have adapted to survive in

the harsh Pilbara climatic regime. Several Pilbara fauna species are listed as Threatened or Priority (see section 2).

A comprehensive biological survey of the Pilbara was conducted by the Department of Environment and Conservation (DEC) from 2002–2007 (McKenzie *et al.* 2009). This survey provided a benchmark for environmental assessment studies in the Pilbara, as it comprehensively surveyed the biota and summarised fauna and floristic data for the region for many groups of plants and animals. Survey data have provided substantial background information on the small mammal, bat and bird fauna of the region (Baynes & McDowell 2010; Burbidge *et al.* 2010; Gibson & McKenzie 2009; McKenzie & Bullen 2009) and for selected invertebrates, including target SRE taxa such as spiders (Durrant *et al.* 2010) and scorpions (Volschenk *et al.* 2010).

3.5.1 Vertebrate fauna

Within the Pilbara bioregion there are currently 44 declared threatened (CR, EN, VU; definitions provided in section 2) fauna (15 mammals, 14 birds, 11 reptiles and four fish) and 34 Priority (P1–P4) species (10 mammals, seven birds, 16 reptiles and one fish) (DPaW 2013; Western Australian Government 2013).

The Pilbara bioregion is relatively high in endemism with 22 described bioregional endemic vertebrate species and several undescribed species only recorded from the bioregion (Catullo *et al.* 2011; Doughty *et al.* 2011; Doughty *et al.* 2012; Doughty & Oliver 2011; Doughty *et al.* 2010; McKenzie *et al.* 2003; McKenzie *et al.* 2009).

3.5.2 Short-range endemic invertebrates

Short-range endemic (SRE) fauna are defined as animals that display restricted geographic distributions, nominally less than 10,000 km^2, that may also be disjunct and highly localised (Harvey 2002; Ponder & Colgan 2002). Short-range endemism in terrestrial invertebrates is believed to have evolved through two primary processes (Harvey 2002), relictual short-range endemism – where drying climate has forced range contraction into small pockets with remaining moist conditions (e.g. south-facing rock faces or slopes of mountains or gullies) – and habitat specialist SREs that may have settled in particular isolated habitat types (e.g. rocky or granite outcrops) by means of dispersal and evolved in isolation into distinct species. However, SRE invertebrates have also been reported in more widespread habitats such as spinifex plains or woodlands and here mainly in groups with low dispersal capabilities such as mygalomorph spiders and millipedes.

Short-range endemic fauna need to be considered in environmental impact assessments (EIA) as localised, small populations of species are generally at greater risk of changes in conservation status due to environmental change than other, more widely distributed taxa (EPA 2009).

There can be uncertainty in categorising a specimen as SRE due to a number of factors including poor regional survey density, lack of taxonomic research and problems of identification, i.e. specimens that may represent SREs cannot be identified to species level based on the life stage at hand. For example, in contrast to mature males, juvenile and female millipedes, mygalomorph spiders and scorpions cannot be identified to species level. Molecular techniques such as 'barcoding' (Hebert *et al.* 2003a; Hebert *et al.* 2003b) are routinely employed to overcome taxonomic or identification problems.

Currently, there is no accepted system to determine the likelihood that a species is an SRE. The WA Museum has introduced a three tier-rating (confirmed, potential and not SRE) (Western Australian Museum 2013). Phoenix employs a system that differentiates an additional level of short-range endemism, 'likely' which better facilitates setting conservation or management priorities (Table 3-2).

Any SRE categorisation of a taxon is based on the information available at the time. As new information emerges from additional surveys, the SRE status may change and therefore the SRE status is dynamic.

Table 3-2 Phoenix SRE categories reflecting survey, taxonomic and identification uncertainties

SRE category	Criteria	Typical representative
Confirmed	Confirmed or almost certainly SRE; taxonomy of the group is well known (but not necessarily published); group well represented in collections, in particular from the region in question; high levels of endemism in documented species; inference is often possible from immature specimens	*Antichiropus* millipedes; some mygalomorph spiders (e.g. genus *Swolnpes*)
Likely	Taxonomically poorly resolved group; unusual morphology for the group (i.e. some form of troglomorphism); often singleton in survey and few, if any, regional records	Harvestman (i.e. in the genus *Dampetrus*), some millipedes (i.e. Siphonotidae) and isopods (family Philosciidae)
Potential	Taxonomically poorly resolved group; often common in certain microhabitats in SRE surveys (i.e. litter dwellers), but no other regional records; congeners often widespread	Most trapdoor spiders (Mygalomorphae) and Flat-rock Spiders (Selenopidae), many isopods (i.e. genus *Buddelundia*)
Widespread	Taxonomically well resolved (but often not published) and demonstrated wide distribution (i.e. > 10,000 km^2)	

4 METHODS

4.1 DESKTOP REVIEW

4.1.1 Database searches and literature review

As a part of the previous gap analysis (Phoenix 2014) database searches and literature reviews of relevant publications were undertaken to compile a list of potential conservation significant species that may occur within the study area based on the proximity of previous records.

The following database searches were undertaken:

- EPBC Act Protected Matters Search Tool (Department of the Environment 2014e) for a line (21°56'21.98"S 117°34'28.99"E; 21°31'28.99"S 117°46'17.00"E and 20°57'24.98"S 117°38'18.99"E) with a 40 km buffer
- DPaW/WA Museum NatureMap (DPaW 2014a) search from three centre points (20°57’02''S 117°38’18''E; 21°31'28'S 117°46'17''E and 21°56’21''S 117°34’28''E) with a 40 km buffer
- DPaW Threatened Fauna database (DPaW 2014c) for a rectangle polygon with the diagonal coordinates of 20°31'24.41"S 117°18'34.21"E (NW point) and 22°22'14.03"S 118°12'7.06"E (SE point)
- Birdlife Australia Birdata database (Birdlife Australia 2014) search for a rectangle polygon with the diagonal coordinates of 20°31'24.41"S 117°18'34.21"E (NW point) and 22°22'14.03"S 118°12'7.06"E (SE point).

The SRE specific fauna database search areas were based on a rectangular search grid determined by the proposed maximum range of short-range endemism, 10,000 km^2, equivalent to approximately 100 km x 100 km (Harvey 2002). Therefore, the search grid extended ca. 100 km from either side of the study area across the mainland:

- WA Museum Arachnology and Myriapodology database for a rectangle polygon with the diagonal coordinates of 20°42'00"S 116°41'30.12"E (NW point) and 22°30'00"S 118°36'29.88"E (SE point)
- WA Museum Mollusca database for a rectangle polygon with the diagonal coordinates of 20°42'00"S 116°41'30.12"E (NW point) and 22°30'00"S 118°36'29.88"E (SE point)
- WA Museum Crustacea database for a rectangle polygon with the diagonal coordinates of 20°42'00"S 116°41'30.12"E (NW point) and 22°30'00"S 118°36'29.88"E (SE point)
- Phoenix specimen database (Isopoda) for a rectangle polygon with the diagonal coordinates of 20°42'00"S 116°41'30.12"E (NW point) and 22°30'00"S 118°36'29.88"E (SE point).

A total of 50 sites from the Pilbara Biological Survey (PBS) (McKenzie *et al.* 2009) were located within the area covered by the desktop review search areas for SREs (Figure 1-1). All of the PBS sites are around the southern and northern thirds of the study area; with no sites in the vicinity of the central part of the study area. Data collected during the PBS is returned through the WA Museum and NatureMap database searches.

A literature search was conducted for accessible reports of vertebrate and SRE invertebrate fauna surveys conducted within the vicinity of the Project to build on the potential species lists developed from the database searches. Reports for many of these surveys may not give detailed distribution

data; however, distribution information for many of the vertebrates and invertebrates collected is available through the WA Museum database, which was accessed for this desktop review.

Some terrestrial fauna surveys have been conducted near the southern and northern ends of the study area and these reports were accessed for the desktop review (Table 4-1; Figure 1-1). Other than these and the PBS site data, there was an obvious paucity of previous survey information for the remainder of the study area.

Table 4-1 Terrestrial fauna surveys examined as part of the desktop review

Author	Survey	Project	Client
Biota (2004)	Terrestrial fauna survey	Sherlock Bay Nickel Project	Australasian Resources Ltd
Bamford (2006, 2008a, b); Turpin (2011)	Vertebrate fauna survey	Balla Balla Magnetite Project	Rutila Resources Ltd
Phoenix (2013a, c)	Terrestrial fauna survey	Balla Balla Export Facility	Rutila Resources Ltd
Ecoscape (2011)	Terrestrial fauna survey	Pilbara Iron Ore Project (PIOP)	Flinders Mines Ltd
Coffey (2008, 2010); Ecologia (2010a, b); Ecoscape (2010a, b); Phoenix (2010); Ecologia (2012a, b)	Terrestrial fauna survey	Solomon Hub	Fortescue Metals Group Ltd

4.1.2 Habitat assessment

Initial characterisation of terrestrial fauna habitats in the study area was undertaken using various remote geographical tools, including aerial photography (incl. Google™ Earth), land system maps and topographic maps. Broad fauna habitats were defined and mapped within the study area (Phoenix 2014). These were then refined following the field surveys.

The potential for the habitats of the study area to support conservation significant vertebrate fauna and SRE invertebrates was then assessed based on species-specific habitat preferences and nearest records. The SRE habitat assessment considered key habitat types known to facilitate short-range endemism.

Based on these analyses a number of sites were chosen for further investigation during the survey; particular attention was given to habitats utilised by listed species under the EPBC Act and WC Act.

4.2 FIELD SURVEYS

A Level 1 vertebrate fauna and Level 2 SRE field survey was undertaken in the the study area over two field surveys from 2–9 June 2014, and from 14–20 July 2014 to assess habitat quality and the likelihood of occurrence of conservation significance vertebrate fauna and SRE invertebrate fauna. The first trip included the previous alignment options that are not here considered part of the study area (Figure 1-1). The field results from the previous alignment options are however considered in this report as regional contextual data.

A targeted fauna survey was conducted from 26 August to 4 September 2014.

4.2.1 Terrestrial fauna survey

4.2.1.1 Level 1 vertebrate fauna survey

Site selection for the field survey was based on the habitats identified during the desktop review which were then refined after ground-truthing during the field survey. At the broadest scale, site selection considered aspect, topography and land systems. At the finer scale, consideration was given to proximity to water bodies (ephemeral drainage lines and creeks), vegetation structure and condition, including recent fire history and soil type.

Sites were primarily chosen to:

- represent the best examples of habitats with the potential to support conservation significant vertebrate or SRE invertebrate fauna species
- represent the best examples of the broader habitat associations of the study area
- best inform the assessment process (e.g. possible impact/non-impact areas based on the extent of mesas).

Habitat descriptions were compiled at each of the survey sites (Appendix 1) and additional data points were collected to refine the habitat mapping.

Survey methods for the Level 1 vertebrate fauna survey included active/targeted searches for vertebrates at 57 survey sites, 40 of which were located in the current study area and 17 in the previous alignment options (Table 4-2; Figure 4-1). Twenty infra-red remote sensor camera traps and five SM2BAT SongMeter recording devices were deployed at a subset of these sites (Table 4-2). A total of 124 person hours of active/targeted searches for vertebrates were conducted (Table 4-2).

No spotlighting for nocturnal species was undertaken during the field survey; however, additional time was allocated during active searches to target diurnal retreat sites of nocturnal species, particularly reptiles.

4.2.1.1.1 **Active searches**

Active searches comprised searches of any observable microhabitats likely to support mammals, reptiles and amphibians. Searches aimed to record any vertebrate fauna species from direct sightings and secondary evidence of species occurrence. Techniques included raking leaf and bark litter, overturning logs and rocks, searching beneath the bark of trees, investigating dead trees and fallen logs, burrows, rock piles and identifying any secondary evidence including tracks, diggings, scats, fur or sloughs (shed skins), predation or feeding sites, and fauna constructed structures such as pebble mounds. Searches were undertaken at all opportunistic sites for a minimum of one person hour per site and totalled 62 person hours over the survey period.

Targeted searches were conducted for conservation significant species in accordance with relevant survey guidelines (DSEWPaC 2011b, e, f, 2010) including (but not limited to) Northern Quoll, Pilbara Olive Python, Pilbara Leaf-nosed Bat, Ghost Bat (*Macroderma gigas*; P4-DPaW) and Western Pebble-mound Mouse (*Pseudomys chapmani*; P4-DPaW).

4.2.1.1.2 **Avifauna surveys**

Avifauna surveys consisted of bird recordings from visual sightings and call recognition. Surveys were undertaken at all sites for a minimum of one person hour per site and totalled 62 person hours over the survey period. Avifauna surveys were confined to the habitat type represented by each trapping site in order to collect assemblage data for each habitat.

4.2.1.1.3 **Opportunistic records**

Opportunistic records were documented during travel between sites and while other field work was being completed, including observations made during active searches and images captured by remote camera trapping. All opportunistic observations of vertebrate species were recorded during the survey. Opportunistic or non-systematic sampling involved recording all sightings of vertebrate fauna species within the study area.

4.2.1.1.4 **Infra-red motion-sensor camera traps**

A total of 20 infrared motion-sensor camera traps (Reconyx Hyperfire^{TM} HC600) were deployed for between four and seven consecutive nights during the field survey (Figure 4-1; Appendix 2).

Traps were deployed in areas that showed signs of animal movement or disturbance, provided a resource such as food or water (e.g. pools of collected rainwater), or provided potential habitat for conservation significant species. Most cameras were deployed in habitat considered suitable to support Northern Quoll.

Camera traps were set to take between three and ten photos or collect between three and ten photos every time movement was detected, 24 hours a day for the duration of deployment. The cameras contained no-glow infrared sensors and flashes to minimise disturbance to nocturnal species. All camera traps baited using a universal bait mix to lure fauna into the detection zone.

4.2.1.1.5 **Bat echolocation call recordings**

Two SongMeter 2 recording devices were used to record bat echolocation calls at five opportunistic sites within the study area (Figure 4-1; Appendix 2). In total, seven nights of recording were conducted, recording between eight and 12 continuous hours per night.

Recording devices were deployed horizontally at height or aimed at a 45° angle from the ground, and were set to record overnight. Areas of habitat likely to support bat species or areas of expected movement such as gorges, gullies and drainage were targeted. SongMeter deployments particularly targeted Ghost Bat and Pilbara Leaf-nosed Bat.

The recorded data was analyzed by Mr. Bob Bullen, Bat Call WA.

4.2.1.2 Level 2 short-range endemic invertebrate survey

Foraging and leaf/soil sieving for invertebrates were conducted in compliance with Guidance Statement 20 (EPA 2009) at all 57 survey sites (Table 4-2; Figure 4-1). A total of 124 person hours of foraging was conducted, and 57 person hours of foraging and 107 litter/soil sieves were performed for SRE invertebrates (Table 4-2).

Survey methods for SRE invertebrate fauna comprised:

- foraging (4.2.1.2.1)
- litter/soil sieving (4.2.1.2.2).

4.2.1.2.1 **Foraging**

Foraging was undertaken at each site and incorporated the systematic inspection of logs, larger plant debris, the underside of bark of larger trees and the underside of rocks. Methodical searches were conducted amongst the leaf litter of shade-bearing tall shrubs and trees and spinifex bases

were inspected thoroughly. Rocks and rock crevices were inspected, particularly for pseudoscorpions.

A standardised approach was undertaken, whereby each site was sampled for one person hour. Any inhabited trapdoor spider burrows identified during the searches were excavated. Excavation involved removing soil from around the burrow to carefully expose the burrow chamber and remove the spider.

Specimens of the target taxa were immediately fixed in absolute ethanol (EtOH) to preserve tissue for future molecular analyses.

4.2.1.2.2 **Litter/soil sieving**

Up to three combined leaf litter and soil samples were taken at each site (Table 4-2). The collection of leaf litter samples were standardised volumetrically by the diameter and height (310 mm x 50 mm = 1.55 L) of the sieves which were completely filled with compressed litter and the upper layers of underlying soil.

Samples were sieved through three stages of decreasing mesh size over a round tray and invertebrates were picked from the sieves and tray with forceps.

These samples particularly targeted small spiders (Araneomorphae), pseudoscorpions, buthid scorpions, millipedes, centipedes (in particular Geophilomorpha and Cryptopidae), smaller species of molluscs (e.g. Pupillidae) and slaters.

Table 4-2 Survey effort for the terrestrial fauna survey of the Balla Balla Railway

Site	Study area	Habitat type	Northing (zone 50)	Easting (zone 50)	Vertebrates			SRE invertebrates	
					Song-Meter	Camera trap	Active/ targeted searches	Foraging	Litter sifts
Site 01	Yes	Granite outcrop	7648582	597122		3	✓	✓	3
Site 02	Yes	Granite outcrop	7648581	598009		2	✓	✓	3
Site 03	Yes	Granite outcrop	7649493	596979		1	✓	✓	3
Site 04	No	Creek line/riparian zone	7638810	593692			✓	✓	3
Site 05	No	Creek line/riparian zone	7641960	586822			✓	✓	3
Site 06	No	Creek line/riparian zone	7642300	580495			✓	✓	3
Site 07[1]	Yes	Creek line/riparian zone/rocky hill side	7624951	594788	✓	4	✓	✓	1
Site 08	Yes	Plain (spinifex grassland)	7629245	596151			✓	✓	0
Site 09	No	Plain (spinifex grassland)	7669111	583223			✓	✓	3
Site 10[1]	Yes	Creek line/riparian zone /steep sided open gully	7601440	590210	✓	3	✓	✓	3
Site 11	Yes	Abandoned building	7613407	591318		2	✓	✓	2
Site 12	Yes	creek line/permanent pool/riparian zone	7613355	591196	✓✓	1	✓	✓	2
Site 13	Yes	Plain (mixed shrubland)	7620938	597359			✓	✓	0
Site 14	No	Plain (spinifex grassland)	7645740	578146			✓	✓	3
Site 15	No	Rocky hill side	7651271	575161		2	✓	✓	3
Site 16	No	Plain (mixed shrubland)	7663128	576312			✓	✓	3
Site 17	No	Plain (spinifex grassland)	7669732	569042			✓	✓	0
Site 18	No	Plain (coastal grass)	7694829	570211			✓	✓	0
Site 19	No	Plain (spinifex grassland)	7683157	571131			✓	✓	3
Site 20	No	Rocky hill side	7680210	574472			✓	✓	0
Site 21	No	Plain (mixed shrubland)	7676296	577087			✓	✓	3
Site 22	No	Plain (spinifex grassland)	7673169	579538			✓	✓	3
Site 23	No	Plain (spinifex grassland)	7663398	586204			✓	✓	0
Site 24	Yes	Plain (mixed shrubland with exposed rock outcrop	76576	592204			✓	✓	0
Site 25	Yes	Granite outcrop	7658150	593096			✓	✓	0

Site	Study area	Habitat type	Northing (zone 50)	Easting (zone 50)	Vertebrates			SRE invertebrates	
					Song-Meter	Camera trap	Active/ targeted searches	Foraging	Litter sifts
Site 26	Yes	Plain (mixed shrubland)	7652712	596704			✓	✓	3
Site 27	Yes	Plain (spinifex grassland)	7606627	591230			✓	✓	2
Site 28	Yes	Plain (mixed shrubland)	7636714	599809			✓	✓	3
Site 29[1]	Yes	Basalt rock pile	7642803	597979		2	✓	✓	3
Site 30	No	Plain (spinifex grassland)	7658931	575778			✓	✓	3
Site 31	No	Plain (coastal grass)	7702314	568530			✓	✓	3
Site 32	No	Plain (spinifex grassland)	7685508	569623			✓	✓	0
Site 33	Yes	Granite outcrop	7657647	598691			✓	✓	3
Site 34	Yes	Plain (spinifex grassland)	7663881	597379			✓	✓	0
Site 35	Yes	Plain (spinifex grassland)	7670739	594599			✓	✓	0
Site 36[1]	Yes	Sand dune	7677088	592431			✓	✓	3
Site 37	Yes	Plain (spinifex grassland)	7682090	586121			✓	✓	0
Site 38	Yes	Creek line/riparian zone	7684646	579121			✓	✓	1
Site 39	Yes	Rocky hill side (burned)	7688544	577850			✓	✓	0
Site 40	Yes	Plain (spinifex grassland)	7683317	569917			✓	✓	0
Site 41	Yes	Riparian zone	7680063	569422			✓	✓	3
Site 42	Yes	Creek line/riparian zone/ rocky hill side	7618633	595196			✓	✓	0
Site 43	Yes	Plain (mixed shrubland)	7631194	599785			✓	✓	3
Site 44	Yes	Creek line/riparian zone	7644451	593058			✓	✓	3
Site 45	Yes	Plain (mixed shrubland)	7694826	575116			✓	✓	3
Site 46	Yes	Plain (spinifex grassland)	7698041	573434			✓	✓	0
Site 47	Yes	Mulga woodland	7598133	583946			✓	✓	3
Site 48	Yes	Creek line/riparian zone/open gully	7593956	582306			✓	✓	3
Site 49	Yes	Creek line/riparian zone	7591205	580311			✓	✓	3
Site 50	Yes	Plain (mixed shrubland)	7588033	571691	✓		✓	✓	3
Site 51	Yes	Gully	7560080	544172	✓✓		✓	✓	0
Site 52	Yes	Creek line/plain (disturbed)	7582631	566903			✓	✓	3
Site 53	Yes	Plain (mixed shrubland)	7574415	563658			✓	✓	0

Site	Study area	Habitat type	Northing (zone 50)	Easting (zone 50)	Vertebrates			SRE invertebrates	
					Song-Meter	Camera trap	Active/ targeted searches	Foraging	Litter sifts
Site 54	Yes	Plain (mixed shrubland)	7569052	563157			✓	✓	0
Site 55	Yes	Creek line/riparian zone	7564741	555282			✓	✓	3
Site 56	Yes	Plain (mixed shrubland)	7561780	549725			✓	✓	3
Site 57	Yes	Plain (mixed shrubland)	7553801	552160			✓	✓	3
Total:					**5**	**20**	**62 hrs**	**57 hrs**	**107**

✓✓ indicates two SongMeter recording nights; [1] indicates a site revisited for the targeted fauna survey

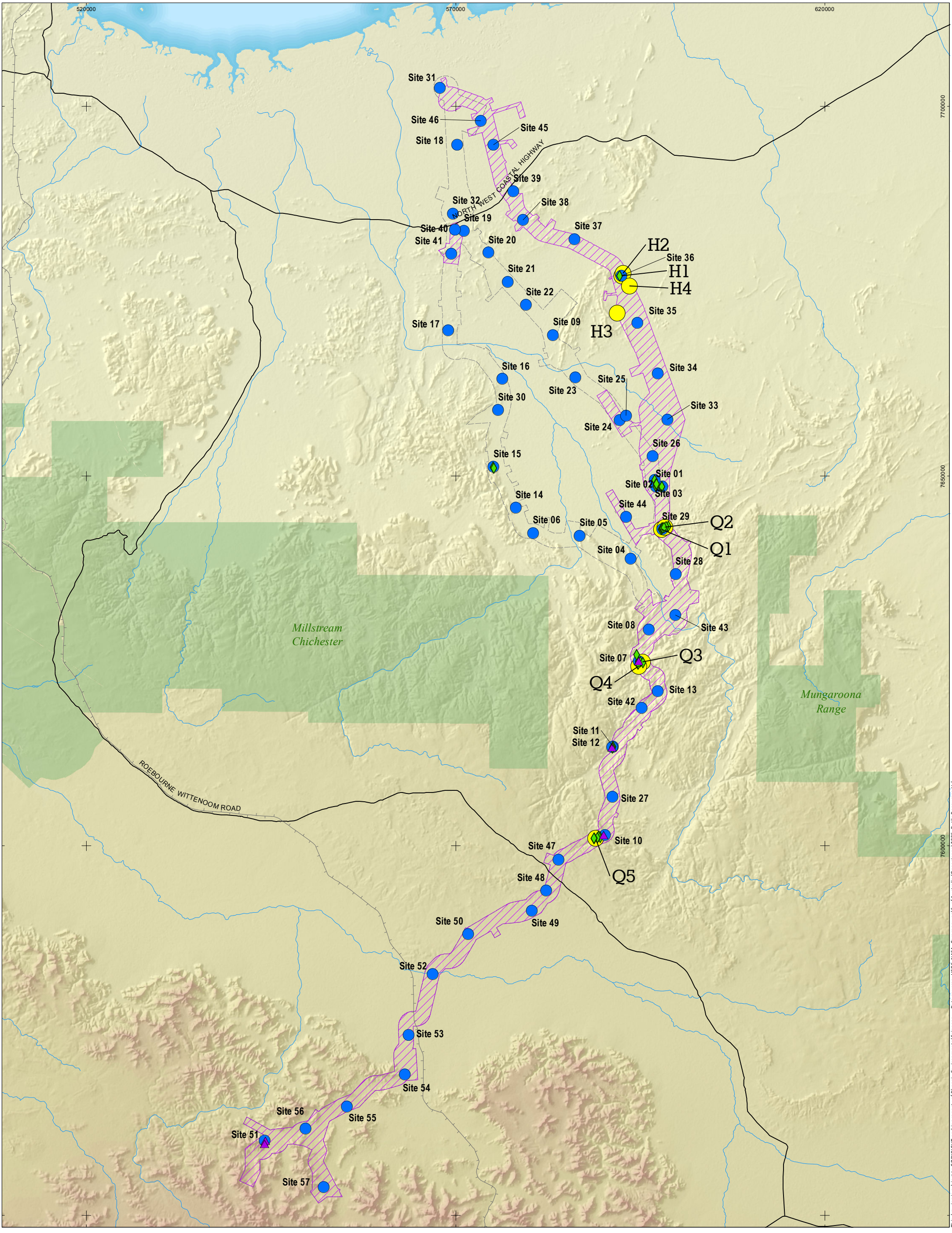

Figure 4-1

Survey sites, camera trap and SongMeter locations for the Balla Balla Railway fauna surveys

Client: Rutila Resources Ltd
Project: Balla Balla Railway

Author: G. Bouteloup
Date: 31/10/2014

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

0 3.5 7 14 Kilometres
1:450,000

- Study area (current alignment)
- Study area (previous alignment)
- Camera trap
- SongMeter
- Survey sites
- Targeted survey sites
- Railways
- Principal Road; Secondary Road
- Major water courses
- Australian Protected Areas

Western Australia
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4.2.2 Targeted vertebrate fauna survey

The targeted vertebrate fauna survey focused on species of higher level conservation significance listed under the WC Act and EPBC Act. For some species, particularly species of lesser conservation significance (DPaW Priority fauna), sufficient information was available from the desktop review and collected during the Level 1 field survey to assess the species likelihood of occurrence and no further targeted work was required.

4.2.2.1 Northern Quoll

Several sites with potential habitat for Northern Quoll were identified in the study area from the desktop habitat mapping and Level 1 survey. Four of these sites were selected for a follow up trapping survey as potential for impact to these sites from the Project was identified (Q1, Q2, Q4, Q5; Figure 4-1). The sites were open for seven consecutive nights (Table 4-3).

An additional site adjacent to one of these four (site Q3; Figure 4-1) was also included to maximise survey effort during the field trip but this site was closed after two days due to access constraints preventing all traps being checked and cleared within a reasonable period from sunrise (Table 4-3). Other potential habitat identified within the study area was omitted from further survey work on the basis that the rail alignment and infrastructure would be designed to avoid it.

The field survey was designed with consideration to the *EPBC Act 1999 referral guidelines for the endangered Northern Quoll* (DSEWPaC 2011b), *Survey guidelines for Australia's threatened mammals* (DSEWPaC 2011e) and *Pilbara northern quoll regional monitoring guidelines* (DPaW 2014b) by setting cage and camera traps (Appendix 2). A combination of Elliot and cage traps were set in locations considered suitable habitat for Northern Quoll, baited and checked each morning. Trap locations were linear and spaced between 30 and 100 m from each other. Any quolls captured during the survey were processed at their capture sites and released after collecting the following data:

- sex
- sexual maturity
- weight (g)
- PES (hind foot) length
- tail diameter (max)
- crown reproductive condition
- head length
- tissue samples (ear clippings) for WA Museum population genetic studies.

Animals were also micro-chipped to enable identification of re-captured quolls and population estimates.

4.2.2.2 Bilby and Mulgara

Four survey sites (H1-H4) for Bilby and Mulgara were chosen in the most prospective habitats identified in the Level 1 survey and from ground-truthing assessments (Figure 4-1). The potential habitats for Bilby and Mulgara identified within the study area from the broad scale desktop and

Level 1 mapping were refined using a ground-truthing method of flying at low altitude over the mapped area to determine suitability.

Bilby and Mulgara were searched for at four sites considered to represent the most suitable habitat. Searches involved two person hours of walking transects in an area approximately 500 m by 500 m searching for any signs including tracks, scats, diggings and burrows. A camera trap was deployed at the entrance to potential burrows to confirm the presence or absence of the species.

4.2.2.3 Pilbara Olive Python

Targeted searches were undertaken at two Northern Quoll sites that were also considered suitable habitat for the Pilbara Olive Python (Q4 and Q5; Figure 4-1). Surveying involved targeted diurnal searches for individuals or any secondary evidence including scats and sloughs (shed skins). Camera traps were deployed at rocky sites near permanent water at sites Q4 and Q5 (Figure 4-1) to increase the likelihood of recording the species. No nocturnal targeted searches were undertaken due to access constraints.

4.2.2.4 Northern Marsupial Mole

Survey sites for the Northern Marsupial Mole were selected from the best available potential habitat present in the study area, in particular sand dunes surrounded by sandplains. Two sand dune sites were searched for evidence of presence by excavating and monitoring “mole trenches” in accordance with the methodology described by Benshemesh (2005) and DSEWPaC (2011e) at various levels at each side of the sand dune (H1 and H2; Figure 4-1). Four trenches were excavated at site H1 and two trenches were excavated at site H2 which were inspected daily following a three to five day drying period. Inspections of trenches involved thorough examination of trench walls for evidence of mole holes indicating species presence.

4.2.2.5 New species of *Lerista*

Targeted searches for *Lerista* species were undertaken at the two sand dune sites, H1 and H2 (Figure 4-1) as these were considered to represent the most prospective habitat within the study area for potential new *Lerista*, i.e. suitable habitat, isolated and remote from any previous survey work. Targeted searches involved raking leaf litter and substrate during periods the species were most likely to be active close to the substrate surface.

Table 4-3 Survey effort for the targeted fauna field survey

Site	Level 1 site equivalent	Study area	Habitat type	Northing	Easting	Zone	Targeted fauna survey						
							Camera trap	Quoll traps/ nights open	Northern Quoll	Pilbara Olive Python	Bilby & Mulgara	Northern Marsupial Mole	*Lerista*
Site Q1	29	Yes	Basalt rock pile	7642793	597874	50	2	17/7	✓				
Site Q2	Near 29	Yes	Basalt rock pile	7643086	598337	50	4	24/7	✓				
Site Q3	Near 07	Yes	Hill slope/gully	7624856	595338	50	0	31/2	✓				
Site Q4	Near 07	Yes	Gully, gorge, hill slope	7624260	594783	50	3	34/7	✓	✓			
Site Q5	10	Yes	Gully, creek line	7601029	588971	50	3	30/7	✓	✓			
Site H1	36	Yes	Sand dune	7677117	592532	50	1				✓	✓	✓
Site H2	Near 36	Yes	Sand dune	7677439	592659	50	0				✓	✓	✓
Site H3	-	Yes	Sandplain	7672076	591890	50	0				✓		
Site H4	-	Yes	Sandplain	7675696	593529	50	0				✓		

4.3 TAXONOMY AND NOMENCLATURE

4.3.1 Morphological species identification

The nomenclature follows a number of taxon-specific references (Table 4-4). However, many invertebrate species are currently unnamed requiring morphospecies designation as listed in this report. These are adopted from the nomenclatural systems developed by the respective taxonomic authorities (Table 4-4). Reference collections for these morphospecies generally reside with WA Museum as expected by EPA (2004).

Table 4-4 Nomenclatural references, morphospecies designations and reference collections

Taxonomic group	Taxonomic reference for described species and higher taxa	Morphospecies designation and reference collection (invertebrates only)
Mammals	Menkhorst and Knight (2011)	
Birds	Simpson and Day (2010); Christidis and Boles (2008)	
Reptiles	Wilson and Swan (2013)	
Amphibians	Tyler and Doughty (2009)	
Araneae	World Spider Catalog (2014)	"MYG"-numbering system for Mygalomorphae developed by V.W. Framenau (WAM, Phoenix) and continued by WAM, reference collection at WAM
Pseudoscorpiones	Harvey (2011)	"PSE"-morphospecies designations developed by M. Harvey (WAM), reference collection at WAM
Scorpiones	Rein (2011); Fet *et al.* (2000), Glauert (1925), Koch, (1977), Kovařík (1997), Kovařík (2002), Volschenk and Prendini (2008), Volschenk *et al.* (2000) Volschenk *et al.* (2012)	Morphospecies designation developed by E.S. Volschenk (Phoenix, WAM), reference collection at WAM
Eupulmonata[a]	Stanisic *et al.* (2010), Whisson & Kirkendale (2014), C. Whisson (Collection Manager: Non-Marine Aquatics, WA Museum, Department of Aquatic Zoology, pers. comm.,)	Morphospecies designations developed by C. Whisson and S. Slack-Smith (WAM); reference collection at WAM
Geophilomorpha	Colloff *et al.* (2005)	"CHI"-morphospecies designations (WAM)
Isopoda	Schotte *et al.* (2008)	Morphospecies designations developed by S. Judd, reference material at WAM

[a] For practical purposes, Eupulmonata (land snails) is here considered an order (after DSEWPaC 2012); however, it is acknowledged that Bouchet *et al.* (2005) consider it a rank-free clade.

Recent changes in the taxonomy and nomenclature of vertebrates have been incorporated; for example the arid zone *Diporiphora* species were revised and three new Pilbara species were described (*D. addunctus, D. paraconvergens* and *D. vescus*) with *D. weneckii* no longer considered to occur in Western Australia (Doughty *et al.* 2012).

Phoenix has considerable in-house expertise in the identification of fauna, including that of all SRE target groups. Senior staff members involved in the identification of SREs are also Research Associates with a longstanding taxonomic research history at the WA Museum (see section 4.5).

4.4 STATISTICAL ANALYSES

4.4.1 Northern Quoll targeted survey

4.4.1.1 Population size

A number of methods are available to estimate population size based on marking and recapturing or resighting animals. Assumptions common to most methods are that (Southwood & Henderson 2000):

- marked animals are not affected by being marked and marks are not being lost
- marked animals become completely mixed in the population
- the probability (p) of capturing a marked animal is the same as for unmarked animals (i.e. trapped animals don't learn that going into a trap is rewarding by getting food
- sampling must be in discrete time intervals and the time for taking the samples must be small in relation to total time of survey.

The trapping study was designed in consideration of the above assumptions. Two basic scenarios can then be modelled when estimating population sizes (Southwood & Henderson 2000):

- The population is closed: there are no immigrations into or emigrations from the population, which includes births and deaths.
- The population is open: immigration (incl. births) and/or emigration (incl. death) occur within the observed population. The population estimates will then, for example also include an estimate of the probability of remaining in the population, or survival (ϕ) (Southwood & Henderson 2000).

For the purpose of the population estimate at sites along the proposed rail alignment, the Northern Quoll population can be considered closed. There are no births expected based on the life history of the animals and deaths are unlikely or assumed negligible within the short period of time of the survey. Similarly, within the short time period of the survey, major immigration or emigration events of Northern Quolls could be considered negligible.

Consequently, the population estimate was modelled with a method applicable to closed populations. The **Schnabel index** was considered the most appropriate method as it is based on multiple recapture events. It provides a single population estimate (Southwood & Henderson 2000). The method was tabulated following Sutherland (1996):

The population estimate N is given by:

$$N = \frac{A}{B}$$

with:

$$A = \sum n_i \, M_i^2$$

$$B = \sum m_i \, M_i$$

with:

n_i number of animals in the *i*-th sample

m_i: number of animals in the *i*-th sample that are already carrying marks

and:

$$M_i = \sum_{j=1}^{i-1} u_i$$

u_i: $n_i - m_i$, i.e. number of unmarked animals in the *i*-th sample

Confidence limits (95%) of the estimate are given by:

$$CI\ (95\%) = \frac{A}{B \pm t\sqrt{(AC - B^2/(S-2)}}$$

with:

$$C = \sum m_i^2/n_i$$

and:

S: number of samples

t: Student's t for S–2 degrees of freedom at the 5% significance level.

The majority of surveys conducted for Northern Quoll in the Pilbara and investigated for this report did not estimate population size. Some studies, however, report the 'capture rate' which allowed a basic comparison between surveys of how readily quolls were captured in any particular survey where capture rates were not reported, they were easily calculated for comparison. It should be noted that survey methods, effort and trap densities across the surveys were not consistent; therefore, comparing capture rates between them is not an ideal metric and should be treated with caution.

The capture rate is simply calculated by dividing the total trapping effort (trap nights x number of traps) by the total number of quolls captured in a single survey.

4.4.2 Level 2 short-range endemic invertebrate survey

For SRE invertebrates, species estimation curves were compiled to obtain an estimate of survey completeness, i.e. whether the collection adequately represents the fauna of the study area. Individual-based taxon accumulation curves were plotted in favour of sample-based curves, as they assess species richness rather than density (Gotelli & Colwell 2001).

Species richness estimates were calculated separately for SRE target taxa at the order level as this avoids groups generally collected in high numbers, such as slaters and snails, disproportionally influencing the results for other groups. A minimum of 20 specimens collected was considered the lowest number to provide reliable statistical results (Gotelli & Colwell 2001). Therefore, analyses were conducted only for pseudoscorpions, slaters and snails. Where unidentified species were collected alongside a single congeneric identified species, these were treated as the same species.

Taxon richness from Mao Tau estimates (Colwell *et al.* 2004) was calculated using the software package EstimateS v8.2 (Colwell 2009) with 999 randomizations. In addition, the abundance-based, non-parametric species estimators ACE, Chao1 and Jack Knife1 were used to estimate the total number of each group within the study area. These estimators were chosen as they are insensitive to pooling collection data ("grain size") and perform well when tested against real data (Hortal *et al.* 2006; Walther & Moore 2005).

The species accumulation data is based on all SRE target taxa collected in the survey, not just those species considered to belong to one of the three SRE categories. It is impossible to provide statistically reliable estimates on actual SREs in the study are due to the low number of individuals collected. The likelihood of finding more SREs was based on the estimate for each group and their likelihood to contain SREs.

A number of important limitations must be considered when interpreting the species accumulation results. The above analyses do not extrapolate the total species numbers within the study area, but provide estimates for the circumstances under which the data were collected. They reflect potential results for more comprehensive surveys (i.e. more samples), but with the same methods in the same habitats at the same time of the year. Total species numbers for the study area may be higher, for example due to seasonal variation in invertebrate presence.

4.5 PROJECT PERSONNEL

The personnel involved in the survey are presented (Table 4-5).

Table 4-5 Project team

Discipline	Name	Qualifications	Role/s
Vertebrate fauna	Mr Ryan Ellis[1,2]	Dip. (Cons. Land Mgmt.)	Project manager, field survey (Level 1), taxonomy (Amphibia, Reptilia, Mammalia), report writing
	Dr Sean Doody[4]	B.Sc. (Zool.), M.Sc. (Biol. Sci.), Ph.D. (App. Sci.)	Field survey (targeted)
	Mr Mike Brown[4]	B.Sc. (App. Sci.)	Field survey (targeted)
	Mr Brendan Schembri[4]		Field survey (targeted)
	Ms Anna Leung[1]	B.Sc. (Env. Sci.) (Hons)	Field survey (Level 1 and targeted), taxonomy (Avifauna), report writing
	Mr Bob Bullen[4]	B. Eng. (Aero. Eng.)	Bat echolocation analysis
Invertebrate fauna	Dr Volker W. Framenau[1, 2]	M.Sc. (Cons. Biol.), Ph.D. (Zool.)	Taxonomy (Araneae (Mygalomorphae, Araneomorphae), Opiliones, Diplopoda, Chilopoda), report review
	Dr Erich Volschenk[1, 2]	B.Sc. (Env. Biol.) (Hons) Ph.D. (Zool.)	Taxonomy (Scorpiones, Pseudoscorpiones), report review
	Dr Simon Judd[1]	Ph. D. (Env. Mgmt.)	Taxonomy (Isopoda)
	Mr Nicholas Dight[1]	B.Sc. (Biol.)	Field survey (Level 1), taxonomy (Eupulmonata), report writing
	Ms Anna Leung[1]	B.Sc. (Env. Sci.) (Hons)	Taxonomy (Chilopoda)
GIS	Mr Guillaume Bouteloup[1]	Adv. Dpi. (Cons. Land Mgmt.)	GIS
Report QA	Mrs Karen Crews[1]	B.Sc. (Env. Biol.) (Hons)	Project oversight, report review

[1]Phoenix Environmental Sciences; [2]Research Associate WA Museum; [3]WA Museum; [4]Freelance taxonomist/zoologist.

5 RESULTS

5.1 DESKTOP REVIEW

5.1.1 Vertebrate fauna

A total of 425 vertebrate fauna species were identified within the area of the desktop review for vertebrates (Appendix 3). This comprised of six amphibians, 137 reptiles, 216 birds and 66 mammals (56 native and 10 introduced). Desktop review results are likely to overestimate the number of vertebrate species that may be present; not all are necessarily likely to occur within the study area. The large number of desktop records reflects the large search area for the desktop review. The limited survey effort in the vicinity of the central part of the study area was evident from the NatureMap database searches which were conducted from three centre points of the alignment to cover the northern, central and southern thirds. For the central section, 206 species records were returned compared with 307 and 302 records for the northern and southern sections respectively. Several marine species were identified in database searches due to the overlap of the search area with the coastline; these species have been excluded from the desktop results and are not discussed any further.

A total of 62 species of conservation significance (four reptiles, 47 birds and 11 mammals) were identified in database searches and survey reports for the desktop search area (Table 5-1). Of these, eight are listed as threatened (five VU and three EN) and 40 as migratory under the EPBC Act (Table 5-1). A total of 47 species listed under the WC Act, including 11 Schedule 1, 39 Schedule 3 (migratory) and one Schedule 4 (Table 5-1). Four species are listed as Schedule 1 and Schedule 3 under the WC Act (Table 5-1). A further 14 species are listed as Priority under the DEC priority fauna list, including one Priority 1, two Priority 3 and 11 Priority 4 (Table 5-1).

Several of these species were considered unlikely to be present within the study area due to a lack of suitable habitat or a lack of specific habitat requirements. These include several migratory shorebird species (see section 5.2.2.1 for an assessment of likelihood of occurrence).

Table 5-1 Conservation significant vertebrate species identified within the search area of the desktop review

Scientific name	Common name	EPBC Act [1]	EPBC Act Migratory [1]	WC Act [2]	DPaW [3]
Reptiles					
Ctenotus angusticeps	Airlie Island Ctenotus	VU		S1	VU
Notoscincus butleri	Lined Soil-crevice Skink				P4
Anilios ganei	No common name				P1
Liasis olivaceus barroni	Pilbara Olive Python	VU		S1	VU
Birds					
Phaps histrionica	Flock Bronzewing				P4
Apus pacificus	Fork-tailed Swift		●	S3	
Ixobrychus flavicollis	Black Bittern				P3
Ardea modesta	Eastern Great Egret		●	S3	
Ardea ibis	Cattle Egret		●	S3	

Scientific name	Common name	EPBC Act [1]	EPBC Act Migratory [1]	WC Act [2]	DPaW [3]
Egretta sacra	Eastern Reef Egret		●	S3	
Plegadis falcinellus	Glossy Ibis		●	S3	
Pandion cristatus	Eastern Osprey		●		
Haliaeetus leucogaster	White-bellied Sea-Eagle		●	S3	
Falco hypoleucos	Grey Falcon				P4
Falco peregrinus	Peregrine Falcon			S4	SP
Ardeotis australis	Australian Bustard				P4
Burhinus grallarius	Bush Stone-curlew				P4
Pluvialis fulva	Pacific Golden Plover		●	S3	
Charadrius mongolus	Lesser Sand Plover		●	S3	
Charadrius leschenaultii	Greater Sand Plover		●	S3	
Charadrius veredus	Oriental Plover		●	S3	
Rostratula australis	Australian Painted Snipe	EN	●	S1-S3	EN
Limosa limosa	Black-tailed Godwit		●	S3	
Limosa lapponica	Bar-tailed Godwit		●	S3	S1-S3
Numenius phaeopus	Whimbrel		●	S3	
Numenius madagascariensis	Eastern Curlew		●	S3	VU
Xenus cinereus	Terek Sandpiper		●	S3	
Actitis hypoleucos	Common Sandpiper		●	S3	
Heteroscelus brevipes	Grey-tailed Tattler		●	S3	
Tringa nebularia	Common Greenshank		●	S3	
Tringa stagnatilis	Marsh Sandpiper		●	S3	
Tringa glareola	Wood Sandpiper		●	S3	
Arenaria interpres	Ruddy Turnstone		●	S3	
Calidris tenuirostris	Great Knot		●	S1-S3	VU
Calidris canutus	Red Knot		●	S1-S3	VU
Calidris alba	Sanderling		●	S3	
Calidris ruficollis	Red-necked Stint		●	S3	
Calidris subminuta	Long-toed Stint		●	S3	
Calidris melanotos	Pectoral Sandpiper		●	S3	
Calidris acuminata	Sharp-tailed Sandpiper		●	S3	
Calidris ferruginea	Curlew Sandpiper		●	S1-S3	VU
Limicola falcinellus	Broad-billed Sandpiper		●	S3	
Glareola maldivarum	Oriental Pratincole		●	S3	
Sternula albifrons	Little Tern		●	S3	
Sterna caspia	Caspian Tern		●	S3	
Sterna dougallii	Roseate Tern		●	S3	
Sterna hirundo	Common Tern		●	S3	
Thalasseus bengalensis	Lesser Crested Tern		●	S3	
Merops ornatus	Rainbow Bee-eater		●	S3	

Scientific name	Common name	EPBC Act [1]	EPBC Act Migratory [1]	WC Act [2]	DPaW[3]
Hirundo rustica	Barn Swallow		●	S3	
Neochmia ruficauda subclarescens	Star Finch				P4
Mammals					
Dasyurus hallucatus	Northern Quoll	EN		S1	EN
Sminthopsis longicaudata	Long-tailed Dunnart				P4
Macrotis lagotis	Greater Bilby	VU		S1	VU
Notoryctes caurinus	Northern Marsupial Mole	EN		S1	EN
Lagorchestes conspicillatus leichardti	Spectacled Hare-wallaby				P3
Petrogale lateralis lateralis	Black-flanked Rock-wallaby	VU		S1	VU
Macroderma gigas	Ghost Bat				P4
Rhinonicteris aurantius	Orange Leaf-nosed Bat	VU		S1	VU
Hydromys chrysogaster	Water-rat				P4
Leggadina lakedownensis	Short-tailed Mouse				P4
Pseudomys chapmani	Western Pebble-mound Mouse				P4

[1] *Environmental Protection and Biodiversity Act 1999*; [2] *Wildlife Conservation Act of Western Australia 1950*; [3] Department of Parks and Wildlife list. CR – Critically Endangered; EN – Endangered; VU – Vulnerable; S1 – Schedule 1; S3 – Schedule 3; S4 – Schedule 4; P1 – Priority 1; P4 – Priority 4.

5.1.2 Short-range endemic invertebrates

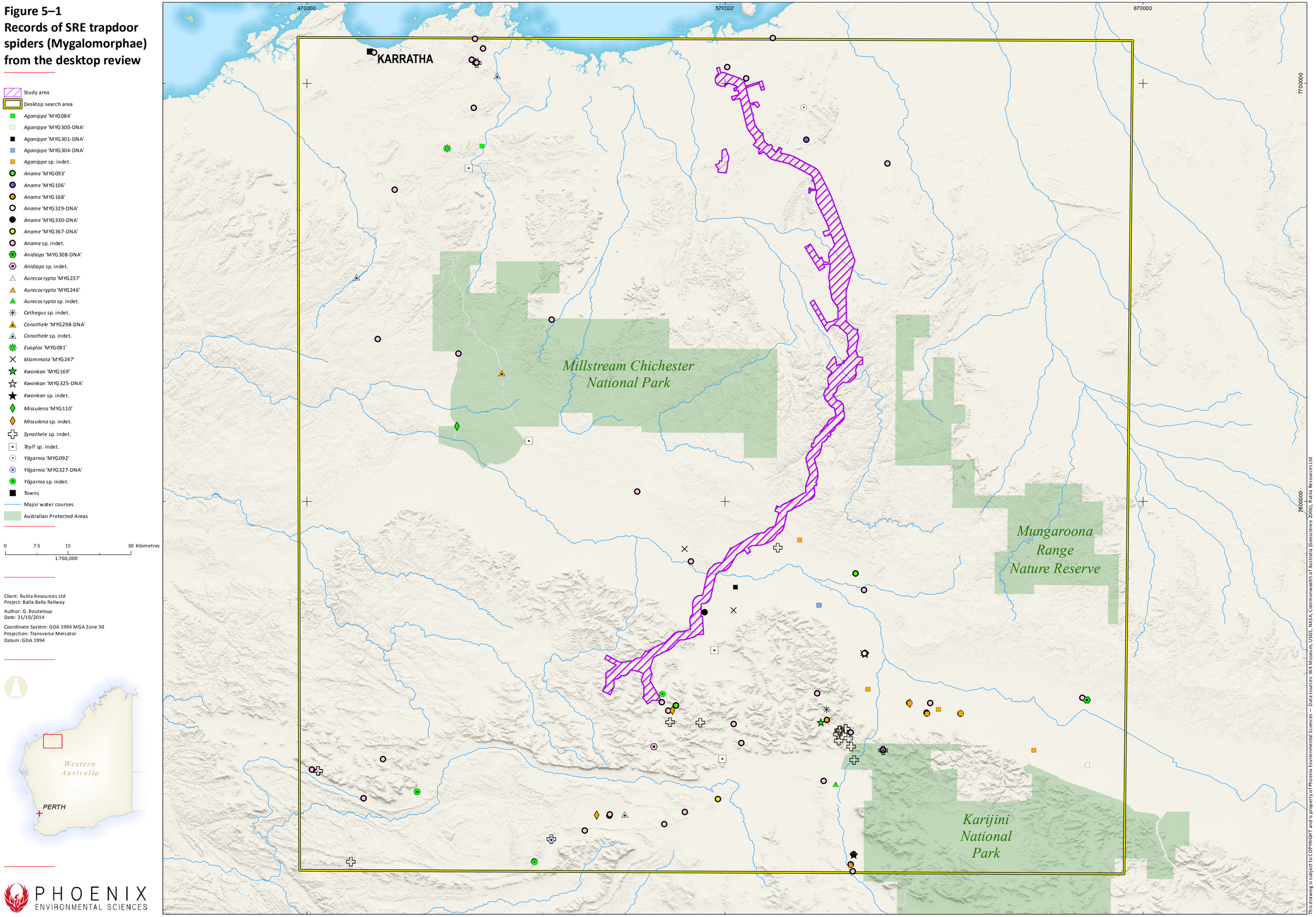
A total of 142 confirmed, likely, or potential SRE invertebrate taxa in 11 orders, at least 23 families and at least 41 genera were identified through the desktop review which therefore may include SREs from the study area (Figure 5-1 – Figure 5-5; Appendix 4). Two of the desktop records were from within the study area: the potential SRE isopods *Buddelundia* '10' and *Buddelundia* '19' (see section 5.2.3.10).

Of the taxa recorded, at least 40 represent higher taxonomic ranks that may contain SREs, but species-level comparison with material from the survey may not be possible ('sp. indet.' or 'sp. indet.'). All records from the desktop review provide an important regional context to interpret the records from the surveys in the study areas.

Thirteen of the 142 taxa are formally described, including four goblin spiders (*Opopaea billroth*, *O. julianneae, O. millstream* and *O. whim*), three selenopid spiders (*Karaops ngarluma* and *K. yindjibarndi* and *K. yurlburr*), one millipede (*Unixenus karijinensis*), and five land snails (*Quistrachia herberti, Q. legendrei, Rhagada convicta, R. pilbarana* and *R. radleyi*) confirming the poor taxonomic coverage of the region.

Searches of the EPBC Protected Matters database and NatureMap did not reveal any conservation significant SRE invertebrates from the area of the desktop review. The WA Museum database results for crustaceans did not include any terrestrial species, but was limited to subterranean forms.

Figure 5–1
Records of SRE trapdoor spiders (Mygalomorphae) from the desktop review



Client: Rutila Resources Ltd
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Figure 5–2
Records of SRE modern spiders (Araneomorphae), harvestmen (Opiliones) and pseudoscorpions (Pseudoscorpiones) from the desktop review

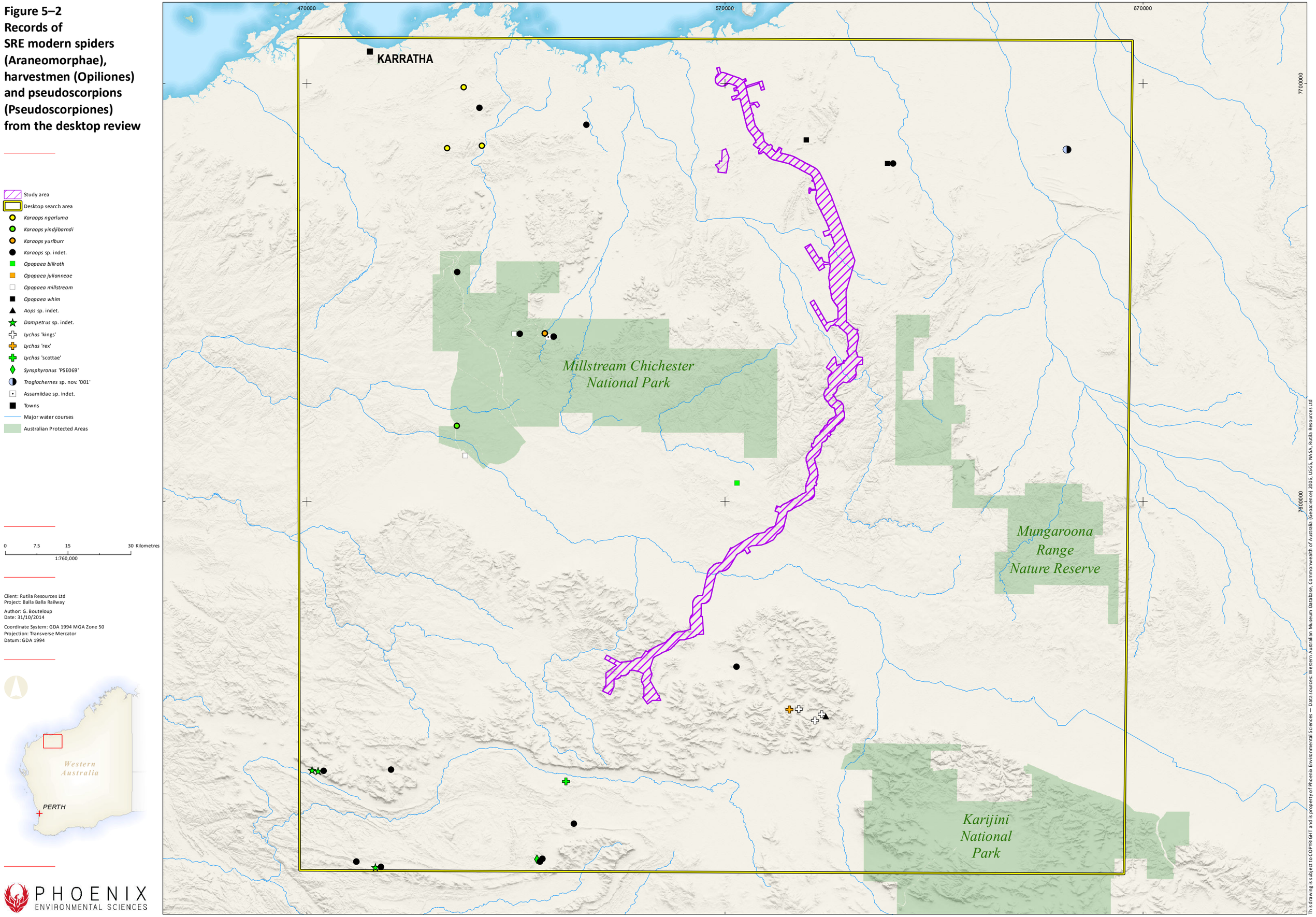


Figure 5–3
Records of SRE millipedes (Diplopoda) and centipedes (Chilopoda) from the desktop review

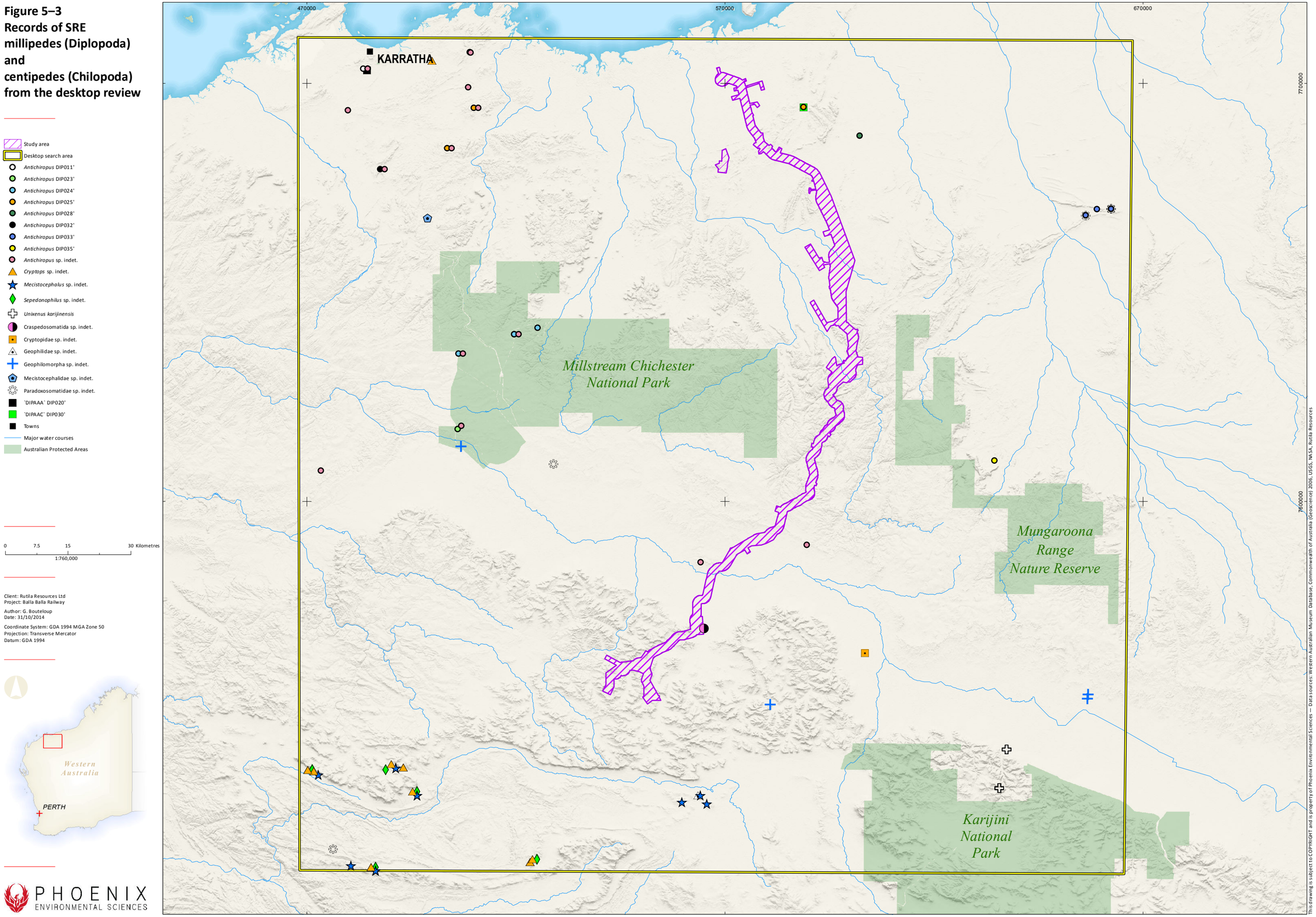


Figure 5–4
Records of SRE slaters (Isopoda) from the desktop review

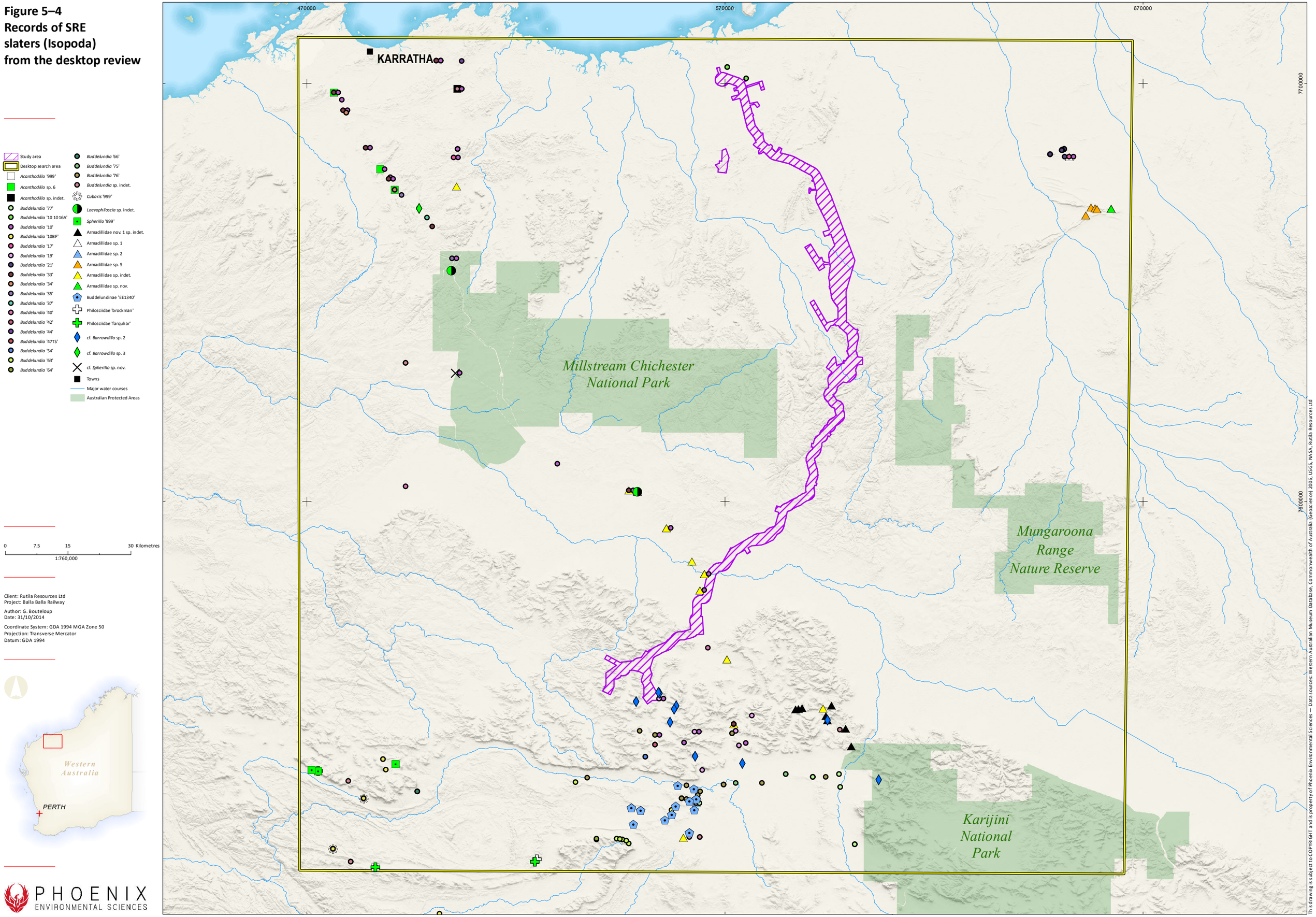
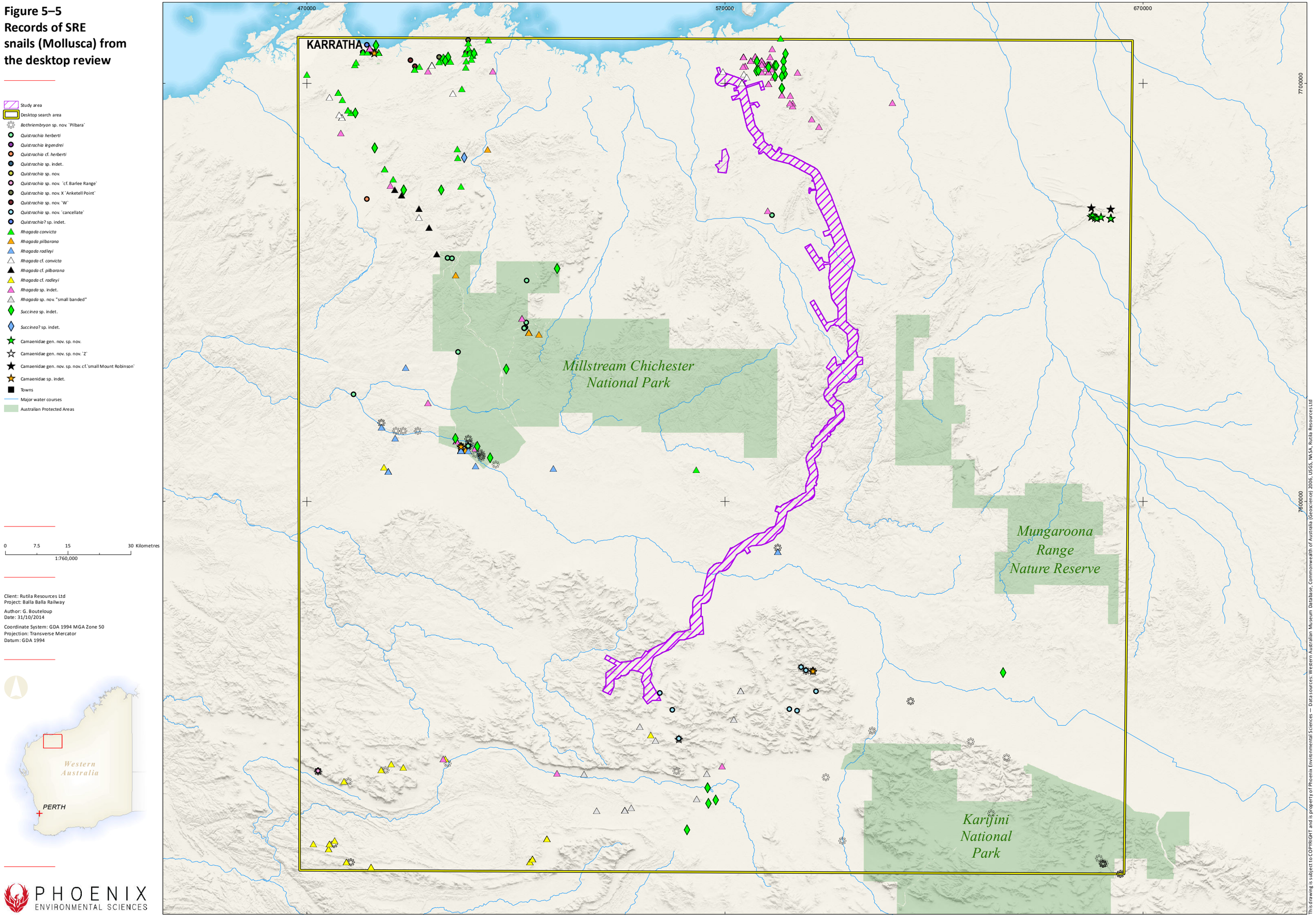


Figure 5–5
Records of SRE snails (Mollusca) from the desktop review



5.2 FIELD SURVEYS

5.2.1 Fauna habitats of the study area

Eight broad fauna habitats were mapped in the study area (Table 5-2, Figure 5-6; Figure 5-7):

- Hummock and tussock grassland – 36% of the study area is comprised of hummock and tussock grassy plains (Table 5-2), generally associated with stony substrates around mesas and rock hill slopes through to clay loam substrates on grassy plains. Hummock and tussock grassland habitats provide potential habitat for Australian Bustard, Flock Bronzewing, Bruch-tailed Mulgara and Short-tailed Mouse.
- Open and closed shrubland – a mix of open and closed shrubland habitats containing small to large shrub species represent 33% of the study area (Table 5-2). Shrublands provide suitable habitat for Bush Stone-curlew, Short-tailed Mouse and, to a lesser extent, foraging habitat for bat species, such as Pilbara Leaf-nosed Bat and Ghost Bat.
- Rocky hill slope – this habitat represents 17% of the study area (Table 5-2) and comprises mesa edges and bordering rocky hill slopes which provide suitable rock cover for Northern Quoll, conservation significant bat species and Pilbara Olive Python. South facing slopes with adequate vegetation and rock cover may provide suitable habitat for potential SRE species.
- Minor creek and drainage line – creek and drainage lines cover 6% of the study area (Table 5-2). Most are bordered by sparse vegetation with spinifex or mixed shrubs and are likely to flow only after heavy or continuous rains. The southern section of the study area crosses the Fortescue River to the west of the Fortescue Marsh. When well vegetated, this habitat type provides sheltering and nesting opportunities for a wide range of vertebrate fauna species as well as food resources. This habitat is likely to support mixed bird species, including migratory waterbirds occasionally when water is present and possibly Lined Soil-crevice Skink. Creek lines may also provide foraging/dispersal habitat for Northern Quoll where they are linked to denning habitats for the species. The moisture, shade and leaf litter beds provided when well vegetated provides suitable habitat for SRE invertebrates.
- Woodland – areas of eucalypt woodland cover <1% of the study area (Table 5-2). The presence of eucalypt communities often indicates areas of persistent moisture and when well vegetated, sheltering and nesting opportunities for a wide range of vertebrate fauna species as well as food resources. The moisture, shade and leaf litter beds provided when well vegetated provides suitable habitat for SRE invertebrates.
- Gully – a small portion (<1%) of the study area is covered by minor gully systems (Table 5-2). Gully systems are located along mesas and are generally associated with creek or drainage lines. Vegetation within the gully systems is more protected than other habitats and often supports mixed species including tall eucalypts, mixed shrubs and grasses, particularly *Triodia*. A number of gullies contain steep rocky sides with scattered boulder piles and caves of various sizes which may support Northern Quoll, Long-tailed Dunnart and possibly provide suitable roost sites for Ghost Bat. Minor gullies are also likely to support Pilbara Olive Python in areas where water remains for long periods after rainfall events. Minor gullies can provide suitable habitat for SRE invertebrate in the form of shade from steep sides and moisture leaf litter beds from associated vegetation and drainages.
- Isolated sand dune – these covered a very small area of the study area (Table 5-2). The soft sandy substrate of sand dunes can support burrowing invertebrates such as trapdoor spiders and Bilby, Mulgara, *Lerista* and Northern Marsupial Mole.

- Sandplain – areas of sandplains supporting a spinifex or sparse shrubs represented 6% of the study area (Table 5-2). This habitat differs from widespread grassland due to the predominantly sandy substrate, potentially supporting Bilby and Mulgara.

Table 5-2 Fauna habitats of the study area and extent of occurrence

Habitat	Total area (ha)	Percentage
Hummock and tussock grassland	20,532	36%
Open and closed shrubland	18,954	33%
Rocky hill slope	9,741	17%
Minor creek and drainage line	3,593	6%
Woodland	95	<1%
Gully	514	<1%
Isolated sand dune	22	<1%
Sandplain	3,612	6%
Total area	**57,063**	100%

Figure 5-6
Terrestrial fauna habitats in the study area, northern half

Study area

Habitat

- Gully
- Hummock and tussock grassland
- Isolated sand dune
- Minor creek and drainage line
- Open and closed shrubland
- Rocky hill slope
- Sandy plain
- Woodland
- Secondary Road; Principal Road
- Major water courses
- National Park, Nature Reserve
- Seas

0 2 4 8 Kilometres

1:260,000

Client: Rutila Resources Ltd
Project: Balla Balla Railway

Author: G. Bouteloup
Date: 31/10/2014

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

PHOENIX ENVIRONMENTAL SCIENCES

570000
590000
610000
7700000
7680000
7660000
7640000
7620000
PEAWAH RIVER
NORTH WEST COASTAL HIGHWAY
LITTLE SHERLOCK RIVER
SHERLOCK RIVER
SHERLOCK RIVER
TANBERRY CREEK
TANBERRY CREEK

Figure 5-7
Terrestrial fauna habitats in the study area, southern half

Study area

Habitat

- Gully
- Hummock and tussock grassland
- Isolated sand dune
- Minor creek and drainage line
- Open and closed shrubland
- Rocky hill slope
- Sandy plain
- Woodland
- Burnt habitat

Secondary Road; Principal Road

Major water courses

National Park, Nature Reserve

Seas

0 2 4 8 Kilometres

1:260,000

Client: Rutila Resources Ltd
Project: Balla Balla Railway

Author: G. Bouteloup
Date: 31/10/2014

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

PHOENIX ENVIRONMENTAL SCIENCES

5.2.2 Vertebrate fauna records

A total of 128 vertebrate fauna species were recorded during the field surveys including 1 amphibian, 40 reptiles, 65 birds and 22 mammals (four introduced and 18 native). Two mammals that were not identified in the desktop review, the Echidna (*Tachyglossus aculeatus*) and Spinifex Hopping-mouse (*Notomys alexis*), were recorded during the field survey.

Five species of conservation significance species were recorded during the survey from direct sightings, secondary evidence, echolocation recordings and camera traps (Figure 5-8; Figure 5-9; Appendix 5):

- Northern Quoll
- Rainbow Bee-eater (*Merops ornatus*) (Migratory – EPBC)
- Lined Soil-crevice Skink, *Notoscincus butleri*) (P4 – DPaW)
- Australian Bustard (*Ardeotis australis*) (P4 – DPaW)
- Western Pebble-mound Mouse (*Pseudomys chapmani*) (P4 – DPaW).

Potential habitat was identified in the study area for a further 23 of the 64 species of conservation significance from the desktop review. Records and an assessment of the potential occurrence and distribution of conservation significant species within the study area are discussed below (section 5.2.2.1).

A number of species identified in the desktop review are considered unlikely to occur within the study area due to lack of suitable habitat to support these species and are not discussed further.

A targeted search for new species of *Lerista* in sandy habitats within the study area did not reveal any new species although two common species (*L. bipes* and *L. muelleri*) were recorded.

Figure 5-8
Conservation significant vertebrate fauna records and habitat in the study area, northern half

Study area
Previous alignment options

Conservation significant vertebrate

B Australian
N Northern
S Lined soil-crevice Skink
R Rainbow Bee-
M Western Pebble-mound

Conservation significant fauna

Greater Bilby, Mulgara
Greater Bilby, Mulgara sp. and Northern
Northern
Northern Quoll and Pilbara Olive
Pilbara Olive
Secondary Road; Principal
Major water courses
National Park, Nature

0 2 4 8 Kilometres
1:260,000

Client: Rutila Resources Ltd
Project: Balla Balla Railway

Author: G. Bouteloup
Date: 31/10/2014

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

PHOENIX ENVIRONMENTAL SCIENCES

Figure 5-9
Conservation significant vertebrate fauna records and habitat in the study area, southern half

Study area
Previous alignment options

Conservation significant vertebrate species (offset for display)

- B Australian Bustard
- N Northern Quoll
- S Lined soil-crevice Skink
- R Rainbow Bee-eater
- M Western Pebble-mound Mouse

Conservation significant fauna habitat

- Greater Bilby, Mulgara sp.
- Greater Bilby, Mulgara sp. and Northern Marsupial Mole
- Northern Quoll
- Northern Quoll and Pilbara Olive Python
- Pilbara Olive Python
- Secondary Road; Principal Road
- Major water courses
- National Park, Nature Reserve

0 2 4 8 Kilometres
1:260,000

Client: Rutila Resources Ltd
Project: Balla Balla Railway

Author: G. Bouteloup
Date: 31/10/2014

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

PHOENIX ENVIRONMENTAL SCIENCES

5.2.2.1 Conservation significant species recorded or potentially occurring in the study area

During the field surveys a total of five species of conservation significance were recorded from direct and secondary evidence. Furthermore, potential habitat was identified within the study area for a further 23 of the 64 species of conservation significance identified in the desktop review. Records and an assessment of the potential occurrence and distribution of conservation significant species within the study area are discussed below. Conservation significant species are listed in a standard taxonomic order following the WA Museum vertebrate fauna checklist (Doughty & Maryan 2008; Johnstone 2009).

Lined Soil-crevice Skink (*Notoscincus butleri*)

Status: Priority 4 (DPaW)

Distribution and ecology: The Lined Soil-crevice Skink is a small terrestrial skink that grows up to 220 mm total length. The species is endemic to the Pilbara region with records scattered across the far west of the region from south of Karratha and Dampier, including West Intercourse Island, to approximately 40 km northwest of Tom Price. Little data are available on the species' preferred habitats; however, the limited records are often associated with spinifex dominated vegetation near creek and river margins (Cogger 2014; Wilson & Swan 2013; Wilson & Knowles 1988). The conservation listing relates to the lack of knowledge of the biology of the species, its endemism in the Pilbara region and potential threats that may lead to the species decline.

Records and likely distribution in the study area: The Lined Soil-crevice Skink was recorded three times during the survey from direct observation at site 11 (Figure 5-9; Appendix 5). The species was found underneath sheets of tin within a derelict building and in adjacent spinifex grassland near a river, consistent with previous records of the species from spinifex grassland in association with drainage systems. Spinifex grassland habitat is well represented in the study area particularly in the northern half (Figure 5-6; Figure 5-7).

5.2.2.1.1 **Gane's Blind Snake (*Anilios ganei*)**

Status: Priority 1 (DPaW)

Distribution and ecology: Gane's Blind Snake is a moderately robust blind snake endemic to the Pilbara region. Little is known of the ecology and habitat preferences of this species, but limited records indicate that it is often associated with moist ridges and gullies (Wilson & Swan 2010). The species diet is considered to be comparable to other blind snakes consisting of primarily the eggs, larvae and pupae of ants (Storr *et al.* 2002; Wilson & Swan 2013). The species is known from few records at scattered localities between Newman and Pannawonica (Wilson & Swan 2010).

Records and likely distribution in the study area: Gane's Blind Snake was not recorded in the study area. The closest record is approximately 66 km west of the study area, in the vicinity of Millstream Chichester National Park (DPaW 2014a). Based on the limited knowledge of the species preferred habitat it is difficult to accurately determine its likelihood of occurrence; however, the presence of suitable habitats (i.e. some of the gully habitat; Figure 5-6; Figure 5-7) comparable with those of previous records in indicates the species may occur within the study area.

5.2.2.1.1 **Pilbara Olive Python (*Liasis olivaceus barroni*)**

Status: Vulnerable (EPBC Act), Schedule 1 (WC Act)

Distribution and ecology: The Pilbara Olive Python is a large and robust python growing to a length of 2.5 to 3 m on average, though lengths of 4.5 to 6.5 m have previously been recorded. The species is generally a uniform olive colour with no patterning, although specimens can show some variation in colouration (Barker & Barker 1994; Smith 1981).

The Pilbara Olive Python is thought to be endemic to the Pilbara, with scattered records from across the region, including some offshore islands (Barker & Barker 1994; Pearson 2007; Smith 1981). The species is nocturnal and cryptic, retreating into rock crevices during the day and is less active during the winter months (DSEWPaC 2011e). It is commonly found in rocky areas in association with watercourses and pools and often associated with areas of permanent pooling water near rocky habitats, such as gullies, gorges and rocky ranges or boulder sites. It has also been recorded in riparian vegetation along major rivers, such as the Robe River (Barker & Barker 1994; Pearson 2003, 2007).

The Pilbara Olive Python is an opportunistic predator with a varied diet including mammals, birds and potentially, frogs and reptiles. Olive Pythons will often wait in an ambush position on rock ledges, at cave entrances or at water sources for prey to come within striking distance (Barker & Barker 1994; Pearson 2007).

Records and likely distribution in the study area: A snake resembling a Pilbara Olive Python was recorded at site Q4 (Figure 4-1) from a remote camera trap; however, conclusive identification was not possible due to the position of the snake in the photo.

Suitable habitat for the species was identified within the study area and the species is considered likely to occur. This species is most often associated with (but not limited to) rocky outcrops or crevices near water sources such as pools and creeklines. Areas of permanent or semi-permanent water associated with rocky habitat present within the study area are likely to support this species (Figure 5-8; Figure 5-9). The nearest records from previous surveys for the Pilbara Olive Python are approximately 10 km east of the northern most point of the study area and 17 km south of the southernmost point (DPaW 2014a).

5.2.2.1.2 **Flock Bronzewing (*Phaps histrionica*)**

Status: Priority 4 (DPaW)

Distribution and ecology: This species inhabits treeless or sparsely wooded grassy plains of north-west WA, south to Carnarvon, and also occurs in the Kimberley and in the arid and semi-arid north-eastern interior of Australia (Johnstone & Storr 1998). The species nests on bare ground amongst low-lying vegetation, particularly grassy plains. It is often associated with permanent water (Garnett & Crowley 2000). Species numbers have declined greatly in the last century due to the degradation of its habitat by livestock.

Records and likely distribution in the study area: The Flock Bronzewing was not recorded in the survey but is considered likely to occur in hummock and tussock grassland habitat within the study area (Figure 5-6; Figure 5-7). The species has previously been recorded multiple times within 5 km of the northern third of the study area (DPaW 2014a; Phoenix 2013c).

5.2.2.1.3 **Fork-tailed Swift (*Apus pacificus*)**

Status: Migratory (EPBC), Schedule 3 (WC Act)

Distribution and ecology: The Fork-tailed Swift is a widespread migratory species that overwinters in Australia. It can be found across most of Western Australia and is uncommon to moderately common in the north-west. They are mostly found over inland plains and also in foothills, coastal areas and over settlements. They occur in a wide range of dry or open habitats, including riparian woodlands, tea-tree swamps, low scrub, heathland, saltmarsh, grassland and spinifex sandplains, open farmland and inland and coastal sand-dunes. Fork-tailed Swifts are often found in areas that experience updraughts around cliffs and normally forage several hundred metres above ground level (DSEWPaC 2011a).

Records and likely distribution in the study area: The species was not recorded during the survey and the nearest record of the Fork-tailed Swift is located approximately 10 km north east of the northern most point of the study area (DPaW 2014a); however, the species can occur within a wide range of habitats, including those within the study area and therefore it is likely to forage within the study area, although unlikely to land or nest.

5.2.2.1.4 **Eastern Great Egret (*Ardea modesta*)**

Status: Migratory (EPBC Act); Schedule 3 (WC Act)

Distribution and ecology: The Eastern Great Egret can be found along inland rivers, lakes and shallow freshwater or saltwater wetlands and inundated samphire flats. This species is highly mobile and can be found throughout most of the western fringes of the State in coastal areas and towards the semi-arid interior (Johnstone & Storr 1998).

Records and likely distribution in the study area: The Eastern Great Egret was not recorded during the survey, but has been recorded multiple times within 5 km of the study area (DPaW 2014a). The species is likely to occur along drainage lines where permanent water is present and more frequently after rains when water is present within minor creek and drainage lines (Figure 5-6; Figure 5-7).

5.2.2.1.5 **Glossy Ibis (*Plegadis falcinellus*)**

Status: Migratory (EPBC Act); Schedule 3 (WC Act)

Distribution and ecology: The preferred habitat of the Glossy Ibis is well-watered flatlands such as shallows, flats and pools of freshwater lakes, swamps and rivers, flooded samphire and sewage ponds. The most notable habitat for this bird in WA is the north-east and south-west Kimberley and the Swan Coastal Plain (Johnstone & Storr 1998).

Records and likely distribution in the study area: The Glossy Ibis was not recorded during the survey; however, the species has previously been recorded approximately 6 km west of the study area (DPaW 2014a) and is considered to possibly occur following rainfall events when flooding occurs, particularly in northern third of study area.

5.2.2.1.6 **White-bellied Sea-Eagle (*Haliaeetus leucogaster*)**

Status: Migratory (EPBC Act); Schedule 3 (WC Act)

Distribution and ecology: White-bellied Sea-eagles are found quite uniformly across most of coastal Australia, in every state, including WA. They occur through a wide variety of coastal habitats and sometimes follow watercourses inland. The nest is usually built on high rocks, a shrub or a tall tree (Johnstone & Storr 1998). Two eggs are laid and young are fed with fish, snakes and birds.

Records and likely distribution in the study area: The White-bellied Sea-Eagle has been recorded multiple times within 5 km of the northern half of the study area, particularly near the coastline (DPaW 2014a) and may occasionally frequent habitats within the study area closest to the coast (the northern section).

5.2.2.1.7 Grey Falcon (*Falco hypoleucos*)

Status: Schedule 1 (WC Act); Vulnerable (DPaW)

Distribution and ecology: The Grey Falcon is a widespread but rare species inhabiting much of the semi-arid interior of Australia. Its distribution is centred along inland drainage systems. It has a large foraging range extending from timbered plains, such as *Acacia* shrublands, into open grasslands. Prey includes mainly birds (Sutton 2010), but also invertebrates and mammals. The species often utilizes old nests of other species, particularly other raptors, in the tallest trees along watercourses and sometimes in telecommunication towers (Sutton 2010).

There are no confirmed threats to the Grey Falcon but it is thought that clearing of the semi-arid zone for marginal farming has reduced habitat availability and overgrazing of arid zone rangelands may affect prey abundance (Garnett *et al.* 2011).

Records and likely distribution in the study area: The Grey Falcon was not recorded during the survey; however, the species has been recorded multiple times within 10 km of the study area (DPaW 2014a). The species is considered likely to forage within the study area, particularly grassland and shrubland habitats and may possibly nest where suitable tall trees or suitable infrastructure is present, particularly along rivers and drainage lines (Figure 5-6; Figure 5-7).

5.2.2.1.8 Peregrine Falcon (*Falco peregrinus*)

Status: Schedule 4 (WC Act)

Distribution and ecology: The Peregrine Falcon is a widespread bird of prey found across Australia, with a large foraging range. In Western Australia, it can be rare or scarce to moderately common. The Peregrine Falcon's preferred habitat includes cliffs and wooded watercourses. Nesting occurs mainly on cliff ledges, granite outcrops, quarries and in trees with old raven or Wedge-tailed Eagle nests (Johnstone & Storr 1998).

Birds constitute a very large proportion of their diet, if not the exclusive part (Johnstone & Storr 1998; Ratcliffe 1980). Historically, the widespread use of DDT caused worldwide global decline of the Peregrine Falcon. The main current threat to the species in Australia is habitat loss, particularly woodland trees for nesting (DSEWPaC 2011d).

Records and likely distribution in the study area: The Peregrine Falcon was not recorded during the survey; however, it has previously been recorded multiple times within 10 km of the southern and northern thirds of the study area (DPaW 2014a). The species is likely to forage in various habitats of the study area and may nest on cliff edges of suitably sized gullies or large granite outcrops.

5.2.2.1.9 Australian Bustard (*Ardeotis australis*)

Status: Priority 4 (DPaW)

Distribution and ecology: The Australian Bustard is the heaviest flying bird in Australia (Ziembicki 2010). They are nomadic, distributed across much of the northern arid areas of the state and may be found singly, in pairs or large groups. Abundance will vary seasonally according to rainfall and food availability (Johnstone & Storr 1998). The species has a broad preference for open habitats, ranging from open grassland plains to low shrub lands and grassy open woodlands. They tend to avoid

densely vegetated areas and favour flat terrain over hilly areas. They may also be associated with watercourses, particularly in more arid regions (Ziembicki 2010).

Bustards have a broad omnivorous diet that includes seeds, fruits, leaves, flowers, green shoots, various invertebrates and small vertebrates. Bustards are highly opportunistic, and will gorge on favoured food items when available (Ziembicki 2009). Breeding takes place from March to September (mainly March to April and July to August). One to three (commonly one) eggs are laid on bare, preferably stony ground, by a bush or tussock (Johnstone & Storr 1998).

Records and likely distribution in the study area: The Australian Bustard was recorded seven times during the survey from secondary evidence (tracks), including inside and outside the study area (Figure 5-8; Appendix 5). The species is considered likely to occur frequently within the study area in grassland and shrubland habitats (Figure 5-6; Figure 5-7) that provide suitable breeding and foraging habitat.

5.2.2.1.10 **Bush Stone-curlew (*Burhinus grallarius*)**

Status: Priority 4 (DPaW)

Distribution and ecology: The Bush Stone-curlew is a relatively large bird that prefers lightly wooded country near daytime shelter such as thickets or long grass. It can be found across much of Australia except the arid interior and southern coast. In Western Australia, the species is uncommon to common in the northern subhumid and semiarid zones, and rare to uncommon and locally extinct further south (Johnstone & Storr 1998). The species is considered sedentary (stable home range and non-migratory) (Garnett & Crowley 2000).

The Bush Stone-curlew is a ground-dwelling species and therefore susceptible to predation and local disturbance by humans (Johnstone *et al.* 2013).

Records and likely distribution in the study area: The Bush-stone Curlew was not recorded during the survey; however, the species has been recorded multiple times within 5 km of the study area (DPaW 2014a). The species is likely to occur in unburnt mixed shrublands and suitably vegetated creek and drainage lines within the study area that provide sufficient cover for the species (Figure 5-6; Figure 5-7).

5.2.2.1.11 **Common Sandpiper (*Actitis hypoleucos*)**

Status: Migratory (EPBC), Schedule 3 (WC Act)

Distribution and ecology: Found across all Australian states, the Common Sandpipers never occurs in large flocks, but mostly singly. In Western Australia the species is mostly found in coastal habitats but it will also occur inland (Geering *et al.* 2007).

The Common sandpiper breeds in temperate Eurasia during the northern hemisphere summer. A small population winters in Australia (approximately 3,000 individuals) (Geering *et al.* 2007). They are found across a wide range of wetlands: small ponds, large inlets, mudflats where they forage on the shore usually close to the vegetation.

Records and likely distribution in the study area: The Common Sandpiper was not recorded during the survey and the nearest records of the species is approximately 6 km west of the northern third of the study area (DPaW 2014a). The species may occur, particularly after rains when flooding occurs closer to the coast and water is present within minor creek and drainage lines.

5.2.2.1.12 **Common Greenshank (*Tringa nebularia*)**

Status: Migratory (EPBC), Schedule 3 (WC Act)

Distribution and ecology: The species is present in summer across all Australian states, mostly on the coast but sometimes inland. According to Delany and Scott (2006) the overall population is stable.

The species is not gregarious. Small groups can sometimes be seen when roosting at high tide (Geering *et al.* 2007). They prefer coastal open mudflats.

Records and likely distribution in the study area: The Common Greenshank was not recorded during the survey and the nearest record of the species is approximately 6 km west of the northern most point of the study area (DPaW 2014a). The species may occur, particularly after rains when flooding occurs closer to the coast and water is present within minor creek and drainage lines.

5.2.2.1.13 **Wood Sandpiper (*Tringa glareola*)**

Status: Migratory (EPBC), Schedule 3 (WC Act)

Distribution and ecology: This graceful, active wader prefers shallows of wooded lakes or swamps with trees. It also inhabits freshwater swamps, lakes, flooded pastures and occasionally, mangroves. It occurs as solitary individuals or in large flocks of mixed waders and is an uncommon migrant (Morcombe 2004).

Records and likely distribution in the study area: The Wood Sandpiper was not recorded during the survey and the nearest records of the species is approximately 10 km west of the northern third of the study area (DPaW 2014a). The species may occur, particularly after rains when flooding occurs closer to the coast and water is present within minor creek and drainage lines.

5.2.2.1.14 **Oriental Pratincole (*Glareola maldivarum*)**

Status: Migratory (EPBC), Schedule 3 (WC Act)

Distribution and ecology: The Oriental Pratincole breeds across central Asia and winters in Australia. Until recently the world population estimate was around 75,000 individuals (Watkins 1993), but was reassessed after 2.8 million birds were counted at 80 Mile Beach, near Broome in 2004 (Bamford *et al.* 2008). Australia consequently supports the quasi-integrity of the wintering world population with a large proportion in WA.

Pratincoles belong to the Glareolidae family. They are slim, elongated shorebirds that can forage in flight or on the ground, mostly feeding on invertebrates. They congregate on the coast as well as inland, in small or in large flocks.

Records and likely distribution in the study area: The Oriental Pratincole was not recorded in the survey; the nearest record is located approximately 13 km north west of the northern most point of the study area (DPaW 2014a). The species may occur in sandplain and grassland habitats of the study area (Figure 5-6; Figure 5-7) depending on climatic conditions and food availability.

5.2.2.1.15 **Rainbow Bee-eater (*Merops ornatus*)**

Status: Migratory (EPBC), Schedule 3 (WC Act)

Distribution and ecology: The Rainbow Bee-eater is a migratory bird that moves between Australia and Asia and is commonly seen singly or in pairs. It can be found across Australia, with complex seasonal movements depending on location and rainfall, preferring the more watered areas of the country. In Western Australia, the Rainbow Bee-eater can be found in lightly wooded, preferably sandy country, near water.

Occurring as a resident, breeding visitor, postnuptial nomad, passage migrant or winter visitor, and being highly mobile, they can be scarce to locally common. They are often associated with creek lines supporting sandy banks in which burrows can be created (Johnstone & Storr 1998). Its diet consists primarily of bees (especially hive bees) and flies, but it is known to predate on other invertebrates.

The species nests in sandy banks and breeding occurs from August to November; however, breeding can occur at other times of year if environmental conditions are suitable. Four to six eggs are laid in an open chamber at the end of a burrow (Johnstone & Storr 1998).

Records and likely distribution in the study area: The Rainbow Bee-eater was recorded seven times during the field survey in riparian vegetation along a drainage line and shrubland habitats, including inside and outside the study area (Figure 5-8; Figure 5-9; Appendix 5). The species is likely to occur frequently throughout the study area particularly along minor creek and drainage line habitat (Figure 5-6; Figure 5-7).

5.2.2.1.16 **Star Finch (*Neochmia ruficauda subclarescens*)**

Status: Priority 4 (DPaW)

Distribution and ecology: The Star Finch is a small granivorous bird present in north-western WA in low densities with a patchy distribution. They are usually found in small flocks in grasslands and eucalypt woodlands typically near permanent water. The species can occur in arid habitat after the wet season, if the conditions are good for breeding.

Habitat alteration (essentially due to grazing), clearance and drainage are responsible for the decline of the species throughout most of its range (Garnett & Crowley 2000).

Records and likely distribution in the study area: The Star Finch was not recorded during the survey; however, the species may occur along minor creek and drainage line habitat when water is present (Figure 5-6; Figure 5-7). The nearest record of the species is located approximately 6 km west of the northern third of the study area (DPaW 2014a).

5.2.2.1.1 **Brush-tailed Mulgara (*Dasycercus blythi*)**

Status: Priority 4 (DPaW)

Distribution and ecology: The Brush-tailed Mulgara is a medium-sized carnivorous marsupial. It feeds on a range of invertebrate and small vertebrate prey items. Little is known about the species' reproductive ecology in the wild, although females with up to six pouch young have been recorded around September. In captivity mating has been observed between mid-May to mid-June (Van Dyck & Strahan 2008).

The Brush-tailed Mulgara is often recorded in sand plains and gibber plain habitats, with or without spinifex hummocks and other vegetative cover (Pavey *et al.* 2011). Brush-tailed Mulgara have home ranges from 1 ha up to 25.5 ha, with notable differences occurring between sexes and seasons. They have a sedentary lifestyle and may occupy burrows in one location for many years (Körtner *et al.* 2007; Masters 2003). The species may construct multiple burrow systems within its home range (Van Dyck & Strahan 2008).

Records and likely distribution in the study area: Mulgaras were not recorded during the surveys. It may occur in the sandplain and sand dune habitats in the study area. From the detailed habitat assessment during the targeted survey a total of 3,612 ha of habitat of high to low suitability was mapped, including potential burrowing and foraging habitats (Figure 5-8).

There are few records of the species in close proximity to the study area, with the nearest record approximately 75 km to the east of mapped habitat (DPaW 2014a). Limited survey effort in this area of the Pilbara region is likely to have resulted in fewer records of the species in close proximity to the study area.

5.2.2.1.2 **Northern Quoll (*Dasyurus hallucatus*)**

Status: Endangered (EPBC Act); Schedule 1 (WC Act)

Distribution and ecology: The Northern Quoll is the smallest of the four Australian quoll species and is a solitary carnivorous marsupial found in the northern parts of Australia. This primarily nocturnal species makes its dens in rock crevices, tree holes or occasionally termite mounds. It occurs in a wide range of habitats and with an omnivorous diet consisting of invertebrates, small vertebrates and fruits of a number of plant species (Oakwood *et al.* 2008).

Historically, the Northern Quoll's distribution occurred from the Pilbara to south-east Queensland. There has been a substantial decline across most of its distribution across northern Australia since the invasion of the Cane Toad (Van Dyck & Strahan 2008).

The Northern Quoll does not have highly specific habitat requirements, being found in a variety of habitats; however, rocky areas provide particular support for high prey densities and diversity, and protection from predators, fire and livestock grazing (Hill & Ward 2010).

Records and likely distribution in the study area: The Northern Quoll was recorded a number of times within the study area from direct captures, camera traps and secondary evidence (scats and bones) (Figure 5-8; Figure 5-9; Appendix 5). Northern Quolls were recorded from three of the five trapping sites in the study area during the targeted survey. A total of 21 individuals were recorded from sites Q3, Q4 and Q5 with a total of 45 captures of which 24 were re-captures. One individual was trapped at site Q3, eight individuals at site Q4, and 12 individuals at site Q5. No quolls were recorded at sites Q1 and Q2.

Of the 21 individual quolls, eight were female, twelve were male and one was indeterminate due to the animal being released without data due to poor animal condition. The average weights of males was 496.7 g (n = 12) and females 361.9 g (n = 8). At least four of the eight had developed pouches and one was under-developed. The species was also recorded eight times from secondary evidence and from eight camera traps during the surveys.

The species is likely to den in the rocky habitats providing suitable formations or rockpiles, particularly gully habitat. Approximately 640 ha of suitable denning and shelter habitat were mapped in the study area (Figure 5-8; Figure 5-9). Foraging and dispersal is likely to occur across most habitats within 2 km of (and including) suitable denning and shelter habitat (DSEWPaC 2011b), particularly rocky hillslope, shrubland and minor creek and drainage line habitats that provide some form of vegetation or rocky cover (Figure 5-6; Figure 5-7).

In addition to the records of the species from the field surveys, there are numerous NatureMap records of Northern Quoll near the northern-most and southern-most sections of the study area (DPaW 2014a).

Population estimate for trapped area

Population estimates were calculated for sites Q4 and Q5 (Figure 4-1) because there were sufficient quantitative data for these two sites. The estimated population size of Q4 and Q5 based on the Schnabel index is 5.49 ± 2.44, and 10.06 ± 3.75 of Northern Quoll respectively. The actual number of quolls caught was greater than the predicted population size but falls within the predicted upper limits for each site. The upper limit at site Q4 is 8 (8 were recorded), and 14 at site Q5 (12 were recorded).

Plotting the number of captured Northern Quoll against the proportion of marked animals for each recapture event (see Sutherland 1996) at sites Q4 and Q5 shows new quolls being caught each day up until that last day where only recaptures were recorded (indicated by a marker at 1 on the x-axis), but no bias through immigration or emigration events which would be indicated by a curve (Figure 5-10 and Figure 5-11). The assumption of a closed population was therefore met.

Capture rate

The capture rates were variable between sites where quolls were captured. The capture rate for Q3, Q4 and Q5 were 1.6, 5, and 15 respectively.

Movement

At site Q4 recaptured quolls were recorded within approximately 150 m of where they were initially trapped. At Q5, all 12 individuals were captured within the eastern-most 1.5 km of the approximately 3 km linear arrangement of traps with one day recording six individuals within a 500 m stretch of survey area. Most animals were re-captured within 500 m of initial capture, and many of these were recaptures in the same trap or traps within 100 m. The largest range of an individual was approximately 1 km between capture locations.

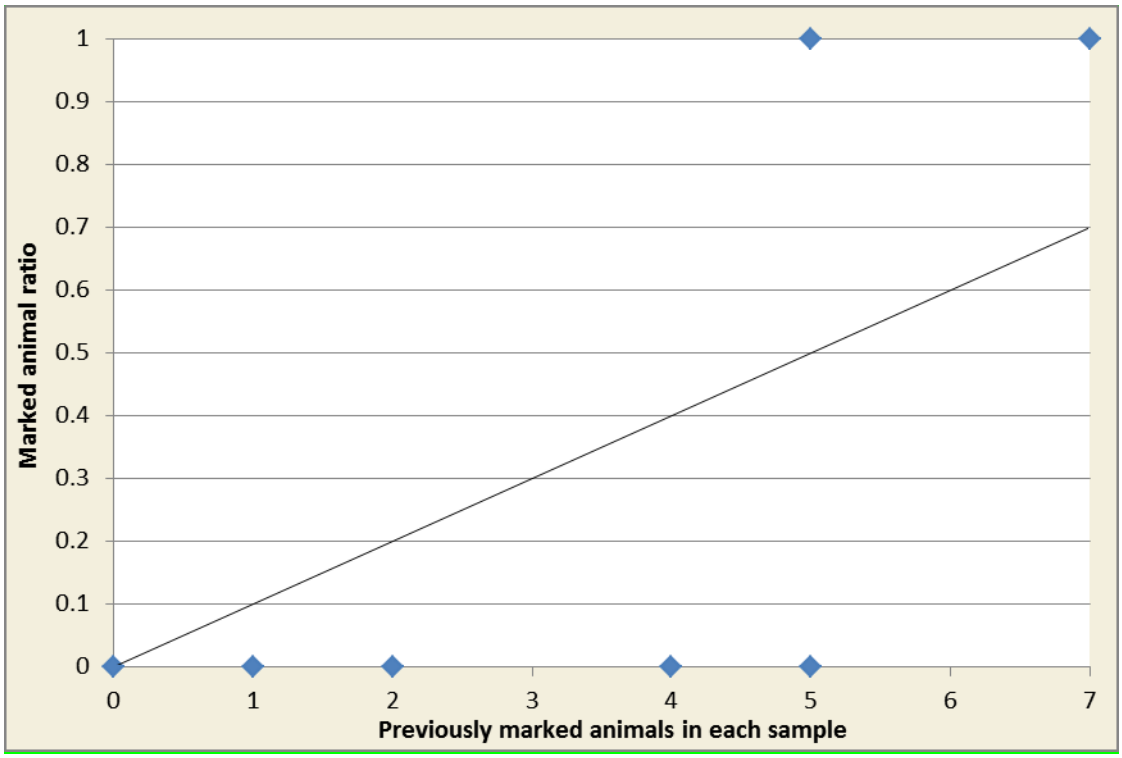


Figure 5-10 **Proportion of marked animals (y-axis) in relation to number of animals caught in each recapture round (x-axis) for site Q4**

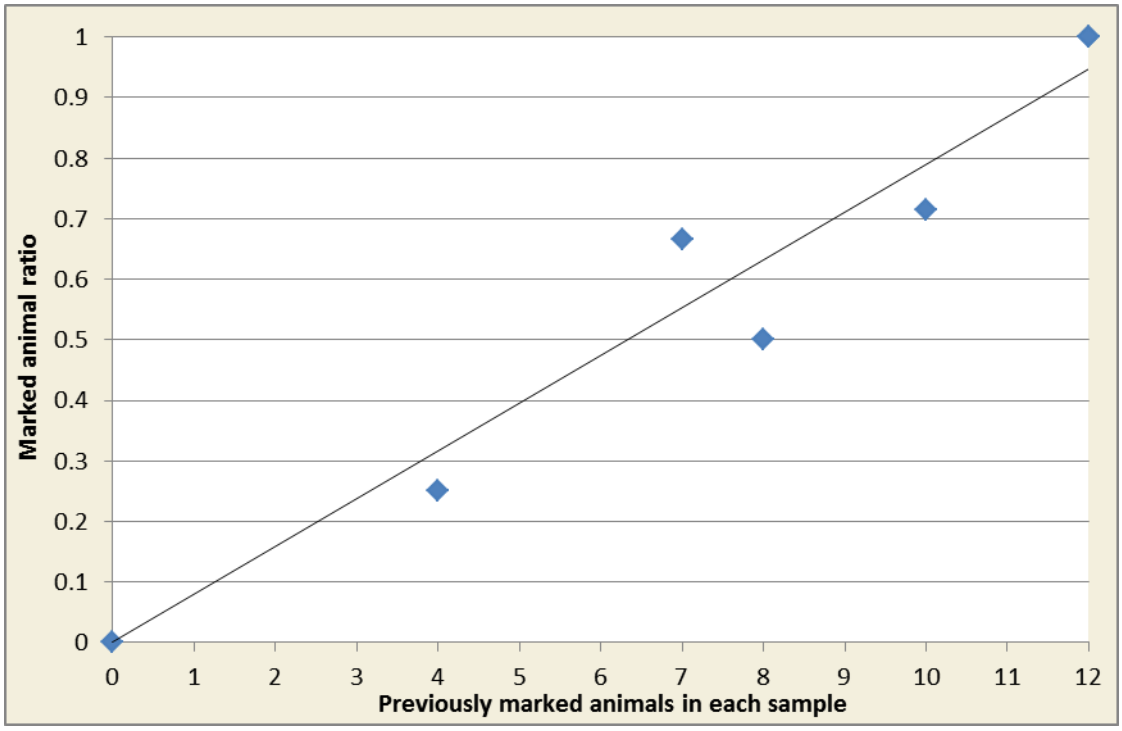


Figure 5-11 Proportion of marked animals (y-axis) in relation to number of animals caught in each recapture round (x-axis) for site Q5.

5.2.2.1.3 Long-tailed Dunnart (*Sminthopsis longicaudata*)

Status: Priority 4 (DPaW)

Distribution and ecology: The Long-tailed Dunnart is a small carnivorous marsupial found in Western Australia, South Australia and the Northern Territory. The species feeds on a variety of invertebrates and occasionally small vertebrates. Breeding occurs in winter with young dispersing in March to April (Van Dyck & Strahan 2008).

In WA the species seems to occur across a large portion of the state, mostly in arid and semi-arid rocky inland deserts. Long-tailed Dunnarts typically inhabit rugged rocky landscapes and occasionally, in more open countries, live on stony substrate. They feed on a wide range of invertebrates.

Records and likely distribution in the study area: The Long-tailed Dunnart was not recorded in the survey; the nearest record of the species occurs within 10 km of the southern section of the study area (DPaW 2014a). The species is considered likely to occur due to the presence of suitable rocky hill slope habitat comparable with previous records of the species (Figure 5-6; Figure 5-7.

5.2.2.1.4 Bilby (*Macrotis lagotis*)

Status: Vulnerable (EPBC Act); Schedule 1 (WC Act)

Distribution and ecology: The Bilby (also named Greater Bilby or Dalgyte) is a rabbit-sized marsupial that originally occupied over 70% of the Australian mainland. It now occurs in less than 20% of its original range, with remaining Western Australian populations predominantly in the Great Sandy and Gibson Deserts. The species is sparsely distributed across the Pilbara region.

Habitat preferences include hummock grassland in plains and alluvial areas, open tussock grassland on uplands and hills, and mulga woodland/shrubland on ridges and rises (DSEWPaC 2011c). The

species is highly mobile and can have large foraging ranges. Home ranges in sandy deserts are usually temporary and may shift in response to changes in food availability (Van Dyck & Strahan 2008). The species can be identified through secondary evidence, such as scats, tracks and its typical burrow systems.

The massive decline in Bilby distribution is thought to be due to effects on food availability from changing fire regimes, drought, grazing by rabbits and livestock, and predation by the Red Fox and feral Cat (Van Dyck & Strahan 2008).

Records and likely distribution in the study area: The Bilby was not recorded during the surveys. As for Mulgara, the species may potentially occur within sandplain and sand dune habitats of the study area where suitable burrowing substrate occurs (Figure 5-8). From the detailed habitat assessment 3,612 ha of potential burrowing and foraging habitat was identified (Figure 5-8). The nearest record is 90 km east of potential habitat identified within the study area (DPaW 2014a).

5.2.2.1.5 Northern Marsupial Mole (*Notoryctes caurinus*)

Status: Endangered (EPBC), Schedule 1 (WC Act), Endangered (DEC priority fauna list)

Distribution and ecology: The Northern Marsupial Mole is a blind marsupial adapted to living underground. It is associated with the sand-dune desert systems of inland Australia (DSEWPC 2011; Van Dyck & Strahan 2008) with dunes appearing to be their primary habitat, but they have also been recorded in some sandplains and sandy river flats, especially where aeolian dunes also occur (Benshemesh 2005).

There are very few formal records for the species and its ecology and distribution are not well understood. In Western Australia, specimens have been collected from the Great Sandy, Little Sandy and Gibson Deserts. Dispersal by marsupial moles is thought to occur underground and requires suitable sandy habitat for tunnelling (Benshemesh 2004).

A key threat to the Northern Marsupial Mole is predation by Red Foxes, Cats and Dingoes (Benshemesh 2004). Other potential threats to the species are not well understood but may include habitat modification by cattle and camel populations and barriers to dispersal from larger roads, railways and pipeline trenches (Benshemesh 2004).

Records and likely distribution in the study area:

A patch of suitable habitat comprising approximately 22.2 ha of isolated sand dunes and surrounded by sandplain was identified within the study area (Figure 5-8). No evidence of moles was observed from the trenching surveys in these dunes during the targeted survey; however, non-presence of this burrowing species is very difficult to ascertain. Given the lack of knowledge and sparse records of the species it is difficult to accurately determine its likelihood of occurrence. Little is known about the habitat requirements of the species including its fine-scale distribution within the Pilbara bioregion and whether it can persist in isolated patches of habitat such as the isolated dunes within the study area.

The nearest NatureMap record for the species located over 200 km east north-east of the mapped habitat within the study area (DPaW 2014a); however, according to Benshemesh (2004), there are several anecdotal records from closer to the study area. The lack of surveys in the vicinity of the study area and difficulties in surveying the species are possible causes for few records.

5.2.2.1.6 **Spectacled Hare-wallaby (*Lagorchestes conspicillatus leichardti*)**

Status: Priority 4 (DPaW)

Distribution and ecology: Once widespread in the northern section of the Australian continent, the Spectacled Hare-wallaby is now found across northern Queensland, Northern Territory and north WA (Kimberley and a small section of the Pilbara) (Van Dyck & Strahan 2008).. Its range apparently contracted towards the north. A large population lives on Barrow Island where the species is common (Van Dyck & Strahan 2008).

In WA, Spectacled Hare-wallabies live in habitat dominated by spinifex, where large hummocks are available. They spend the day hidden in these hummocks in which they tunnel a shelter. At night, the species feeds on various plant materials. Mature when one year old, they breed all year long (Van Dyck & Strahan 2008).

Predation by feral Cat and Red Fox is responsible for the decline and range constriction of the species. Altered fire regimes are also likely to reduce the number of large spinifex hummocks available (Van Dyck & Strahan 2008).

Records and likely distribution in the study area: The Spectacled Hare-wallaby was not recorded during the field surveys; however, the species has previously been recorded within 10 km east of the central third of the study area (DPaW 2014a). The species is considered likely to occur in grassland and shrubland habitats of the study area where mature hummocks of spinifex are present providing suitable cover for the species (Figure 5-6; Figure 5-7).

5.2.2.1.7 **Black-flanked Rock-wallaby (*Petrogale lateralis lateralis*)**

Status: Vulnerable (EPBC Act), Schedule 1 (WC Act), Vulnerable (DPaW)

Distribution and ecology: Several subspecies of Black-footed Rock-wallabies are found in Australia. The nominate race, *P. lateralis lateralis* was formerly present across most WA, with the exception of the Kimberley. The species is now mostly found in rocky countries, gorges, granite outcrops (Van Dyck & Strahan 2008). They rest in a shelter (cave, bush) during the day and forage at night on plant material including seeds, fruits, and roots. The species breeds all year round (Van Dyck & Strahan 2008).

The introduction of predators such as feral Cat and Red Fox is responsible for the decline for the species across its entire range (Van Dyck & Strahan 2008).. Most remaining populations are now isolated and usually rely on fox baiting to survive.

Records and likely distribution in the study area: The Black-flanked Rock-wallaby was not recorded during the field surveys. Potential habitat was identified within the study area and the species is considered to possibly occur in gully and rocky hill slope habitat (Figure 5-6; Figure 5-7). There are historic records of the species from Depuch Island, approximately 15 km north east of the northern-most point of the study area; however, the nearest mainland record is located over 150 km west of the study area.

5.2.2.1.8 **Ghost Bat (*Macroderma gigas*)**

Status: Priority 4 (DPaW)

Distribution and ecology: The Ghost Bat is a large microchiropteran (approximately 150 g). It is Australia's only carnivorous bat that preys on a range of vertebrate fauna species. Ghost bats were previously thought to maintain a foraging area of approximately 60 ha (in a radius of approximately 2 km from a roost) (Tidemann *et al.* 1985); however, there is evidence that some individuals will fly much further than this (B. Bullen, chiropterologist, Bat Call, pers. comm. 14 June 2010).

The species has now been recorded from the broader Pilbara bioregion where it is widespread. It is found across northern Australia, east into the rain forests of north Queensland. (Van Dyck & Strahan 2008). Typically the species prefers to roost in caves beneath bluffs of low, rounded hills composed of Marra Mamba geology, and granite rock piles in the Pilbara. It has been recorded roosting in large colonies within sandstone caves, within boulder piles and in adits (abandoned mines) (Churchill 2008).

Records and likely distribution in the study area: The Ghost Bat was not recorded during the survey; however, the species has previously been recorded in the southern half of the study area (DPaW 2014a), with additional records within 20 km of the northern-most and southern most extents of the study area. Potential roost caves were identified within the southern third of the study area in gully habitat (Figure 5-7) and the species may roost here. Despite no records from bat echolocation call recordings, the species is considered likely to traverse the study area, particularly during foraging or dispersal activities from roost caves outside the study area.

5.2.2.1.9 **Short-tailed Mouse (*Leggadina lakedownensis*)**

Status: Priority 4 (DPaW)

Distribution and ecology: The secretive Short-tailed Mouse is a small, rare rodent, occurring in scattered populations with annually fluctuating numbers. It occurs across northern tropical Australia, including the Pilbara and the Kimberley and on two Western Australian islands – Thevenard Island (natural population) and Serrurier Island (introduced). They occupy a diverse range of habitats including hummock and tussock grasslands, tropical woodlands, samphire, sedge lands and stony ranges within semi-arid to tropical monsoon climates (Van Dyck & Strahan 2008). Distribution records have been sporadic since its relatively recent discovery in 1969 on the Cape York Peninsula. It is for this reason and their secretive behaviour that relatively little is known about their distribution and ecology (Kutt & Kemp 2005).

Records and likely distribution in the study area: The Short-tailed Mouse was not recorded in the survey but has previously been recorded within 10 km of the southern half and within 20 km of the northern half of the study area (DPaW 2014a). It is likely to occur in the open shrubland and grassland habitats of the study area (Figure 5-6; Figure 5-7).

5.2.2.1.10 **Western Pebble Mound Mouse (*Pseudomys chapmani*)**

Status: Priority 4 (DPaW)

Distribution and ecology: The Western Pebble-mound Mouse is widespread in the ranges of the central and southern Pilbara and extends into the Little Sandy Desert ranges (Van Dyck & Strahan 2008). These mice construct large mounds from small pebbles. Colonies of up to 25 mice may live inside a mound. Pebble size averages 3.5 grams and the mounds may cover 0.5–9.0 m^2. The mounds are located on the gentle slopes of rocky ranges covered in rocky mulch, hard spinifex and sparse trees and shrubs (*Eucalyptus*, *Senna*, *Acacia* and *Ptilotus*). They are also often found near *Acacia*-dominated drainage lines (Van Dyck & Strahan 2008).

Threats to the Western Pebble-mound Mouse are not well known but predation by the feral Cat and Red Fox may be responsible for the species' range contraction, and mining activities may be responsible for local small-scale population reduction (Morris 2000).

Records and likely distribution in the study area: The Western Pebble-mound Mouse was recorded once during the survey from secondary evidence (Figure 5-8; Appendix 5). A single inactive mound was recorded on a recently burnt rocky hill slope. No active mounds were recorded during the survey; however, the species is considered likely to occur in grassland and shrubland habitat where

suitable stony substrate present across the study area (Figure 5-6; Figure 5-7). The species has previously recorded multiple times within approximately 20 km of the study area (DPaW 2014a).

5.2.3 Level 2 short-range endemic invertebrate records

A total of 296 individual specimens in the SRE target groups (see section 3.5.2) were collected from the study area, representing at least 30 individually recognized taxa from nine orders, 17 families and at least 23 genera (Appendix 6).

Eleven taxa (16% of total catch of SRE target groups) are considered to include species from two of the three SRE categories (Table 5-3).

Two taxa represented are likely SREs (Figure 5-12):

- the harvestmen *Dampetrus* sp. indet. (family Assamiidae) (Figure 5-13; section 5.2.3.5)
- the centipede *Cryptops* sp. indet. (family Cryptopidae) (Figure 5-13; section 5.2.3.8).

Nine taxa represented are potential SREs (Figure 5-12):

- the flat rock spider *Karaops* sp. indet. (family Selenopidae) (Figure 5-13; section 5.2.3.1)
- the mygalomorph spider *Conothele* sp. indet. (family Ctenizidae) (Figure 5-13; section 5.2.3.4)
- the centipede *Sepedonophilus* sp. indet. (family Geophilidae) (section 5.2.3.8)
- the isopods *Buddelundia* '10 1016a', *Buddelundia* '92', *Buddelundia* '93', *Buddelundia* '94' and *Buddelundia* '95', (family Armadillidae) (Figure 5-14; section 5.2.3.10)
- the snail *Quistrachia* sp. indet. (family Camaenidae) (Figure 5-14; section 5.2.3.11).

Table 5-3 Short-range endemic invertebrate taxa collected during the field survey

Higher taxon	Species (Family)	SRE status	Study area	Outside study area	No. of specimens [study area/outside study area]	Habitat/s
Araneae (spiders)	*Karaops* sp. indet. (Selenopidae)	Potential	01, 10, 11, 13, 33	06	12/1	Gully, rocky hill slope
	Conothele sp. indet. (Ctenizidae)	Potential		21	0/1	Sandplain
Opiliones (harvestmen)	*Dampetrus* sp. indet.	Likely	02	19	5/5	Rocky hill slope, hummock and tussock grassland
Chilopoda (centipedes)	*Cryptops* sp. indet. (Cryptopidae)	Likely	48, 49, 51	04	4/1	Gully, open and closed shrubland
	Sepedonophilus sp. indet. (Chilenophilidae)	Potential	01	05	1/1	Rocky hill slope, hummock and tussock grassland
Isopoda (slaters)	*Buddelundia* '10 1016a' (Armadillidae)	Potential		19, 31	0/6	Hummock and tussock grassland
	Buddelundia '92' (Armadillidae)	Potential	03		1/0	Rocky hill slope
	Buddelundia '93' (Armadillidae)	Potential	30		1/0	Hummock and tussock grassland
	Buddelundia '94' (Armadillidae)	Potential		31	0/3	Hummock and tussock grassland
	Buddelundia '95' (Armadillidae)	Potential	51		2/0	Gully
Eupulmonata (land snails)	*Quistrachia* sp. indet. (Camaenidae)	Potential	37	05, 06	1/2	Minor creek and drainage line, hummock and tussock grassland
Sum					**27/20**	

520000
570000
620000
7700000
7650000
7600000
7550000
NORTH WEST COASTAL HIGHWAY
ROEBOURNE WITTENOOM ROAD
NANUTARRA WITTENOOM ROAD
Millstream Chichester
Mungaroona Range
31
30
19
20
21
37
33
1
2
3
6
5
4
13
11
10
48
49
51
Western Australia
PERTH
This drawing is subject to COPYRIGHT and is property of Phoenix Environmental Sciences — Data sources: USGS, NASA, Commonwealth of Australia (Geoscience) 2006, Rutila Resources Ltd

Figure 5–13

Short-range endemic invertebrates collected during the terrestrial fauna survey for the Balla Balla Railway fauna surveys

Client: Rutila Resources Ltd
Project: Balla Balla Railway

Author: G. Bouteloup
Date: 31/10/2014

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

0 4 8 16 Kilometres
1:500,000

PHOENIX ENVIRONMENTAL SCIENCES

- Study area (current)
- Study area (trip 1)
- *Buddelundia* '93'
- *Buddelundia* '10 1016a'
- *Buddelundia* '92'
- *Buddelundia* '94'
- *Buddelundia* '95'
- *Conothele* sp. indet.
- *Cryptops* sp. indet.
- *Dampetrus* sp. indet.
- *Karaops* sp. indet.
- *Quistrachia* sp. indet.
- *Sepedonophilus* sp. indet.
- Railways
- Principal Road; Secondary Road
- Major water courses
- Australian Protected Areas

Figure 5-13 **Short-range endemic invertebrates collected during the field survey. A, *Conothele* sp. indet. (Ctenizidae); B, *Karaops* sp. indet. (Selenopidae); C, *Dampetrus* sp. indet. Assamiidae); D, *Cryptops* sp. indet. (Cryptopidae)**

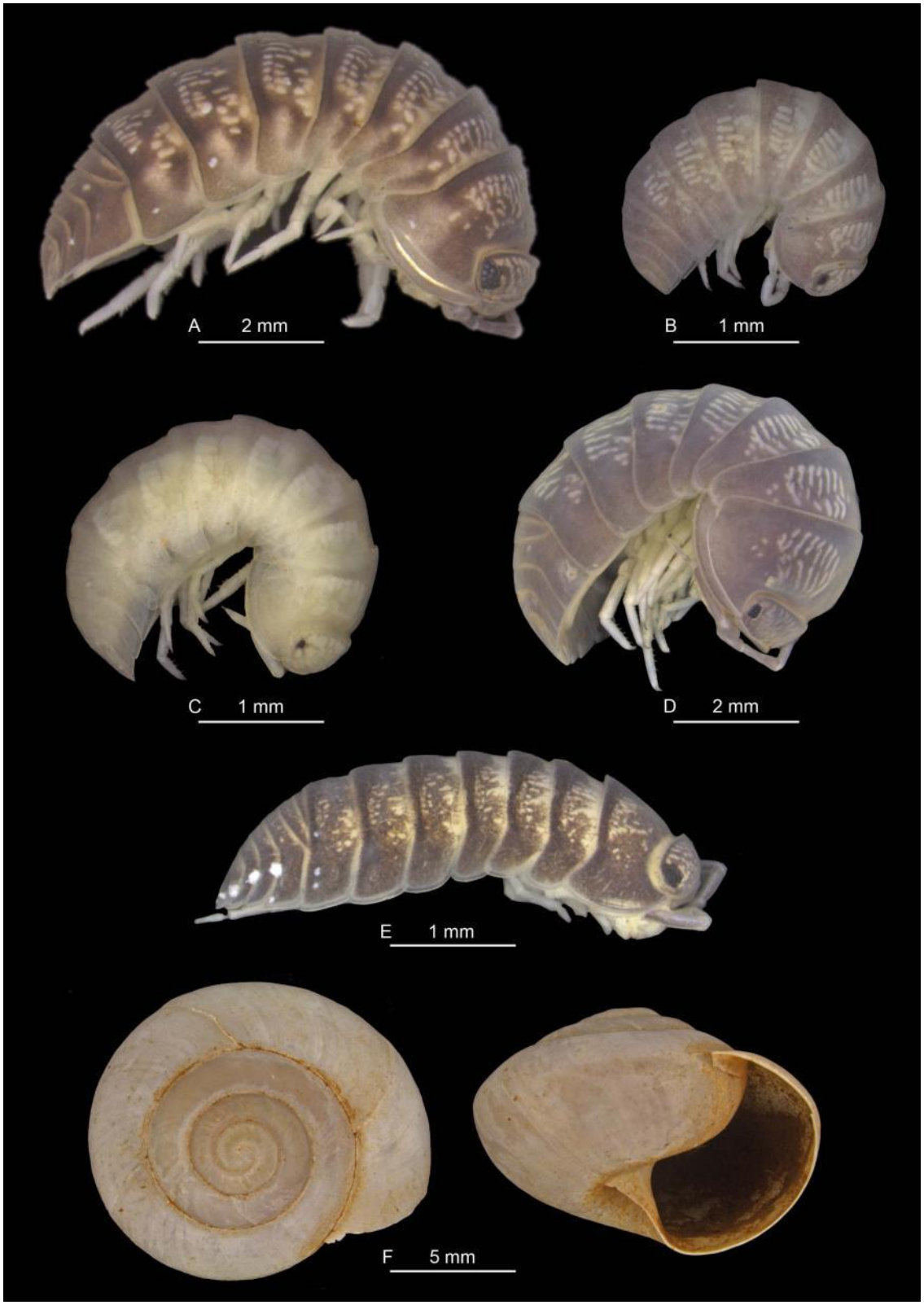


Figure 5-14 **Short-range endemic invertebrates collected during the field survey. A, *Buddelundia* '10 1016a' (Armadillidae); B, *Buddelundia* '92'; C, *Buddelundia* '93'; D, *Buddelundia* '94'; E, *Buddelundia* '95; F, *Quistrachia* sp. indet. (Camaenidae)**

5.2.3.1 Habitats of short-range endemics

Six out of eight habitat types produced SREs. The difference between the number of observed SREs and expected SREs in each habitat type (Table 5-4), was significantly different to what would have been expected based on habitat frequency within the study area (χ^2= 22.095, df = 7, p = 0.0024). This result is likely driven by the apparent preference of SREs for rocky hill slope, minor creek and drainage line and gully and avoidance of hummock and tussock grassland, isolated sand dune and sandplain. Open and closed shrubland also recorded less than expected numbers of target taxa while woodland habitat showed similar numbers of SREs as expected (Table 5-4).

It should be considered that χ^2-calculations are only reliable when all the expected values are five or higher. This assumption is violated by the data, so the p- value may not be accurate, but it is well above accepted significance levels.

Table 5-4 Observed and expected number of short-range endemic target taxa in each habitat type in the study area

Habitat	No. of sites surveyed (% of all sites surveyed)	Observed target taxa in habitat type	Expected target taxa in habitat type (based on % of habitat)
Hummock and tussock grassland	14 (25%)	9	16
Open and closed shrubland	15 (26%)	13	17
Rocky hill slope	10 (18%)	14	11
Minor creek and drainage line	10 (18%)	16	11
Woodland	2 (3%)	2	2
Gully	3 (5%)	9	3
Isolated sand dune	1 (2%)	0	1
Sandplain	2 (3%)	0	2
Total	57	63	63

5.2.3.2 Diversity estimation

Only three SRE target groups were collected in sufficient numbers, i.e. more than 20 individuals, to allow an estimate of species richness on the survey sites: pseudoscorpions, slaters and snails (Table 5-5; Figure 5-15 to Figure 5-17). Species richness estimators suggest that pseudoscorpions and snails present at the time of the survey were comprehensively collected. There could be up to another seven slater species present in the study area; however, the estimates for slaters are possibly too low as the accumulation curves do not plateau (Figure 5-16).

Table 5-5 Survey data and species estimators (ACE, Chao1, Jack Knife1 rounded to nearest whole number) for SRE target groups

Taxa group	Survey data				Species estimators		
	Number of individuals	Number of singleton species	Number of doubleton species	Number of species collected	ACE mean	Chao1 mean	Jack Knife1 mean
Pseudoscorpions	34	1	0	4	5	4	5
Slaters	104	3	2	9	11	11	16
Snails	117	2	2	10	11	10	13

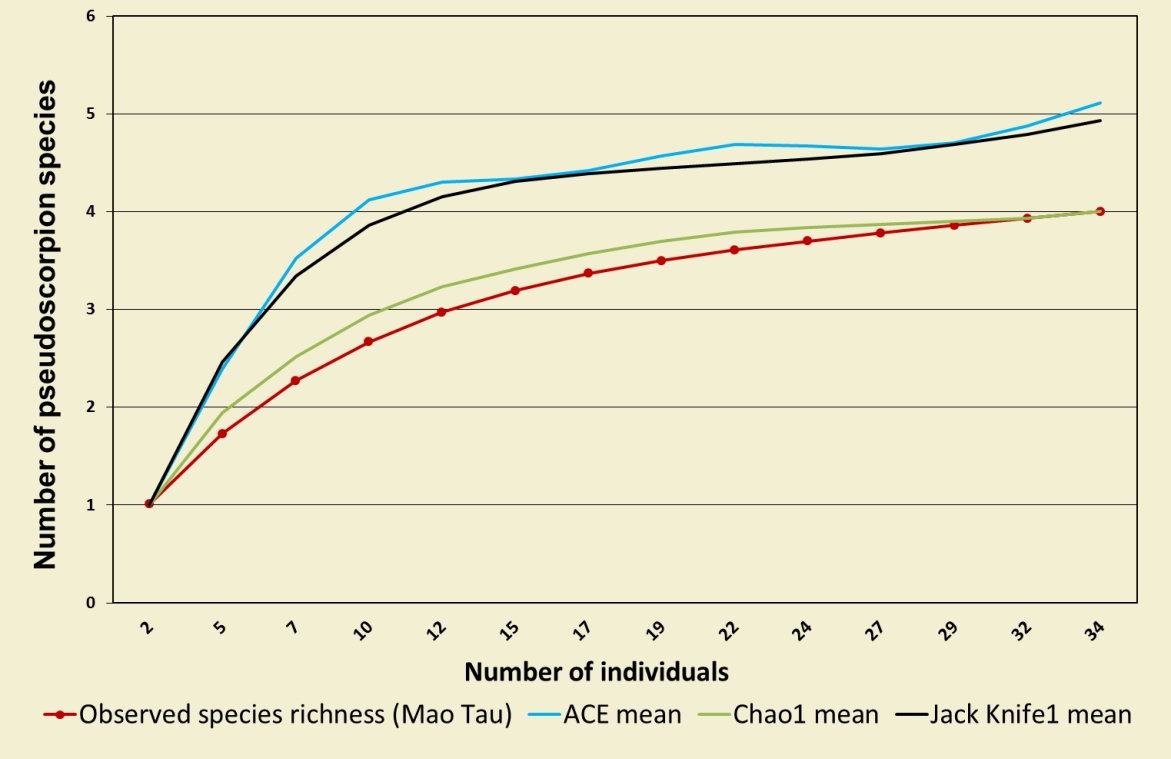


Figure 5-15 Individual based species accumulation curves, with observed species richness, as well as species estimators (ACE, Chao1 and Jack Knife1) for pseudoscorpions

Figure 5-16 **Individual based species accumulation curves, with observed species richness, as well as species estimators (ACE, Chao1 and Jack Knife1) for slaters**

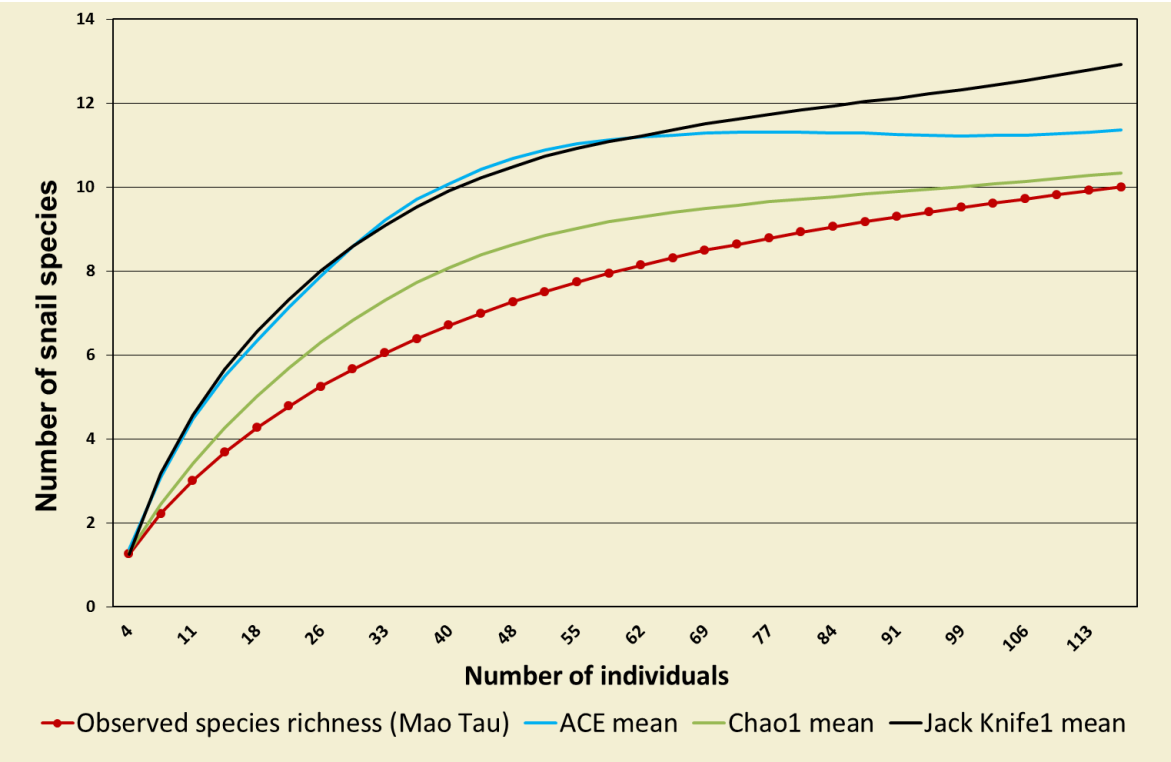


Figure 5-17 **Individual based species accumulation curves, with observed species richness, as well as species estimators (ACE, Chao1 and Jack Knife1) for snails**

5.2.3.3 Araneae – Araneomorphae (modern spiders)

The Araneae (spiders) are characterised by a number of unique characters, including abdominal appendages modified as spinnerets, silk glands and associated spigots, cheliceral venom glands and male pedipalp tarsi modified as secondary genitalia from sperm transfer (Coddington & Levi 1991). Spiders are one of the largest and most diverse orders of arachnids with more than 40,000 described species worldwide (World Spider Catalog 2014), and approximately 3,600 species named from Australia (Framenau 2014; Framenau *et al.* 2014).

Araneomorphae (modern spiders) are rarely targeted in SRE surveys. Araneomorphae often disperse very well, for example by wind-drift on gossamer threads ('ballooning') (e.g. Bell *et al.* 2005), and many species are widely distributed across the Australian landscape (Harvey 2002). However, some families such as the wall crab spiders (Selenopidae) and goblin spiders (Oonopidae) have shown high incidences of range-restricted distributions in recently revised genera and form part of the target SRE taxa.

No SRE araneomorph spiders were recorded from the study area in the desktop review.

5.2.3.3.1 **Family Selenopidae (wall crab spiders)**

Wall crab spiders are small to medium-sized dorso-ventrally flattened spiders. They are superficially similar to huntsmen spiders (family Sparassidae) and flat ground spiders (families Gnaphosidae and Trochanteriidae), but differ by their characteristic eye pattern. Wall crab spiders have a light brown mottled colouration and often strongly banded legs. They are extremely fast runners and therefore very difficult to catch.

Their flat morphology is a perfect adaptation to a life in narrow crevices and they can typically be found under exfoliating slabs of granite outcrops and under bark of trees. The preference for isolated outcrops or mountain ridges predisposes Selenopidae to short-range endemism (Crews & Harvey 2011). Selenopidae occur in tropical and subtropical regions world-wide. In Australia, a single genus, *Karaops*, is known with 37 described species (Crews 2013; Crews & Harvey 2011).

Genus *Karaops*

The genus *Karaops* differs from other genera in the family Selenopidae by the spination of the two first pairs of legs and by the absence of scopulae (brushes of dense setae) from their tarsi (Crews 2013; Crews & Harvey 2011). *Karaops* is currently known from Australia only. Sixteen species are described from the Pilbara region and its vicinity of which one, *K. martamarta* is fairly widespread. This supports a high diversity of the genus in the region and suggests restricted ranges for many of the species. Unidentifiable members of the genus are therefore categorised as potential SREs.

***Karaops* sp. indet.**

A total of 13 juvenile specimens of *Karaops* were collected from six sites (Figure 5-12) within rocky slope, river and plain habitat (Appendix 6). Based on morphology, it is not possible to determine whether this specimen is the same as other *Karaops* from the desktop review. Based on known distribution patterns within the genus, the specimens from the survey are considered to represent potential SREs.

5.2.3.4 Araneae – Mygalomorphae (trapdoor spiders)

Trapdoor spiders represent one of the focal groups in surveys of SRE taxa (Harvey 2002). A number of mygalomorph spiders, e.g. *Idiosoma nigrum* Main, 1952, *Kwonkan eboracum* Main, 1983 and *Moggridgea tingle* Main, 1991 are listed on Schedule 1 of the WC Act (Western Australian

Government 2013). The Western Australian mygalomorph fauna is vast and many families and genera remain taxonomically poorly known (e.g. Barychelidae: *Idiommata*; Idiopidae: *Aganippe*; Nemesiidae: *Aname*, *Chenistonia*, *Kwonkan*). The Pilbara fauna has received considerable taxonomic attention in recent years, in particular employing molecular tools (Castalanelli *et al.* 2014).

No SRE mygalomorph spider was recorded from the study area in the desktop review.

5.2.3.4.1 Family Ctenizidae

The Ctenizidae are represented in Australia by a single genus, *Conothele*. Spiders in this genus can be identified by a distinct dorsal depression in the tibia of the third leg (Raven 1985).

Genus *Conothele*

Members of the genus *Conothele* are found across much of arid and semi-arid Western Australia. The burrows are usually difficult to find as they are sealed with a tight-fitting lid. At least one species is arboreal, living in burrows constructed on the side of tree holes (Main 1985). As in the genus *Missulena*, juvenile *Conothele* are believed to disperse via ballooning (Main 1957, 1976) limiting their predisposition for short-range endemism.

The taxonomic status of the Western Australian fauna is uncertain, with the entire fauna representing unnamed species. The precise distributions of each species are unknown, and much taxonomic work at the species level is required before the status of individual populations can be ascertained. With seven morphospecies, the WAM/DEC (today DPaW) Carnarvon survey recovered a surprisingly high diversity within the genus (Main *et al.* 2000). In contrast, the Pilbara Biological Survey found only a single widespread species based on morphological identifications (Durrant *et al.* 2010). In contrast, a recent molecular study on Pilbara mygalomorph spiders found a very diverse fauna with 18 distinct lineages of sufficient genetic divergence to regard them as separate species (Helix 2012); Castalanelli *et al.* (2014) recovered 13 clades.

***Conothele* sp. indet.**

A single juvenile specimen representing the genus *Conothele* was collected in the study area (Figure 5-12). Based on morphology, it is not possible to determine whether this specimen is the same as other *Conothele* from the desktop review. Based on the high genetic diversity in the Pilbara with localised haplotypes, the specimen is considered to represent a potential SRE.

5.2.3.5 Opiliones (harvestmen)

Harvestmen are often mistaken for spiders but differ distinctly in a number of morphological features, in particular the lack of a constriction between cephalothorax and abdomen and the lack of spinnerets. The harvestmen fauna of Western Australia is composed of eight families with Assamiidae and Zalmoxidae restricted to northern tropical areas, and Caddidae, Monoscutidae, Neopilionidae, Pettalidae and Triaenonychidae found in southern temperate areas. The remaining family, Phalangodidae, is found in south-western Australia (represented by the endemic genus *Bindoona*) and tropical northern Australia (represented by *Glennhuntia*) (Shear 2001; Taylor 2011). Many harvestmen possess small ranges but often larger than the nominal SRE threshold (Harvey 2002).

No SRE Opiliones were recorded from the study area in the desktop review. Ten specimens of harvestmen in the genus *Dampetrus* (family Assamiidae) were collected in the study area (Table 5-3) and are considered to represent likely SREs.

5.2.3.5.1 Family Assamiidae (assamiid harvestmen)

Assamiids are restricted to Europe, Africa and Australasia and are particularly diverse in the rainforests of Asia. The Australian fauna is represented by eight genera, of which all except *Dampetrus* (six species) include a single species only (Department of the Environment 2014b). Most are restricted to northern Australia, but *Dampetrus* extends as far south as Victoria (Forster 1949). Two species of *Dampetrus* (one of which is questionable, Shear 2001) and one species of *Anjolus* are known from northern WA of which *D. isolatus* Shear, 2001 is troglobitic (Shear 2001). Overall, the taxonomy of the Australian genera of the Assamiidae is poorly resolved (Shear 2001).

In Australia, the Assamiidae are easily distinguished from other families of harvestmen by, amongst other features, the presence of 4–8 marginal spines on the front edge of the carapace and the crossed-over raptorial pedipalps of a 'grabber type' (Shear 2001). Few species within the family have been described, most in the genus *Dampetrus*. It appears questionable if any of the other currently known genera, except *Metamermeris*, are distinct from *Dampetrus* (Shear 2001).

Based on their scattered distribution throughout the Pilbara (only ca. 20 specimens from the region were registered in the WA Museum collection prior to this survey, many of which were from subterranean habitats), with apparent propensity to live in typical shaded SRE habitats, assamiids are currently considered likely SREs, but the taxonomy is too poorly known for an assessment at the species level.

Genus *Dampetrus*

The genus *Dampetrus* is currently endemic to Australia but it appears that some genera described from New Guinea represent junior synonyms (Shear 2001). The genus contains six species, of which only one, the cave-dwelling *D. isolatus*, is known from Western Australia (Forster 1955; Shear 2001). Hunt (1991); however, suggested that the genus contains many more species.

***Dampetrus* sp. indet.**

Ten specimens of *Dampetrus* were collected from the study area from two sites (Figure 5-12). Based on morphology, it is not possible to determine whether this specimen is the same as other *Dampetrus* from the desktop review. Based on the scarce distribution of species within the Pilbara they are considered to represent likely SRE.

5.2.3.6 Pseudoscorpiones (pseudoscorpions)

The Western Australian pseudoscorpion fauna is fairly diverse with representatives of 17 different families (M. Harvey 2012, pers. comm.). They are found in a variety of biotopes, but can be most commonly collected from the bark of trees, from the underside of rocks, or from leaf litter habitats (Harvey 1992).

No SRE pseudoscorpions were recorded from the study area in the desktop review. A total of 34 pseudoscorpion specimens from at least four species were collected from the study area (Appendix 6). All specimens belong to the families Atemnidae or Olpiidae and none of these are considered to include SRE species.

5.2.3.7 Scorpiones (scorpions)

Scorpions are characterised by the presence of chelate pedipalps, pectines and an elongate metasoma furnished with a sting. Scorpions are important components of arid ecosystems because their levels of diversity and abundance contribute significantly to the biomass of animal assemblages and they are important predators and prey for other species (Volschenk *et al.* 2010).

The comprehensive DEC Pilbara Biological Survey (PBS) recovered two families of scorpions, Buthidae and Urodacidae. The buthids were represented by two genera, *Lychas* (10 species) and *Isometroides* (2 species). The family Urodacidae was represented by 10 species in the single genus *Urodacus* (Volschenk *et al.* 2010). However, the regional scorpion fauna is clearly more diverse both at the species and the genus level, than was recorded in the PBS survey. For example, the urodacid genus *Aops* was recently described from Barrow Island (Volschenk & Prendini 2008) and has since also been found on the mainland in the Pilbara.

No SRE scorpions were recorded from the study area in the desktop review. A total of six specimens of scorpions representing two species in the same genus were collected in the survey (Appendix 6). *Lychas* 'bituberculatus' and *L. '*multipunctatus' are widespread species.

5.2.3.8 Chilopoda (centipedes)

The centipedes represent a diverse group of predatory arthropods. Each pair of legs is attached to a separate body segment which distinguishes this class from the millipedes (Diplopoda; two pairs of legs per segment) (Colloff *et al.* 2005). Adult body length ranges from 4–300 mm, with most species measuring 10–100 mm long. In most cases, they feed on small live arthropods and other invertebrates, although large scolopendrids can take vertebrate prey (Edgecombe & Giribet 2007).

All five orders of centipedes can be found in Australia, of which one, the Craterostigmomorpha, only occurs in Tasmania and New Zealand (Colloff *et al.* 2005). Scolopendromorpha (tropical centipedes) and Scutigeromorpha (house centipedes) are the most commonly encountered centipedes in WA. Most species are very fast runners and are highly mobile and therefore, widespread (e. g. Edgecombe & Barrow 2007; Edgecombe & Giribet 2009; Koch 1982, 1983a, b, c). Therefore, they are not considered target groups for SRE surveys.

In contrast, Geophilomorpha (soil centipedes), Lithobiomorpha (stone centipedes) and the Cryptopidae (within the Scolopendromorpha) may include Gondwanan refugial SREs based on the habitat preference for moist and deep leaf litter. Geophilomorpha and Cryptopidae have been found in subterranean environments in the Pilbara where they are limited to very small ranges (e. g. Edgecombe 2005).

No SRE centipedes were recorded from the study area in the desktop review. A total of nine centipede specimens, in at least three species from at least three genera and families were collected from the study area (Appendix 6). *Orphnaeus brevilabiatus* is a world-wide tramp species commonly collected throughout Australia and not uncommon in WA (Department of the Environment 2014a). Due to the low number of individuals collected, it was not statistically meaningful to calculate species accumulation curves for centipedes.

Order Geophilomorpha (soil centipedes)

Geophilomorphan centipedes can range from 9–200 mm in length, have 27–191 pairs of legs, a slender body of 33 or more segments, filiform antennae with 14 segments and lack ocelli (Hoffman 1982). Geophilomorpha translates into 'soil-lover' and as this name suggests, their behaviour is characterised by burrowing into soil, leaf litter and under rocks. Systematic relationship between the families of Geophilomorpha have recently received a modern taxonomic treatment (Bonato *et al.* 2014).

The Australian fauna contains five families, the Ballophilidae with a single described species, the Geophilidae (incl. traditional Chilenophilidae) with 34 described species, the Mecistocephalidae with six described species, and the Oryidae and Schendylidae with a single described species (Department of the Environment 2014a).

5.2.3.8.1 Family Geophilidae

The Geophilidae are 50–90 mm in length and their generally slender body is made up of 29–125 segments, a number that can vary within species. They have slender filiform antennae. The head is usually slightly or moderately elongate, sternal pores and coxal organs are usually present (Bonato 2011).

Thirty-four species in 19 genera are currently listed for the Geophilidae (incl. the traditional Chilenophilidae) in Australia, of which five genera occur in Western Australia: *Eurytion* (one species), *Geophila* (one species), *Ribautia* (five species), *Sepedonophilus* (one species) and *Tuoba* (three species) (Department of the Environment 2014a).

Genus *Sepedonophilus*

Centipedes in the genus *Sepedonophilus* have 49–79 pairs of legs and no sternal pores. Four species are described from Australia, of which one, *S. antipodus*, is known from WA (Bonato 2011; Department of the Environment 2014a).

***Sepedonophilus* sp. indet.**

Two unidentified specimens of *Sepedonophilus* were collected from the study area from two sites (Figure 5-12). Based on morphology, it is not possible to determine whether this specimen is the same as other *Sepedonophilus* from the desktop review. In addition, due to the cryptic behaviour of geophilidan centipedes with preference for deep and moist litter and soil these specimens are here considered a potential SRE.

Order Scolopendromorpha (tropical centipedes)

Scolopendromorpha are robust centipedes of up to 15 cm in Australia with 21 or 23 leg-bearing segments. About 700 species are known world-wide (Edgecombe & Bonato 2011). They include the most aggressive and voracious predators among the centipedes (Edgecombe & Giribet 2007). The Australian fauna has been comprehensively revised in the 1980s (e.g. (Koch 1982, 1983a, b, c; Koch & Burgman 1984), but a new genus was recently described from central Australia (Waldock & Edgecombe 2012). Almost all species have been found widespread and therefore scolopendromorphan centipedes do not belong to the target groups of SRE surveys. However, one family within the order, the Cryptopidae, includes blind litter-dwellers and may include range-restricted species (Edgecombe 2005).

5.2.3.8.2 Family Cryptopidae

The Cryptopidae are characterised by the lack of eyes (ocelli). They are smaller than most other scolopendromorphans and uniformly yellowish-brown. Two genera are named, Cryptops (with five subgenera) and Paracryptops, but only Cryptops is currently known from Australia (Edgecombe 2005; Edgecombe & Bonato 2011).

Six species in the genus *Cryptops* are currently known from Australia, of which *C. roeplainensis* was only recently described from caves on the Nullarbor Plain (Edgecombe 2005). The taxonomy of the group is poorly resolved, but recent molecular analyses of COI sequence data revealed high genetic divergence suggesting considerable species diversity in the Pilbara region of WA (Phoenix unpublished data). Unidentified specimens within the Cryptopidae are therefore considered potential SREs.

***Cryptops* sp. indet.**

Five unidentified specimens of *Cryptops* were collected from the study are from four sites (Figure 5-12). Based on morphology, it is not possible to determine whether this specimen is the same as

other *Cryptops* from the desktop review. In addition, due to the cryptic behaviour of cryptopid centipedes with preference for deep and moist litter and soil these specimens are here considered a likely SRE.

5.2.3.9 Diplopoda (millipedes)

The Australian millipedes are poorly studied and biogeographic patterns remain largely unresolved (Black 1997; Shelley & Golovatch 2011). At least eight orders of millipedes are native to Australia; all species in the order Julida are introduced (Mesibov 2006). Millipedes belong to one of the main target groups of SRE surveys. SREs are particularly expected within the orders Sphaerotheriida (rolling millipedes), Polydesmida, and Chordeumatida (not known from WA) (EPA 2009; Harvey 2002). A recent review of Australian *Atelomastix* (order Spirostreptida) found all of 29 species treated were SREs (Edward & Harvey 2010).

No SRE millipedes were recorded from the study area in the desktop review. A single millipede specimen was collected from the study area, *Austrostrophus stictopygus* (Appendix 7). Following its description from few localities in the western Pilbara, *A. stictopygus* has now been shown to be one of the most common millipede species in the Pilbara (Harvey *et al.* 2011).

5.2.3.10 Isopoda (Slaters)

Almost 200 described species of Oniscidea, a suborder of the Isopoda containing the supralittoral, terrestrial and secondarily aquatic slaters (or woodlice), have been recorded from Australia (Department of the Environment 2011). The WA fauna is comparatively poorly known with many undescribed species (Judd & Horwitz 2003). Slaters are an ideal biological model for faunistic and biogeographical studies, due to their reduced dispersal ability and narrow habitat preferences (e.g. Taiti & Argano 2009). Consequently, they belong to one of the target groups of SRE surveys (EPA 2009; Harvey 2002).

Two SRE isopods were recorded from the study area in the desktop review, *Buddelundia* '10' and *Buddelundia* '19'. A total of 104 isopod specimens, from nine species, two genera and a single family were collected from the study area (Appendix 6). *Buddelundia* '14mv' and an unidentified species (subfamily Buddelundiinae) are not considered to represent SRE species. Species accumulation curves did not reach a plateau for isopods and therefore the number of species in the study area is likely considerably higher than recorded here.

5.2.3.10.1 **Family Armadillidae (pill bugs)**

Armadillidae typically have a convex dorsal surface and the animal can roll up into a ball. Most species of the Armadillidae are found in the southern hemisphere and mainly occur in the tropical and subtropical zone (Lewis 1998), although the genus *Buddelundia* is also widespread in south-western WA. The family is diverse in Australia, currently 24 genera are described; many species live in litter or under wood and stones in forest or woodland or near the coast (Green *et al.* 2010). The armadillid genus *Buddelundia* is endemic to Australia (Lewis 1998).

Genus *Buddelundia*

Members of the genus *Buddelundia* belong to the most common terrestrial isopods in WA and the genus was well represented in the study area. The genus is currently under taxonomic revision by S. Judd. Species of *Buddelundia* often have a very wide distribution and are not expected to have many SRE species (S. Judd unpublished data). For example, *Buddelundia* '14' is very widespread throughout the Pilbara region.

Small numbers of five species of SRE isopods (14 total) were collected from the study area (Table 5-3). These species currently have small known distributions and are considered to represent potential SREs.

Of the two species recorded from the desktop review from within the study area, *Buddelundia* '10' is a part of a species complex, which while widespread within the area for desktop review (Figure 5-4), species within the complex appear to have short ranges (i.e. *Buddelundia* '10 1016a'). *Buddelundia* '19' is another complex which includes specimens which also appear to have short ranges. Currently both of these species are considered to be potential SREs.

5.2.3.11 Eupulmonata (land snails)

Molluscs are one of the most diverse groups of invertebrates and the Australian fauna is characterised by a high degree of endemism (Beesley *et al.* 1998). Land snails (Eupulmonata) belong to the target groups for SRE surveys due to their limited dispersal capabilities, in combination with often strict dependencies on particular soils (EPA 2009; Harvey 2002). These characteristics have also resulted in a significant global decline of non-marine molluscs (Lydeard *et al.* 2004).

No SRE snails were recovered from the study area by the desktop review. A total of 117 snail shells from four species were collected from the study area (Appendix 6). All are widespread species not considered to represent SRE species, with the exception of *Quistrachia* sp. indet. Due to the low number of individuals collected, it was not statistically meaningful to calculate species accumulation curves for snails.

5.2.3.11.1 **Family Camaenidae**

The Camaenidae is one of the most diverse land snail families in Australia both in species richness and morphology. Shell diameter ranges between 5 to 70 mm and shell shapes vary from discoidal and lenticular to globose, trochoidal, conical and elongate (Stanisic *et al.* 2010). The family is found Australia-wide with the exception of Tasmania and south-west WA (Stanisic *et al.* 2010).

In northern WA, the Camaenidae are the dominant group of land snails, with greatest diversity in the Kimberley region, where 19 of the 25 camaenid genera include SREs (Harvey *et al.* 2011; Solem 1997). In the Ningbing Ranges east of Kununurra, for example, the median geographical range of the 26 species occupying the area is less than one square-kilometre (Cameron 1992). Many of these ranges are shrinking, due to grazing and fire (Solem 1997) which resulted in the listing of 31 camaenid species under the WC Act (Western Australian Government 2013).

Based on the latest taxonomic revision, the Pilbara camaenid fauna comprised 27 species from six genera, distributed in latitude between Port Hedland and Cape Range, with no evidence of sympatry between congeneric species (Solem 1997). However, recent targeted sampling of camaenid land snails in the region has shown that many forms are parapatric, allowing direct genetic tests of reproductive isolation. This has revealed that some species have broader distributions than formerly thought, while other described species are actually complexes of multiple species, some with very narrow distributions. The molecular analyses have also shown the unreliability of shell characteristics on their own for assessing species taxonomy in many of these snails (Stankowski 2011). However, molecular 'barcoding' of COI sequence data may also not provide satisfactory results to distinguish species in some camaenid genera (Köhler & Johnson 2012).

Genus *Quistrachia*

Shells of the genus *Quistrachia* differ from those of *Rhagada* by the presence of a pustulose apex and a continuation of the pustules on the spire, absence of any strong post-apical shell sculpture and an open umbilicus or a narrow lateral crack (Solem 1997). The genus currently includes nine

described species and is limited to north-western WA (Solem 1997). All currently known species are SREs.

***Quistrachia* sp. indet.**

Three unidentified specimens of *Quistrachia* were collected from the study area (Table 5-3). Due to conservative shells morphology, it is not possible to determine whether these specimens are the same as other *Quistrachia* from the desktop review therefore they are considered to represent potential SREs.

5.3 SURVEY LIMITATIONS

Guidance Statement 56 (EPA 2004) identifies potential limitations that may be encountered during terrestrial fauna surveys. Potential limitations of the current surveys have been considered in line with Guidance Statement 54 (Table 5-6).

An analysis of survey compliance against the Northern Quoll – *Environment Protection and Biodiversity Conservation Act 1999* referral guidelines for the endangered northern quoll, *Dasyurus hallucatus* DSEWPaC (2011b) is provided (Table 5-7).

Table 5-6 Survey limitations from EPA Guidance Statement 56 (EPA 2004)

Limitations	Limitation for this survey?	Comments
Competency/experience of survey personnel, including taxonomy	No	The field leader, field team and report authors have extensive experience in the region and targeted fauna surveys.
Scope and completeness - were all target groups sampled, were all planned survey methods implemented successfully, was the study area fully surveyed	Partial	All target potential quoll habitat (i.e. in areas where direct impact may occur, as identified by the client) were surveyed appropriately. Northern Quoll habitat identified as avoidable by the client was not surveyed in the targeted survey. Habitat suitable for Bilby, Mulgara sp. Northern Marsupial Mole and *Lerista* were surveyed appropriately. Pilbara Olive Python surveys presented difficulty without the capacity of the field team to undertake night surveys.
Intensity - in retrospect, was the intensity adequate	No	The survey intensity was appropriate for the areas that were surveyed. Survey effort was determined by DSEWPaC (2011b) formula taking into account area of habitat and number of nights for Northern Quoll survey.
Proportion of fauna identified, recorded and/or collected.	Partial	All of the fauna was identified to an appropriate level. The scope did not include systematic Level 2 trapping, therefore comprehensive assemblage data was not collected
Availability of adequate contextual information	Yes	There is a paucity of comparative data in this area regarding approximate/typical abundance and distribution of many species, including the target species in the targeted fauna survey.
Timing, weather, season, cycle	No	Rainfall in the months preceding the survey was highly variable with a high rainfall event in May, but otherwise below average rainfall in most other months. It is unclear if this would have influenced the survey results. Survey timing was outside of that recommended for SRE surveys in the Pilbara (November–May) (EPA 2009); however, there is now ample evidence by records of sexually active males (i.e.

Limitations	Limitation for this survey?	Comments
		paradoxosomatid millipedes, mygalomorph spiders) (e.g. Car & Harvey 2013; Harms & Framenau 2013; Harvey *et al.* 2012) that the dry season (winter) with colder and more humid nights is equally suitable for SRE surveys.
Disturbances which affected the results of the survey	No	No disturbances occurred during the period of field surveys are considered to have impacted the results.
Remoteness and/or access problems	No	The use of a helicopter facilitated the survey of less accessible areas.

Table 5-7 Analysis of compliance with Northern Quoll survey guidelines DSEWPaC (2011b)

Survey requirement	Compliant?	Comments
Configure trapping program to address impact and non-impact zones	Partial	Targeted survey focused on mapped habitat patches that the client identified direct impact may occur in. Several other sites were not surveyed because the client determined that direct impact to these areas could be avoided. Actual area of direct impact is not currently known as the alignment design is still being developed.
Concentrate trapping in critical habitat with some consideration to non-rocky foraging and dispersal habitats	Yes	Targeted survey trapping was concentrated on critical denning/shelter habitat with consideration of movement between these habitats.
Set traps for seven nights, unless two or more individuals caught twice in which case traps should be closed after four nights of trapping	Yes	One site (site Q3) closed after two nights. This site was not critical to survey scope as it was identified by the client that this site will be avoided by the rail alignment. All other sites remained open for seven nights.
Where large Elliot traps are the primary trapping technique, a minimum of four cage traps should be used per configuration.	Yes	A combination of Elliot traps and cage traps were set at each site. At least half of the traps at each site were cage traps.
To be considered effective, traps should be baited with sardines or bolus mix of oats and peanut butter with honey, chicken wings and diced bacon optional.	Yes	Rolled oats, peanut butter and sardines used.
Traps should be baited at least every second day (baits should be fresh), cleared within 2–3 hours of sunrise and have adequate shade cover during the day. Consideration should be given to closing traps during the day to eliminate by-catch and potential heat stress issues.	Partially	Traps were baited every second day. Traps were generally cleared within 3 hours of sunrise, although major logistical constraints along a very long study area led to a violation of this requirement in some cases. Shade was plentiful throughout the study area and traps were positioned to remain shaded as much as possible. Closing

Survey requirement	Compliant?	Comments
		traps during the day was not necessary.
Tissue samples (ear clippings) should be collected from all individuals captured and analysed. Tissue samples should be sent to the WA Museum with the following details: weight, sex, pes (left hind foot measurement), tail diameter/circumference, crown, reproductive condition, presence/absence of bite marks and parasites, locality (latitude - longitude), collectors name and date.	Yes	Tissue samples were collected from all but one individual. Tissue will be deposited with the WA Museum. Weight, sex, reproductive condition, presence/absence of bites marks, parasites etc. (general animal condition) and locality were recorded.
Targeted searches may be supplemented by one of several non-invasive techniques such as latrine searches.	Yes	Camera trapping and active searching was undertaken in the Level 1 vertebrate fauna survey in June and July.
Trapping effort should be determined by the formula $y = 50x^{0.5}$, where y is the number of trap nights and x is the area of potential Northern Quoll habitat (ha). Trapping effort is calculated as the number of traps by the number of nights of trapping (i.e. trap nights). For linear habitat critical to the survival of the species (e.g. gorges, major drainage lines, breakaways less than 100 m wide), one trap per 100 linear m is recommended.	Yes	All denning/shelter habitat was considered linear in orientation and traps were placed approximately at 30–100 m intervals in locations considered most likely to capture individuals with consideration of protection from the environmental elements.

6 DISCUSSION

The objective of the fauna surveys for the Project was to define the fauna values of the study area with particular regard to values of conservation significance, including Threatened or Priority fauna and SRE invertebrates. The potential significance of the fauna values identified in the study area is discussed below with consideration given to the local and regional context where possible. The study area traverses a poorly surveyed part of the Pilbara, in particular with reference to the central section, where limited desktop records for conservation significant fauna exist. We have therefore relied on interpretation of potential regional habitat extents based on the land systems that the study area habitats occur in supported by observations made from the air during the field surveys.

6.1 VERTEBRATE FAUNA

Of the eight broad fauna habitats identified within the study area all are considered likely to support terrestrial fauna, including species of conservation significance (Table 6-1). Some habitats of the study area are considered to be of high value for fauna assemblages and/or support species of high conservation significance (i.e. Threatened species), specifically:

- gully and rocky hill slope habitats (Figure 5-6; Figure 5-7), which support Northern Quoll and are likely to support other species of conservation significance including Pilbara Olive Python and Ghost Bat
- sandplain and sand dune habitats (Figure 5-6; Figure 5-7), which may support Bilby, Brush-tailed Mulgara and Northern Marsupial Mole
- creek and drainage line habitats (Figure 5-6; Figure 5-7), particularly when water is present, which are likely to provide suitable foraging and refuge habitat for many birds and mammals.

All habitats represented within the study area are also represented in land systems adjacent to the study area and across the broader Pilbara bioregion. Gully and rocky hill slope habitats are common within the study area and across the Pilbara bioregion, particularly within the Hamersley and Chichester subregions. Sandplain habitat is well represented outside of the study area in the Pilbara bioregion, particularly around Port Hedland and adjacent to the Little Sandy Desert. The extent of sand dune habitat outside the study area is not well understood; it appears to be sparse and patchy across the Pilbara region.

Up to 28 conservation significant species may occur in the study area based on habitat preferences and known geographic distribution (i.e. historic or recent records nearby) (Table 6-1). Only five of these were recorded during the field surveys from direct sightings, secondary evidence and remote sensor camera traps and only one of those subject to targeted vertebrate surveys, the Northern Quoll, was confirmed to occur.

Approximately 640 ha of Northern Quoll denning/shelter habitat was mapped as scattered ‘patches’ within the study area, spanning several land systems (Figure 5-8; Figure 5-9). The federal referral guidelines for Northern Quoll identify denning/shelter habitat within its modelled distribution as habitat critical to the survival of the species (DSEWPaC 2011b). All of the land systems containing suitable habitat are well represented more broadly in the study area surrounds and it is likely that Northern Quoll occur more broadly in these areas.

During the targeted survey a total of 21 Northern Quoll individuals were recorded at sites Q3, Q4 and Q5 (Figure 5-8; Figure 5-9) and based on population estimates, these reflect the number of animals in the trapping area. Broader extrapolations of the local populations could be conducted but

would require detailed habitat mapping outside the study area. Despite no records from sites Q1 and Q2 (Figure 5-8), these sites are still considered suitable and likely to support the species.

Northern Quoll sites Q3, Q4, and Q5 are situated within the Rocklea land system which is extensive (2,881,632 ha in total) and less than 1% (6,813 ha) occurs in the study area. It extends to the east and west of the study area and is the dominant land system of the Chichester Range (van Vreeswyk *et al.* 2004). Site Q5 also intersects the Capricorn and Granitic land systems. Less than 1% of the Capricorn land system and 3% of the Granitic land system are represented inside the study area (Table 3-1). Rocky hills and ridges supported by shrubland and spinifex vegetation complexes are features of the Rocklea, Capricorn and Granitic land systems. Suitable habitat for Northern Quoll was observed in the Chichester Ranges from the helicopter fly-overs to and from the targeted Northern Quoll survey sites. Quolls present at Q3 and Q4 have the potential to occur at both of these sites because they are separated by a creek line, which acts as a sheltered migration path between the sites and is suitable foraging habitat.

Northern Quoll sites Q1 and Q2 are located in the Boolgeeda land system which is characterised by flat to undulating topography (Figure 3-2). This land system contains linear basalt rock piles (the survey sites), but these are a minor feature. These rock piles dissect the rail alignment in a south-west to north-east linear fashion and extend beyond the study area (Figure 5-8). Here, they extend 5 km to the south-west and 15 km to the north-east and represent a more prominent land feature and are classified as their own separate land system, the Black land system (Figure 3-2). A total of 479 ha of the Black land system occur within the study area, which represents less than 1% of the entire system in the Pilbara (Table 3-1). Although no Northern Quoll were caught at site Q1 and Q2, the habitat is considered suitable, and there is still potential for them to occur.

The records of the Lined Soil-crevice Skink from the survey, at site 11 (Figure 5-8) represent an easterly range extension of approximately 40 km for this species and may be considered significant in this regard. While its preferred habitat is not clearly known, the survey records from within spinifex grassland habitat are consistent with the majority of previous records for the species. Spinifex grassland habitat is well represented both within the study area and more broadly across surrounding habitat outside of the study area and the species may occur in the broader region.

Bilby and Mulgara have the potential to occur in the 3,612 ha of suitable habitat identified within the study area during the surveys (Figure 5-8). The mapped habitat was characterised by both suitable burrowing substrate and adequate vegetation structure consistent with that preferred by the both species, although habitat quality was variable within the mapped areas. The majority of suitable habitat was located in the Uaroo land system, which represents one of the dominant land systems (18%) of the study area (Figure 3-2). This land system is well represented outside of the study area with less than 1% of the entire system (10,172 of 987,046 ha) occurring in the study area (Table 3-1). During the field survey it was noted that much of the potential habitat was heavily impacted by cattle which have highly degraded the soils and vegetation.

It is highly likely the Pilbara Olive Python occurs within the study area, particularly in the approximately 40 km section containing creekline habitat within the Rocklea land system in the central part of the alignment which was identified as very suitable for the species (Figure 3-2). This habitat is lined by rocky land features and dotted with permanent pools which are ideal for basking, foraging and sheltering. The Rocklea land system extends well outside the study area and minor creeklines, permanent waterholes and rocky refuges suitable for this species were evident in this system beyond the study area boundaries.

Based on the lack of records from the targeted survey, the sand dune habitat in the study area does not appear to be significant habitat for Northern Marsupial Mole; however, species absence is difficult to proof in particular for such a cryptic species. Little is known about the habitat requirements of the species including its fine-scale distribution within the Pilbara bioregion and

whether it can persist in isolated patches of habitat such as the dunes within the study area (Benshemesh 2005). There are records of the species from the broader bioregion and the sand dunes within the study area do represent potential habitat. The sand dunes occupy an approximate total area of 22 ha and occur within the Gregory land system (Figure 5-8). A total of 526 ha of the land system is located within the study area accounting for 3.4% of the entire range in the Pilbara (15,575 ha; Table 3-1). This section of the land system is part of a larger 1,216 ha section which extends south-westwards of the study area (Figure 3-2). It is also isolated, being surrounded by the Capricorn land system to the south and west which is characterised by rocky substrates, and the Uaroo land system to the north and east which is characterised by broad sandy and pebbly plains (Figure 3-2).

The Rainbow Bee-eater, Australian Bustard and Western Pebble-mound Mouse are common and widespread throughout the Pilbara bioregion and the records of these species from the surveys are not considered to be significant.

Table 6-1 Summary of conservation significant vertebrate species, likelihood of occurrence

Scientific name	Common name	EPBC Threatened species	EPBC Migratory	WC Act	DPaW	Records	Likelihood of occurrence	Suitable habitats								Summary of records and occurrence
								H&T grassland[1]	O&C shrubland[2]	Rocky hill slope	Minor creek & DL[3]	Woodland	Gully	Sand dune	Sandplain	
REPTILES																
Notoscincus butleri	Lined Soil-crevice Skink				P4	Field survey	Recorded	●	●		●					The species was recorded three times during the survey from direct observation. Little known of species habitat preferences or ecology; however, habitats consistent with other records of the species are present within the study area
Anilios ganei	No common name				P1	Desktop	Likely				●		●			Limited knowledge of habitat and occurrence of species. Nearest record approximately 66 km west of the study area
Liasis olivaceus barroni	Pilbara Olive Python	VU		S1	VU	Desktop	Likely			●	●	●	●			Species likely to occur in rocky habitats where water persists for long periods including gully habitat within study area. Nearest record approximately 10 km east of the northern most point of the study area
BIRDS																
Phaps histrionica	Flock Bronzewing				P4	Desktop	Likely	●							●	Species likely to occur in hummock and tussock grassland habitat within the study area. Previously recorded multiple times within 5 km of northern most point of study area
Apus pacificus	Fork-tailed Swift		●	S3		Desktop	Likely	●	●	●	●	●	●	●	●	Species likely to forage in flight; however, unlikely to land or nest in the vicinity of the Project. Nearest record located approximately 10 km north east of the study area
Ardea modesta	Eastern Great Egret		●	S3		Desktop	Likely				●					Potential habitat present along creek and drainage line habitat when water present

Scientific name	Common name	EPBC Threatened species	EPBC Migratory	WC Act	DPaW	Records	Likelihood of occurrence	Suitable habitats								Summary of records and occurrence
								H&T grassland[1]	O&C shrubland[2]	Rocky hill slope	Minor creek & DL[3]	Woodland	Gully	Sand dune	Sandplain	
Plegadis falcinellus	Glossy Ibis		●	S3		Desktop	Possible				●					Species may occur within study area following rainfall events when flooding occurs, particularly in northern third of study area
Haliaeetus leucogaster	White-bellied Sea-Eagle		●	S3		Desktop	Possible				●	●				Species may occur within study area, particularly northern most point near the coast. Species may forage within study area.
Falco hypoleucos	Grey Falcon				P4	Desktop	Likely	●	●	●	●	●	●	●	●	The species is likely to forage within and in the vicinity of the study area, particularly grassland and shrubland habitats and possibly nest where suitable tall trees or suitable infrastructure are present, particularly along rivers and drainage lines.
Falco peregrinus	Peregrine Falcon			S4	SP	Desktop	Likely	●	●	●	●	●	●	●	●	The species is likely to forage within and in the vicinity of the study area, particularly grassland and shrubland habitats and possibly nest on cliff edges of suitably sized gullies present within the study area. Where suitable tall trees or suitable infrastructure are present, particularly along rivers and drainage lines.
Ardeotis australis	Australian Bustard				P4	Field Survey	Recorded	●	●		●				●	The species was recorded seven times during the field surveys from tracks in grassland and shrubland habitat
Burhinus grallarius	Bush Stone-curlew				P4	Desktop	Likely	●	●		●	●			●	Species likely to occur within the study are in grassland and shrubland habitats. Previously recorded multiple times within 5 km of the study area
Actitis hypoleucos	Common Sandpiper		●	S3		Desktop	Possible				●					Species may occur within the study area, particularly after rainfall events when water is present within drainage lines.

Scientific name	Common name	EPBC Threatened species	EPBC Migratory	WC Act	DPaW	Records	Likelihood of occurrence	Suitable habitats								Summary of records and occurrence
								H&T grassland[1]	O&C shrubland[2]	Rocky hill slope	Minor creek & DL[3]	Woodland	Gully	Sand dune	Sandplain	
Tringa nebularia	Common Greenshank		●	S3		Desktop	Possible				●					Species may occur within the study area, particularly after rainfall events when water is present within drainage lines.
Tringa glareola	Wood Sandpiper		●	S3		Desktop	Possible				●					Species may occur within the study area, particularly after rainfall events when water is present within drainage lines.
Glareola maldivarum	Oriental Pratincole		●	S3		Desktop	Possible	●			●				●	Potential habitat present in northern third of study area
Merops ornatus	Rainbow Bee-eater		●	S3		Field Survey	Recorded	●	●	●	●	●	●			Recorded seven times during the field surveys in riparian vegetation along drainage lines and shrubland habitats.
Neochmia ruficauda subclarescens	Star Finch				P4	Desktop	Possible		●		●	●				May occur along drainage lines and associated riparian habitat when water is present. The nearest record of the specie sis located approximately 6 km west of the northern third of the study area.
MAMMALS																
Dasycercus blythi	Brush-tailed Mulgara				P4	Field survey	Possible	●	●						●	Species may occur in grassland and shrubland habitat where suitable burrowing substrates are present. Previously recorded 75 km east of the study area.
Dasyurus hallucatus	Northern Quoll	EN		S1	EN	Field survey	Recorded			●	●	●	●			Recorded during Level 1 and targeted survey from various locations within the study area.
Sminthopsis longicaudata	Long-tailed Dunnart				P4	Desktop	Possible			●			●			Species may occur in rock hill slope or gully habitat where suitable rock cover present. Previously recorded within 10 km of southern third of study area.

Scientific name	Common name	EPBC Threatened species	EPBC Migratory	WC Act	DPaW	Records	Likelihood of occurrence	Suitable habitats								Summary of records and occurrence
								H&T grassland[1]	O&C shrubland[2]	Rocky hill slope	Minor creek & DL[3]	Woodland	Gully	Sand dune	Sandplain	
Macrotis lagotis	Greater Bilby	VU		S1	VU	Desktop	Possible	●	●					●	●	Species may occur in grassland and shrubland habitat where suitable burrowing substrates are present. Previously recorded 90 km east of the study area; however, species distribution in the Pilbara patchy.
Notoryctes caurinus	Northern Marsupial Mole	EN		S1	EN	Desktop	Possible							●	●	Species may occur in loose sands in sandplain and sand dune habitats within the study area. Previous record of the species over 200 km from study area (Benshemesh 2004).
Lagorchestes conspicillatus leichardti	Spectacled Hare-wallaby				P3	Desktop	Likely	●	●			●				Species may occur in grassland and shrubland habitats within the study area. Species previously recorded within 10 km of central third of study area.
Petrogale lateralis lateralis	Black-flanked Rock-wallaby	VU		S1	VU	Desktop	Possible			●			●			Potential habitat present for the species; however, no evidence of presence recorded. Only Rothschild's Rock Wallaby was recorded during the survey and the nearest mainland record of the species is located over 150 km west of the study area.
Macroderma gigas	Ghost Bat				P4	Desktop	Likely			●	●	●	●			Likely to forage within the study area in drainage and woodland habitat and occasionally roost in suitable sites within gully habitat. Previously recorded within the central third of the study area.
Leggadina lakedownensis	Short-tailed Mouse				P4	Desktop	Possible	●	●							Species may occur within the study area, particularly in shrubland and grassland habitats. Previously recorded within 10 km of the study area.

Scientific name	Common name	EPBC Threatened species	EPBC Migratory	WC Act	DPaW	Records	Likelihood of occurrence	Suitable habitats								Summary of records and occurrence
								H&T grassland[1]	O&C shrubland[2]	Rocky hill slope	Minor creek & DL[3]	Woodland	Gully	Sand dune	Sandplain	
Pseudomys chapmani	Western Pebble-mound Mouse				P4	Field Survey	Recorded	●		●						Recorded once during the survey from secondary evidence (pebble-mound) in the northern third of the study area. No active mounds recorded; however, species likely to occur in grassland and shrubland habitat where suitable stony substrate present.

EN – Endangered (EPBC Act); VU – Vulnerable (EPBC Act); S1 – Schedule 1 (WC Act); S4 – Schedule 4 (WC Act) P1 – Priority 1 (DEC); P2 – Priority 2 (DEC); P3 – Priority 3 (DEC); P4 – Priority 4 (DEC); M – Migratory species (EPBC Act).

1 – hummock and tussock grassland; 2 – open and closed shrubland; 3 – minor creek and drainage line.

6.2 SHORT-RANGE ENDEMIC INVERTEBRATES

A total of 13 SRE taxa have been identified as occurring within the study area. Eleven taxa were collected from the study area during the field survey, representing approximately 36% of all taxa collected. Two additional species was recorded through the desktop review, *Buddelundia* '10' and *Buddelundia* '19' both from the same single location in the southern section of the study area (Figure 5-4; Table 6-2). There were comparatively fewer numbers of range-restricted species in comparison with similar regional rail surveys; for example, the terrestrial invertebrate fauna survey of the East Pilbara Independent Rail Project recovered 21 SREs (Phoenix 2013b).

Two of the 13 SRE taxa are only known from the study area, *Buddelundia* '92' and *Buddelundia* '95', both are only known from a single site (Table 6-2). *Buddelundia* '92' was recorded from rocky hill slope habitat, while *Buddelundia* '95' was recorded from gully habitat (Figure 5-12). The gully habitat from which *Buddelundia* '92' was recorded is highly characteristic of the Newman land system which represents 7% of the study area (Table 3-1). The rocky hill slope habitat from which *Buddelundia* '95' was recorded specifically comprised of granitic hills (Site 03; Appendix 1) characteristic of the Granitic land system which makes up only 3% of the study area (Table 3-1). The study area intersects less than 1% of the areas of both Granitic and Newman land systems within the Pilbara (Table 3-1) and it is therefore likely that both species occur outside the study area.

Four SRE taxa were only recorded outside the study area (Table 6-2). Of the remaining seven taxa collected from inside and outside the study area, five represent higher taxonomic levels ('sp. indet') as species level identification was not possible with morphological methods (Table 6-2). It is possible that *Karaops* sp. indet., *Dampetrus* sp. indet. *Cryptops* sp. indet., *Sepedonophilus* sp. indet. and *Quistrachia* sp. indet. are either conspecific with specimens collected from outside the study area or represent a known species from the desktop review. For all taxa (except for *Quistrachia* sp. indet. as no tissue was collected) this could be determined by employing molecular tools to compare tissue samples with often publicly available sequence data, for example in mygalomorph spiders in the Pilbara (Castalanelli *et al.* 2014).

Table 6-2 Summary of potential impacts to short-range endemic invertebrates

Taxon[a]	SRE category	No. of sites	Recorded outside study area	Recorded inside study area	Suitable habitats for species							
					Hummock and tussock grassland	Open and closed shrubland	Rocky hill slope	Minor creek and drainage line	Woodland	Gully	Isolated sand dune	Sandplain
Araneae (spiders)												
Conothele sp. indet.	Potential	1	✓			✓						
Karaops sp. indet.	Potential	6	✓	✓		✓	✓	✓		✓		
Opiliones (harvestman)												
Dampetrus sp. indet.	Likely	2	✓	✓		✓	✓					
Chilopoda (centipedes)												
Cryptops sp. indet.	Likely	4	✓	✓		✓		✓		✓		
Sepedonophilus sp. indet.	Potential	2	✓	✓			✓	✓				
Isopoda (slaters)												
Buddelundia '10'	Potential	1	✓	✓		✓						
Buddelundia '10 1016a'	Potential	2	✓							✓		
Buddelundia '19'	Potential	1	✓	✓		✓						
Buddelundia '92'	Potential	1		✓	✓							
Buddelundia '93'	Potential	1	✓		✓							

Taxon[a]	SRE category	No. of sites	Recorded outside study area	Recorded inside study area	Suitable habitats for species							
					Hummock and tussock grassland	Open and closed shrubland	Rocky hill slope	Minor creek and drainage line	Woodland	Gully	Isolated sand dune	Sandplain
Buddelundia '94'	Potential	1	✓							✓		
Buddelundia '95'	Potential	1		✓						✓		
Eupulmonata (land snails)												
Quistrachia sp. indet.	Potential	3	✓	✓	✓			✓				

[a] Higher level identification, conspecifity cannot be determined based on morphology

7 REFERENCES

Bamford. 2006. *Fauna assessment of the Balla Balla Vanadium Project*. Bamford Consulting Ecologists, Kingsley, WA. Unpublished report prepared for URS Australia Pty Ltd.

Bamford. 2008a. *Balla Balla Magnetitie Project. Further information on vertebrate and short-range endemic invertebrate fauna in response to advice provided by DEC's Environmental Management Branch*. Bamford Consulting Ecologists, Kingsley, WA.

Bamford. 2008b. *Fauna assessment Balla Balla Project linear infrastructure corridor Ferro Metals Australia Pty Ltd*. Bamford Consulting Ecologists, Kingsley, WA. Unpublished report prepared for John Consulting Services.

Bamford, M., Watkins, D., Bancroft, W., Tischler, G. & Wahl, J. 2008. *Migratory shorebirds of the East Asian—Australasian flyway: population estimates and internationally important sites*. Wetlands International - Oceania, Canberra, ACT.

Barker, D. G. & Barker, T. M. 1994. *Pythons of the world: volume 1, Australia*. Advanced Vivarium Systems Inc., Irvine, California.

Baynes, A. & McDowell, M. C. 2010. The original mammal fauna of the Pilbara biogeographic region of north-western Australia. *Records of the Western Australian Museum, Supplement* **78**: 285–298.

Beesley, P. L., Ross, G. J. B. & Wells, A. 1998. *Mollusca: the southern synthesis*. CSIRO Publishing, Collingwood, Vic.

Bell, J. R., Bohan, D. A., Shaw, E. M. & Weyman, G. S. 2005. Ballooning dispersal using silk: world fauna, phylogenies, genetics and models. *Bulletin of Entomological Research* **95**: 69–114.

Benshemesh, J. 2004. *Recovery plan for Marsupial Moles Notoryctes typhlops and N. caurinus. 2005–2010*. Northern Territory Department of Infrastructure, Planning and Environment, Alice Springs, NT.

Benshemesh, J. 2005. *Manual for marsupial mole survey and monitoring by trenches. Version 1.0*. Unpublished report prepared for Anangu-Pitjantjatjara Land Management and the Department of Heritage and Environment (SA).

Biota. 2004. *Sherlock Bay Nickel fauna survey: fauna and faunal assemblage report*. Biota Environmental Sciences Pty Ltd, West Leederville, WA. Unpublished report prepared for Sherlock Bay Nickel Corporation Ltd.

Birdlife Australia. 2014. *Birdata*. Birdlife Australia, Carlton, Vic.

Black, D. G. 1997. Diversity and biogeography of Australian millipedes (Diplopoda). *Memoirs of the Museum of Victoria* **56**: 557–561.

BOM. 2014. *Climate statistics for Australian locations*. Commonwealth of Australia, Bureau of Meterology. Available at: http://www.bom.gov.au/climate/data/

Bonato, L. 2011. Order Geophilomorpha. *In:* Minelli, A. (ed.) *Treatise on zoology - anatomy, taxonomy, biology. The Myriapoda. Volume 1*. Brill, Leiden (The Netherlands), Bosten (USA), pp. 407–443.

Bonato, L., Drago, L. & Murienne, J. 2014. Phylogeny of Geophilomorpha (Chilopoda) inferred from new morphological and molecular evidence. *Cladistics* **30**: 485–507.

Bouchet, P., Rocroi, J.-P., Frýda, J., Hausdorf, B., Ponder, W. F., Valdés, Á. & Warén, A. 2005. Classification and nomenclator of gastropod families. *Malacologia: International Journal of Malacology* **47**: 1–397.

Burbidge, A. H., Johnstone, R. E. & Pearson, D. J. 2010. Birds in a vast arid upland: avian biogeographical patterns in the Pilbara region of Western Australia. *Records of the Western Australian Museum, Supplement* **78**: 247–270.

Cameron, R. A. D. 1992. Land snail faunas of the Napier and Oscar Ranges, Western Australia – diversity, distribution and speciation. *Biological Journal of the Linnean Society* **45**: 271–286.

Car, C. A. & Harvey, M. S. 2013. A review of the Western Australian keeled millipede genus *Boreohesperus* (Diplopoda, Polydesmida, Paradoxosomatidae). *ZooKeys* **290**: 1–19.

Castalanelli, M. A., Teale, R., Rix, M. G., Kennington, J. & Harvey, M. S. 2014. Barcoding of mygalomorph spiders (Araneae: Mygalomorphae) in the Pilbara region of Western Australia *Invertebrate Systematics* **28**: 375–385.

Catullo, R. A., Doughty, P., Roberts, J. D. & Keogh, J. S. 2011. Multi-locus phylogeny and taxonomic revision of *Uperoleia* toadlets (Anura: Myobatrachidae) from the western arid zone of Australia, with a description of a new species. *Zootaxa* **2902**: 1–43.

Christidis, L. & Boles, W. E. 2008. *Systematics and taxonomy of Australian birds*. CSIRO Publishing, Collingwood, Vic.

Churchill, S. 2008. *Australian bats. 2nd edition*. Allen & Unwin - Jacana Books, Sydney, NSW.

Coddington, J. A. & Levi, H. W. 1991. Systematics and evolution of spiders (Araneae). *Annual Review of Ecology and Systematics* **22**: 565–592.

Coffey. 2008. *Level 2 terrestrial vertebrate fauna assessment for the Solomon Project*. Coffey Environments, Burswood, WA. Unpublished report prepared for Fortescue Metals Group Ltd.

Coffey. 2010. *Level 1 vertebrate fauna assessment - Solomon Rail Project*. Coffey Environments, Burswood, WA. Unpublished report prepared for Fortescue Metals Group Ltd.

Cogger, H. G. 2014. *Reptiles and Amphibians of Australia*. CSIRO Publishing, Collingwood, Victoria.

Colloff, M. J., Hastings, A. M., Spier, F. & Devonshire, J. 2005. *Centipedes of Australia*. CSIRO Entomology and Australian Biological Resources Study, Canberra, ACT. Available at: http://www.ento.csiro.au/biology/centipedes/centipedeKey.html (accessed 25 June 2012).

Colwell, R. K. 2009. *EstimateS: statistical estimation of species richness and shared species from samples, version 8.2. User's guide and application*. Available at: http://purl.oclc.org/estimates (accessed 10 April 2011).

Colwell, R. K., Xuan Mao, C. & Chang, J. 2004. Interpolating, extrapolating, and comparing incidence-based species accumulation curves. *Ecology* **85**: 2717–2727.

Crews, S. C. 2013. Thirteen new species of the spider genus *Karaops* (Araneae: Selenopidae) from Western Australia. *Zootaxa* **3647**: 443–469.

Crews, S. C. & Harvey, M. S. 2011. The spider family Selenopidae (Arachnida, Araneae) in Australasia. *ZooKeys* **99**: 1–103.

Delany, S. & Scott, D. 2006. *Waterbird population estimates, fourth edition*. Wetlands International, Wageningen, The Netherlands.

Department of Agriculture. 2003. *Evaporation data for Western Australia*. Department of Agriculture, South Perth, WA. Resource Management Technical Report No. 65.

Department of the Environment. 2011. *Australian Faunal Directory: Suborder Oniscidea Latreille, 1802*. Department of the Environment, Canberra, ACT. (accessed 13 May 2014).

Department of the Environment. 2014a. *Australian Faunal Directory: family Geophilomorpha*. Department of the Environment, Parkes, ACT. Available at: http://www.environment.gov.au/biodiversity/abrs/online-resources/fauna/afd/taxa/GEOPHILOMORPHA (accessed 13 May 2014).

Department of the Environment. 2014b. *Australian Faunal Directory: order Opiliones. Daddy-long legs, harvest spiders*. Department of the Environment, Parkes, ACT. Available at: http://www.environment.gov.au/biodiversity/abrs/online-resources/fauna/afd/taxa/OPILIONES (accessed 4 June 2014).

Department of the Environment. 2014c. *EPBC Act list of threatened fauna*. Australian Government, Department of the Envrionment, Canberra, ACT. Available at: http://www.environment.gov.au/cgi-bin/sprat/public/publicthreatenedlist.pl#other_animals_vulnerable (accessed 13 May 2014).

Department of the Environment. 2014d. *Maps: Australia's bioregions (IBRA)*. Department of the Environment, Canberra, ACT. Available at: http://www.environment.gov.au/topics/land/national-reserve-system/science-maps-and-data/australias-bioregions-ibra (accessed 24 April 2014).

Department of the Environment. 2014e. *Protected matters search tool*. Australian Government Department of Sustainability, Environment, Water, Population and Communities, Canberra, ACT. Available at: http://www.environment.gov.au/epbc/pmst/index.html

Doughty, P., Kealley, L. & Donnellan, S. C. 2011. Revision of the Pygmy Spiny-tailed Skinks (*Egernia depressa* species-group) from Western Australia, with descriptions of three new species. *Records of the Western Australian Museum* **26**: 115–137.

Doughty, P., Kealley, L. & Melville, J. 2012. Taxonomic assessment of *Diporiphora* (Reptilia: Agamidae) dragon lizards from the western arid zone of Australia. *Zootaxa* **3518**: 1–24.

Doughty, P. & Maryan, B. 2008. *Checklist of the reptiles of Western Australia*. Western Australian Museum, Welshpool, WA.

Doughty, P. & Oliver, P. M. 2011. A new species of *Underwoodisaurus* (Squamata: Gekkota: Carphodactylidae) from the Pilbara region of Western Australia. *Zootaxa* **3010**: 20–30.

Doughty, P., Pepper, M. & Keogh, J. S. 2010. Morphological and molecular assessment of the *Diplodactylus savagei* species complex in the Pilbara region, Western Australia, with a description of a new species. *Zootaxa* **2393**: 33–45.

DPaW. 2013. *Threatened and priority fauna rankings (18 September 2013)*. Department of Parks and Wildlife, Perth, WA.

DPaW. 2014a. *NatureMap*. Department of Parks and Wildlife, Perth, WA. Available at: http://naturemap.dec.wa.gov.au/

DPaW. 2014b. *Pilbara northern quoll regional project: surveying and monitoring Dasyurus hallucatus in the Pilbara, Western Australia*. Department of Parks and Wildlife, Perth.

DPaW. 2014c. *Threatened Flora, Fauna and Ecological Community Data Searches*. Department of Parks and Wildlife, Perth, WA. Available at: http://www.dpaw.wa.gov.au/images/documents/plants-animals/threatened-species/flora_fauna_tec_searches_feb2012.pdf (accessed 15 June 2014).

DSEWPaC. 2011a. *Apus pacificus. In: Species Profile and Threats Database*. Department of Sustainability, Environment, Water, Population and Communities, Parkes, ACT. Available at: http://www.environment.gov.au/sprat (accessed 15 Jun 2011).

DSEWPaC. 2011b. *Environment Protection and Biodiversity Conservation Act 1999 referral guidelines for the endangered Northern Quoll, Dasyurus hallucatus. EPBC Act policy statement 3.25*. Department of Sustainability, Environment, Water, Population and Communities, Parkes, ACT.

DSEWPaC. 2011c. *Macrotis lagotis - Greater Bilby. In: Species Profile and Threats Database*. Department of Sustainability, Environment, Water, Population and Communities, Parkes, ACT. Available at: http://www.environment.gov.au/sprat (accessed 15 June 2011).

DSEWPaC. 2011d. *The Peregrine Falcon (Falco peregrinus). Fact sheet*. Department of Sustainability, Environment, Water, Populations and Communities, Parkes, ACT. Available at: www.environment.gov.au/biodiversity/threatened/publications/peregrine-fact.html (accessed 3 June 2011).

DSEWPaC. 2011e. *Survey guidelines for Australia's threatened mammals. Guidelines for detecting mammals listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999*. Department of Sustainability, Environment, Water, Population and Communities, Parkes, ACT.

DSEWPaC. 2011f. *Survey guidelines for Australia's threatened reptiles. Guidelines for detecting reptiles listed as threatened under the Environmental Protection and Biodiveristy*

Conservation Act 1999. Department of Sustainability, Environment, Water, Population and Communities, Parkes, ACT.

DSEWPaC. 2012. *Australian Biological Resources Study: Australian Faunal Directory: Phylum Mollusca*. Department of Systainability, Environment, Water, Population and Communities, Parkes, ACT. Available at: http://www.environment.gov.au/biodiversity/abrs/online-resources/fauna/afd/taxa/MOLLUSCA (accessed 3 October 2012).

DSEWPC. 2011. *Macrotis lagotis - Greater Bilby. In: Species Profile and Threats Database*. Department of Sustainability, Environment, Water, Population and Communities, Canberra, ACT. Available at: http://www.environment.gov.au/sprat (accessed 15 June 2011).

Durrant, B. J., Harvey, M. S., Framenau, V. W., Ott, R. & Waldock, J. M. 2010. Patterns in the composition of ground-dwelling spider communities in the Pilbara bioregion, Western Australia. *Records of the Western Australian Museum, Supplement* **78**: 185–204.

Ecologia. 2010a. *Fortescue Metals Group Solomon Project - Firetail. Short-range endemic invertebrate and habitat assessment*. Ecologia Environment Pty Ltd, West Perth, WA. Unpublished report prepared for Fortescue Metals Group Ltd.

Ecologia. 2010b. *Kings area vertebrate fauna assessment*. Ecologia Environment Pty Ltd, West Perth, WA. Unpublished report prepared for Fortescue Metals Group Ltd.

Ecologia. 2012a. *Central Pilbara Project - mine: short range endemic invertebrate fauna assessment*. Ecologia Environment Pty Ltd, West Perth, WA. Unpublished report prepared for Fortescue Metals Group Ltd.

Ecologia. 2012b. *Central Pilbara Project - rail: short range endemic invertebrate fauna assessment*. Ecologia Environment Pty Ltd, West Perth, WA. Unpublished report prepared for Fortescue Metals Group Ltd.

Ecoscape. 2010a. *Solomon Project - Rail Camp Sites 1, 2, and 3, Fauna Assessment*. Ecoscape (Australia) Pty Ltd, North Fremantle, WA. Unpublished report prepared for Fortescue Metals Group Ltd.

Ecoscape. 2010b. *Vertebrate fauna and fauna habitat assessment for the Firetail Project*. Ecoscape (Australia) Pty Ltd, North Fremantle, WA. Unpublished report prepared for Fortescue Metals Group Ltd.

Ecoscape. 2011. *Pilbara Iron Ore Project – Blacksmith vertebrate fauna and short range endemic survey*. Ecoscape (Australia) Pty Ltd, North Fremantle, WA. Unpublished report prepared for Flinders Mines Ltd.

Edgecombe, G. D. 2005. A troglomorphic species of the centipede *Cryptops* (*Trigonocryptos*) (Chilopoda: Scolopendromorpha) from Western Australia. *Records of the Western Australian Museum* **22**: 315–323.

Edgecombe, G. D. & Barrow, L. 2007. A new genus of scutigerid centipedes (Chilopoda) from Western Australia, with new characters for morphological phylogenetics of Scutigeromorpha. *Zootaxa* **1409**: 23–50.

Edgecombe, G. D. & Bonato, L. 2011. Order Scolopendromorpha. *In:* Minelli, A. (ed.) *Treatise on zoology - anatomy, taxonomy, biology. The Myriapoda. Volume 1*. Brill, Leiden (The Netherlands), Bosten (USA), pp. 392–407.

Edgecombe, G. D. & Giribet, G. 2007. Evolutionary biology of centipedes (Myriapoda: Chilopoda). *Annual Review of Entomology* **52**: 151–170.

Edgecombe, G. D. & Giribet, G. 2009. Phylogenetics of scutigeromorph centipedes (Myriapoda: Chilopoda) with implications for species delimitation and historical biogeography of the Australian and New Caledonian faunas. *Cladistics* **25**: 406–427.

Edward, K. L. & Harvey, M. S. 2010. A review of the Australian millipede genus *Atelomastix* (Diplopoda: Spirostreptida: Iulomorphidae). *Zootaxa* **2371**: 1–63.

Environment Australia. 2001. *A directory of important wetlands in Australia. 3rd edition*. Environment Australia, Canberra, ACT.

EPA. 2002. *Position Statement no. 3. Terrestrial biological surveys as an element of biodiversity protection*. Environmental Protection Authority, Perth, WA. Available at: http://www.epa.wa.gov.au/docs/1033_PS3.pdf (accessed 7 September 2012).

EPA. 2004. *Guidance for the assessment of environmental factors (in accordance with the Environmental Protection Act 1986). Terrestrial fauna surveys for environmental impact assessment in Western Australia. No. 56*. Environmental Protection Authority, Perth, WA. Available at: http://www.epa.wa.gov.au/EPADocLib/1850_GS56.pdf (accessed 7 September 2012).

EPA. 2009. *Guidance for the assessment of environmental factors (in accordance with the Environmental Protection Act 1986). Sampling of short range endemic invertebrate fauna for environmental impact assessment in Western Australia. No. 20*. Environmental Protection Authority, Perth, WA. Available at: http://www.epa.wa.gov.au/EPADocLib/2953_GS20SRE250509.pdf (accessed 7 September 2012).

EPA. 2013. *Balla Balla Export Facilities. Forge Resources Swan Pty Ltd. Report and recommendations of the Environmental Protection Authority*. Environmental Protection Authority, Perth, WA.

Fet, V., Sissom, W. D., Lowe, G. & Braunwalder, M. E. (eds). 2000. *Catalogue of the scorpions of the world (1758–1998)*. New York Entomological Society, New York.

Forge Resources. 2013. *Balla Balla Magentite Project - Barge-transhipment proposal. Environmental Protection Act - Section 38 referral: supporting information*. Forge Resources Ltd, Nedlands, WA.

Forster, R. R. 1949. Australian Opiliones. *Memoirs of the National Museum of Victoria* **16**: 59–89.

Forster, R. R. 1955. Further Australian harvestmen (Arachnida: Opiliones). *Australian Journal of Zoology* **3**: 354–411.

Framenau, V. W. 2014. *Checklist of Australian spiders, version 1.28*. Australasian Arachnological Society. Available at: http://www.australasian-arachnology.org/download/checklist_australian_spiders.pdf (accessed 6 August 2014).

Framenau, V. W., Baehr, B. C. & Zborowski, P. 2014. *A guide to the spiders of Australia*. New Holland Publishers Pty Ltd, London, Sydney, Cape Town, Auckland.

Garnett, S. T. & Crowley, G. M. 2000. *The action plan for Australian birds 2000*. Birds Australia, Environment Australia, Canberra, ACT. Available at: www.environment.gov.au/biodiversity/threatened/publications/action/birds2000/

Garnett, S. T., Szabo, J. K. & Dutson, G. 2011. *The action plan for Australian birds 2010*. CSIRO Publishing, Collingwood, Vic.

Geering, A., Agnew, L. & Harding, S. 2007. *Shorebirds of Australia*. CSIRO Publishing, Collingwood, Vic.

Gibson, L. A. & McKenzie, N. L. 2009. Environmental associations of small ground-dwelling mammals in the Pilbara region, Western Australia. *Records of the Western Australian Museum, Supplement* **78**: 91–122.

Glauert, L. 1925. Australian Scorpionidea. Part 1. *Journal of the Royal Society of Western Australia* **11**: 89–118.

Gotelli, N. J. & Colwell, R. K. 2001. Quantifying biodiversity: procedures and pitfalls in the measurement and comparison of species richness. *Ecology Letters* **4**: 379–391.

Green, A. J. A., Lew Ton, H. M. & Poore, G. C. B. 2010. *Australian Faunal Directory: suborder Oniscidea Latreille, 1802*. Australian Biological Resources Study, Canberra, ACT. Available at: http://www.environment.gov.au/biodiversity/abrs/online-resources/fauna/afd/taxa/ONISCIDEA (accessed 12 April 2011).

Harms, D. & Framenau, V. W. 2013. New species of mouse spiders (Araneae: Mygalomorphae: Actinopodidae: *Missulena*) from the Pilbara region, Western Australia. *Zootaxa* **3637**: 521–540.

Harvey, F. S. B., Framenau, V. W., Wojcieszek, J. M., Rix, M. G. & Harvey, M. S. 2012. Molecular and morphological characterisation of new species in the trapdoor spider genus *Aname* (Araneae: Mygalomorphae: Nemesiidae) from the Pilbara bioregion of Western Australia. *Zootaxa* **3383**: 15–38.

Harvey, M. S. 1992. The phylogeny and systematics of the Pseudoscorpionida (Chelicerata: Arachnida). *Invertebrate Taxonomy* **6**: 1373–1435.

Harvey, M. S. 2002. Short-range endemism among the Australian fauna: some examples from non-marine environments. *Invertebrate Systematics* **16**: 555–570.

Harvey, M. S. 2011. *Pseudoscorpions of the World, version 2.0.* Western Australian Museum, Perth, WA. Available at: http://www.museum.wa.gov.au/catalogues/pseudoscorpions (accessed 6 May 2012).

Harvey, M. S., Rix, M. G., Framenau, V. W., Hamilton, Z. R., Johnson, M. S., Teale, R. J., Humpherys, G. & Humphreys, W. F. 2011. Protecting the innocent: studying short-range endemic taxa enhances conservation outcomes. *Invertebate Sytematics* **25**: 1–10.

Hebert, P. D. N., A., C., Ball, S. L. & de Waard, J. R. 2003a. Biological identifications through DNA barcodes. *Proceedings of the Royal Society London B* **270**: 313–321.

Hebert, P. D. N., Ratnasingham, S. & de Waard, J. R. 2003b. Barcoding animal life: Cytochrome c oxidase subunit 1 divergences among closely related species. *Proceedings of the Royal Society London B, Supplement* **270**: 96–99.

Helix. 2012. *Report on the molecular systematics of Mygalomorphae from the Pilbara*. Helix Molecular Solutions, School of Animal Biology, The University of Western Australia, Crawley, W.A. Unpublished report to Biota Environmenal Science Pty Ltd.

Hill, B. & Ward, S. 2010. *National recovery plan for the Northern Quoll Dasyurus hallucatus*. Northern Territory Department of Natural Resources, Environment, The Arts and Sport, Darwin, NT.

Hoffman, R. L. 1982. Diplopoda. *In:* Parker, S. P. (ed.) *Synopsis and classification of living organisms*. McGraw-Hill Publishing, New York, pp. 689–724.

Hortal, J., Borges, P. A. V. & Gaspar, C. 2006. Evaluating the performance of species richness estimators: sensitivity to sample grain size. *Journal of Animal Ecology* **75**: 274–287.

Hunt, G. S. 1991. Opiliones (Arachnida) of the Kimberley rainforests, Western Australia. *In:* McKenzie, N. L., Johnston, R. B. & Kendrick, P. G. (eds) *Kimberley rainforests*. Surrey Beatty and Sons, Chipping North, pp. 295–297.

Johnstone, R. E. 2009. *Checklist of the birds of Western Australia*. Unpublished spreadsheet.

Johnstone, R. E., Burbidge, A. H. & Darnell, J. C. 2013. Birds of the Pilbara region, including seas and offshore islands, Western Australia: distribution, status and historical changes. *Records of the Western Australian Museum, Supplement* **78**: 343–441.

Johnstone, R. E. & Storr, G. M. 1998. *Handbook of Western Australian birds. Volume 1: Non-passerines (Emu to Dollarbird)*. Western Australian Museum, Perth, WA.

Judd, S. & Horwitz, P. 2003. Diversity and biogeography of terrestrial isopods (Isopoda: Oniscidea) from south-western Australia: organic matter and microhabitat utilisation in seasonally dry landscapes. *Crustaceana Monographs* **2**: 191–215.

Kendrick, P. 2001a. Pilbara 2 (PIL2—Fortescue Plains subregion). *In:* May, J. E. & McKenzie, N. L. (eds) *A biodiversity audit of Western Australia's 53 biogeographical subregions in 2002.* Department of Conservation and Land Management, Perth, WA, pp. 559–567.

Kendrick, P. 2001b. Pilbara 3 (PIL3—Hamersley subregion). *In:* May, J. E. & McKenzie, N. L. (eds) *A biodiversity audit of Western Australia's 53 biogeographical subregions in 2002.* Department of Conservation and Land Management, Perth, WA, pp. 568–580.

Kendrick, P. & McKenzie, N. 2001. Pilbara 1 (PIL1—Chichester subregion). *In:* May, J. E. & McKenzie, N. L. (eds) *A biodiversity audit of Western Australia's 53 biogeographical subregions in 2002.* Department of Conservation and Land Management, Perth, WA, pp. 547–558.

Kendrick, P. & Stanley, F. 2001. Pilbara 4 (PIL4—Roebourne synopsis). *In:* May, J. E. & McKenzie, N. L. (eds) *A biodiversity audit of Western Australia's 53 biogeographical subregions in 2002.* Department of Conservation and Land Management, Perth, WA, pp. 581–594.

Koch, L. E. 1977. The taxonomy, geographic distribution and evolutionary radiation of Australo-Papuan scorpions. *Records of the Western Australian Museum* **5**: 1–358.

Koch, L. E. 1982. Taxonomy of the centipede *Scolopendra laeta* Haase (Chilopoda: Scolopendridae) in Australia. *Zoological Journal of the Linnean Society* **76**: 125–140.

Koch, L. E. 1983a. Morphological characters of Australian scolopendrid centipedes, and the taxonomy and distribution of *Scolopendra morsitans* L. (Chilopoda: Scolopendridae: Scolopendrinae). *Australian Journal of Zoology* **31**: 79–91.

Koch, L. E. 1983b. Revision of the Australian centipedes of the genus *Cormocephalus* Newport (Chilopoda: Scolopendridae: Scolopendrinae). *Australian Journal of Zoology* **31**: 799–833.

Koch, L. E. 1983c. A taxonomic study of the centipede genus *Ethmostigmus* Pocock (Chilopoda: Scolopendridae: Otostigminae) in Australia. *Australian Journal of Zoology* **31**: 835–849.

Koch, L. E. & Burgman, M. A. 1984. The zoogeography and phylogenetic relationships of three genera of Australian scolopendrid centipedes (Chilopoda: Scolopendridae). *Australian Journal of Zoology* **32**: 507–518.

Köhler, F. & Johnson, M. S. 2012. Species limits in molecular phylogenies: a cautionary tale from Australian land snails (Camaenidae: *Amplirhagada* Iredale, 1933). *Zoological Journal of the Linnean Society* **165**: 337–362.

Körtner, G., Pavey, C. R. & Geiser, F. 2007. Spatial ecology of the Mulgara in arid Australia: impact of fire history on home range size and burrow use. *Journal of Zoology* **273**: 350–357.

Kovařík, F. 1997. Revision of the genera *Lychas* and *Hemilychas*, with descriptions of six new species (Scorpiones: Buthidae). *Acta Societatis Zoologicae Bohemicae* **61**: 311–371.

Kovařík, F. 2002. The provenance of *Lychas buchari* (Scorpiones: Buthidae). *Acta Societatis Zoologicae Bohemicae* **66**: 291–292.

Kutt, A. S. & Kemp, J. E. 2005. Distribution, habitat and conervation status of *Leggadina lakedownensis* (Rodentia: Muridae) in Queensland. *Australian Zoologist* **33**: 258–264.

Leighton, K. A. 2004. Climate. *In:* van Vreeswyk, A. M. E., Payne, A. L., Leighton, K. A. & Hennig, P. (eds) *Technical Bulletin 9. An inventory and condition survey of the Pilbara region, Western Australia*. Department of Agriculture, Government of Western Australia, South Perth, WA, pp. 19–38.

Lewis, F. 1998. New genera and species of terrestrial isopods (Crustacea: Oniscidea) from Australia. *Journal of Natural History* **32**: 701–732.

Lydeard, C., Cowie, R. H., Ponder, W. F., Bogan, A. E., Bouchet, P., Clark, S. A., Cummings, K. S., Frest, T. J., Gargominy, O. & Herbert, D. G. 2004. The global decline of nonmarine mollusks. *Bioscience* **54**: 321–330.

Main, B. Y. 1957. Occurrence of the trap-door spider *Conothele malayana* (Doleschall) in Australia (Mygalomorphae: Ctenizidae). *Western Australian Naturalist* **5**: 209–216.

Main, B. Y. 1976. *Spiders*. Collins, Sydney, NSW.

Main, B. Y. 1985. Further studies on the systematics of ctenizid trapdoor spiders: a review of the Australian genera (Araneae: Mygalomorphae: Ctenizidae). *Australian Journal of Zoology, Supplement* **108**: 1–84.

Main, B. Y., Sampey, A. & West, P. L. J. 2000. Mygalomorph spiders of the southern Carnarvon Basin, Western Australia. *Records of the Western Australian Museum, Supplement* **61**: 281–293.

Masters, P. 2003. Movement patterns and spatial organisation of the Mulgara, *Dasycercus cristicauda* (Marsupialia: Dasyuridae), in central Australia. *Wildlife Research* **30**: 339–344.

McKenzie, N. L. & Bullen, R. D. 2009. The echolocation calls, habitat relationships, foraging niches and communities of Pilbara microbats. *Records of the Western Australian Museum, Supplement* **78**: 123–155.

McKenzie, N. L., May, J. E. & McKenna, S. (eds). 2003. *Bioregional summary of the 2002 biodiversity audit for Western Australia. A contribution to the development of Western Australia's biodiversity conservation strategy*. Department of Conservation and Land Management, Perth, WA.

McKenzie, N. L., van Leeuwen, S. & Pinder, A. M. 2009. Introduction to the Pilbara Biodiversity Survey, 2002–2007. *Records of the Western Australian Museum, Supplement* **78**: 3–89.

Menkhorst, P. W. & Knight, F. 2011. *A field guide to the mammals of Australia. 3rd edition*. Oxford University Press, Oxford (UK).

Mesibov, B. 2006. *Millipedes of Australia (revised 2011)*. Penguin, Tas. Available at: http://www.polydesmida.info/millipedesofaustralia/ (accessed 10 April 2011).

Morcombe, M. 2004. *Field guide to Australian birds. Complete compact edition*. Steve Parish Publishing, Archerfield, QLD.

Morris, K. D. 2000. The status and conservation of native rodents in Western Australia. *Wildlife Research* **27**: 405–419. http://dx.doi.org/10.1071/WR97054.

Oakwood, M., Woinarski, J. & Burnett, S. 2008. *Dasyurus hallucatus. In: IUCN Red List of Threatened Species. Version 2010.4*. International Union for Conservation of Nature, Gland, Switzerland. Available at: www.iucnredlist.org (accessed 10 June 2011).

Pavey, C. R., Nano, C., Cooper, S. J. B., Cole, J. R. & McDonald, P. J. 2011. Habitat use, population dynamics and species identification of mulgara, *Dasycercus blythi* and *D. cristicauda*, in a zone of sympatry in central Australia. *Australian Journal of Zoology* **59**: 156–169.

Payne, A. L. & Leighton, K. A. 2004. Land systems. *In:* van Vreeswyk, A. M. E., Payne, A. L., Leighton, K. A. & Hennig, P. (eds) *Technical Bulletin 9. An inventory and condition survey of the Pilbara region, Western Australia*. Department of Agriculture, Government of Western Australia, South Perth, WA, pp. 175–384.

Pearson, D. 2003. Giant pythons of the Pilbara. *Landscope* **19**: 32–39.

Pearson, D. 2007. Pilbara Olive Python *Liasis olivaceus barroni*. *In:* Swan, M. (ed.) *Keeping and breeding Australian pythons*. Mike Swan Herp Books, Melbourne, Vic.

Phoenix. 2010. *Short range endemic invertebrate survey of Solomon Project: Kings Mining Area and reference sites*. Phoenix Environmental Sciences Pty Ltd, Balcatta, WA. Unpublished report prepared for Fortescue Metals Group Ltd.

Phoenix. 2013a. *Migratory shorebird survey of the Balla Balla Magnetite Project barge loading facility*. Phoenix Environmental Sciences Pty Ltd, Balcatta, WA. Unpublished report prepared for Forge Resources Ltd.

Phoenix. 2013b. *Short-range endemic invertebrate fauna survey for the East Pilbara Independent Rail Project, stage 1*. Phoenix Environmental Sciences Pty Ltd, Balcatta, WA. Unpublished Report for Aurizon Operations Ltd.

Phoenix. 2013c. *Terrestrial fauna survey for the Balla Balla Magnetite Project barge loading facility*. Phoenix Environmental Sciences Pty Ltd, Balcatta, WA. Unpublished report prepared for Forge Resources Ltd.

Phoenix. 2014. *Rutila Rail terrestrial fauna gap analysis, Phoenix project: 1050-RC-RUT-FAU*. Phoenix Environmental Sciences Pty Ltd, Balcatta, W.A. Unpulblished memo prepared for Preston Consulting Pty Ltd on behalf of Rutila Resources Ltd.

Ponder, W. F. & Colgan, D. J. 2002. What makes a narrow-range taxon? Insights from Australian freshwater snails. *Invertebrate Systematics* **16**: 571–582.

Ratcliffe, D. 1980. *The Peregrine Falcon*. Buteo Books, Shipman, VA (USA).

Raven, R. J. 1985. The spider infraorder Mygalomorphae (Araneae): cladistics and systematics. *Bulletin of the American Museum of Natural History* **182**: 1–180.

Rein, J. O. 2011. *The scorpion files*. Norwegion University of Science and Technology, Trondheim. Available at: http://www.ntnu.no/ub/scorpion-files/ (accessed 23 March 2011).

Schotte, M., Boyko, C. B., Bruce, N. L., Poore, G. C. B., Taiti, S. & Wilson, G. D. F. 2008. *World list of marine freshwater and terrestrial isopod crustaceans*. Available at: http://www.marinespecies.org/isopoda (accessed 23 March 2011).

Shear, W. A. 2001. Two new cave-dwelling harvestmen from Western Australia (Arachnida: Opiliones: Assamiidae and "Phalangodidae"). *Records of the Western Australian Museum, Supplement* **64**: 153–158.

Shelley, R. M. & Golovatch, S. I. 2011. Atlas of myriapod biogeography. I. Indigenous ordinal and supra-ordinal distributions in the Diplopoda: perspectives on taxon origins and ages, and a hypothesis on the origin and early evolution of the class. *Insecta Mundi* **158**: 1–134.

Simpson, K. & Day, N. 2010. *Field guide to the birds of Australia*. Penguin Group, Camberwell, Vic.

Smith, L. A. 1981. A revision of the *Liasis olivaceus* species-group (Serpentes: Boidae) in Western Australia. *Records of the Western Australian Museum* **9**: 227–233.

Solem, A. 1997. Camaenid land snails from Western and Central Australia (Mollusca: Pulmonata: Camaenidae). VII. Taxa from Dampierland through the Nullabor. *Records of the Western Australian Museum, Supplement* **50**: 1461–1906.

Southwood, T. R. E. & Henderson, P. 2000. *Ecological methods*. Blackwell Science, Oxford.

Stanisic, J., Shea, M., Potter, D. & Griffiths, O. 2010. *Australian land snails. Volume 1. A field guide to eastern Australian species*. Bioculture Press, Mauritius.

Stankowski, S. 2011. Extreme, continuous variation in an island snail: local diversification and association of shell form with the current environment. *Biological Journal of the Linnean Society* **104**: 756–769.

Storr, G. M., Smith, L. A. & Johnstone, R. E. 2002. *Snakes of Western Australia - revised edition*. Western Australian Museum, Perth, WA.

Sutherland, W. J. 1996. *Ecological census techniques – a handbook*. Cambridge University Press, Cambridge, New York, Melbourne.

Sutton, A. J. G. 2010. Aspects of the biology of the Grey Falcon *Falco hypoleucos* in the Pilbara region of Western Australia. *Corella* **35**: 11–15.

Taiti, S. & Argano, R. 2009. New species of terrestrial isopods (Isopoda: Oniscidea) from Sardinia. *Zootaxa* **2318**: 38–55.

Taylor, C. K. 2011. Revision of the genus *Megalopsalis* (Arachnida: Opiliones: Phalangioidea) in Australia and New Zealand and implications for phalangioid classification. *Zootaxa* **2773**: 1–65.

Thackway, R. & Cresswell, I. D. 1995. *An Interim Biogeographic Regionalisation for Australia: a framework for establishing the national system of reserves, Version 4.0*. Australian Nature Conservation Agency, Canberra, ACT.

Tidemann, C. R., Priddel, D. M., Nelson, J. E. & Pettigrew, J. D. 1985. Foraging behaviour of the Australian Ghost Bat, *Macroderma gigas* (Microchiroptera: Megadermatidae). *Australian Journal of Zoology* **33**: 705–713.

Traditional Owners - Millstream Park Council, DEC & Conservation Commission of Western Australia. 2011. *Millstream-Chichester National Park and Mungaroona Range Nature Reserve Management Plan*. Traditional Owners - Millstream Park Council, Department of Environment and Conservation and Conservation Commission of Western Australia, Millstream, Perth and Crawley, WA.

Turpin, J. 2011. *Balla Balla Project Ankatell [sic] Slurry Pipeline fauna survey sites*. Atlas Iron Ltd.

Tyler, M. J. & Doughty, P. 2009. *Field guide to frogs of Western Australia. 4th edition*. Western Australian Museum, Perth, WA.

Van Dyck, S. & Strahan, R. 2008. *The mammals of Australia*. New Holland Publishers, Sydney, NSW.

van Vreeswyk, A. M. E., Payne, A. L., Leighton, K. A. & Hennig, P. 2004. An inventory and condition survey of the Pilbara region, Western Australia. *Department of Agriculture, Government of Australia, Technical Bulletin* **92**: 1–424.

Volschenk, E. S., Burbidge, A. H., Durrant, B. J. & Harvey, M. S. 2010. Spatial distribution patterns of scorpions (Scorpiones) in the arid Pilbara region of Western Australia. *Records of the Western Australian Museum, Supplement* **78**: 271–284.

Volschenk, E. S., Harvey, M. S. & Prendini, L. 2012. A new species of *Urodacus* (Scorpiones: Urodacidae) from Western Australia. *American Museum Novitates* **3748**: 1–18.

Volschenk, E. S. & Prendini, L. 2008. *Aops oncodactylus*, gen. et sp. nov., the first troglobitic urodacid (Urodacidae: Scorpiones), with a re-assessment of cavernicolous, troglobitic and troglomorphic scorpions. *Invertebrate Systematics* **22**: 235–257.

Volschenk, E. S., Smith, G. T. & Harvey, M. S. 2000. A new species of *Urodacus* from Western Australia, with additional descriptive notes for *Urodacus megamastigus* (Scorpiones). *Records of the Western Australian Museum* **20**: 57–67.

Waldock, J. M. & Edgecombe, G. D. 2012. A new genus of scolopendrid centipede (Chilopoda: Scolopendromorpha: Scolopendrini) from the central Australian deserts. *Zootaxa* **3321**: 22–36.

Walther, B. A. & Moore, J. L. 2005. The concepts of bias, precision and accuracy, and their use in testing the performance of species richness estimators, with a literature review of estimator performance. *Ecography* **28**: 815–829.

Watkins, D. 1993. *A national plan for shorebird conservation in Australia*. Royal Australasian Ornithologists Union, Australian Wader Study Group, Carlton and Moonee Ponds, Vic. RAOU Report No. 90.

Western Australian Government. 2013. Wildlife Conservation Act 1950, Wildlife Conservation (Specially Protected Fauna) Notice 2013. *Western Australian Government Gazette* **204**: 4320–4331.

Western Australian Museum. 2013. *WAM short-range endemic categories*. Western Australian Museum, Welshpool, WA.

Whisson, C. & Kirkendale, L. 2014. *Field Guide to the terrestrial and freshwater molluscs of the North West, version 1.0.* Western Australian Museum, Perth, WA. Available at: http://museum.wa.gov.au/catalogues-beta/wam-fieldguides/pilbara-snails (accessed 2 May 2014).

Wilson, S. & Swan, G. 2013. *A complete guide to reptiles of Australia*. New Holland, Sydney, NSW.

Wilson, S. K. & Knowles, D. G. 1988. *Australia's reptiles: a photographic reference to terrestrial reptiles of Australia.* Collins, Sydney, NSW.

World Spider Catalog. 2014. *World Spider Catalog*. Natural History Museum Bern, Bern (Switzerland). Available at: http://wsc.nmbe.ch/ (accessed 26 August 2014).

Ziembicki, M. 2009. *Ecology and movements of the Australian Bustard Ardeotis australis in a dynamic landscape*. PhD thesis. School of Earth and Environmental Sciences, University of Adelaide, Adelaide, SA.

Ziembicki, M. 2010. *The Australian Bustard*. CSIRO Publishing, Collingwood, Vic.

Appendix 1 Survey site descriptions

Site 01: Rocky outcrop and boulder pile on stony plain. Large areas of exposed rock and boulders with scattered trees to 10 m over herbs and spinifex to 0.6 m.

Site 02: Rocky outcrop and boulder pile on stony plain. Large exposed outcrop and boulder pile with scattered trees to 10 m over scattered mixed shrubs to 2m over spinifex to 1 m.

Site 03: Rocky outcrop and boulder pile with small eucalypt woodland at base. Patches of dense eucalypts to 10 m over mixed shrubs to 3 m over hummock and tussock grasses to 1 m. Rocky outcrop and boulders with sparse vegetation cover bordering woodland.

Site 04: Moderate drainage line with riparian vegetation fringing. Eucalypts to 12 m along banks over mixed shrubs to 3 m over hummock and tussock grasses to 0.6 m. Patches of dense leaf litter. Beyond riparian vegetation mature spinifex grassland on stony substrate.

Site 05: Moderate drainage line (dry) with scattered eucalypts to 14 m over mixed shrubs to 3 m over mixed grasses to 1m. Pastoral grasses dominant on drainage line and banks. Rocky slope bordering drainage line on north side.

Site 06: Moderate drainage line with eucalypts to 14 m over mixed shrubs to 3 m over grasses to 1 m. Banks dominated by mixed grasses and mature eucalypts, bed of Melaleuca. Scattered pools of water remaining from previous rains.

Site 07: Drainage line with rocky hills lope on SW side and riparian vegetation on opposite with eucalypts to 11 m over mixed shrubs to 3 m, dominated by Melaleuca over mixed grasses to 0.6 m. Rocky hill slope sparsely vegetated. Scattered shallow pools present, widespread dried algae growth.

Site 08: Spinifex grassland with sparse scattered eucalypts to 12 m over sparse scattered shrubs to 2 m over scattered patches of mature spinifex to 1 m. Area previously burnt with large open areas with sparse vegetation and scattered patches of dense spinifex or regrowth shrubs.

Site 09: Spinifex grassland with sparse scattered eucalypts to 10 m over scattered mixed shrubs to 3 m over spinifex to 1 m. Patches of sparse vegetation with exposed gravelly substrate.

Site 10: Open gully with steep sides dominated by scattered eucalypts to 8 m over dense spinifex. Drainage line and riparian vegetation at base with eucalypts to 14 m over mixed shrubs to 3 m over mixed grasses to 1 m. Scattered pools of water present.

Site 11: Abandoned homestead on gentle rocky hill slope with sparse scattered eucalypts to 12 m over sparse scattered mixed shrubs to 2 m over dense spinifex to 0.6 m. Large scale clearing and building materials scattered throughout.

Site 12: Large drainage line with scattered eucalypts to 16 m over patches of dense Melaleuca to 4 m over mixed small to medium shrubs. Spinifex bordering riparian vegetation. Large pools of water present.

Site 13: Low open shrubland with sparse scattered eucalypts to 10 m over mixed shrubs to 2 m. Low shrub cover and scattered patches of spinifex dominant vegetation. Area heavily grazed.

Site 14: Open shrubland with sparse scattered eucalypts to 12 m over scattered mixed shrubs to 3 m over spinifex and small shrubs to 1m. Scattered open areas with sparse vegetation and exposed gravelly or loose sandy loam substrate.

Site 15: Rocky hill slope with sparse scattered eucalypts to 10 m over mixed shrubs to 3 m over spinifex to 1 m. Large boulders and fallen rocks.

Site 16: Open shrubland with scattered sparse eucalypts to 12 m over mixed shrubs to 3 m over young spinifex to 0.8 m. Large areas of sparse vegetation with exposed gravelly or loose soil substrate.

Site 17: Spinifex grassland with sparse scattered eucalypts to 8 m and mixed shrubs to 3 m over spinifex to 1m. Scattered areas of sparse vegetation with exposed gravelly or loose soil substrate.

Site 18: Grassland dominated by pastoral grasses and mixed small shrubs to 0.5 m. Area heavily grazed by cattle.

Site 19: Open shrubland with sparsely scattered eucalypts to 12 m over mixed shrubs to 3 m over spinifex to 1 m. Scattered patches of sparse vegetation with exposed gravelly or loose clay substrate.

Site 20: Rocky hill slope with scattered shrubs to 2 m over spinifex to 0.8 m. Scattered areas of sparse vegetation with exposed rocky substrate.

Site 21: Open shrubland with scattered sparse eucalypts to 8 m over mixed small to medium shrubs to 1.5 m over spinifex to .8 m. Mixed small shrubs and spinifex dominant on loose sandy substrate.

Site 22: Spinifex grassland with sparse scattered eucalypts to 12 m and shrubs to 3 m over patchy mature spinifex to 1 m. Scattered areas of open vegetation with exposed slightly cracking clay and gravelly substrate.

Site 23: Spinifex grassland with scattered sparse medium shrubs to 3 m over spinifex and small shrubs to 1 m. Scattered patches of sparse vegetation with exposed crust or cracking clay substrate.

Site 24: Open shrubland with scattered shrubs to 3 m over spinifex to 0.8 m. Scattered patches of sparse vegetation with exposed outcrops of gravelly or loose soil substrate.

Site 25: Large granite outcrop with scattered large shrubs to 3 m over sparse catered patches of spinifex to 1 m. Sparse spinifex grassland with scattered small to large shrubs surrounding outcrop.

Site 26: Open shrubland with scattered patches of mixed shrubs to 3 m over young spinifex and small shrubs to 1m. Spinifex cover widespread with open areas of exposed crust or loose soil substrate.

Site 27: Spinifex grassland with sparse scattered eucalypts to 8 m and shrubs to 3 m over patchy dense spinifex to 0.8 m. Scattered patches of sparse spinifex cover with exposed gravelly substrate. Area dissected by scattered minor drainage lines with scattered small to medium shrub cover.

Site 28: Open shrubland with minor drainage line dissecting. Sparse scattered eucalypts to 10 m over mixed small to medium shrubs to 2 m over spinifex to 0.8 m with scattered eucalypts along to 10 m over mixed shrubs to 3 m over spinifex to 0.8 m along drainage line scattered patches of sparse vegetation with exposed gravelly or loose sandy soil substrate.

Site 29: Spinifex grassland on rocky hill slope. Scattered sparse eucalypts to 10 m over mixed small to large shrubs to 3 m over young spinifex to 0.8 m. Spinifex cover sparse in areas with exposed rocky substrate. Large stony hill with large rocks and no vegetation.

Site 30: Spinifex grassland with sparse scattered mulga stands to 6 m over mixed small shrubs and mature spinifex to 1m. Scattered patches of sparse vegetation with exposed sandy clay substrate.

Site 31: Open grassland with scattered patches of shrub thickets to 2 m over mixed pastoral grasses to 0.5 m. Area heavily grazed and close to coastline.

Site 32: Spinifex grassland with scattered patches of spinifex to 1 m with open patches of exposed gravelly clay substrate. Area degraded by cattle grazing and movement.

Site 33: Granite outcrop and boulder piles with scattered acacia shrubs to 4 m over mixed small to mediums shrubs to 2 m and scattered spinifex to 1m.

Site 34: Spinifex grassland with sparse scattered eucalypts to 8m over mixed small to medium shrubs to 2m over dense mature spinifex to 1m.

Site 35: Spinifex grassland with sparse scattered acacia to 3m over mixed small to medium shrubs to 1m over dense mature to juvenile spinifex to 1m.

Site 36: Isolated sand dune on plain. Scattered sparse eucalypts to 12 m associated with drainage over scattered patches of mixed shrubs to 3m over spinifex to 1m. Dune dominated by spinifex and mixed small to medium shrubs to 1.5 m.

Site 37: Sparse acacia to 2m over sparse acacia shrub to 1 m over spinifex grassland over cracking clay substrate

Site 38: Minor drainage line with scattered eucalypts to 10 m on edge over mixed medium to large shrubs to 3 m over spinifex to 1 m. Drainage line dry.

Site 39: South facing rocky hill slope. Recently burnt with scattered sparse eucalypts to 10 m over mixed regrowth shrubs and spinifex to 0.5 m.

Site 40: Stony plain with sparse scattered eucalypts to 10 m over sparse scattered shrubs to 2 m over spinifex to 1 m. Scattered areas of sparse vegetation with exposed stony substrate.

Site 41: Tall 8 m eucalypts over 4 m acacia shrubs over 1 m spinifex bordering drainage line**.**

Site 42: Major drainage line with scatters patches of riparian vegetation consisting of eucalypts to 16 m over mixed small to medium shrubs to 3 m over patchy spinifex to 1 m. Rocky slopes bordering with sparse scattered shrubs over spinifex to 1m. Scattered large pools of water present.

Site 43: Open shrubland of acacia to 8 m over acacia shrub to 1.5 m over spinifex to 1 m. Surface disturbed near trees by cattle

Site 44: Eucalypts to 10 m over acacia shrubs to 3 m over dominant Buffel grass with spinifex present on drainage line.

Site 45: Acacia to 5 m over acacia to 2 m over patchy spinifex and mixed pastoral grasses from low to 1 m.

Site 46: Broad open plain of spinifex to 1 m under sparse acacia shrub to 2m.

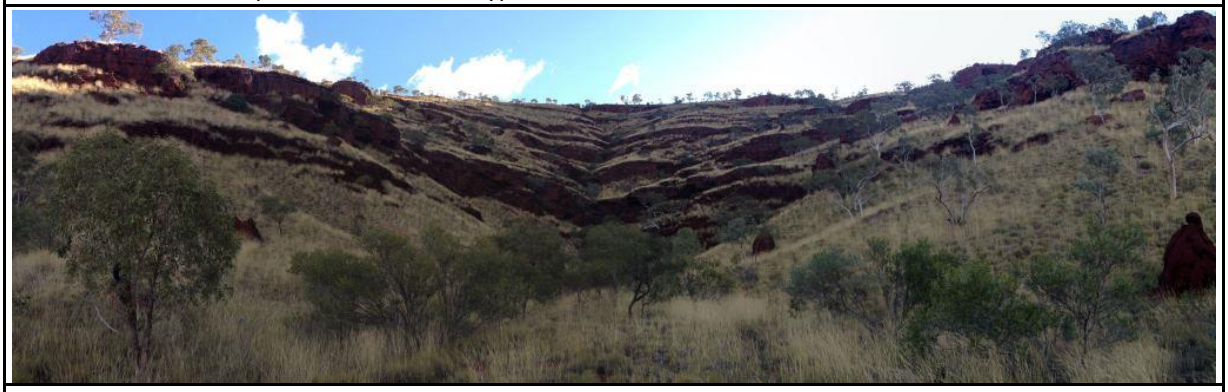
Site 47: Dense mulga woodland to 4 m over grazed and trampled grasses.

Site 48: Minor open gully with rocky hill slope edges dominated by spinifex to 0.6 m and scattered mixed shrubs to 2 m. Minor dry drainage line at base of gully with riparian vegetation consisting of eucalypts to 16 m over mixed shrubs to 3m over mixed small shrubs and grasses to 1m.

Site 49: Acacia to 8 m with mixed eucalypts to 8 m over acacia to 4 m over spinifex to 1 m on drainage line.

Site 50: Eucalypts to 8 m over open acacia shrub to 1.5 m over spinifex to .5 m. Mix of clay loam and exposed gravelly substrate.

Site 51: Large open gully with scattered eucalypts to 12 m over mixed shrubs to 3 m over spinifex to 0.8m. Steep rocky slopes with scattered areas of rock fall and caves present. Gully sides dominated by spinifex and scattered shrubs and sparse scattered eucalypts.



Site 52: Sparse Eucalypts to 8 m over open acacia shrubland to 3 m on bank of Fortescue River.

Site 53: Open shrubland with sparse eucalypts to 10 m over open acacia shrub to 5 m over spinifex 1 m.

Site 54: Sparse eucalypts to 5 m over burnt acacia to 3 m over mixed burnt and live spinifex to 1 m.

Site 55: Eucalypts to 20 m over acacia shrub to 5 m over Buffel grass on drainage line.

Site 56: Open eucalypts woodland at 8 m over acacia shrub to 2 m over spinifex to 1 m.

Site 57: Open shrubland with sparse scattered eucalypts to 8 m over scattered patches of mixed shrubs to 3 m over spinifex to 1m. Scattered patches of sparse vegetation with exposed gravelly clay loam substrate. Drill pads and tracks across area.

Site Q1: Linear basalt rock piles surrounded by spinifex grasslands

Site Q2: Linear basalt rock piles surrounded by spinifex grasslands

Site Q3: Steep-sided rocky slope with scattered areas of rock fall and scattered eucalypts to 12 m over mixed shrubs to 3 m over spinifex to 0.8m.

Site Q4: Steep-sided rocky slope with scattered areas of rock fall and scattered eucalypts to 12 m over mixed shrubs to 3 m over spinifex to 0.8m. Gorge and permanent water running through middle.

Site Q5: Open gully with steep sides recently burned on the northern side. Drainage line and riparian vegetation at base with eucalypts to 14 m over mixed shrubs to 3 m over mixed grasses to 1 m. Scattered pools of water present.

Site H1: Isolated sand dune on plain. Scattered sparse eucalypts to 12 m associated with drainage over scattered patches of mixed shrubs to 3m over spinifex to 1m. Dune dominated by spinifex and mixed small to medium shrubs to 1.5 m (same site as site 36).

Site H2: Isolated sand dune on plain. Scattered sparse eucalypts to 12 m associated with drainage over scattered patches of mixed shrubs to 3m over spinifex to 1m. Dune dominated by spinifex and mixed small to medium shrubs to 1.5 m

Site H3: Open shrubland with sparse scattered eucalypts to 8 m over scattered patches of mixed shrubs to 3 m over spinifex to 1m.

Site H4: Open shrubland with sparse scattered eucalypts to 8 m over scattered patches of mixed shrubs to 3 m over spinifex to 1m.

Appendix 2 Cage trap, Camera trap and SongMeter locations from the Level 1 and targeted fauna survey

Trap type	Number	Easting	Northing	Zone
Camera trap	NQ01	594733	7624958	50
Camera trap	NQ02	589578	7601114	50
Camera trap	NQ03	591296	7613402	50
Camera trap	NQ04	591301	7613398	50
Camera trap	NQ05	575059	7651202	50
Camera trap	NQ06	595019	7624901	50
Camera trap	NQ08	575200	7651065	50
Camera trap	NQ09	595356	7624773	50
Camera trap	NQ10	591268	7613257	50
Camera trap	NQ7	589387	7601226	50
Camera trap	R01	597836	7642818	50
Camera trap	R02	594500	7625813	50
Camera trap	R04	589186	7601103	50
Camera trap	R05	597873	7648476	50
Camera trap	R06	597945	7642884	50
Camera trap	Rh03	596990	7649491	50
Camera trap	Rh04	597156	7648579	50
Camera trap	Rh07	597965	7648578	50
Camera trap	Rh11	597122	7648952	50
Camera trap	Rh20	597192	7648901	50
Camera trap	H1-1-CT15	592199.78	7677073.9	50
Camera trap	Q1-1-CT10	597951.92	7642966.53	50
Camera trap	Q1-2-CT30	597997.87	7642984.41	50
Camera trap	Q1-3-CT7	598062.07	7642984.02	50
Camera trap	Q2-1-CT22	598786.59	7643258.05	50
Camera trap	Q2-2-CT29	598503.41	7643137	50
Camera trap	Q2-3-CT13	598253.86	7643035.34	50
Camera trap	Q4-1-CT19	594707.26	7624605.56	50
Camera trap	Q4-2-CT27	594733.95	7624597.99	50
Camera trap	Q5-1-CT2	588825.83	7601020.53	50
Camera trap	Q5-2-CT20	588755.52	7600991.37	50
Camera trap	Q5-3-CT8	588725.94	7600992.86	50
Camera trap	H1-1-CT15	592199.78	7677073.9	50
SongMeter	SM01	594789	7624952	50
SongMeter	SM02	591219	7613313	50
SongMeter	SM03	590065	7601422	50
SongMeter	SM04	544301	7560097	50
SongMeter	SM05	544187	7559613	50
Cage trap	Q1-01	598037.32	7642973.21	50
Cage trap	Q1-02	598055.63	7642912.11	50
Cage trap	Q1-03	598019.43	7642878.79	50
Cage trap	Q1-04	597991.37	7642851.28	50
Cage trap	Q1-05	597971.94	7642829.26	50
Cage trap	Q1-06	597941.89	7642817.26	50
Cage trap	Q1-07	597905.26	7642797.45	50
Cage trap	Q1-08	597873.71	7642793.32	50
Cage trap	Q1-09	597831.36	7642771.44	50
Cage trap	Q1-10	597809.93	7642761.16	50
Cage trap	Q1-11	597776.31	7642741.44	50
Cage trap	Q1-12	597758.38	7642726.16	50

Trap type	Number	Easting	Northing	Zone
Cage trap	Q1-13	597722.98	7642720.94	50
Cage trap	Q1-14	597690.06	7642713.72	50
Cage trap	Q1-15	597669.51	7642711.97	50
Cage trap	Q1-16	597666.69	7642726.59	50
Cage trap	Q1-17	597658.44	7642768.6	50
Cage trap	Q2-01	598070.29	7642970.25	50
Cage trap	Q2-02	598097.01	7642963.44	50
Cage trap	Q2-03	598121.16	7642977.91	50
Cage trap	Q2-04	598136.07	7642990.88	50
Cage trap	Q2-05	598190.97	7643013.36	50
Cage trap	Q2-06	598214.03	7643018.09	50
Cage trap	Q2-07	598252.85	7643057.7	50
Cage trap	Q2-08	598271.76	7643061.91	50
Cage trap	Q2-09	598312.05	7643070.41	50
Cage trap	Q2-10	598336.52	7643085.65	50
Cage trap	Q2-11	598374.61	7643089.63	50
Cage trap	Q2-12	598430.13	7643111.54	50
Cage trap	Q2-13	598453.6	7643115.27	50
Cage trap	Q2-14	598485.88	7643137.22	50
Cage trap	Q2-15	598516	7643126.3	50
Cage trap	Q2-16	598555.56	7643150.52	50
Cage trap	Q2-17	598585.18	7643158.65	50
Cage trap	Q2-18	598621.75	7643169.16	50
Cage trap	Q2-19	598645.14	7643194.26	50
Cage trap	Q2-20	598694.41	7643193.96	50
Cage trap	Q2-21	598715.81	7643199.7	50
Cage trap	Q2-22	598750.19	7643224.29	50
Cage trap	Q2-23	598787.93	7643256.93	50
Cage trap	Q2-24	598801.85	7643277.11	50
Cage trap	Q3-01	595144.88	7624814.42	50
Cage trap	Q3-02	595154.16	7624824.33	50
Cage trap	Q3-03	595175.69	7624821.22	50
Cage trap	Q3-04	595193.88	7624847.68	50
Cage trap	Q3-06	595217.56	7624858.16	50
Cage trap	Q3-07	595228.07	7624900.39	50
Cage trap	Q3-08	595246.57	7624858.66	50
Cage trap	Q3-09	595264.07	7624855.68	50
Cage trap	Q3-10	595278.99	7624839.32	50
Cage trap	Q3-11	595310.71	7624858.28	50
Cage trap	Q3-12	595320.69	7624864.64	50
Cage trap	Q3-13	595300.89	7624862.76	50
Cage trap	Q3-14	595337.94	7624855.91	50
Cage trap	Q3-15	595343.35	7624859.86	50
Cage trap	Q3-16	595384.18	7624878.1	50
Cage trap	Q3-17	595406.25	7624878.97	50
Cage trap	Q3-18	595419.75	7624866.05	50
Cage trap	Q3-19	595447.61	7624899.32	50
Cage trap	Q3-20	595459.27	7624909.87	50
Cage trap	Q3-21	595445.67	7624905.3	50
Cage trap	Q3-22	595529.5	7624958.39	50
Cage trap	Q3-23	595552.9	7624955.81	50
Cage trap	Q3-24	595552.86	7624967.1	50

Trap type	Number	Easting	Northing	Zone
Cage trap	Q3-25	595549.98	7624988.82	50
Cage trap	Q3-26	595560.17	7624994.18	50
Cage trap	Q3-27	595567.2	7625026.57	50
Cage trap	Q3-28	595592.74	7625017.9	50
Cage trap	Q3-29	595598.94	7625032.36	50
Cage trap	Q3-30	595610.83	7625046.02	50
Cage trap	Q3-31	595712.47	7625028.26	50
Cage trap	Q3-32	595721.16	7625025.66	50
Cage trap	Q4-01	594935	7624140.86	50
Cage trap	Q4-02	594962.2	7624157.2	50
Cage trap	Q4-03	594988.54	7624178.41	50
Cage trap	Q4-04	595035.34	7624155	50
Cage trap	Q4-05	595073.1	7624147.25	50
Cage trap	Q4-06	595117.33	7624180.98	50
Cage trap	Q4-08	594911.39	7624148.75	50
Cage trap	Q4-09	594907.75	7624128.74	50
Cage trap	Q4-10	594875.43	7624112.88	50
Cage trap	Q4-11	594839.74	7624139.76	50
Cage trap	Q4-12	594803.99	7624138.2	50
Cage trap	Q4-13	594793.02	7624104.51	50
Cage trap	Q4-14	594767	7624095.69	50
Cage trap	Q4-15	594732.05	7624078.18	50
Cage trap	Q4-16	594820.24	7624207.07	50
Cage trap	Q4-17	594829.51	7624197.38	50
Cage trap	Q4-18	594815.93	7624161.05	50
Cage trap	Q4-19	594822.94	7624207.27	50
Cage trap	Q4-20	594722.81	7624163.25	50
Cage trap	Q4-21	594716.25	7624176.46	50
Cage trap	Q4-22	594739.78	7624178.21	50
Cage trap	Q4-23	594756.11	7624188.85	50
Cage trap	Q4-24	594764.31	7624208.95	50
Cage trap	Q4-25	594782.95	7624259.87	50
Cage trap	Q4-26	594767.18	7624274.13	50
Cage trap	Q4-27	594818.68	7624382.2	50
Cage trap	Q4-28	594731.93	7624395.43	50
Cage trap	Q4-29	594724.47	7624448.28	50
Cage trap	Q4-30	594737.5	7624461.04	50
Cage trap	Q4-31	594756.03	7624529.23	50
Cage trap	Q4-32	594766.28	7624546.11	50
Cage trap	Q4-33	594738.23	7624586.45	50
Cage trap	Q4-34	594703.97	7624610.01	50
Cage trap	Q4-35	594649.65	7624604.79	50
Cage trap	Q5-01	590179.32	7601518.63	50
Cage trap	Q5-02	590084.68	7601448.65	50
Cage trap	Q5-03	590005.7	7601422.2	50
Cage trap	Q5-04	589966.83	7601410.02	50
Cage trap	Q5-05	589919.29	7601400.54	50
Cage trap	Q5-06	589859.02	7601389.15	50
Cage trap	Q5-07	589803.39	7601376.73	50
Cage trap	Q5-08	589797.24	7601238.73	50
Cage trap	Q5-09	589700.04	7601394.46	50
Cage trap	Q5-10	589806.49	7601191.63	50

Trap type	Number	Easting	Northing	Zone
Cage trap	Q5-11	589620.59	7601284.66	50
Cage trap	Q5-12	589834.79	7601182.5	50
Cage trap	Q5-13	589507.09	7601265.7	50
Cage trap	Q5-14	589371.48	7601232.25	50
Cage trap	Q5-15	589319.44	7601213.06	50
Cage trap	Q5-16	588910.75	7600812.29	50
Cage trap	Q5-17	588970.71	7601028.48	50
Cage trap	Q5-18	588877.65	7600776.17	50
Cage trap	Q5-19	588772.28	7601010.09	50
Cage trap	Q5-20	588680.82	7600933.45	50
Cage trap	Q5-21	588708.58	7600995.83	50
Cage trap	Q5-22	588378.95	7600635.35	50
Cage trap	Q5-23	588575.4	7600821.34	50
Cage trap	Q5-24	588081.38	7600437.74	50
Cage trap	Q5-25	588474.42	7600707.55	50
Cage trap	Q5-26	587707.62	7600174.12	50
Cage trap	Q5-27	588236.12	7600565.29	50
Cage trap	Q5-28	587522.62	7600054.04	50
Cage trap	Q5-29	587919.21	7600350.41	50
Cage trap	Q5-30	587584.88	7600089.34	50

Appendix 3 Vertebrate species list from the desktop review (Phoenix 2014) and recorded during the field survey

Family	Scientific name	Common name	EPBC Threatened species	EPBC Migratory	WC Act	DEC	Birdata	EPBC Protected matters	DEC Threatened Fauna base	NatureMap	This survey
Amphibians											
Hylidae	*Cyclorana maini*	Sheep Frog								●	
Hylidae	*Litoria rubella*	Little Red Tree Frog								●	●
Limnodynastidae	*Notaden nichollsi*	Desert Spadefoot								●	
Myobatrachidae	*Pseudophryne douglasi*	Gorge Toadlet								●	
Myobatrachidae	*Uperoleia russelli*	Northwest Toadlet								●	
Myobatrachidae	*Uperoleia saxatilis*	Pilbara Toadlet								●	
Reptiles											
Agamidae	*Amphibolurus gilberti*	Ta-Ta or Gilbert's Dragon								●	
Agamidae	*Amphibolurus longirostris*	No common name								●	●
Agamidae	*Ctenophorus caudicinctus caudicinctus*	No common name								●	●
Agamidae	*Ctenophorus isolepis isolepis*	No common name								●	●
Agamidae	*Ctenophorus nuchalis*	Central Netted Dragon								●	●
Agamidae	*Ctenophorus reticulatus*	Western Netted Dragon								●	
Agamidae	*Diporiphora vescus*	Northern Pilbara Tree Dragon								●	
Agamidae	*Pogona minor minor*	No common name								●	
Agamidae	*Pogona minor mitchelli*	No common name								●	
Agamidae	*Tympanocryptis cephalus*	Pebble Dragon								●	●
Gekkonidae	*Crenadactylus ocellatus*	Clawless Gecko								●	
Gekkonidae	*Diplodactylus conspicillatus*	Fat-tailed Gecko								●	●
Gekkonidae	*Diplodactylus galaxias*	No common name								●	
Gekkonidae	*Diplodactylus mitchelli*	No common name								●	

Family	Scientific name	Common name	EPBC Threatened species	EPBC Migratory	WC Act	DEC	Birdata	EPBC Protected matters	DEC Threatened Fauna base	NatureMap	This survey
Gekkonidae	*Diplodactylus savagei*	No common name								●	
Gekkonidae	*Lucasium stenodactylum*	No common name								●	●
Gekkonidae	*Lucasium wombeyi*	No common name								●	
Gekkonidae	*Oedura marmorata*	Marbled Velvet Gecko								●	●
Gekkonidae	*Rhynchoedura ornata*	Beaked Gecko								●	●
Gekkonidae	*Strophurus elderi*	No common name								●	
Gekkonidae	*Strophurus strophurus*	No common name								●	
Gekkonidae	*Strophurus wellingtonae*	No common name								●	
Gekkonidae	*Nephrurus levis pilbarensis*	No common name								●	
Gekkonidae	*Nephrurus wheeleri cinctus*	No common name								●	
Gekkonidae	*Underwoodisaurus seorsus*	Pilbara Barking Gecko								●	
Gekkonidae	*Gehyra pilbara*	No common name								●	●
Gekkonidae	*Gehyra punctata*	No common name								●	●
Gekkonidae	*Gehyra purpurascens*	No common name								●	
Gekkonidae	*Gehyra variegata*	No common name								●	●
Gekkonidae	*Heteronotia binoei*	Bynoe's Gecko								●	●
Gekkonidae	*Heteronotia spelea*	Desert Cave Gecko								●	
Pygopodidae	*Delma butleri*	No common name								●	
Pygopodidae	*Delma elegans*	No common name								●	
Pygopodidae	*Delma nasuta*	No common name								●	
Pygopodidae	*Delma pax*	No common name								●	●
Pygopodidae	*Delma tincta*	No common name								●	
Pygopodidae	*Lialis burtonis*	No common name								●	●
Pygopodidae	*Pygopus nigriceps*	No common name								●	

Family	Scientific name	Common name	EPBC Threatened species	EPBC Migratory	WC Act	DEC	Birdata	EPBC Protected matters	DEC Threatened Fauna base	NatureMap	This survey
Scincidae	*Carlia munda*	No common name								●	●
Scincidae	*Carlia triacantha*	No common name								●	●
Scincidae	*Cryptoblepharus buchananii*	No common name								●	
Scincidae	*Cryptoblepharus plagiocephalus*	No common name								●	●
Scincidae	*Cryptoblepharus ustulatus*	No common name								●	
Scincidae	*Ctenotus angusticeps*	Airlie Island Ctenotus	VU		S1	VU		●			
Scincidae	*Ctenotus duricola*	No common name								●	
Scincidae	*Ctenotus grandis grandis*	No common name								●	
Scincidae	*Ctenotus grandis titan*	No common name								●	●
Scincidae	*Ctenotus hanloni*	No common name								●	
Scincidae	*Ctenotus helenae*	No common name								●	●
Scincidae	*Ctenotus leonhardii*	No common name								●	
Scincidae	*Ctenotus pantherinus ocellifer*	No common name								●	●
Scincidae	*Ctenotus robustus*	No common name								●	
Scincidae	*Ctenotus rubicundus*	No common name								●	
Scincidae	*Ctenotus rutilans*	No common name								●	
Scincidae	*Ctenotus saxatilis*	Rock Ctenotus								●	●
Scincidae	*Ctenotus schomburgkii*	No common name								●	
Scincidae	*Ctenotus serventyi*	No common name								●	
Scincidae	*Ctenotus severus*	No common name								●	
Scincidae	*Ctenotus uber uber*	No common name								●	
Scincidae	*Cyclodomorphus melanops melanops*	No common name								●	●
Scincidae	*Egernia cygnitos*	Western Pilbara Spiny-tailed Skink								●	

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Scincidae	*Egernia epsisolus*	Eastern Pilbara Spiny-tailed Skink								●	
Scincidae	*Egernia formosa*	No common name								●	
Scincidae	*Egernia pilbarensis*	Pilbara Skink								●	
Scincidae	*Eremiascincus isolepis*	No common name								●	
Scincidae	*Eremiascincus musivus*	Mosaic Desert Skink								●	
Scincidae	*Eremiascincus pallidus*	Western Sand-swimming Skink								●	
Scincidae	*Eremiascincus richardsonii*	Broad-banded Sand Swimmer								●	
Scincidae	*Lerista bipes*	No common name								●	●
Scincidae	*Lerista clara*	No common name								●	
Scincidae	*Lerista flammicauda*	No common name								●	
Scincidae	*Lerista jacksoni*	No common name								●	
Scincidae	*Lerista muelleri*	No common name								●	●
Scincidae	*Lerista timida*	No common name								●	
Scincidae	*Lerista verhmens*	No common name								●	
Scincidae	*Lerista zietzi*	No common name								●	
Scincidae	*Menetia greyii*	No common name								●	●
Scincidae	*Menetia surda surda*	No common name								●	
Scincidae	*Morethia ruficauda exquisita*	No common name								●	●
Scincidae	*Notoscincus butleri*	Lined Soil-crevice Skink				P4			●	●	●
Scincidae	*Notoscincus ornatus ornatus*	No common name								●	●
Scincidae	*Proablepharus reginae*	No common name								●	●
Scincidae	*Tiliqua multifasciata*	Central Blue-tongue								●	●
Varanidae	*Varanus acanthurus*	Spiny-tailed Monitor								●	●
Varanidae	*Varanus brevicauda*	Short-tailed Pygmy Monitor								●	●

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Varanidae	*Varanus bushi*	Pilbara Mulga Monitor								●	
Varanidae	*Varanus caudolineatus*	No common name								●	
Varanidae	*Varanus eremius*	Pygmy Desert Monitor								●	●
Varanidae	*Varanus gilleni*	Pygmy Mulga Monitor								●	
Varanidae	*Varanus gouldii*	Bungarra or Sand Monitor								●	●
Varanidae	*Varanus panoptes rubidus*	No common name								●	●
Varanidae	*Varanus pilbarensis*	Pilbara Rock Monitor								●	●
Varanidae	*Varanus tristis tristis*	Racehorse Monitor								●	●
Typhlopidae	*Anilios ammodytes*	No common name								●	
Typhlopidae	*Anilios ganei*	No common name				P1				●	
Typhlopidae	*Anilios grypus*	No common name								●	
Typhlopidae	*Anilios hamatus*	No common name								●	
Typhlopidae	*Anilios pilbarensis*	No common name								●	
Boidae	*Antaresia perthensis*	Pygmy Python								●	
Boidae	*Antaresia stimsoni*	Stimson's Python								●	●
Boidae	*Aspidites melanocephalus*	Black-headed Python								●	
Boidae	*Liasis olivaceus barroni*	Pilbara Olive Python	VU		S1	VU		●	●	●	
Elapidae	*Acanthophis pyrrhus*	Desert Death Adder								●	
Elapidae	*Acanthophis wellsi*	Pilbara Death Adder								●	
Elapidae	*Brachyurophis approximans*	No common name								●	
Elapidae	*Demansia psammophis cupreiceps*	No common name								●	
Elapidae	*Demansia rufescens*	Rufous Whipsnake								●	
Elapidae	*Furina ornata*	Moon Snake								●	
Elapidae	*Parasuta monachus*	No common name								●	

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Elapidae	*Pseudechis australis*	Mulga Snake								●	
Elapidae	*Pseudonaja mengdeni*	Western Brown Snake								●	
Elapidae	*Pseudonaja modesta*	Ringed Brown Snake								●	
Elapidae	*Suta fasciata*	Rosen's Snake								●	
Elapidae	*Suta punctata*	Spotted Snake								●	
Elapidae	*Vermicella snelli*	No common name								●	
Birds											
Casuariidae	*Dromaius novaehollandiae*	Emu					●			●	●
Phasianidae	*Coturnix pectoralis*	Stubble Quail					●			●	
Phasianidae	*Coturnix ypsilophora*	Brown Quail					●			●	●
Anatidae	*Dendrocygna eytoni*	Plumed Whistling-Duck					●			●	
Anatidae	*Cygnus atratus*	Black Swan					●			●	●
Anatidae	*Chenonetta jubata*	Australian Wood Duck					●			●	
Anatidae	*Malacorhynchus membranaceus*	Pink-eared Duck					●				
Anatidae	*Anas gracilis*	Grey Teal					●			●	
Anatidae	*Anas superciliosa*	Pacific Black Duck					●			●	●
Anatidae	*Aythya australis*	Hardhead					●			●	
Podicipedidae	*Tachybaptus novaehollandiae*	Australasian Grebe					●			●	
Podicipedidae	*Podiceps cristatus*	Great Crested Grebe					●			●	
Columbidae	*Columba livia*	Rock Dove						●			
Columbidae	*Phaps chalcoptera*	Common Bronzewing					●			●	●
Columbidae	*Phaps histrionica*	Flock Bronzewing				P4			●	●	
Columbidae	*Ocyphaps lophotes*	Crested Pigeon					●			●	●
Columbidae	*Geophaps plumifera*	Spinifex Pigeon					●			●	●

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Columbidae	*Geopelia cuneata*	Diamond Dove					●			●	●
Columbidae	*Geopelia striata*	Peaceful Dove					●			●	
Columbidae	*Geopelia humeralis*	Bar-shouldered Dove								●	
Podargidae	*Podargus strigoides*	Tawny Frogmouth					●			●	
Eurostopodidae	*Eurostopodus argus*	Spotted Nightjar					●			●	●
Aegothelidae	*Aegotheles cristatus*	Australian Owlet-nightjar					●			●	●
Apodidae	*Apus pacificus*	Fork-tailed Swift		●	S3			●	●	●	
Porcellariidae	*Macronectes giganteus*	Southern Giant-Petrel	EN	●	S1	EN		●			
Porcellariidae	*Puffinus apacificus*	Wedge-tailed Shearwater		●	S3				●	●	
Anhingidae	*Anhinga novaehollandiae*	Australasian Darter					●			●	
Phalacrocoracidae	*Microcarbo melanoleucos*	Little Pied Cormorant					●				●
Phalacrocoracidae	*Phalacrocorax carbo*	Great Cormorant					●				
Phalacrocoracidae	*Phalacrocorax sulcirostris*	Little Black Cormorant					●			●	
Phalacrocoracidae	*Phalacrocorax varius*	Pied Cormorant					●			●	
Pelecanidae	*Pelecanus conspicillatus*	Australian Pelican					●			●	●
Ciconiidae	*Ephippiorhynchus asiaticus*	Black-necked Stork					●			●	
Ardeidae	*Ixobrychus flavicollis*	Black Bittern				P3	●			●	
Ardeidae	*Ardea pacifica*	White-necked Heron					●			●	●
Ardeidae	*Ardea modesta*	Eastern Great Egret		●	S3		●	●	●	●	
Ardeidae	*Ardea intermedia*	Intermediate Egret					●			●	
Ardeidae	*Ardea ibis*	Cattle Egret		●	S3			●			
Ardeidae	*Butorides striata*	Striated Heron								●	
Ardeidae	*Egretta novaehollandiae*	White-faced Heron					●			●	●
Ardeidae	*Egretta garzetta*	Little Egret					●			●	●

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Ardeidae	*Egretta sacra*	Eastern Reef Egret		●	S3				●	●	
Ardeidae	*Nycticorax caledonicus*	Nankeen Night-Heron					●			●	●
Threskiornithidae	*Plegadis falcinellus*	Glossy Ibis		●	S3		●		●	●	
Threskiornithidae	*Threskiornis molucca*	Australian White Ibis					●			●	
Threskiornithidae	*Threskiornis spinicollis*	Straw-necked Ibis					●			●	
Threskiornithidae	*Platalea regia*	Royal Spoonbill					●			●	
Threskiornithidae	*Platalea flavipes*	Yellow-billed Spoonbill					●			●	
Accipitridae	*Pandion cristatus*	Eastern Osprey		●			●	●		●	
Accipitridae	*Elanus axillaris*	Black-shouldered Kite					●			●	
Accipitridae	*Lophoictinia isura*	Square-tailed Kite					●			●	
Accipitridae	*Hamirostra melanosternon*	Black-breasted Buzzard								●	
Accipitridae	*Haliaeetus leucogaster*	White-bellied Sea-Eagle		●	S3		●	●	●	●	
Accipitridae	*Haliastur sphenurus*	Whistling Kite					●			●	
Accipitridae	*Haliastur indus*	Brahminy Kite								●	
Accipitridae	*Milvus migrans*	Black Kite					●			●	●
Accipitridae	*Accipiter fasciatus*	Brown Goshawk					●			●	●
Accipitridae	*Accipiter cirrocephalus*	Collared Sparrowhawk					●			●	
Accipitridae	*Accipiter novaehollandiae*	Grey Goshawk									
Accipitridae	*Circus assimilis*	Spotted Harrier					●			●	●
Accipitridae	*Circus approximans*	Swamp Harrier					●			●	●
Accipitridae	*Aquila audax*	Wedge-tailed Eagle					●			●	●
Accipitridae	*Hieraaetus morphnoides*	Little Eagle					●			●	●
Falconidae	*Falco cenchroides*	Nankeen Kestrel					●			●	●
Falconidae	*Falco berigora*	Brown Falcon					●			●	●

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Falconidae	*Falco longipennis*	Australian Hobby					●			●	●
Falconidae	*Falco hypoleucos*	Grey Falcon				P4	●		●	●	
Falconidae	*Falco peregrinus*	Peregrine Falcon			S4	SP	●		●	●	
Gruidae	*Grus rubicunda*	Brolga					●			●	
Rallidae	*Porphyrio porphyrio*	Purple Swamphen					●			●	
Rallidae	*Gallirallus philippensis*	Buff-banded Rail								●	
Rallidae	*Porzana fluminea*	Australian Spotted Crake								●	
Rallidae	*Porzana tabuensis*	Spotless Crake								●	
Rallidae	*Tribonyx ventralis*	Black-tailed Native-hen					●			●	
Rallidae	*Fulica atra*	Eurasian Coot					●			●	
Otididae	*Ardeotis australis*	Australian Bustard				P4	●		●	●	●
Burhinidae	*Burhinus grallarius*	Bush Stone-curlew				P4	●		●	●	
Burhinidae	*Esacus magnirostris*	Beach Stone-curlew								●	
Haematopodidae	*Haematopus longirostris*	Australian Pied Oystercatcher								●	
Haematopodidae	*Haematopus fuliginosus ophtalmicus*	Sooty Oystercatcher								●	
Recurvirostridae	*Himantopus himantopus*	Black-winged Stilt					●			●	
Recurvirostridae	*Recurvirostra novaehollandiae*	Red-necked Avocet								●	
Recurvirostridae	*Cladorhynchus leucocephalus*	Banded Stilt								●	
Charadriidae	*Pluvialis fulva*	Pacific Golden Plover		●	S3				●	●	
Charadriidae	*Charadrius ruficapillus*	Red-capped Plover								●	
Charadriidae	*Charadrius bicinctus*	Double-banded Plover									
Charadriidae	*Charadrius mongolus*	Lesser Sand Plover		●	S3				●	●	
Charadriidae	*Charadrius leschenaultii*	Greater Sand Plover		●	S3				●	●	

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Charadriidae	*Charadrius veredus*	Oriental Plover		●	S3			●		●	
Charadriidae	*Elseyornis melanops*	Black-fronted Dotterel					●			●	●
Charadriidae	*Erythrogonys cinctus*	Red-kneed Dotterel								●	
Charadriidae	*Vanellus tricolor*	Banded Lapwing					●			●	
Rostratulidae	*Rostratula australis*	Australian Painted Snipe	EN	●	S1-S3	EN		●			
Scolopacidae	*Limosa limosa*	Black-tailed Godwit		●	S3				●	●	
Scolopacidae	*Limosa lapponica*	Bar-tailed Godwit		●	S3	S1-S3			●	●	
Scolopacidae	*Numenius phaeopus*	Whimbrel		●	S3				●	●	
Scolopacidae	*Numenius madagascariensis*	Eastern Curlew		●	S3	VU			●	●	
Scolopacidae	*Xenus cinereus*	Terek Sandpiper		●	S3				●	●	
Scolopacidae	*Actitis hypoleucos*	Common Sandpiper		●	S3		●		●	●	
Scolopacidae	*Heteroscelus brevipes*	Grey-tailed Tattler		●	S3				●	●	
Scolopacidae	*Tringa nebularia*	Common Greenshank		●	S3				●	●	
Scolopacidae	*Tringa stagnatilis*	Marsh Sandpiper		●	S3				●	●	
Scolopacidae	*Tringa glareola*	Wood Sandpiper		●	S3		●		●	●	
Scolopacidae	*Arenaria interpres*	Ruddy Turnstone		●	S3				●	●	
Scolopacidae	*Calidris tenuirostris*	Great Knot		●	S1-S3	VU			●	●	
Scolopacidae	*Calidris canutus*	Red Knot		●	S1-S3	VU			●	●	
Scolopacidae	*Calidris alba*	Sanderling		●	S3				●	●	
Scolopacidae	*Calidris ruficollis*	Red-necked Stint		●	S3				●	●	
Scolopacidae	*Calidris subminuta*	Long-toed Stint		●	S3				●	●	

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Scolopacidae	*Calidris melanotos*	Pectoral Sandpiper		●	S3				●	●	
Scolopacidae	*Calidris acuminata*	Sharp-tailed Sandpiper		●	S3				●	●	
Scolopacidae	*Calidris ferruginea*	Curlew Sandpiper		●	S1-S3	VU			●	●	
Scolopacidae	*Limicola falcinellus*	Broad-billed Sandpiper		●	S3				●	●	
Turnicidae	*Turnix velox*	Little Button-quail					●			●	
Glareolidae	*Glareola maldivarum*	Oriental Pratincole		●	S3		●	●	●	●	
Glareolidae	*Stiltia isabella*	Australian Pratincole								●	
Laridae	*Sternula albifrons*	Little Tern		●	S3					●	
Laridae	*Gelochelidon nilotica*	Gull-billed Tern					●			●	
Laridae	*Sterna caspia*	Caspian Tern		●	S3		●		●	●	
Laridae	*Chlidonias hybrida*	Whiskered Tern					●			●	
Laridae	*Sterna dougallii*	Roseate Tern		●	S3				●	●	
Laridae	*Sterna hirundo*	Common Tern		●	S3				●	●	
Laridae	*Thalasseus bengalensis*	Lesser Crested Tern		●	S3				●	●	
Laridae	*Thalasseus bergii*	Crested Tern								●	
Laridae	*Chroicocephalus novaehollandiae*	Silver Gull								●	
Cacatuidae	*Eolophus roseicapillus*	Galah					●			●	●
Cacatuidae	*Cacatua sanguinea*	Little Corella					●			●	●
Cacatuidae	*Nymphicus hollandicus*	Cockatiel					●			●	●
Psittacidae	*Barnardius zonarius*	Australian Ringneck					●			●	●
Psittacidae	*Psephotus varius*	Mulga Parrot					●				
Psittacidae	*Melopsittacus undulatus*	Budgerigar					●			●	●
Psittacidae	*Neopsephotus bourkii*	Bourke's Parrot					●			●	

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Cuculidae	*Centropus phasianinus*	Pheasant Coucal					●			●	
Cuculidae	*Chalcites basalis*	Horsfield's Bronze-Cuckoo					●			●	
Cuculidae	*Cacomantis pallidus*	Pallid Cuckoo					●			●	
Strigidae	*Ninox connivens peninsularis*	Barking Owl (Pilbara)					●			●	
Strigidae	*Ninox novaeseelandiae*	Southern Boobook					●			●	
Tytonidae	*Tyto javanica*	Eastern Barn Owl					●				
Halcyonidae	*Dacelo leachii*	Blue-winged Kookaburra					●			●	●
Halcyonidae	*Todiramphus pyrrhopygius*	Red-backed Kingfisher					●			●	●
Halcyonidae	*Todiramphus sanctus*	Sacred Kingfisher					●			●	●
Halcyonidae	*Todiramphus chloris*	Collared Kingfisher					●			●	
Meropidae	*Merops ornatus*	Rainbow Bee-eater		●	S3		●	●	●	●	●
Climacteridae	*Climacteris melanura*	Black-tailed Treecreeper					●			●	
Ptilonorhynchidae	*Ptilonorhynchus guttatus*	Western Bowerbird					●			●	●
Maluridae	*Malurus leucopterus*	White-winged Fairy-wren					●			●	
Maluridae	*Malurus lamberti*	Variegated Fairy-wren					●			●	●
Maluridae	*Stipiturus ruficeps*	Rufous-crowned Emu-wren					●			●	
Maluridae	*Amytornis striatus whitei*	Striated Grasswren (Pilbara)					●			●	
Acanthizidae	*Pyrrholaemus brunneus*	Redthroat					●				
Acanthizidae	*Smicrornis brevirostris*	Weebill					●			●	●
Acanthizidae	*Gerygone fusca*	Western Gerygone					●			●	
Acanthizidae	*Gerygone tenebrosa*	Dusky Gerygone								●	
Acanthizidae	*Acanthiza robustirostris*	Slaty-backed Thornbill								●	
Acanthizidae	*Acanthiza chrysorrhoa*	Yellow-rumped Thornbill					●			●	
Acanthizidae	*Acanthiza uropygialis*	Chestnut-rumped Thornbill					●			●	

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Acanthizidae	*Acanthiza apicalis*	Inland Thornbill					●			●	
Pardalotidae	*Pardalotus rubricatus*	Red-browed Pardalote					●			●	●
Pardalotidae	*Pardalotus striatus*	Striated Pardalote					●			●	●
Meliphagidae	*Certhionyx variegatus*	Pied Honeyeater								●	
Meliphagidae	*Lichenostomus virescens*	Singing Honeyeater					●			●	●
Meliphagidae	*Lichenostomus keartlandi*	Grey-headed Honeyeater					●			●	●
Meliphagidae	*Lichenostomus plumulus*	Grey-fronted Honeyeater								●	
Meliphagidae	*Lichenostomus penicillatus*	White-plumed Honeyeater					●			●	●
Meliphagidae	*Manorina flavigula*	Yellow-throated Miner					●			●	●
Meliphagidae	*Acanthagenys rufogularis*	Spiny-cheeked Honeyeater					●			●	
Meliphagidae	*Conopophila whitei*	Grey Honeyeater								●	
Meliphagidae	*Epthianura tricolor*	Crimson Chat					●			●	
Meliphagidae	*Sugomel niger*	Black Honeyeater					●			●	
Meliphagidae	*Lichmera indistincta*	Brown Honeyeater					●			●	●
Meliphagidae	*Melithreptus gularis*	Black-chinned Honeyeater					●			●	
Pomatostomatidae	*Pomatostomus temporalis*	Grey-crowned Babbler					●			●	●
Pomatostomatidae	*Pomatostomus superciliosus*	White-browed Babbler					●				
Neosittidae	*Daphoenositta chrysoptera*	Varied Sittella					●			●	
Campephagidae	*Coracina maxima*	Ground Cuckoo-shrike								●	
Campephagidae	*Coracina novaehollandiae*	Black-faced Cuckoo-shrike					●			●	●
Campephagidae	*Lalage sueurii*	White-winged Triller					●			●	●
Pachycephalidae	*Pachycephala melanura*	Mangrove Golden Whistler								●	
Pachycephalidae	*Pachycephala rufiventris*	Rufous Whistler					●			●	●
Pachycephalidae	*Pachycephala lanioides*	White-breasted Whistler								●	

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Pachycephalidae	*Colluricincla harmonica*	Grey Shrike-thrush					●			●	●
Pachycephalidae	*Oreoica gutturalis pallescens*	Crested Bellbird					●			●	
Artamidae	*Artamus leucorhynchus*	White-breasted Woodswallow					●			●	
Artamidae	*Artamus personatus*	Masked Woodswallow					●			●	●
Artamidae	*Artamus superciliosus*	White-browed Woodswallow					●			●	
Artamidae	*Artamus cinereus*	Black-faced Woodswallow								●	
Artamidae	*Artamus minor*	Little Woodswallow					●			●	●
Artamidae	*Cracticus torquatus*	Grey Butcherbird					●			●	
Artamidae	*Cracticus nigrogularis*	Pied Butcherbird					●			●	●
Artamidae	*Cracticus tibicen*	Australian Magpie					●			●	●
Rhipiduridae	*Rhipidura albiscapa*	Grey Fantail								●	
Rhipiduridae	*Rhipidura phasiana*	Mangrove Grey Fantail								●	
Rhipiduridae	*Rhipidura leucophrys*	Willie Wagtail					●			●	●
Corvidae	*Corvus bennetti*	Little Crow					●			●	
Corvidae	*Corvus orru*	Torresian Crow					●			●	●
Monarchidae	*Grallina cyanoleuca*	Magpie-lark					●			●	●
Petroicidae	*Petroica goodenovii*	Red-capped Robin					●			●	
Petroicidae	*Melanodryas cucullata*	Hooded Robin					●			●	●
Petroicidae	*Peneonanthe pulverulenta*	Mangrove Robin								●	
Alaudidae	*Mirafra javanica*	Horsfield's Bushlark					●			●	●
Acrocephalidae	*Acrocephalus australis*	Australian Reed-Warbler					●			●	
Megaluridae	*Megalurus gramineus*	Little Grassbird					●			●	
Megaluridae	*Cincloramphus mathewsi*	Rufous Songlark					●			●	
Megaluridae	*Cincloramphus cruralis*	Brown Songlark					●			●	

Family	Scientific name	Common name	EPBC Threatened species	EPBC Migratory	WC Act	DEC	Birdata	EPBC Protected matters	DEC Threatened Fauna base	NatureMap	This survey
Megaluridae	*Eremiornis carteri*	Spinifexbird					●			●	●
Timaliidae	*Zosterops luteus*	Yellow White-eye					●			●	
Hirundinidae	*Hirundo rustica*	Barn Swallow		●	S3			●			
Hirundinidae	*Hirundo neoxena*	Welcome Swallow					●			●	
Hirundinidae	*Petrochelidon ariel*	Fairy Martin					●			●	●
Hirundinidae	*Petrochelidon nigricans*	Tree Martin					●			●	●
Nectariniidae	*Dicaeum hirundinaceum*	Mistletoebird					●			●	
Estrildidae	*Taeniopygia guttata*	Zebra Finch					●			●	●
Estrildidae	*Neochmia ruficauda subclarescens*	Star Finch				P4	●			●	
Estrildidae	*Emblema pictum*	Painted Finch					●			●	●
Passeridae	*Passer montanus*	Eurasian Tree Sparrow						●			
Motacillidae	*Anthus novaeseelandiae*	Australasian Pipit					●			●	
Mammals											
Tachyglossidae	*Tachyglossus aculeatus*	Echidna									●
Dasyuridae	*Dasykaluta rosamondae*	Little Red Kaluta								●	
Dasyuridae	*Dasyurus hallucatus*	Northern Quoll	EN		S1	EN		●	●	●	●
Dasyuridae	*Ningaui timealeyi*	Pilbara Ningaui								●	●
Dasyuridae	*Planigale* sp.	Planigale sp.								●	
Dasyuridae	*Pseudantechinus woolleyae*	Woolley's Pseudantechinus								●	
Dasyuridae	*Pseudantechinus* sp.	Pseudantechinus sp.									●
Dasyuridae	*Sminthopsis hirtipes*	Hairy-footed Dunnart								●	
Dasyuridae	*Sminthopsis longicaudata*	Long-tailed Dunnart				P4			●	●	
Dasyuridae	*Sminthopsis macroura*	Stripe-faced Dunnart								●	
Dasyuridae	*Sminthopsis youngsoni*	Lesser Hairy-footed Dunnart								●	

Family	Scientific name	Common name	EPBC Threatened species	EPBC Migratory	WC Act	DEC	Birdata	EPBC Protected matters	DEC Threatened Fauna base	NatureMap	This survey
Thylacomyidae	*Macrotis lagotis*	Greater Bilby	VU		S1	VU		●			
Notoryctidae	*Notoryctes caurinus*	Northern Marsupial Mole	EN		S1	EN		●			
Macropodidae	*Lagorchestes conspicillatus leichardti*	Spectacled Hare-wallaby				P3			●	●	
Macropodidae	*Macropus robustus erubescens*	Euro								●	●
Macropodidae	*Macropus rufus*	Red Kangaroo								●	
Macropodidae	*Petrogale lateralis lateralis*	Black-flanked Rock-wallaby	VU		S1	VU			●	●	
Macropodidae	*Petrogale rothschildi*	Rothschild's Rock-wallaby								●	●
Phalangeridae	*Trichosurus vulpecula arnhemensis*	Northern Brushtail Possum								●	
Pteropodidae	*Pteropus alecto*	Black Flying-fox								●	
Megadermatidae	*Macroderma gigas*	Ghost Bat				P4			●	●	
Hipposideridae	*Rhinonicteris aurantius*	Orange Leaf-nosed Bat	VU		S1	VU		●	●	●	
Emballonuridae	*Saccolaimus flaviventris*	Yellow-bellied Sheath-tail Bat								●	●
Emballonuridae	*Taphozous georgianus*	Common Sheath-tail Bat								●	●
Emballonuridae	*Taphozous hilli*	Hill's Sheath-tail Bat								●	
Vespertilionidae	*Chalinolobus gouldii*	Gould's Wattled Bat								●	●
Vespertilionidae	*Nyctophilus arnhemensis*	Arnhem Land Long-eared Bat								●	
Vespertilionidae	*Nyctophilus geoffroyi*	Lesser Long-eared Bat								●	
Vespertilionidae	*Scotorepens greyii*	Little Broad-nosed Bat								●	●
Vespertilionidae	*Vespadelus finlaysoni*	Finlayson's Cave Bat								●	●
Molossidae	*Chaerephon jobensis*	Northern Freetail Bat								●	●
Molossidae	*Mormopterus beccarii*	Beccari's Freetail Bat								●	●
Molossidae	*Mormopterus loriae*	Little Northern Freetail Bat								●	
Molossidae	*Tadarida australis*	White-striped Freetail Bat								●	

Family	Scientific name	Common name	EPBC Threatened species	EPBC Migratory	WC Act	DEC	Birdata	EPBC Protected matters	DEC Threatened Fauna base	NatureMap	This survey
Muridae	*Hydromys chrysogaster*	Water Rat				P4			●	●	
Muridae	*Leggadina lakedownensis*	Short-tailed Mouse				P4			●	●	
Muridae	*Mus musculus*	House Mouse						●		●	
Muridae	*Notomys alexis*	Spinifex Hopping-mouse									●
Muridae	*Pseudomys chapmani*	Western Pebble-mound Mouse				P4			●	●	●
Muridae	*Pseudomys delicatulus*	Delicate Mouse								●	
Muridae	*Pseudomys desertor*	Desert Mouse								●	●
Muridae	*Pseudomys hermannsburgensis*	Sandy Inland Mouse								●	
Muridae	*Rattus rattus*	Black Rat						●		●	
Muridae	*Zyzomys argurus*	Common Rock-rat								●	●
Leporidae	*Oryctolagus cuniculus*	Rabbit						●			
Canidae	*Canis* sp.	Dog/Dingo									●
Canidae	*Canis dingo*	Dingo								●	
Canidae	*Canis familiaris*	Dog						●		●	
Canidae	*Vulpes vulpes*	Red Fox						●		●	●
Felidae	*Felis catus*	Cat						●		●	●
Mustelidae	*Equus asinus*	Donkey						●			
Mustelidae	*Equus caballus*	Horse						●		●	
Camelidae	*Camelus dromedarius*	Camel						●			●
Bovidae	*Bos taurus*	European Cattle								●	●

Appendix 4 Short-range endemic invertebrates identified in the desktop review

WAM reg. no. (or other data source)	Family	Genus and species	Species author	Location (as provided by data source)	Easting (zone 50)	Northing (zone 50)	SRE rating
Order Araneae (spiders)							
Infraorder Araneomorphae (modern spiders)							
T121120	Oonopidae	*Opopaea billroth*	Baehr & Harvey, 2013	5 km WSW. of Python Pool site PW03	519598	7640067	confirmed
T81731	Oonopidae	*Opopaea billroth*	Baehr & Harvey, 2013	12 km ESE. of Mt Billroth Pilbara Biological Survey site PE10	572943	7604363	confirmed
T82090	Oonopidae	*Opopaea julianneae*	Baehr & Ott, 2013	1.2 km SSE. of Millstream Pilbara Biological Survey site PW08	507970	7610980	confirmed
T121107	Oonopidae	*Opopaea millstream*	Baehr & Harvey, 2013	1.2 km SSE. of Millstream site PW08	507970	7610980	confirmed
T121108	Oonopidae	*Opopaea millstream*	Baehr & Harvey, 2013	1.2 km SSE. of Millstream site PW08	507970	7610980	confirmed
T81936	Oonopidae	*Opopaea millstream*	Baehr & Harvey, 2013	1.2 km SSE. of Millstream Pilbara Biological Survey site PW08	507970	7610980	confirmed
T82116	Oonopidae	*Opopaea millstream*	Baehr & Harvey, 2013	5 km WSW. of Python Pool Pilbara Biological Survey site PW03	519598	7640067	confirmed
T130238	Oonopidae	*Opopaea whim*	Baehr & Harvey, 2013	11 km SSE. of Whim Creek Hotel site DRE10	589533	7686488	potential
T81937	Oonopidae	*Opopaea whim*	Baehr & Harvey, 2013	10 km S. of Mallina Homestead Pilbara Biological Survey site DRE13	608944	7680871	potential
T81986	Oonopidae	*Opopaea whim*	Baehr & Harvey, 2013	11 km SSE. of Whim Creek Hotel Pilbara Biological Survey site DRE10	589533	7686488	potential
T79393	Selenopidae	*Karaops ngarluma*	Crews, 2013	9 km NW. of Lake Poongkaliyarra Pilbara Survey site DRC5	503639	7684492	confirmed
T79394	Selenopidae	*Karaops ngarluma*	Crews, 2013	5 km N. of Lake Poongkaliyarra Pilbara Survey site DRC7	511957	7685086	confirmed
T79396	Selenopidae	*Karaops ngarluma*	Crews, 2013	8 km SW. of Roebourne Pilbara Survey site DRC9	507596	7699100	confirmed
T79405	Selenopidae	*Karaops yindjibarndi*	Crews, 2013	6 km N. of Millstream Pilbara Survey site PW11	505902	7618064	confirmed
T132486	Selenopidae	*Karaops yurlburr*	Crews, 2013	2.3 km ESE. of Python Pool site PW01	526960	7640234	confirmed
T132487	Selenopidae	*Karaops yurlburr*	Crews, 2013	2.3 km ESE. of Python Pool site PW01	526960	7640234	confirmed
T79403	Selenopidae	*Karaops yurlburr*	Crews, 2013	2.3 km ESE. of Python Pool Pilbara Survey site PW1	526960	7640234	confirmed
T114678	Selenopidae	*Karaops* sp. indet.		Karratha to Millstream-Chichester National Park	504670	7654831	potential
T79395	Selenopidae	*Karaops* sp. indet.		3.5 km WNW. of Mt Gregory Pilbara Survey site DRC8	509987	7694162	potential
T79398	Selenopidae	*Karaops* sp. indet.		10 km S. of Mallina Homestead Pilbara Survey site DRE13	608944	7680871	potential

WAM reg. no. (or other data source)	Family	Genus and species	Species author	Location (as provided by data source)	Easting (zone 50)	Northing (zone 50)	SRE rating
T79402	Selenopidae	*Karaops* sp. indet.		67.5 km S. of Fortescue River Crossing on Dampier-Paraburdoo Railway Pilbara Survey site PE12	571504	7560458	potential
T79404	Selenopidae	*Karaops* sp. indet.		5 km WSW. of Python Pool Pilbara Survey site PW3	519598	7640067	potential
T92502	Selenopidae	*Karaops* sp. indet.		Mt Herbert 80.5 km SE. of Karratha A20080811.CH01-02	527788	7639458	potential
T92504	Selenopidae	*Karaops* sp. indet.		Mt Herbert 80.5 km SE. of Karratha A20080811.CH01-01	527788	7639458	potential
T92505	Selenopidae	*Karaops* sp. indet.		Wickham 54.2 km E. of Karratha A20080813CH09-01	535570	7690077	potential
T100075	Selenopidae	*Karaops* sp. indet.		Nammuldi-Silvergrass 584 km NW. of Tom Price	532526	7522930	potential
T124798	Selenopidae	*Karaops* sp. indet.		~4km 299° from Mt Farquhar site 999-D12	472701	7535570	potential
T124800	Selenopidae	*Karaops* sp. indet.		~13.3km ENE. Mt Farquhar site 999-F5	488874	7535855	potential
T124803	Selenopidae	*Karaops* sp. indet.		7.5km WSW. Mt Brockman site 999-E9	524483	7513857	potential
T124807	Selenopidae	*Karaops* sp. indet.		6.5km WSW. Mt Brockman site 999-E7	524998	7514542	potential
T124808	Selenopidae	*Karaops* sp. indet.		~21km 167° from Mt Farquhar site 999-E5	480558	7513853	potential
T124809	Selenopidae	*Karaops* sp. indet.		7.5km WSW. Mt Brockman site 999-E9	524483	7513857	potential
T124811	Selenopidae	*Karaops* sp. indet.		6.5km Brockman site 999-E7	524998	7514542	potential
T124812	Selenopidae	*Karaops* sp. indet.		~21km 167° from Mt Farquhar site 999-E5	480558	7513853	potential
T124792	Selenopidae	*Karaops* sp. indet.		~24km 154° from Mt Farquhar site 999-E6	486422	7512564	potential
Infraorder Mygalomorphae (trapdoor spiders)							
T97323	Actinopodidae	*Missulena* MYG110'		Millstream-Chichester National Park 6 km N. of Millstream homestead site PW11	505902	7618064	potential
T125327	Actinopodidae	*Missulena* sp. indet.		Koodaideri Western Corridor 215.8 km NW. of Newman	614265	7551759	potential
T102133	Actinopodidae	*Missulena* sp. indet.		Serenity Valley ca. 93 km N. of Tom Price Serenity site 3	557433	7550177	potential
T112315	Actinopodidae	*Missulena* sp. indet.		60 km N. of Tom Price	539325	7525073	potential
T103010	Barychelidae	*Aurecocrypta* MYG237'		Zion site 6 ca. 63 km N. of Tom Price	599669	7543434	potential
T120075	Barychelidae	*Aurecocrypta* MYG246'		29.4km NE of Tom Price	600093	7513230	potential
T131540	Barychelidae	*Aurecocrypta* sp. indet.		ca. 40 km NE. of Tom Price	596508	7532372	potential
T125328	Barychelidae	*Idiommata* MYG247'		Koodaideri Western Corridor 231.2 km NW. of Newman	603101	7563726	potential
T125335	Barychelidae	*Idiommata* MYG247'		Koodaideri Western Corridor 262.6 km NW. of Newman	572082	7574049	potential
T99602	Barychelidae	*Idiommata* MYG247'		Emu Siding to Rosella 101 km NNW. of Tom Price	560364	7588764	potential
T102141	Barychelidae	*Synothele* sp. indet.		Zion ca. 60 km N. of Tom Price Zion site 8	598859	7545686	potential
T103008	Barychelidae	*Synothele* sp. indet.		Zion site 2 ca. 63 km N. of Tom Price	597309	7545187	potential
T103013	Barychelidae	*Synothele* sp. indet.		Zion site 4 ca. 63 km N. of Tom Price	597517	7545385	potential
T103016	Barychelidae	*Synothele* sp. indet.		Serenity Valley site 15 ca. 93 km N. of Tom Price	564123	7547140	potential
T117867	Barychelidae	*Synothele* sp. indet.		4.9 km W. of Roebourne	510618	7704997	potential
T102135	Barychelidae	*Synothele* sp. indet.		Karijini NP ca. 60 km N. of Tom Price Karijini site 4	600275	7541448	potential

WAM reg. no. (or other data source)	Family	Genus and species	Species author	Location (as provided by data source)	Easting (zone 50)	Northing (zone 50)	SRE rating
T102136	Barychelidae	*Synothele* sp. indet.		Zion ca. 60 km N. of Tom Price Zion site 2	596995	7544380	potential
T102137	Barychelidae	*Synothele* sp. indet.		Zion ca. 60 km N. of Tom Price Zion site 1	597192	7542951	potential
T102138	Barychelidae	*Synothele* sp. indet.		Zion ca. 60 km N. of Tom Price Zion site 9	598859	7545686	potential
T102139	Barychelidae	*Synothele* sp. indet.		Serenity Valley ca. 93 km N. of Tom Price Serenity site 12	556907	7547279	potential
T102140	Barychelidae	*Synothele* sp. indet.		Karijini NP ca. 60 km N. of Tom Price Karijini site 14	607896	7540600	potential
T103009	Barychelidae	*Synothele* sp. indet.		Karijini NP site 1 ca. 60 km N. of Tom Price	600873	7538267	potential
T103015	Barychelidae	*Synothele* sp. indet.		Zion site 7 ca. 63 km N. of Tom Price	599567	7543523	potential
T124720	Barychelidae	*Synothele* sp. indet.		~21km 167° from Mt Farquhar site 999-E5	480558	7513853	potential
T118332	Barychelidae	*Synothele* sp. indet.		4.5km NW. Mt Brockman site 999-E8	528505	7519407	potential
T124722	Barychelidae	*Synothele* sp. indet.		~4km 299° from Mt Farquhar site 999-D12	472701	7535570	potential
T124723	Barychelidae	*Synothele* sp. indet.		~4km 299° from Mt Farquhar site 999-D12	472701	7535570	potential
T19939	Barychelidae	*Synothele* sp. indet.		Coolawanyah on Milabilam Road	582694	7589096	potential
T99601	Ctenizidae	*Conothele* MYG298-DNA'		Emu Siding to Rosella 82.8 km SE. of Karratha	516685	7630774	potential
T112316	Ctenizidae	*Conothele* sp. indet.		60 km N. of Tom Price	546119	7525187	potential
T60559	Ctenizidae	*Conothele* sp. indet.		4 km SW. of Zebra Hill on Munni Munni Creek	481943	7653715	potential
T118333	Ctenizidae	*Conothele* sp. indet.		4.5km Brockman site 999-E8	528505	7519407	potential
T26781	Ctenizidae	*Conothele* sp. indet.		Roebourne area	515612	7701828	potential
T103018	Dipluridae	*Cethegus* sp. indet.		Karijini NP site 14 ca. 60 km N. of Tom Price	607896	7540600	potential
T101868	Dipluridae	*Cethegus* sp. indet.		Hamersley Range	594351	7550341	potential
T97000	Idiopidae	*Aganippe* MYG084'		5 km N. of Lake Poongkaliyarra Pilbara Biological Survey site DRC07	511957	7685086	potential
T122214	Idiopidae	*Aganippe* MYG300-DNA'		Koodaideri Corridor West 88.1 km NE. of Tom Price	656718	7536997	potential
T122275	Idiopidae	*Aganippe* MYG301-DNA'		Koodaideri Corridor West 90.5 km NE. of Tom Price	572520	7579592	potential
T125312	Idiopidae	*Aganippe* MYG304-DNA'		Koodaideri Western Corridor 246.8 km NW. of Newman	592537	7575237	potential
T125313	Idiopidae	*Aganippe* MYG304-DNA'		Koodaideri Western Corridor 245.6 km NW. of Newman	592537	7575249	potential
T55901	Idiopidae	*Aganippe* sp. indet.		Mount Florence homestead	587873	7590916	potential
T125326	Idiopidae	*Aganippe* sp. indet.		Koodaideri Western Corridor 215.4 km NW. of Newman	614265	7551770	potential
T125314	Idiopidae	*Aganippe* sp. indet.		Koodaideri Western Corridor 215.6 km NW. of Newman	614161	7551704	potential
T125320	Idiopidae	*Aganippe* sp. indet.		Koodaideri Western Corridor 208.2 km NW. of Newman	621061	7550324	potential
T125325	Idiopidae	*Aganippe* sp. indet.		Koodaideri Western Corridor 214.4 km NW. of Newman	614265	7551748	potential
T125332	Idiopidae	*Aganippe* sp. indet.		Koodaideri Western Corridor 185.6 km NW. of Newman	643869	7540642	potential
T126312	Idiopidae	*Aganippe* sp. indet.		Mt Florence Station 69 km NNW. of Tom Price	604180	7555172	potential
T125352	Idiopidae	*Aganippe* sp. indet.		Koodaideri Western Corridor 204.1 km NW. of Newman	626314	7549485	potential
T125354	Idiopidae	*Aganippe* sp. indet.		Koodaideri Western Corridor 103.5 km NW. of Newman	626519	7549328	potential

WAM reg. no. (or other data source)	Family	Genus and species	Species author	Location (as provided by data source)	Easting (zone 50)	Northing (zone 50)	SRE rating
T126319	Idiopidae	*Aganippe* sp. indet.		Mt Florence Station 70 km NW. of Tom Price	618372	7549293	potential
T126321	Idiopidae	*Aganippe* sp. indet.		Mt Florence Station 72 km NW. of Tom Price	621061	7550313	potential
T126313	Idiopidae	*Aganippe* sp. indet.		Mt Florence Station 69 km NNW. of Tom Price	604180	7555172	potential
T97639	Idiopidae	*Anidiops* MYG308-DNA'		Murray Hill Mulga Downs Station Ecologia project 1142	656565	7552589	potential
T97640	Idiopidae	*Anidiops* MYG308-DNA'		Murray Hill Mulga Downs Station Ecologia project 1142	656565	7552589	potential
T118688	Idiopidae	*Anidiops* sp. indet.		Yanneri Ridge site 997-SRE-4	553072	7541403	potential
T96997	Idiopidae	*Euoplos* MYG081'		9 km NW. of Lake Poongkaliyarra Pilbara Biological Survey site DRC05	503639	7684492	potential
T88665	Nemesiidae	*Teyl*? sp. indet.		36.7 km SE. of Karratha	508731	7679853	potential
T88672	Nemesiidae	*Teyl*? sp. indet.		100.7 km S. of Karratha	523087	7614540	potential
T88676	Nemesiidae	*Teyl*? sp. indet.		75.8 km N. of Tom Price	567497	7564538	potential
T88689	Nemesiidae	*Teyl*? sp. indet.		50.1 km N. of Tom Price	569446	7538549	potential
T97309	Nemesiidae	*Aname* MYG093'		Mt Florence Homestead 14.5 km SE	601262	7582767	potential
T103011	Nemesiidae	*Aname* MYG093'		Serenity Valley site 10 ca. 93 km N. of Tom Price	558365	7551203	potential
T97315	Nemesiidae	*Aname* MYG106'		11 km SSE. of Whim Creek Hotel Pilbara Biological Survey site DRE10	589533	7686488	potential
T100158	Nemesiidae	*Aname* MYG168'		Valley of the Kings ca. 61 km N. of Tom Price site 949-KNG-09	594438	7547706	potential
T122273	Nemesiidae	*Aname* MYG329-DNA'		Koodaideri Corridor West 77 km NE. of Tom Price	603514	7563679	potential
T122296	Nemesiidae	*Aname* MYG329-DNA'		Koodaideri Corridor West 77.7 km NE. of Tom Price	603410	7563657	potential
T122295	Nemesiidae	*Aname* MYG330-DNA'		Koodaideri Corridor West 84.5 km NE. of Tom Price	565160	7573536	potential
T99604	Nemesiidae	*Aname* MYG367-DNA'		Emu Siding to Rosella 40.4 km N. of Tom Price	568373	7528835	potential
T125315	Nemesiidae	*Aname* sp. indet.		Koodaideri Western Corridor 217.6 km NW. of Newman	614162	7551770	potential
T102132	Nemesiidae	*Aname* sp. indet.		Serenity Valley ca. 93 km N. of Tom Price Serenity site 1	556504	7550003	potential
T103019	Nemesiidae	*Aname* sp. indet.		Zion site 9 ca. 63 km N. of Tom Price	600090	7544726	potential
T103020	Nemesiidae	*Aname* sp. indet.		Karijini NP site 14 ca. 60 km N. of Tom Price	607896	7540600	potential
T103012	Nemesiidae	*Aname* sp. indet.		Serenity Valley site 6 ca. 93 km N. of Tom Price	554965	7552034	potential
T125340	Nemesiidae	*Aname* sp. indet.		Koodaideri Western Corridor 212.7 km NW. of Newman	619113	7551833	potential
T125349	Nemesiidae	*Aname* sp. indet.		Koodaideri Western Corridor 104.6 km NW. of Newman	626416	7549296	potential
T120068	Nemesiidae	*Aname* sp. indet.		28.5km NE of Tom Price	600596	7511533	potential
T120071	Nemesiidae	*Aname* sp. indet.		31.8 km NE of Tom Price	600828	7515561	potential
T120078	Nemesiidae	*Aname* sp. indet.		29.4km NE of Tom Price	600093	7513230	potential
T119240	Nemesiidae	*Aname* sp. indet.		3.5 km WNW. Of Mt Gregory site DCR08	509987	7694162	potential
T119241	Nemesiidae	*Aname* sp. indet.		5 km NNE. of Python Pool site PW13	528625	7643474	potential
T119246	Nemesiidae	*Aname* sp. indet.		18.5 km SE. of Mt Florence Homestead site PE05	603303	7578846	potential

WAM reg. no. (or other data source)	Family	Genus and species	Species author	Location (as provided by data source)	Easting (zone 50)	Northing (zone 50)	SRE rating
T119247	Nemesiidae	*Aname* sp. indet.		5.5 km SSW. Of Chichester Microwave Repeater Station site PW12	506323	7635341	potential
T125324	Nemesiidae	*Aname* sp. indet.		Koodaideri Western Corridor 110.8 km NW. of Newman	618270	7549437	potential
T125350	Nemesiidae	*Aname* sp. indet.		Koodaideri Western Corridor 103.8 km NW. of Newman	626416	7549329	potential
T96521	Nemesiidae	*Aname* sp. indet.		Cape Lambert 25.4 km E. of Karratha	509473	7705672	potential
T96522	Nemesiidae	*Aname* sp. indet.		Cape Lambert 25.4 km E. of Karratha	509473	7705672	potential
T117864	Nemesiidae	*Aname* sp. indet.		4.9 km W. of Roebourne	510514	7704997	potential
T117865	Nemesiidae	*Aname* sp. indet.		4.9 km W. of Roebourne	510514	7704997	potential
T117866	Nemesiidae	*Aname* sp. indet.		4.9 km W. of Roebourne	510618	7704997	potential
T117871	Nemesiidae	*Aname* sp. indet.		5.8 km NW. of Roebourne	512182	7708371	potential
T99582	Nemesiidae	*Aname* sp. indet.		Nammuldi-Silvergrass 51.7 km NW. of Tom Price	542413	7524865	potential
T99583	Nemesiidae	*Aname* sp. indet.		Nammuldi-Silvergrass 51.8 km NW. of Tom Price	542516	7525142	potential
T125945	Nemesiidae	*Aname* sp. indet.		Cape Lambert	510309	7710685	potential
T99603	Nemesiidae	*Aname* sp. indet.		Emu Siding to Rosella 98 km NNW. of Tom Price	561903	7585659	potential
T103005	Nemesiidae	*Aname* sp. indet.		Serenity Valley site 10 ca. 93 km N. of Tom Price	558365	7551203	potential
T112990	Nemesiidae	*Aname* sp. indet.		Anketell Rail Corridor NNW. Tom Price	549036	7602362	potential
T112991	Nemesiidae	*Aname* sp. indet.		Anketell Rail Corridor NNW. Tom Price	572163	7546817	potential
T112992	Nemesiidae	*Aname* sp. indet.		Anketell Rail Corridor NNW. Tom Price	487040	7638823	potential
T101315	Nemesiidae	*Aname* sp. indet.		Hamersley Range	592104	7554130	potential
T97638	Nemesiidae	*Aname* sp. indet.		Murray Hill Mulga Downs Station Ecologia project 1142	655538	7553042	potential
T113529	Nemesiidae	*Aname* sp. indet.		Rio Tinto Nammuldi Silvergrass 70 km N. of Tom Price	560431	7525724	potential
T113532	Nemesiidae	*Aname* sp. indet.		Rio Tinto Nammuldi Silvergrass 70 km N. of Tom Price	555582	7522831	potential
T120066	Nemesiidae	*Aname* sp. indet.		28.5km NE of Tom Price	600596	7511533	potential
T120077	Nemesiidae	*Aname* sp. indet.		29.4km NE of Tom Price	600093	7513230	potential
T132355	Nemesiidae	*Aname* sp. indet.		~ 12 km W. Mount Sheila	573997	7542248	potential
T27845	Nemesiidae	*Aname* sp. indet.		Balla	581540	7710857	potential
T44341	Nemesiidae	*Aname* sp. indet.		Karratha	486153	7707363	potential
T114360	Nemesiidae	*Aname* sp. indet.		100 km E. of Karratha	575144	7701202	potential
T126320	Nemesiidae	*Aname* sp. indet.		Mt Florence Station 70 km NW. of Tom Price	618372	7549293	potential
T114361	Nemesiidae	*Aname* sp. indet.		100 km E. of Karratha	570576	7703944	potential
T44343	Nemesiidae	*Aname* sp. indet.		Mt Brockman Nammuldi Mine (Hamersley Iron) site 12	536536	7521294	potential
T128556	Nemesiidae	*Aname* sp. indet.		ca. 40 km N. of Tom Price	593629	7533153	potential
T109328	Nemesiidae	*Aname* sp. indet.		10 km S. of Mallina Homestead Pilbara Biological Survey site DRE13	608944	7680871	potential

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T124765	Nemesiidae	*Aname* sp. indet.		~5km 294° from Mt Farquhar site 999-D13	471259	7535899	potential
T124768	Nemesiidae	*Aname* sp. indet.		~5km 294° from Mt Farquhar site 999-D13	471259	7535899	potential
T124774	Nemesiidae	*Aname* sp. indet.		7.5km Brockman site 999-E9	524483	7513857	potential
T124775	Nemesiidae	*Aname* sp. indet.		~9 km 122° from Mt Farquhar site 999-D11	483628	7528999	potential
T124776	Nemesiidae	*Aname* sp. indet.		~13km 70° from Mt Farquhar site 999-F4	488254	7538368	potential
T124778	Nemesiidae	*Aname* sp. indet.		~9 km 122° from Mt Farquhar site 999-D11	483628	7528999	potential
T114647	Nemesiidae	*Aname* sp. indet.		Karratha to Millstream-Chichester National Park	491064	7674519	potential
T100159	Nemesiidae	*Kwonkan* MYG169'		Valley of the Kings ca. 61 km N. of Tom Price site 949-KNG-11	592991	7547217	potential
T122269	Nemesiidae	*Kwonkan* MYG325-DNA'		Koodaideri Corridor West 77.2 km NE. of Tom Price	603513	7563734	potential
T122287	Nemesiidae	*Kwonkan* MYG325-DNA'		Koodaideri Corridor West 77.5 km NE. of Tom Price	603514	7563701	potential
T120074	Nemesiidae	*Kwonkan* sp. indet.		31.8 km NE of Tom Price	600828	7515561	potential
T97008	Nemesiidae	*Yilgarnia* MYG092'		5 km E. of Whim Creek Hotel Pilbara Biological Survey site DRE08	588847	7694383	potential
T122267	Nemesiidae	*Yilgarnia* MYG327-DNA'		Koodaideri Corridor West 72.2 km NE. of Tom Price	603514	7563723	potential
T122271	Nemesiidae	*Yilgarnia* MYG327-DNA'		Koodaideri Corridor West 77.3 km NE. of Tom Price	603410	7563690	potential
T122274	Nemesiidae	*Yilgarnia* MYG327-DNA'		Koodaideri Corridor West 77.2 km NE. of Tom Price	603513	7563734	potential
T122289	Nemesiidae	*Yilgarnia* MYG327-DNA'		Koodaideri Corridor West 77.3 km NE. of Tom Price	603514	7563679	potential
T122291	Nemesiidae	*Yilgarnia* MYG327-DNA'		Koodaideri Corridor West 77 km NE. of Tom Price	603514	7563668	potential
T103006	Nemesiidae	*Yilgarnia* sp. indet.		Serenity Valley site 7 ca. 93 km N. of Tom Price	555075	7554004	potential
T124761	Nemesiidae	*Yilgarnia* sp. indet.		~21km 99° from Mt Farquhar site 999-F1	496396	7530634	potential
T124763	Nemesiidae	*Yilgarnia* sp. indet.		~21km 99° from Mt Farquhar site 999-F1	496396	7530634	potential
T124767	Nemesiidae	*Yilgarnia* sp. indet.		7.5km Brockman site 999-E9	524483	7513857	potential
Order Opiliones (harvestmen)							
T124981	Assamiidae	*Dampetrus* sp. indet.		~24km 154° from Mt Farquhar site 999-E6	486422	7512564	likely
T124982	Assamiidae	*Dampetrus* sp. indet.		~4km 299° from Mt Farquhar site 999-D12	472701	7535570	likely
T124978	Assamiidae	*Dampetrus* sp. indet.		~5km 294° from Mt Farquhar site 999-D13	471259	7535899	likely
T92621	Assamiidae	Assamiidae sp. indet.		Mt Herbert 80.5 km SE. of Karratha A20080811.CH01-01	527788	7639458	likely
Order Pseudoscorpiones (pseudoscorpions)							
T103693	Chernetidae	*Troglochernes* sp. nov. 001'		Mount Dove	651812	7684145	confirmed
T103706	Chernetidae	*Troglochernes* sp. nov. 001'		Mount Dove	651916	7684121	confirmed
T103643	Chernetidae	*Troglochernes* sp. nov. 001'		Mount Dove	651812	7684145	confirmed

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T103664	Chernetidae	*Troglochernes* sp. nov. 001'		Mount Dove	651812	7684145	confirmed
T103667	Chernetidae	*Troglochernes* sp. nov. 001'		Mount Dove	651812	7684145	confirmed
T126307	Garypidae	*Synsphyronus* PSE069'		6.5 km WSW. Mt Brockman	524998	7514542	potential
T126310	Garypidae	*Synsphyronus* PSE069'		6.5 km WSW. Mt Brockman	524998	7514542	potential
Order Scorpiones (Scorpions)							
T100601	Buthidae	*Lychas* 'kings'		Valley of the Kings ca. 61 km N. of Tom Price site no. 949-KNG-20	587648	7550447	potential
T100604	Buthidae	*Lychas* 'kings'		Valley of the Kings ca. 61 km N. of Tom Price site no. 949-KNG-15	593210	7549208	potential
T100607	Buthidae	*Lychas* 'kings'		Valley of the Kings ca. 61 km N. of Tom Price site no. 949-KNG-20	587648	7550447	potential
T100992	Buthidae	*Lychas* 'kings'		Valley of the Kings ca. 61 km N. of Tom Price site 949-KNG-17 REF	591551	7547701	potential
T100600	Buthidae	*Lychas* 'rex'		Valley of the Kings ca. 61 km N. of Tom Price site no. 949-KNG-03	585482	7550315	potential
T100173	Buthidae	*Lychas* 'rex'		Valley of the Kings ca. 61 km N. of Tom Price site 949-KNG-03	585482	7550315	potential
T60450	Buthidae	*Lychas* 'scottae'		Mt Brockman Nammuldi mine (Hamersley Iron) site 33	532032	7533048	potential
T100606	Urodacidae	*Aops* sp. indet.		Valley of the Kings ca. 61 km N. of Tom Price site no. 949-KNG-14	594134	7548693	potential
Class Chilopoda (centipedes)							
Order Geophilomorpha (soil centipedes)							
T126773	Geophilidae	*Sepedonophilus* sp. indet.		~13.3km ENE Mt Farquhar site 999-F5	488874	7535855	potential
T126603	Geophilidae	*Sepedonophilus* sp. indet.		~5km 294° from Mt Farquhar site 999-D13	471259	7535899	potential
T126605	Geophilidae	*Sepedonophilus* sp. indet.		~21km 99° from Mt Farquhar site 999-F1	496396	7530634	potential
T126607	Geophilidae	*Sepedonophilus* sp. indet.		~24km 154° from Mt Farquhar site 999-E6	486422	7512564	potential
T126772	Geophilidae	*Sepedonophilus* sp. indet.		6.5km Brockman site 999-E7	524998	7514542	potential
T126610	Geophilidae	*Sepedonophilus* sp. indet.		~5km 294° from Mt Farquhar site 999-D13	471259	7535899	potential
T131536	Geophilidae	Geophilidae sp. indet.		c.a. 40 km N. of Tom Price	563537	7529819	potential
T128560	Mecistocephalidae	*Mecistocephalus* sp. indet.		ca. 40 km N. of Tom Price	559724	7529026	potential
T128561	Mecistocephalidae	*Mecistocephalus* sp. indet.		ca. 40 km N. of Tom Price	564158	7530702	potential

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T128562	Mecistocephalidae	*Mecistocephalus* sp. indet.		ca. 40 km N. of Tom Price	565695	7528658	potential
T126733	Mecistocephalidae	*Mecistocephalus* sp. indet.		~4km 299° from Mt Farquhar site 999-D12	472701	7535570	potential
T126736	Mecistocephalidae	*Mecistocephalus* sp. indet.		~16km 78° from Mt Farquhar site 999-F3	491243	7537174	potential
T126738	Mecistocephalidae	*Mecistocephalus* sp. indet.		~24km 154° from Mt Farquhar site 999-E6	486422	7512564	potential
T126734	Mecistocephalidae	*Mecistocephalus* sp. indet.		~21km 99° from Mt Farquhar site 999-F1	496396	7530634	potential
T126735	Mecistocephalidae	*Mecistocephalus* sp. indet.		~16km 78° from Mt Farquhar site 999-F3	491243	7537174	potential
T126739	Mecistocephalidae	*Mecistocephalus* sp. indet.		~24km 154° from Mt Farquhar site 999-E6	486422	7512564	potential
T126740	Mecistocephalidae	*Mecistocephalus* sp. indet.		~21km 167° from Mt Farquhar site 999-E5	480558	7513853	potential
T126737	Mecistocephalidae	*Mecistocephalus* sp. indet.		~21km 99° from Mt Farquhar site 999-F1	496396	7530634	potential
T114685	Mecistocephalidae	Mecistocephalidae sp. indet.		Karratha to Millstream-Chichester National Park	498857	7667870	potential
T97635		Geophilomorpha sp. indet.		Murray Hill Mulga Downs Station Ecologia project 1142	656672	7552920	potential
T97636		Geophilomorpha sp. indet.		Murray Hill Mulga Downs Station Ecologia project 1142	656888	7553959	potential
T92258		Geophilomorpha sp. indet.		Hamersley Range c. 25 km NE. of Hamersley Homestead site VQSRE2	580848	7551524	potential
T24214		Geophilomorpha sp. indet.		ca. 1 km NE. of Millstream Homestead	506936	7613293	potential
Order Scolopendromorpha (tropical centipedes)							
T113054	Cryptopidae	*Cryptops* sp. indet.		Anketell Rail Corridor NNW. Tom Price	501041	7705443	potential
T126649	Cryptopidae	*Cryptops* sp. indet.		7.5km Brockman site 999-E9	524483	7513857	potential
T126657	Cryptopidae	*Cryptops* sp. indet.		~21km 99° from Mt Farquhar site 999-F1	496396	7530634	potential
T126658	Cryptopidae	*Cryptops* sp. indet.		~18 km 82° from Mt Farquhar site 999-F2	494128	7536478	potential
T126660	Cryptopidae	*Cryptops* sp. indet.		~16km 78° from Mt Farquhar site 999-F3	491243	7537174	potential

WAM reg. no. (or other data source)	Family	Genus and species	Species author	Location (as provided by data source)	Easting (zone 50)	Northing (zone 50)	SRE rating
T126661	Cryptopidae	*Cryptops* sp. indet.		~24km 154° from Mt Farquhar site 999-E6	486422	7512564	potential
T126667	Cryptopidae	*Cryptops* sp. indet.		~4km 299° from Mt Farquhar site 999-D12	472701	7535570	potential
T126668	Cryptopidae	*Cryptops* sp. indet.		~5km 294° from Mt Farquhar site 999-D13	471259	7535899	potential
T126659	Cryptopidae	*Cryptops* sp. indet.		~18 km 82° from Mt Farquhar site 999-F2	494128	7536478	potential
T126665	Cryptopidae	*Cryptops* sp. indet.		~4km 299° from Mt Farquhar site 999-D12	472701	7535570	potential
T126666	Cryptopidae	*Cryptops* sp. indet.		~4km 299° from Mt Farquhar site 999-D12	472701	7535570	potential
T126669	Cryptopidae	*Cryptops* sp. indet.		~5km 294° from Mt Farquhar site 999-D13	471259	7535899	potential
T126644	Cryptopidae	*Cryptops* sp. indet.		7.5km Brockman site 999-E9	524483	7513857	potential
T126646	Cryptopidae	*Cryptops* sp. indet.		6.5km Brockman site 999-E7	524998	7514542	potential
T126664	Cryptopidae	*Cryptops* sp. indet.		~24km 154° from Mt Farquhar site 999-E6	486422	7512564	potential
T122330	Cryptopidae	Cryptopidae sp. indet.		Koodaideri Corridor West 76.9 km NW. of Tom Price	603514	7563723	potential
Class Diplopoda (millipedes)							
Order Craspedosomatida							
T113055		Craspedosomatida sp. indet.		Anketell Rail Corridor NNW. Tom Price	565041	7569773	confirmed
T113056		Craspedosomatida sp. indet.		Anketell Rail Corridor NNW. Tom Price	565041	7569773	confirmed
Order Polydesmida (keeled millipedes)							
T76147	Paradoxosomatidae	`DIPAAA` DIP020'		Pilbara Survey site DRC 2 crown land reserve NW. of Mt Prinsep	484387	7703111	confirmed
T76053	Paradoxosomatidae	`DIPAAC` DIP030'		5 km E. of Whim Creek Hotel Pilbara Biological Survey site DRE08	588847	7694383	confirmed
T76152	Paradoxosomatidae	*Antichiropus* DIP011'		Pilbara Survey site DRC 2 crown land reserve SE. of Dampier	483554	7703509	confirmed
T76143	Paradoxosomatidae	*Antichiropus* DIP023'		Pilbara Survey site PW 3 Millstream-Chichester National Park	519598	7640056	confirmed
T76150	Paradoxosomatidae	*Antichiropus* DIP023'		Pilbara Survey site PW 10 Millstream-Chichester National Park	506109	7617344	confirmed
T76148	Paradoxosomatidae	*Antichiropus* DIP024'		Pilbara Survey site PW 12 Millstream-Chichester National Park	506323	7635330	confirmed
T76149	Paradoxosomatidae	*Antichiropus* DIP024'		Pilbara Survey site PW 2 Millstream-Chichester National Park	525199	7641521	confirmed
T76153	Paradoxosomatidae	*Antichiropus* DIP024'		Pilbara Survey site PW 3 Millstream-Chichester National Park	519598	7640056	confirmed
T76142	Paradoxosomatidae	*Antichiropus* DIP025'		Pilbara Survey site DRC 5 Mt Welcome Station W. of Mt Roe	503639	7684492	confirmed
T76171	Paradoxosomatidae	*Antichiropus* DIP025'		Pilbara Survey site DRC 8 Mt Welcome Station W. of Mt Roe	509987	7694173	confirmed
T124545	Paradoxosomatidae	*Antichiropus* DIP025'		5 km E. of Whim Creek Hotel Pilbara Biological Survey site DRE08	588847	7694383	confirmed
T76057	Paradoxosomatidae	*Antichiropus* DIP028'		20 km ESE. of Whim Creek Hotel Pilbara Biological Survey site DRE12	602227	7687489	confirmed

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T114681	Paradoxosomatidae	*Antichiropus* DIP032'		Karratha to Millstream-Chichester National Park; Molecular Species	487631	7679475	confirmed
T102546	Paradoxosomatidae	*Antichiropus* DIP032'		Anketell Point ca. 30 km E. of Karratha; Molecular Species	509058	7707499	confirmed
T113374	Paradoxosomatidae	*Antichiropus* DIP033'		c. 25 km N. of Wodgina; site PS05	656345	7668448	confirmed
T113375	Paradoxosomatidae	*Antichiropus* DIP033'		c. 25 km N. of Wodgina; site PS03	658956	7669918	confirmed
T113377	Paradoxosomatidae	*Antichiropus* DIP033'		c. 25 km N. of Wodgina; site WE23	662387	7670028	confirmed
T124596	Paradoxosomatidae	*Antichiropus* DIP035'		16 km E. of Mt Bruce Pilbara Biological Survey site TCMBE05	634456	7609845	confirmed
T76151	Paradoxosomatidae	*Antichiropus* sp. indet.		Pilbara Survey site PW 11 Millstream-Chichester National Park	505902	7618053	confirmed
T76154	Paradoxosomatidae	*Antichiropus* sp. indet.		Pilbara Survey site PW 3 Millstream-Chichester National Park	519598	7640056	confirmed
T76155	Paradoxosomatidae	*Antichiropus* sp. indet.		Pilbara Survey site PW 12 Millstream-Chichester National Park	506323	7635330	confirmed
T76156	Paradoxosomatidae	*Antichiropus* sp. indet.		Pilbara Survey site DRC 5 Mt Welcome Station W. of Mt Roe	503639	7684492	confirmed
T76158	Paradoxosomatidae	*Antichiropus* sp. indet.		Pilbara Survey site DRC 2 crown land reserve SE. of Dampier	483554	7703509	confirmed
T76161	Paradoxosomatidae	*Antichiropus* sp. indet.		Pilbara Survey site DRC 1 crown land reserve SE. of Dampier	483554	7703509	confirmed
T76166	Paradoxosomatidae	*Antichiropus* sp. indet.		Pilbara Survey site DRC 8 Mt Welcome Station W. of Mt Roe	509987	7694173	confirmed
T76169	Paradoxosomatidae	*Antichiropus* sp. indet.		Mt Florence Station NW. of homestead Pilbara Survey site PE 4	588589	7589617	confirmed
T76170	Paradoxosomatidae	*Antichiropus* sp. indet.		Pilbara Survey site DRC 9 Mt Welcome Station W. of Mt Roebourne	507596	7699089	confirmed
T112611	Paradoxosomatidae	*Antichiropus* sp. indet.		Pilbara Survey site DRC 2 crown land reserve SE. of Dampier	483554	7703509	confirmed
T76060	Paradoxosomatidae	*Antichiropus* sp. indet.		2.5 km N. of Fortescue River crossing on Dampier Paraburdoo Railway Pilbara Biological Survey site PE11	563142	7585466	confirmed
T66482	Paradoxosomatidae	*Antichiropus* sp. indet.		Pannawonica Road @	472370	7607427	confirmed
T114682	Paradoxosomatidae	*Antichiropus* sp. indet.		Karratha to Millstream-Chichester National Park	478779	7693543	confirmed
T114680	Paradoxosomatidae	*Antichiropus* sp. indet.		Karratha to Millstream-Chichester National Park	487631	7679475	confirmed
T73498	Paradoxosomatidae	*Antichiropus* sp. indet.		Cape Lambert 24.2 km E. of Karratha	508121	7707366	confirmed
T126620	Paradoxosomatidae	Paradoxosomatidae sp. indet.		~17km 178° from Mt Farquhar site 999-E4	476335	7516913	confirmed
T113057	Paradoxosomatidae	Paradoxosomatidae sp. indet.		Anketell Rail Corridor NNW. Tom Price	528978	7609052	confirmed
T113372	Paradoxosomatidae	Paradoxosomatidae sp. indet.		c. 25 km N. of Wodgina; site WE23	662387	7670028	confirmed
T113373	Paradoxosomatidae	Paradoxosomatidae sp. indet.		c. 25 km N. of Wodgina; site PS05	656345	7668448	confirmed
T113376	Paradoxosomatidae	Paradoxosomatidae sp.		c. 25 km N. of Wodgina; site WE23	662387	7670028	confirmed

WAM reg. no. (or other data source)	Family	Genus and species	Species author	Location (as provided by data source)	Easting (zone 50)	Northing (zone 50)	SRE rating
		indet.					
Order Polyxenida (pin-cushion millipedes)							
T129519	Polyxenidae	*Unixenus karijinensis*	Short & Huynh, 2011	Wittenoom Gorge asbestos mine	635647	7531526	confirmed
T71106	Polyxenidae	*Unixenus karijinensis*	Short & Huynh, 2011	Wittenoom Gorge asbestos mine	635647	7531526	confirmed
T116451	Polyxenidae	*Unixenus karijinensis*	Short & Huynh, 2011	Wittenoom Gorge asbestos mine	635647	7531526	confirmed
T116452	Polyxenidae	*Unixenus karijinensis*	Short & Huynh, 2011	Wittenoom Gorge asbestos mine	635647	7531526	confirmed
T116453	Polyxenidae	*Unixenus karijinensis*	Short & Huynh, 2011	Wittenoom Gorge asbestos mine	635647	7531526	confirmed
T116454	Polyxenidae	*Unixenus karijinensis*	Short & Huynh, 2011	Wittenoom Gorge asbestos mine	635647	7531526	confirmed
T116455	Polyxenidae	*Unixenus karijinensis*	Short & Huynh, 2011	Wittenoom Gorge asbestos mine	635647	7531526	confirmed
T116456	Polyxenidae	*Unixenus karijinensis*	Short & Huynh, 2011	Wittenoom Gorge asbestos mine	635647	7531526	confirmed
T116457	Polyxenidae	*Unixenus karijinensis*	Short & Huynh, 2011	Wittenoom Gorge asbestos mine	635647	7531526	confirmed
T116466	Polyxenidae	*Unixenus karijinensis*	Short & Huynh, 2011	Wittenoom [town site]	637376	7540745	confirmed
T116467	Polyxenidae	*Unixenus karijinensis*	Short & Huynh, 2011	Wittenoom [town site]	637376	7540745	confirmed
T116468	Polyxenidae	*Unixenus karijinensis*	Short & Huynh, 2011	Wittenoom [town site]	637376	7540745	confirmed
T116469	Polyxenidae	*Unixenus karijinensis*	Short & Huynh, 2011	Wittenoom [town site]	637376	7540745	confirmed
Order Isopoda (slaters)							
PES8058	Armadillidae	*Acanthodillo* '999'		ca. 24km 154° from Mt Farquhar	486412	7512564	Potential
SJ1098	Armadillidae	*Acanthodillo* sp. 6		Karratha to Millstream-Chichester National Park	476515	7697801	Potential
SJ1099	Armadillidae	*Acanthodillo* sp. 6		Karratha to Millstream-Chichester National Park	487642	7679475	Potential
SJ1100	Armadillidae	*Acanthodillo* sp. 6		Karratha to Millstream-Chichester National Park	491105	7674519	Potential
SJ1023	Armadillidae	*Acanthodillo* sp. indet.		Central Pilbara	505994	7698724	Potential

WAM reg. no. (or other data source)	Family	Genus and species	Species author	Location (as provided by data source)	Easting (zone 50)	Northing (zone 50)	SRE rating
SJ0183	Armadillidae	Armadillidae nov. 1 sp. indet.		Hamersley Range	595480	7551198	Potential
SJ0467	Armadillidae	Armadillidae nov. 1 sp. indet.		Valley of the Kings ca.61km N of Tom Price	587607	7550447	Potential
SJ0468	Armadillidae	Armadillidae nov. 1 sp. indet.		Valley of the Kings ca.61km N of Tom Price	586905	7550329	Potential
SJ0469	Armadillidae	Armadillidae nov. 1 sp. indet.		Valley of the Kings ca.61km N of Tom Price	594489	7547706	Potential
SJ0470	Armadillidae	Armadillidae nov. 1 sp. indet.		Valley of the Kings ca.61km N of Tom Price	594165	7548693	Potential
SJ0471	Armadillidae	Armadillidae nov. 1 sp. indet.		Valley of the Kings ca.61km N of Tom Price	588474	7550630	Potential
SJ0472	Armadillidae	Armadillidae nov. 1 sp. indet.		Karijini NP ca. 60km N of Tom Price.	600234	7541448	Potential
SJ0473	Armadillidae	Armadillidae nov. 1 sp. indet.		Zion ca. 63km N of Tom Price.	598869	7545685	Potential
SJ1282	Armadillidae	Armadillidae sp. 1		Mt Dove	652368	7682435	Potential
SJ1058	Armadillidae	Armadillidae sp. 2		Rio Tinto Nammuldi Silvergrass 70km N of Tom Price	563199	7527861	Potential
SJ1271	Armadillidae	Armadillidae sp. 5		c. 25km N of Wodgina	657590	7670429	Potential
SJ1276	Armadillidae	Armadillidae sp. 5		c. 25km N of Wodgina	662345	7670029	Potential
SJ1272	Armadillidae	Armadillidae sp. 5		c. 25km N of Wodgina	658502	7670243	Potential
SJ1273	Armadillidae	Armadillidae sp. 5		c. 25km N of Wodgina	658988	7669917	Potential
SJ1274	Armadillidae	Armadillidae sp. 5		c. 25km N of Wodgina	656303	7668448	Potential
SJ0190	Armadillidae	Armadillidae sp. indet.		Hamersley Range	593517	7550568	Potential
SJ0952	Armadillidae	Armadillidae sp. indet.		Central Pilbara	562109	7585647	Potential
SJ0943	Armadillidae	Armadillidae sp. indet.		Central Pilbara	556030	7593705	Potential
SJ0944	Armadillidae	Armadillidae sp. indet.		Central Pilbara	549087	7602362	Potential
SJ0945	Armadillidae	Armadillidae sp. indet.		Central Pilbara	570480	7562289	Potential
SJ0946	Armadillidae	Armadillidae sp. indet.		Central Pilbara	556030	7593705	Potential
SJ0947	Armadillidae	Armadillidae sp. indet.		Central Pilbara	565053	7582635	Potential
SJ0948	Armadillidae	Armadillidae sp. indet.		Central Pilbara	572184	7546817	Potential
SJ0949	Armadillidae	Armadillidae sp. indet.		Central Pilbara	565053	7582635	Potential
SJ0950	Armadillidae	Armadillidae sp. indet.		Central Pilbara	564025	7578865	Potential
SJ0951	Armadillidae	Armadillidae sp. indet.		Central Pilbara	549087	7602362	Potential

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SJ0953	Armadillidae	Armadillidae sp. indet.		Central Pilbara	564025	7578865	Potential
SJ0954	Armadillidae	Armadillidae sp. indet.		Central Pilbara	570480	7562289	Potential
SJ0955	Armadillidae	Armadillidae sp. indet.		Central Pilbara	565053	7582635	Potential
SJ0956	Armadillidae	Armadillidae sp. indet.		Central Pilbara	565053	7582635	Potential
SJ0957	Armadillidae	Armadillidae sp. indet.		Central Pilbara	549087	7602362	Potential
SJ1020	Armadillidae	Armadillidae sp. indet.		Central Pilbara	547050	7602645	Potential
SJ1021	Armadillidae	Armadillidae sp. indet.		Central Pilbara	505819	7675450	Potential
SJ1060	Armadillidae	Armadillidae sp. indet.		Rio Tinto Nammuldi Silvergrass 70km N of Tom Price	560099	7519670	Potential
SJ1277	Armadillidae	Armadillidae sp. nov.		c. 25km N of Wodgina	662345	7670029	Potential
SJ1064	Armadillidae	*Buddelundia* '10'		Karratha to Millstream-Chichester National Park	477412	7696098	Potential
SJ1069	Armadillidae	*Buddelundia* '10'		Karratha to Millstream-Chichester National Park	488984	7677583	Potential
SJ1070	Armadillidae	*Buddelundia* '10'		Karratha to Millstream-Chichester National Park	504785	7658141	Potential
SJ0968	Armadillidae	*Buddelundia* '10'		Central Pilbara	505032	7684348	Potential
SJ0962	Armadillidae	*Buddelundia* '10'		Central Pilbara	500999	7705443	Potential
SJ0964	Armadillidae	*Buddelundia* '10'		Central Pilbara	564025	7578865	Potential
SJ0970	Armadillidae	*Buddelundia* '10'		Central Pilbara	565053	7582635	Potential
SJ0958	Armadillidae	*Buddelundia* '10'		Central Pilbara	505146	7682267	Potential
SJ0959	Armadillidae	*Buddelundia* '10'		Central Pilbara	500999	7705443	Potential
SJ0960	Armadillidae	*Buddelundia* '10'		Central Pilbara	500999	7705443	Potential
SJ0961	Armadillidae	*Buddelundia* '10'		Central Pilbara	505994	7698724	Potential
SJ0963	Armadillidae	*Buddelundia* '10'		Central Pilbara	505994	7698724	Potential
SJ0965	Armadillidae	*Buddelundia* '10'		Central Pilbara	500999	7705443	Potential
SJ0966	Armadillidae	*Buddelundia* '10'		Central Pilbara	505994	7698724	Potential
SJ0967	Armadillidae	*Buddelundia* '10'		Central Pilbara	528937	7609041	Potential
SJ0969	Armadillidae	*Buddelundia* '10'		Central Pilbara	505032	7684348	Potential
SJ0971	Armadillidae	*Buddelundia* '10'		Central Pilbara	500999	7705443	Potential
SJ0972	Armadillidae	*Buddelundia* '10'		Central Pilbara	505032	7684348	Potential
SJ0973	Armadillidae	*Buddelundia* '10'		Central Pilbara	556030	7593705	Potential
SJ0974	Armadillidae	*Buddelundia* '10'		Central Pilbara	505994	7698724	Potential
SJ0975	Armadillidae	*Buddelundia* '10'		Central Pilbara	547050	7602645	Potential
SJ1151	Armadillidae	*Buddelundia* '10'		Anketell Rail Karratha area	505544	7630748	Potential
SJ1063	Armadillidae	*Buddelundia* '10'		Karratha to Millstream-Chichester National Park	476515	7697801	Potential
SJ1065	Armadillidae	*Buddelundia* '10'		Karratha to Millstream-Chichester National Park	478727	7693543	Potential
SJ1067	Armadillidae	*Buddelundia* '10'		Karratha to Millstream-Chichester National Park	487642	7679475	Potential

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SJ1068	Armadillidae	*Buddelundia* '10'		Karratha to Millstream-Chichester National Park	489608	7677174	Potential
SJ1066	Armadillidae	*Buddelundia* '10'		Karratha to Millstream-Chichester National Park	484124	7684552	Potential
SJ1156	Armadillidae	*Buddelundia* '10'		Central Pilbara	554318	7552878	Potential
SJ1157	Armadillidae	*Buddelundia* '10'		Central Pilbara	562795	7544976	Potential
SJ1158	Armadillidae	*Buddelundia* '10'		Central Pilbara	553278	7544148	Potential
SJ1159	Armadillidae	*Buddelundia* '10'		Central Pilbara	559228	7542311	Potential
SJ1160	Armadillidae	*Buddelundia* '10'		Central Pilbara	573977	7542248	Potential
SJ1281	Armadillidae	*Buddelundia* '10'		Mt Dove	652368	7682435	Potential
PES10374	Armadillidae	*Buddelundia* '10 1016A'		100 km east of Karratha	575123	7701202	Potential
PES10376	Armadillidae	*Buddelundia* '10 1016A'		100 km east of Karratha	570607	7703944	Potential
PES70377	Armadillidae	*Buddelundia* '10 1016A'		100 km east of Karratha	570607	7703944	Potential
SJ3699	Armadillidae	*Buddelundia* '10BF'		c.a. 40km Nth Tom Price	559734	7529026	Potential
SJ3700	Armadillidae	*Buddelundia* '10BF'		c.a. 40km Nth Tom Price	557262	7526190	Potential
PES7619	Armadillidae	*Buddelundia* '10BF'		ca. 13.3km ENE Mt Farquhar	488916	7535855	Potential
PES14452	Armadillidae	*Buddelundia* '10BF'		ca. 100 km W. of Tom Price	501799	7501390	Potential
PES7642	Armadillidae	*Buddelundia* '10BF'		ca. 17km 178° from Mt Farquhar	476325	7516913	Potential
PES7732	Armadillidae	*Buddelundia* '10BF'		ca. 9km 122° from Mt Farquhar	483618	7528999	Potential
PES7735	Armadillidae	*Buddelundia* '10BF'		ca. 9km 122° from Mt Farquhar	483618	7528999	Potential
PES7736	Armadillidae	*Buddelundia* '10BF'		ca. 9km 122° from Mt Farquhar	483618	7528999	Potential
PES7741	Armadillidae	*Buddelundia* '10BF'		ca. 9km 122° from Mt Farquhar	483618	7528999	Potential
PES8095	Armadillidae	*Buddelundia* '10BF'		ca. 13km 70° from Mt Farquhar	488234	7538368	Potential
PES8099	Armadillidae	*Buddelundia* '10BF'		ca. 13km 70° from Mt Farquhar	488234	7538368	Potential
PES8138	Armadillidae	*Buddelundia* '10BF'		ca. 17km 178° from Mt Farquhar	476325	7516913	Potential
PES9326	Armadillidae	*Buddelundia* '10BF'		7.5km WSW Mt Brockman	524524	7513857	Potential
PES9357	Armadillidae	*Buddelundia* '10BF'		ca. 5km 294° from Mt Farquhar	471228	7535899	Potential
SJ1016	Armadillidae	*Buddelundia* '17'		Central Pilbara	505146	7682267	Potential
SJ1018	Armadillidae	*Buddelundia* '17'		Central Pilbara	505994	7698724	Potential
SJ1284	Armadillidae	*Buddelundia* '17'		Mt Dove	652368	7682435	Potential
SJ1161	Armadillidae	*Buddelundia* '19'		Central Pilbara	554318	7552878	Potential
SJ1162	Armadillidae	*Buddelundia* '19'		Central Pilbara	576441	7548845	Potential
SJ1163	Armadillidae	*Buddelundia* '19'		Central Pilbara	572640	7545177	Potential
SJ1164	Armadillidae	*Buddelundia* '19'		Central Pilbara	562795	7544976	Potential
SJ1165	Armadillidae	*Buddelundia* '19'		Central Pilbara	571720	7544594	Potential
SJ1166	Armadillidae	*Buddelundia* '19'		Central Pilbara	553362	7541833	Potential

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SJ1167	Armadillidae	*Buddelundia* '19'		Central Pilbara	573366	7541664	Potential
SJ1168	Armadillidae	*Buddelundia* '19'		Central Pilbara	564612	7535770	Potential
SJ0667	Armadillidae	*Buddelundia* '21'		Mount Dove	651812	7684145	Potential
SJ0668	Armadillidae	*Buddelundia* '21'		Mount Dove	651812	7684145	Potential
SJ0669	Armadillidae	*Buddelundia* '21'		Mount Dove	651812	7684145	Potential
SJ0670	Armadillidae	*Buddelundia* '21'		Mount Dove	651812	7684145	Potential
SJ0671	Armadillidae	*Buddelundia* '21'		Mount Dove	651812	7684145	Potential
SJ0672	Armadillidae	*Buddelundia* '21'		Mount Dove	651812	7684145	Potential
SJ0673	Armadillidae	*Buddelundia* '21'		Mount Dove	651812	7684145	Potential
SJ0674	Armadillidae	*Buddelundia* '21'		Mount Dove	651812	7684145	Potential
SJ0675	Armadillidae	*Buddelundia* '21'		Mount Dove	651905	7684122	Potential
SJ0676	Armadillidae	*Buddelundia* '21'		Mount Dove	651905	7684122	Potential
SJ0677	Armadillidae	*Buddelundia* '21'		Mount Dove	651905	7684122	Potential
SJ0678	Armadillidae	*Buddelundia* '21'		Mount Dove	651905	7684122	Potential
SJ0679	Armadillidae	*Buddelundia* '21'		Mount Dove	651905	7684122	Potential
SJ0680	Armadillidae	*Buddelundia* '21'		Mount Dove	651905	7684122	Potential
SJ0681	Armadillidae	*Buddelundia* '21'		Mount Dove	652187	7684219	Potential
SJ0682	Armadillidae	*Buddelundia* '21'		Mount Dove	652187	7684219	Potential
SJ0683	Armadillidae	*Buddelundia* '21'		Mount Dove	652187	7684219	Potential
SJ0684	Armadillidae	*Buddelundia* '21'		Mount Dove	652187	7684219	Potential
SJ0685	Armadillidae	*Buddelundia* '21'		Mount Dove	652187	7684219	Potential
SJ0686	Armadillidae	*Buddelundia* '21'		Mount Dove	652187	7684219	Potential
SJ0687	Armadillidae	*Buddelundia* '21'		Mount Dove	652187	7684219	Potential
SJ0688	Armadillidae	*Buddelundia* '21'		Mount Dove	652187	7684219	Potential
SJ0689	Armadillidae	*Buddelundia* '21'		Mount Dove	652187	7684219	Potential
SJ0690	Armadillidae	*Buddelundia* '21'		Mount Dove	652187	7684219	Potential
SJ0691	Armadillidae	*Buddelundia* '21'		Mount Dove	648870	7683097	Potential
SJ0692	Armadillidae	*Buddelundia* '21'		Mount Dove	648870	7683097	Potential
SJ0693	Armadillidae	*Buddelundia* '21'		Mount Dove	648870	7683097	Potential
SJ0694	Armadillidae	*Buddelundia* '21'		Mount Dove	648870	7683097	Potential
SJ0695	Armadillidae	*Buddelundia* '21'		Mount Dove	648870	7683097	Potential
SJ0696	Armadillidae	*Buddelundia* '21'		Mount Dove	648870	7683097	Potential
SJ1236	Armadillidae	*Buddelundia* '21'		Mt Dove	651895	7684144	Potential
SJ1237	Armadillidae	*Buddelundia* '21'		Mt Dove	652219	7684285	Potential

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SJ1238	Armadillidae	*Buddelundia* '21'		Mt Dove	652219	7684285	Potential
SJ1239	Armadillidae	*Buddelundia* '21'		Mt Dove	652219	7684285	Potential
SJ1240	Armadillidae	*Buddelundia* '21'		Mt Dove	652219	7684285	Potential
SJ1241	Armadillidae	*Buddelundia* '21'		Mt Dove	652219	7684285	Potential
SJ1242	Armadillidae	*Buddelundia* '21'		Mt Dove	652219	7684285	Potential
SJ1243	Armadillidae	*Buddelundia* '21'		Mt Dove	651769	7684023	Potential
SJ1244	Armadillidae	*Buddelundia* '21'		Mt Dove	651769	7684023	Potential
SJ1245	Armadillidae	*Buddelundia* '21'		Mt Dove	651769	7684023	Potential
SJ1246	Armadillidae	*Buddelundia* '21'		Mt Dove	651769	7684023	Potential
SJ1247	Armadillidae	*Buddelundia* '21'		Mt Dove	651769	7684023	Potential
SJ1248	Armadillidae	*Buddelundia* '21'		Mt Dove	651676	7684057	Potential
SJ1249	Armadillidae	*Buddelundia* '21'		Mt Dove	651676	7684057	Potential
SJ1250	Armadillidae	*Buddelundia* '21'		Mt Dove	651676	7684057	Potential
SJ1251	Armadillidae	*Buddelundia* '21'		Mt Dove	651676	7684057	Potential
SJ1253	Armadillidae	*Buddelundia* '21'		Mt Dove	652368	7682435	Potential
SJ1006	Armadillidae	*Buddelundia* '33'		Central Pilbara	572184	7546817	Potential
SJ1007	Armadillidae	*Buddelundia* '33'		Central Pilbara	572184	7546817	Potential
SJ1010	Armadillidae	*Buddelundia* '33'		Central Pilbara	505994	7698724	Potential
SJ1011	Armadillidae	*Buddelundia* '33'		Central Pilbara	572184	7546817	Potential
SJ1012	Armadillidae	*Buddelundia* '33'		Central Pilbara	500083	7665734	Potential
SJ1014	Armadillidae	*Buddelundia* '33'		Central Pilbara	500999	7705443	Potential
SJ1015	Armadillidae	*Buddelundia* '33'		Central Pilbara	500999	7705443	Potential
SJ1087	Armadillidae	*Buddelundia* '33'		Karratha to Millstream-Chichester National Park	484124	7684552	Potential
SJ1088	Armadillidae	*Buddelundia* '33'		Karratha to Millstream-Chichester National Park	489608	7677174	Potential
SJ1008	Armadillidae	*Buddelundia* '33'		Central Pilbara	505994	7698724	Potential
SJ1009	Armadillidae	*Buddelundia* '33'		Central Pilbara	547050	7602645	Potential
SJ1013	Armadillidae	*Buddelundia* '33'		Central Pilbara	572184	7546817	Potential
SJ1085	Armadillidae	*Buddelundia* '33'		Karratha to Millstream-Chichester National Park	478727	7693543	Potential
SJ1089	Armadillidae	*Buddelundia* '33'		Karratha to Millstream-Chichester National Park	491105	7674519	Potential
SJ1090	Armadillidae	*Buddelundia* '33'		Karratha to Millstream-Chichester National Park	496904	7670127	Potential
SJ1084	Armadillidae	*Buddelundia* '33'		Karratha to Millstream-Chichester National Park	476515	7697801	Potential
SJ1086	Armadillidae	*Buddelundia* '33'		Karratha to Millstream-Chichester National Park	479497	7693013	Potential
SJ1092	Armadillidae	*Buddelundia* '34'		Karratha to Millstream-Chichester National Park	491105	7674519	Potential
SJ1091	Armadillidae	*Buddelundia* '34'		Karratha to Millstream-Chichester National Park	479497	7693013	Potential

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SJ1093	Armadillidae	*Buddelundia* '35'		Karratha to Millstream-Chichester National Park	504785	7658141	Potential
SJ1094	Armadillidae	*Buddelundia* '35'		Karratha to Millstream-Chichester National Park	504567	7655285	Potential
SJ1095	Armadillidae	*Buddelundia* '35'		Karratha to Millstream-Chichester National Park	492717	7673269	Potential
SJ1097	Armadillidae	*Buddelundia* '37'		Karratha to Millstream-Chichester National Park	498826	7667870	Potential
SJ1155	Armadillidae	*Buddelundia* '40'		Anketell Rail Karratha area	565941	7565064	Potential
SJ1148	Armadillidae	*Buddelundia* '40'		Anketell Rail Karratha area	493698	7633183	Potential
SJ1152	Armadillidae	*Buddelundia* '40'		Anketell Rail Karratha area	493648	7603664	Potential
SJ1196	Armadillidae	*Buddelundia* '42'		Central Pilbara	553362	7541833	Potential
SJ1197	Armadillidae	*Buddelundia* '42'		Central Pilbara	551003	7538985	Potential
SJ0001	Armadillidae	*Buddelundia* '44'		Roebourne ca 8.5km W of	507131	7705364	Potential
SJ4677	Armadillidae	*Buddelundia* '47TS'		Nammuldi ca. 12km NE. of Mt Brockman	544198	7519325	Potential
SJ4678	Armadillidae	*Buddelundia* '47TS'		Nammuldi ca. 12km NE. of Mt Brockman	545505	7519200	Potential
SJ4679	Armadillidae	*Buddelundia* '47TS'		Nammuldi ca. 12km NE. of Mt Brockman	546430	7518931	Potential
SJ1182	Armadillidae	*Buddelundia* '54'		Central Pilbara	548788	7552154	Potential
SJ1183	Armadillidae	*Buddelundia* '54'		Central Pilbara	551003	7538985	Potential
SJ4680	Armadillidae	*Buddelundia* '63'		Nammuldi ca. 12km NE of Mt Brockman	544198	7519325	Likely
SJ4681	Armadillidae	*Buddelundia* '63'		Nammuldi ca. 12km NE of Mt Brockman	545505	7519200	Likely
SJ4682	Armadillidae	*Buddelundia* '63'		Nammuldi ca. 12km NE of Mt Brockman	547086	7518188	Likely
SJ4683	Armadillidae	*Buddelundia* '63'		Nammuldi ca. 12km NE of Mt Brockman	546430	7518931	Likely
SJ4684	Armadillidae	*Buddelundia* '63'		Nammuldi ca. 12km NE of Mt Brockman	544939	7519279	Likely
SJ4685	Armadillidae	*Buddelundia* '63'		Nammuldi ca. 12km NE of Mt Brockman	539371	7519172	Likely
SJ4686	Armadillidae	*Buddelundia* '63'		Nammuldi ca. 12km NE of Mt Brockman	534339	7532921	Likely
PES7362	Armadillidae	*Buddelundia* '64'		ca. 21km 167° from Mt Farquhar	480537	7513853	Potential
PES7494	Armadillidae	*Buddelundia* '64'		ca. 24km 154° from Mt Farquhar	486412	7512564	Potential
PES7504	Armadillidae	*Buddelundia* '64'		6.5km WSW Mt Brockman	524998	7514542	Potential
SJ4692	Armadillidae	*Buddelundia* '64'		Nammuldi ca. 12km NE of Mt Brockman	539362	7519383	Potential
PES8050	Armadillidae	*Buddelundia* '64'		ca. 24km 154° from Mt Farquhar	486412	7512564	Potential
PES8107	Armadillidae	*Buddelundia* '64'		ca. 21km 167° from Mt Farquhar	480537	7513853	Potential
PES9299	Armadillidae	*Buddelundia* '64'		6.5km WSW Mt Brockman	524998	7514542	Potential
PES9329	Armadillidae	*Buddelundia* '66'		ca. 5km 294° from Mt Farquhar	471228	7535899	Potential
PES9353	Armadillidae	*Buddelundia* '66'		ca. 5km 294° from Mt Farquhar	471228	7535899	Potential
PES9375	Armadillidae	*Buddelundia* '66'		ca. 21km 99° from Mt Farquhar	496437	7530634	Potential
PES9378	Armadillidae	*Buddelundia* '66'		ca. 21km 99° from Mt Farquhar	496437	7530634	Potential
PES9379	Armadillidae	*Buddelundia* '66'		ca. 21km 99° from Mt Farquhar	496437	7530634	Potential

WAM reg. no. (or other data source)	Family	Genus and species	Species author	Location (as provided by data source)	Easting (zone 50)	Northing (zone 50)	SRE rating
SJ3717	Armadillidae	*Buddelundia* '75'		c.a. 40km Nth Tom Price	572603	7532723	Potential
SJ3714	Armadillidae	*Buddelundia* '75'		c.a. 40km NE Tom Price	597378	7534813	Potential
SJ3715	Armadillidae	*Buddelundia* '75'		c.a. 40km Nth Tom Price	584614	7534777	Potential
SJ3716	Armadillidae	*Buddelundia* '75'		c.a. 40km NE Tom Price	584614	7534777	Potential
SJ3718	Armadillidae	*Buddelundia* '75'		c.a. 40km Nth Tom Price	569696	7532261	Potential
SJ3719	Armadillidae	*Buddelundia* '75'		c.a. 40km Nth Tom Price	569696	7532261	Potential
SJ3722	Armadillidae	*Buddelundia* '76'		c.a. 40km NE Tom Price	594170	7534113	Potential
SJ3720	Armadillidae	*Buddelundia* '76'		c.a. 40km Nth Tom Price	591090	7534154	Potential
SJ3721	Armadillidae	*Buddelundia* '76'		c.a. 40km NE Tom Price	591090	7534154	Potential
SJ3723	Armadillidae	*Buddelundia* '76'		c.a. 40km Nth Tom Price	569696	7532261	Potential
SJ3724	Armadillidae	*Buddelundia* '76'		c.a. 40km Nth Tom Price	564138	7530702	Potential
SJ3726	Armadillidae	*Buddelundia* '76'		c.a. 40km Nth Tom Price	559734	7529026	Potential
SJ3728	Armadillidae	*Buddelundia* '76'		c.a. 40km Nth Tom Price	560897	7528855	Potential
SJ3725	Armadillidae	*Buddelundia* '76'		c.a. 40km Nth Tom Price	563547	7529819	Potential
SJ3727	Armadillidae	*Buddelundia* '76'		c.a. 40km Nth Tom Price	559734	7529026	Potential
SJ1027	Armadillidae	*Buddelundia* '76'		Rio Tinto Nammuldi Silvergrass 70km N of Tom Price	563199	7527861	Potential
SJ1170	Armadillidae	*Buddelundia* '76'		Central Pilbara	549622	7545145	Potential
SJ1171	Armadillidae	*Buddelundia* '76'		Central Pilbara	571720	7544594	Potential
SJ1172	Armadillidae	*Buddelundia* '76'		Central Pilbara	553278	7544148	Potential
SJ1173	Armadillidae	*Buddelundia* '76'		Central Pilbara	562916	7539185	Potential
SJ1175	Armadillidae	*Buddelundia* '76'		Central Pilbara	537112	7533956	Potential
SJ1176	Armadillidae	*Buddelundia* '76'		Central Pilbara	578906	7532693	Potential
SJ1177	Armadillidae	*Buddelundia* '76'		Central Pilbara	560848	7532121	Potential
SJ3729	Armadillidae	*Buddelundia* '77'		c.a. 40km Nth Tom Price	563930	7527813	Potential
SJ3730	Armadillidae	*Buddelundia* '77'		c.a. 40km Nth Tom Price	563930	7527813	Potential
SJ3701	Armadillidae	*Buddelundia* '77'		c.a. 40km NE Tom Price	597378	7534813	Potential
SJ3702	Armadillidae	*Buddelundia* '77'		c.a. 40km NE Tom Price	591090	7534154	Potential
SJ3703	Armadillidae	*Buddelundia* '77'		c.a. 40km NE Tom Price	591090	7534154	Potential
SJ3705	Armadillidae	*Buddelundia* '77'		c.a. 40km NE Tom Price	597617	7531756	Potential
SJ3706	Armadillidae	*Buddelundia* '77'		c.a. 40km NE Tom Price	597617	7531756	Potential
SJ3707	Armadillidae	*Buddelundia* '77'		c.a. 40km NE Tom Price	601060	7517995	Potential
SJ3708	Armadillidae	*Buddelundia* '77'		c.a. 40km NE Tom Price	601060	7517995	Potential
SJ3709	Armadillidae	*Buddelundia* '77'		c.a. 40km NE Tom Price	601060	7517995	Potential
SJ3710	Armadillidae	*Buddelundia* '77'		c.a. 40km NE Tom Price	601060	7517995	Potential

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PES9372	Armadillidae	*Buddelundia* sp. indet.		7.5km WSW Mt Brockman	524524	7513857	Potential
SJ1022	Armadillidae	*Buddelundia* sp. indet.		Central Pilbara	505994	7698724	Potential
PES13963	Armadillidae	*Buddelundia* sp. indet.		ca. 130 km WNW. Of Tom Price	479988	7533146	Potential
PES6242	Armadillidae	*Buddelundia* sp. indet.		7.5km WSW Mt Brockman	524524	7513857	Potential
SJ0435	Armadillidae	*Buddelundia* sp. indet.		Zion ca. 63km N of Tom Price.	597558	7545384	Potential
SJ1149	Armadillidae	*Buddelundia* sp. indet.		Anketell Rail Karratha area	493698	7633183	Potential
PES7857	Armadillidae	*Buddelundia* sp. indet.		7.5km WSW Mt Brockman	524524	7513857	Potential
PES7943	Armadillidae	*Buddelundia* sp. indet.		7.5km WSW Mt Brockman	524524	7513857	Potential
PES9319	Armadillidae	*Buddelundia* sp. indet.		ca. 21km 167° from Mt Farquhar	480537	7513853	Potential
SJ1025	Armadillidae	*Buddelundia* sp. indet.		Rio Tinto Nammuldi Silvergrass 70km N of Tom Price	561499	7519775	Potential
SJ1026	Armadillidae	*Buddelundia* sp. indet.		Rio Tinto Nammuldi Silvergrass 70km N of Tom Price	564010	7519743	Potential
SJ1061	Armadillidae	*Buddelundia* sp. indet.		Rio Tinto Nammuldi Silvergrass 70km N of Tom Price	564010	7519743	Potential
SJ3947	Armadillidae	Buddelundiinae 'EE1340'		c.a. 40km Nth Tom Price	558209	7526087	Likely
SJ3948	Armadillidae	Buddelundiinae 'EE1340'		c.a. 40km Nth Tom Price	562602	7530298	Likely
SJ3949	Armadillidae	Buddelundiinae 'EE1340'		c.a. 40km Nth Tom Price	558701	7531044	Likely
SJ1040	Armadillidae	Buddelundiinae 'EE1340'		Rio Tinto Nammuldi Silvergrass 70km N of Tom Price	561499	7519775	Likely
SJ1041	Armadillidae	Buddelundiinae 'EE1340'		Rio Tinto Nammuldi Silvergrass 70km N of Tom Price	562695	7525294	Likely
SJ1042	Armadillidae	Buddelundiinae 'EE1340'		Rio Tinto Nammuldi Silvergrass 70km N of Tom Price	557285	7524098	Likely
SJ1043	Armadillidae	Buddelundiinae 'EE1340'		Rio Tinto Nammuldi Silvergrass 70km N of Tom Price	547655	7525724	Likely
SJ1044	Armadillidae	Buddelundiinae 'EE1340'		Rio Tinto Nammuldi Silvergrass 70km N of Tom Price	549887	7525186	Likely
SJ1045	Armadillidae	Buddelundiinae 'EE1340'		Rio Tinto Nammuldi Silvergrass 70km N of Tom Price	549887	7525186	Likely
SJ1046	Armadillidae	Buddelundiinae 'EE1340'		Rio Tinto Nammuldi Silvergrass 70km N of Tom Price	547655	7525724	Likely
SJ1047	Armadillidae	Buddelundiinae 'EE1340'		Rio Tinto Nammuldi Silvergrass 70km N of Tom Price	561499	7519775	Likely
SJ1048	Armadillidae	Buddelundiinae 'EE1340'		Rio Tinto Nammuldi Silvergrass 70km N of Tom Price	548116	7521760	Likely
SJ1049	Armadillidae	Buddelundiinae 'EE1340'		Rio Tinto Nammuldi Silvergrass 70km N of Tom Price	557285	7524098	Likely
SJ1050	Armadillidae	Buddelundiinae 'EE1340'		Rio Tinto Nammuldi Silvergrass 70km N of Tom Price	563199	7527861	Likely
SJ1051	Armadillidae	Buddelundiinae 'EE1340'		Rio Tinto Nammuldi Silvergrass 70km N of Tom Price	563199	7527861	Likely
SJ1052	Armadillidae	Buddelundiinae 'EE1340'		Rio Tinto Nammuldi Silvergrass 70km N of Tom Price	549887	7525186	Likely
SJ1053	Armadillidae	Buddelundiinae 'EE1340'		Rio Tinto Nammuldi Silvergrass 70km N of Tom Price	547655	7525724	Likely
SJ1054	Armadillidae	Buddelundiinae 'EE1340'		Rio Tinto Nammuldi Silvergrass 70km N of Tom Price	563199	7527861	Likely
SJ1055	Armadillidae	Buddelundiinae 'EE1340'		Rio Tinto Nammuldi Silvergrass 70km N of Tom Price	561499	7519775	Likely
SJ1056	Armadillidae	Buddelundiinae 'EE1340'		Rio Tinto Nammuldi Silvergrass 70km N of Tom Price	561550	7527369	Likely
SJ1057	Armadillidae	Buddelundiinae 'EE1340'		Rio Tinto Nammuldi Silvergrass 70km N of Tom Price	555634	7522831	Likely
SJ0428	Armadillidae	cf. *Barrowdillo* sp. 2		Serenity Valley ca. 93km N of Tom Price.	558324	7551203	Potential

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SJ0429	Armadillidae	cf. *Barrowdillo* sp. 3		Valley of the Kings ca.61km N of Tom Price	594500	7547706	Potential
SJ0430	Armadillidae	cf. *Barrowdillo* sp. 4		Serenity Valley ca. 93km N of Tom Price.	554426	7554162	Potential
SJ0431	Armadillidae	cf. *Barrowdillo* sp. 5		Serenity Valley ca. 93km N of Tom Price.	557836	7550441	Potential
SJ0432	Armadillidae	cf. *Barrowdillo* sp. 6		Serenity Valley ca. 93km N of Tom Price.	556917	7547279	Potential
SJ0433	Armadillidae	cf. *Barrowdillo* sp. 7		Serenity Valley ca. 93km N of Tom Price.	554086	7554417	Potential
SJ0434	Armadillidae	cf. *Barrowdillo* sp. 8		Karijini NP ca. 60km N of Tom Price.	606807	7533589	Potential
SJ1178	Armadillidae	cf. *Barrowdillo* sp. 9		Central Pilbara	548788	7552154	Potential
SJ1179	Armadillidae	cf. *Barrowdillo* sp. 10		Central Pilbara	562916	7539185	Potential
SJ1180	Armadillidae	cf. *Barrowdillo* sp. 11		Central Pilbara	574149	7537388	Potential
SJ1101	Armadillidae	cf. *Barrowdillo* sp. 3		Karratha to Millstream-Chichester National Park	496904	7670127	Potential
PES8136	Armadillidae	*Cubaris* '999'		ca. 17km 178° from Mt Farquhar	476325	7516913	Likely
PES9313	Armadillidae	*Cubaris* '999'		ca. 9km 122° from Mt Farquhar	483618	7528999	Likely
SJ1024	Armadillidae	*Laevophiloscia* sp. indet.		Central Pilbara	549087	7602362	Likely
SJ1102	Armadillidae	*Laevophiloscia* sp. indet.		Karratha to Millstream-Chichester National Park	504567	7655285	Likely
PES7868	Philosciidae	Philosciidae 'brockman'		7.5km WSW Mt Brockman	524524	7513857	Likely
PES7891	Philosciidae	Philosciidae 'brockman'		6.5km WSW Mt Brockman	524998	7514542	Likely
PES7498	Philosciidae	Philosciidae 'farquhar'		ca. 24km 154° from Mt Farquhar	486412	7512564	Likely
PES7695	Philosciidae	Philosciidae 'farquhar'		7.5km WSW Mt Brockman	524524	7513857	Likely
PES7529	Philosciidae	Philosciidae 'farquhar'		ca. 4km 299° from Mt Farquhar	472743	7535570	Likely
SJ1150	Barrowdillo	cf. Spherillo sp. nov.		Anketell Rail Karratha area	505544	7630748	Likely
PES6312	Armadillidae	*Spherillo* '999'		ca. 16km 78° from Mt Farquhar	491253	7537174	Potential
PES7505	Armadillidae	*Spherillo* '999'		ca. 16km 78° from Mt Farquhar	491253	7537174	Potential
PES9350	Armadillidae	*Spherillo* '999'		ca. 4km 299° from Mt Farquhar	472743	7535570	Potential
PES9351	Armadillidae	*Spherillo* '999'		ca. 5km 294° from Mt Farquhar	471228	7535899	Potential
PES9315	Armadillidae	*Spherillo* '999'		ca. 4km 299° from Mt Farquhar	472743	7535570	Potential
PES9330	Armadillidae	*Spherillo* '999'		ca. 5km 294° from Mt Farquhar	471228	7535899	Potential
Order Eupulmonata (land snails)							
S83699	Bothriembryontidae	*Bothriembryon* sp. nov. `Pilbara`		MT FARQUAR	472701	7535570	Potential
S83571	Bothriembryontidae	*Bothriembryon* sp. nov. `Pilbara`		MT FARQUHAR	472701	7535570	Potential
S83572	Bothriembryontidae	*Bothriembryon* sp. nov. `Pilbara`		MT FARQUHAR	472701	7535570	Potential
S65305	Bothriembryontidae	*Bothriembryon* sp. nov.		KARIJINI NP	660493	7513406	Potential

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		`Pilbara`					
S65312	Bothriembryontidae	*Bothriembryon* sp. nov. `Pilbara`		KARIJINI NP	660802	7513458	Potential
S9519	Bothriembryontidae	*Bothriembryon* sp. nov. `Pilbara`		DALES GORGE	664583	7510949	Potential
S9520	Bothriembryontidae	*Bothriembryon* sp. nov. `Pilbara`		COOLAWANYAH HMSD	582694	7589096	Potential
S9521	Bothriembryontidae	*Bothriembryon* sp. nov. `Pilbara`		GREGORY GORGE	493063	7616979	Potential
S9522	Bothriembryontidae	*Bothriembryon* sp. nov. `Pilbara`		MILLSTREAM NAT. PARK	508592	7613292	Potential
S34354	Bothriembryontidae	*Bothriembryon* sp. nov. `Pilbara`		MILLSTREAM	506936	7613293	Potential
S34356	Bothriembryontidae	*Bothriembryon* sp. nov. `Pilbara`		FORTESCUE CROSSING	614372	7552356	Potential
S9526	Bothriembryontidae	*Bothriembryon* sp. nov. `Pilbara`		MILLSTREAM	506936	7613293	Potential
S9527	Bothriembryontidae	*Bothriembryon* sp. nov. `Pilbara`		DALES GORGE	664583	7510949	Potential
S34359	Bothriembryontidae	*Bothriembryon* sp. nov. `Pilbara`		MILLSTREAM	508592	7613292	Potential
S34360	Bothriembryontidae	*Bothriembryon* sp. nov. `Pilbara`		MILLSTREAM	508592	7613292	Potential
S34361	Bothriembryontidae	*Bothriembryon* sp. nov. `Pilbara`		DOGGER GORGE	487884	7618824	Potential
S34365	Bothriembryontidae	*Bothriembryon* sp. nov. `Pilbara`		DAWSON CREEK	510352	7613291	Potential
S34366	Bothriembryontidae	*Bothriembryon* sp. nov. `Pilbara`		MILLSTREAM	508592	7613292	Potential
S12122	Bothriembryontidae	*Bothriembryon* sp. nov. `Pilbara`		MILLSTREAM	511800	7611420	Potential
S83294	Bothriembryontidae	*Bothriembryon* sp. nov. `Pilbara`		CROSSING POOL	508903	7614012	Potential
S83296	Bothriembryontidae	*Bothriembryon* sp. nov.		DAWSON CREEK	511386	7611819	Potential

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		`Pilbara`					
S83297	Bothriembryontidae	*Bothriembryon* sp. nov. `Pilbara`		KANGEENAMARINA GORGE	588220	7560417	Potential
S83298	Bothriembryontidae	*Bothriembryon* sp. nov. `Pilbara`		MILLERS GORGE	589453	7559591	Potential
S61796	Bothriembryontidae	*Bothriembryon* sp. nov. `Pilbara`		SERENITY VALLEY	559057	7543330	Potential
S83570	Bothriembryontidae	*Bothriembryon* sp. nov. `Pilbara`		MT FARQUHAR	472701	7535570	Potential
S83573	Bothriembryontidae	*Bothriembryon* sp. nov. `Pilbara`		MT FARQUHAR	480558	7513864	Potential
S12702	Bothriembryontidae	*Bothriembryon* sp. nov. `Pilbara`		Hamersley Ranges	591104	7559538	Potential
S28579	Bothriembryontidae	*Bothriembryon* sp. nov. `Pilbara`		MILLSTREAM	506936	7613293	Potential
S30143	Bothriembryontidae	*Bothriembryon* sp. nov. `Pilbara`		BROCKMAN MINE	503709	7537387	Potential
S81859	Bothriembryontidae	*Bothriembryon* sp. nov. `Pilbara`		TOM PRICE	598071	7518933	Potential
S81860	Bothriembryontidae	*Bothriembryon* sp. nov. `Pilbara`		TOM PRICE	594150	7534113	Potential
S3781	Bothriembryontidae	*Bothriembryon* sp. nov. `Pilbara`		CROSSING POOL	508903	7614012	Potential
S3782	Bothriembryontidae	*Bothriembryon* sp. nov. `Pilbara`		COOLAWANYAH HMSD	582694	7589096	Potential
S3783	Bothriembryontidae	*Bothriembryon* sp. nov. `Pilbara`		CROSSING POOL	508593	7615141	Potential
S3784	Bothriembryontidae	*Bothriembryon* sp. nov. `Pilbara`		GREGORY GORGE	491406	7616978	Potential
S3785	Bothriembryontidae	*Bothriembryon* sp. nov. `Pilbara`		CROSSING POOL	515213	7608894	Potential
S3786	Bothriembryontidae	*Bothriembryon* sp. nov. `Pilbara`		CROSSING POOL	508593	7615141	Potential
S3787	Bothriembryontidae	*Bothriembryon* sp. nov.		DEEP REACH POOL	510351	7611443	Potential

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		`Pilbara`					
S3788	Bothriembryontidae	*Bothriembryon* sp. nov. `Pilbara`		BEE GORGE	628837	7542667	Potential
S81617	Bothriembryontidae	*Bothriembryon* sp. nov. `Pilbara`		TOM PRICE	480019	7533146	Potential
S3794	Bothriembryontidae	*Bothriembryon* sp. nov. `Pilbara`		HAMERSLEY HOMESTEAD	558410	7535706	Potential
S3796	Bothriembryontidae	*Bothriembryon* sp. nov. `Pilbara`		MOUNT WATKINS	637360	7538896	Potential
S12245	Bothriembryontidae	*Bothriembryon* sp. nov. `Pilbara`		DAWSON CREEK	511696	7610523	Potential
S1496	Bothriembryontidae	*Bothriembryon* sp. nov. `Pilbara`		DOGGER GORGE	487884	7618824	Potential
S1497	Bothriembryontidae	*Bothriembryon* sp. nov. `Pilbara`		FORTESCUE FALLS	659478	7514701	Potential
S1499	Bothriembryontidae	*Bothriembryon* sp. nov. `Pilbara`		GREGORY GORGE	496583	7616980	Potential
S81642	Bothriembryontidae	*Bothriembryon* sp. nov. `Pilbara`		TOM PRICE	476539	7518098	Potential
S83698	Bothriembryontidae	*Bothriembryon* sp. nov. `Pilbara`		MT FARQUAR	480558	7513864	Potential
S83700	Bothriembryontidae	*Bothriembryon* sp. nov. `Pilbara`		MT FARQUAR	488874	7535855	Potential
S83701	Bothriembryontidae	*Bothriembryon* sp. nov. `Pilbara`		MT FARQUAR	472701	7535570	Potential
S65332	Bothriembryontidae	*Bothriembryon* sp. nov. `Pilbara`		KARIJINI NP	660391	7513451	Potential
S84100	Bothriembryontidae	*Bothriembryon* sp. nov. `Pilbara`		DAWSON CREEK	511800	7610999	Potential
S84101	Bothriembryontidae	*Bothriembryon* sp. nov. `Pilbara`		DAWSON CREEK	511800	7610999	Potential
S7619	Bothriembryontidae	*Bothriembryon* sp. nov. `Pilbara`		DAWSON CREEK	508592	7613292	Potential
S7624	Bothriembryontidae	*Bothriembryon* sp. nov.		DALES GORGE	664583	7510949	Potential

WAM reg. no. (or other data source)	Family	Genus and species	Species author	Location (as provided by data source)	Easting (zone 50)	Northing (zone 50)	SRE rating
		`Pilbara`					
S11548	Bothriembryontidae	*Bothriembryon* sp. nov. `Pilbara`		MILLERS GORGE	589453	7559591	Potential
S11549	Bothriembryontidae	*Bothriembryon* sp. nov. `Pilbara`		WITTENOOM BYPASS	614372	7552356	Potential
S65350	Bothriembryontidae	*Bothriembryon* sp. nov. `Pilbara`		KARIJINI NP	660493	7513406	Potential
S65353	Bothriembryontidae	*Bothriembryon* sp. nov. `Pilbara`		KARIJINI NP	633740	7525486	Potential
S65357	Bothriembryontidae	*Bothriembryon* sp. nov. `Pilbara`		KARIJINI NP	660493	7513406	Potential
S81733	Bothriembryontidae	*Bothriembryon* sp. nov. `Pilbara`		TOM PRICE	476539	7518098	Potential
S11942	Bothriembryontidae	*Bothriembryon* sp. nov. `Pilbara`		HAMERSLEY RANGES	591104	7559538	Potential
S30031	Bothriembryontidae	*Bothriembryon* sp. nov. `Pilbara`		Millers Gorge	591104	7559538	Potential
S61801	Bothriembryontidae	*Bothriembryon* sp. nov. `Pilbara`		KARINJINI NP	605248	7545312	Potential
S33120	Camaenidae	Camaenidae gen. nov. sp. nov.		WODGINA	657610	7670440	Potential
S33121	Camaenidae	Camaenidae gen. nov. sp. nov.		WODGINA	662387	7670040	Potential
S65072	Camaenidae	Camaenidae gen. nov. sp. nov.		WODGINA	660000	7670340	Potential
S64802	Camaenidae	Camaenidae gen. nov. sp. nov.		WODGINA MINE	662283	7670052	Potential
S65069	Camaenidae	Camaenidae gen. nov. sp. nov.		WODGINA	662283	7670029	Potential
S65071	Camaenidae	Camaenidae gen. nov. sp. nov.		WODGINA	660000	7670340	Potential
S64817	Camaenidae	Camaenidae gen. nov. sp. nov.		WODGINA MINE	662283	7670052	Potential
S65888	Camaenidae	Camaenidae gen. nov. sp.		WODGINA	658544	7670243	Potential

WAM reg. no. (or other data source)	Family	Genus and species	Species author	Location (as provided by data source)	Easting (zone 50)	Northing (zone 50)	SRE rating
		nov.					
S65899	Camaenidae	Camaenidae gen. nov. sp. nov.		WODGINA	662387	7670040	Potential
S65901	Camaenidae	Camaenidae gen. nov. sp. nov.		WODGINA	657610	7670440	Potential
S65907	Camaenidae	Camaenidae gen. nov. sp. nov.		WODGINA	657610	7670440	Potential
S43984	Camaenidae	Camaenidae gen. nov. sp. nov.		WODGINA	658544	7670243	Potential
S43985	Camaenidae	Camaenidae gen. nov. sp. nov.		WODGINA	657925	7670769	Potential
S43990	Camaenidae	Camaenidae gen. nov. sp. nov.		WODGINA	662387	7670040	Potential
S43991	Camaenidae	Camaenidae gen. nov. sp. nov.		WODGINA	658956	7669918	Potential
S43992	Camaenidae	Camaenidae gen. nov. sp. nov.		WODGINA	657610	7670440	Potential
S43993	Camaenidae	Camaenidae gen. nov. sp. nov.		WODGINA	658544	7670243	Potential
S43994	Camaenidae	Camaenidae gen. nov. sp. nov.		WODGINA	657610	7670440	Potential
S43997	Camaenidae	Camaenidae gen. nov. sp. nov.		WODGINA	657925	7670725	Potential
S43998	Camaenidae	Camaenidae gen. nov. sp. nov.		WODGINA	658544	7670243	Potential
S43999	Camaenidae	Camaenidae gen. nov. sp. nov.		WODGINA	658956	7669918	Potential
S65059	Camaenidae	Camaenidae gen. nov. sp. nov.		WODGINA	662283	7670029	Potential
S65062	Camaenidae	Camaenidae gen. nov. sp. nov.		WODGINA	660000	7670340	Potential
S61793	Camaenidae	Camaenidae gen. nov. sp. nov. `Z`		SERENITY VALLEY	559057	7543330	Potential
S33119	Camaenidae	Camaenidae gen. nov. sp.		WODGINA	657610	7670440	Potential

WAM reg. no. (or other data source)	Family	Genus and species	Species author	Location (as provided by data source)	Easting (zone 50)	Northing (zone 50)	SRE rating
		nov. cf.`small Mount Robinson`					
S65073	Camaenidae	Camaenidae gen. nov. sp. nov. cf.`small Mount Robinson`		WODGINA	662283	7670029	Potential
S61924	Camaenidae	*Quistrachia* cf. *herberti*		PINDERI HILLS	484416	7672311	Potential
S14867	Camaenidae	*Quistrachia herberti*	Solem, 1997	CHICHESTER RANGE NATIONAL PARK	522088	7641503	Potential
S14868	Camaenidae	*Quistrachia herberti*	Solem, 1997	MT HERBERT	522088	7641503	Potential
S14869	Camaenidae	*Quistrachia herberti*	Solem, 1997	MT HERBERT	522088	7641503	Potential
S61494	Camaenidae	*Quistrachia herberti*	Solem, 1997	MOUNT HERBERT	522296	7641691	Potential
S61498	Camaenidae	*Quistrachia herberti*	Solem, 1997	MOUNT HERBERT	522622	7652869	Potential
S61500	Camaenidae	*Quistrachia herberti*	Solem, 1997	FORTESCUE RIVER	481249	7625603	Potential
S5701	Camaenidae	*Quistrachia herberti*	Solem, 1997	MOUNT HERBERT	522505	7642797	Potential
S81225	Camaenidae	*Quistrachia herberti*	Solem, 1997	KARRATHA	503737	7658296	Potential
S81237	Camaenidae	*Quistrachia herberti*	Solem, 1997	KARRATHA	504775	7658141	Potential
S28052	Camaenidae	*Quistrachia herberti*	Solem, 1997	ROEBOURNE	522088	7641503	Potential
S61848	Camaenidae	*Quistrachia herberti*	Solem, 1997	HARDING RIVER	506220	7635806	Potential
S5804	Camaenidae	*Quistrachia herberti*	Solem, 1997	TOM PRICE	581333	7668433	Potential
S61674	Camaenidae	*Quistrachia herberti*	Solem, 1997	MILLSTREAM CHICHESTER NP	508592	7613292	Potential
S61675	Camaenidae	*Quistrachia herberti*	Solem, 1997	MILLSTREAM CHICHESTER NP	508592	7613292	Potential
S8976	Camaenidae	*Quistrachia herberti*	Solem, 1997	MOUNT HERBERT	522088	7641503	Potential
S12105	Camaenidae	*Quistrachia legendrei*	Solem, 1997	KARRATHA	483446	7707515	Potential
S83697	Camaenidae	*Quistrachia* sp. nov. `cf. Barlee Range`		MT FARQUAR	472701	7535570	Potential
S61766	Camaenidae	*Quistrachia* sp. nov. `cancellate`		HAMMERSLEY RANGE	591797	7554574	Potential
S61792	Camaenidae	*Quistrachia* sp. nov. `cancellate`		SERENITY VALLEY	559057	7543330	Potential
S61797	Camaenidae	*Quistrachia* sp. nov. `cancellate`		SERENITY VALLEY	554456	7554161	Potential
S61800	Camaenidae	*Quistrachia* sp. nov. `cancellate`		SERENITY VALLEY	557433	7550177	Potential
S34687	Camaenidae	*Quistrachia* sp. nov. `cancellate`		TOM PRICE	587336	7549939	Potential

WAM reg. no. (or other data source)	Family	Genus and species	Species author	Location (as provided by data source)	Easting (zone 50)	Northing (zone 50)	SRE rating
S34688	Camaenidae	*Quistrachia* sp. nov. `cancellate`		TOM PRICE	585482	7550315	Potential
S61677	Camaenidae	*Quistrachia* sp. nov. `cancellate`		MILLERS GORGE	589453	7559591	Potential
S61678	Camaenidae	*Quistrachia* sp. nov. `cancellate`		KANGEENAMARINA GORGE	588220	7560417	Potential
S34677	Camaenidae	*Quistrachia* sp. nov. `cancellate`		Millers Gorge	591104	7559538	Potential
S61496	Camaenidae	*Quistrachia* sp. nov. `W`		QUARTZ HILL	494795	7705519	Potential
S61676	Camaenidae	*Quistrachia* sp. nov. `W`		PILBARA	495940	7704059	Potential
S64526	Camaenidae	*Quistrachia* sp. nov. X `Anketell Point`		ANKETELL POINT	508121	7707344	Potential
S63252	Camaenidae	*Quistrachia* sp. nov. X `Anketell Point`		ANKETELL POINT	501666	7706328	Potential
S64537	Camaenidae	*Quistrachia* sp. nov. X `Anketell Point`		ANKETELL POINT	508643	7710376	Potential
S64511	Camaenidae	*Quistrachia* sp. nov. X `Anketell Point`		ANKETELL POINT	509058	7707499	Potential
S28117	Camaenidae	*Quistrachia* sp. nov.		KARRATHA	486152	7707429	Potential
S61890	Camaenidae	*Quistrachia*? sp. indet.		KARRATHA	484381	7709209	Potential
S28113	Camaenidae	*Quistrachia* sp. indet.		MILLSTREAM	506936	7613293	Potential
S28114	Camaenidae	*Quistrachia* sp. indet.		MILLSTREAM	506936	7613293	Potential
S28115	Camaenidae	*Quistrachia* sp. indet.		MILLSTREAM	506936	7613293	Potential
S65795	Camaenidae	*Rhagada* cf. *convicta*		CENTRAL PILBARA	501041	7705454	Potential
S65798	Camaenidae	*Rhagada* cf. *convicta*		CENTRAL PILBARA	501041	7705454	Potential
S65799	Camaenidae	*Rhagada* cf. *convicta*		CENTRAL PILBARA	501041	7705454	Potential
S65800	Camaenidae	*Rhagada* cf. *convicta*		CENTRAL PILBARA	506035	7698724	Potential
S65802	Camaenidae	*Rhagada* cf. *convicta*		CENTRAL PILBARA	501041	7705454	Potential
S65818	Camaenidae	*Rhagada* cf. *convicta*		CENTRAL PILBARA	501041	7705454	Potential
S81234	Camaenidae	*Rhagada* cf. *convicta*		KARRATHA	497923	7669032	Potential
S81248	Camaenidae	*Rhagada* cf. *convicta*		KARRATHA	479507	7693024	Potential
S81265	Camaenidae	*Rhagada* cf. *convicta*		KARRATHA	476484	7697801	Potential
S81275	Camaenidae	*Rhagada* cf. *convicta*		KARRATHA	479507	7693024	Potential
S81290	Camaenidae	*Rhagada* cf. *convicta*		KARRATHA	479507	7693024	Potential

WAM reg. no. (or other data source)	Family	Genus and species	Species author	Location (as provided by data source)	Easting (zone 50)	Northing (zone 50)	SRE rating
S83938	Camaenidae	*Rhagada* cf. *convicta*		WHIM CREEK	575144	7701202	Potential
S83939	Camaenidae	*Rhagada* cf. *convicta*		WHIM CREEK	570576	7703944	Potential
S83941	Camaenidae	*Rhagada* cf. *convicta*		WHIM CREEK	575570	7703358	Potential
S83943	Camaenidae	*Rhagada* cf. *convicta*		WHIM CREEK	576295	7702691	Potential
S61927	Camaenidae	*Rhagada* cf. *convicta*		WHIM CREEK	586671	7696077	Potential
S83944	Camaenidae	*Rhagada* cf. *convicta*		WHIM CREEK	575144	7701202	Potential
S81223	Camaenidae	*Rhagada* cf. *convicta*		KARRATHA	478779	7693543	Potential
S65793	Camaenidae	*Rhagada* cf. *convicta*		CENTRAL PILBARA	501041	7705454	Potential
S81233	Camaenidae	*Rhagada* cf. *pilbarana*		KARRATHA	501142	7659259	Potential
S81236	Camaenidae	*Rhagada* cf. *pilbarana*		KARRATHA	499273	7665568	Potential
S81239	Camaenidae	*Rhagada* cf. *pilbarana*		KARRATHA	496884	7670127	Potential
S81242	Camaenidae	*Rhagada* cf. *pilbarana*		KARRATHA	491064	7674530	Potential
S81226	Camaenidae	*Rhagada* cf. *pilbarana*		KARRATHA	492727	7673269	Potential
S83716	Camaenidae	*Rhagada* cf. *radleyi*		MT BROCKMAN	528505	7519407	Potential
S83730	Camaenidae	*Rhagada* cf. *radleyi*		MT FARQUAR	488874	7535855	Potential
S83739	Camaenidae	*Rhagada* cf. *radleyi*		MT BROCKMAN	524998	7514553	Potential
S83717	Camaenidae	*Rhagada* cf. *radleyi*		MT FARQUAR	480558	7513864	Potential
S83721	Camaenidae	*Rhagada* cf. *radleyi*		MT FARQUAR	494128	7536489	Potential
S83722	Camaenidae	*Rhagada* cf. *radleyi*		MT BROCKMAN	528505	7519407	Potential
S83723	Camaenidae	*Rhagada* cf. *radleyi*		MT BROCKMAN	524998	7514553	Potential
S83734	Camaenidae	*Rhagada* cf. *radleyi*		MT FARQUAR	504224	7538460	Potential
S83735	Camaenidae	*Rhagada* cf. *radleyi*		MT BROCKMAN	524483	7513857	Potential
S83736	Camaenidae	*Rhagada* cf. *radleyi*		MT FARQUAR	476335	7516924	Potential
S81203	Camaenidae	*Rhagada* cf. *radleyi*		ANKETELL RAIL	489548	7608300	Potential
S81730	Camaenidae	*Rhagada* cf. *radleyi*		TOM PRICE	477773	7518985	Potential
S81734	Camaenidae	*Rhagada* cf. *radleyi*		TOM PRICE	476539	7518098	Potential
S83588	Camaenidae	*Rhagada* cf. *radleyi*		MT FARQUHAR	476335	7516924	Potential
S83589	Camaenidae	*Rhagada* cf. *radleyi*		MT FARQUHAR	491243	7537174	Potential
S83590	Camaenidae	*Rhagada* cf. *radleyi*		MT FARQUHAR	486422	7512575	Potential
S83591	Camaenidae	*Rhagada* cf. *radleyi*		MT BROCKMAN	524998	7514553	Potential
S83592	Camaenidae	*Rhagada* cf. *radleyi*		MT FARQUHAR	480558	7513864	Potential
S83593	Camaenidae	*Rhagada* cf. *radleyi*		MT BROCKMAN	524483	7513857	Potential
S83594	Camaenidae	*Rhagada* cf. *radleyi*		MT FARQUHAR	486422	7512575	Potential
S83598	Camaenidae	*Rhagada* cf. *radleyi*		MT BROCKMAN	524998	7514553	Potential

WAM reg. no. (or other data source)	Family	Genus and species	Species author	Location (as provided by data source)	Easting (zone 50)	Northing (zone 50)	SRE rating
S83599	Camaenidae	*Rhagada* cf. *radleyi*		MT BROCKMAN	528505	7519407	Potential
S83601	Camaenidae	*Rhagada* cf. *radleyi*		MT BROCKMAN	528505	7519407	Potential
S81618	Camaenidae	*Rhagada* cf. *radleyi*		TOM PRICE	480019	7533146	Potential
S81622	Camaenidae	*Rhagada* cf. *radleyi*		TOM PRICE	472629	7518147	Potential
S81643	Camaenidae	*Rhagada* cf. *radleyi*		TOM PRICE	476539	7518098	Potential
S65782	Camaenidae	*Rhagada* cf. *radleyi*		CENTRAL PILBARA	553288	7544148	Potential
S83690	Camaenidae	*Rhagada convicta*	(Cox, 1870)	DAMPIER SALT	468984	7702149	Potential
S60008	Camaenidae	*Rhagada convicta*	(Cox, 1870)	ANKETELL POINT	507601	7708540	Potential
S60010	Camaenidae	*Rhagada convicta*	(Cox, 1870)	ANKETELL POINT	507601	7708540	Potential
S60022	Camaenidae	*Rhagada convicta*	(Cox, 1870)	ANKETELL POINT	501666	7706328	Potential
S65804	Camaenidae	*Rhagada convicta*	(Cox, 1870)	CENTRAL PILBARA	501041	7705454	Potential
S65807	Camaenidae	*Rhagada convicta*	(Cox, 1870)	CENTRAL PILBARA	506035	7698724	Potential
S65808	Camaenidae	*Rhagada convicta*	(Cox, 1870)	CENTRAL PILBARA	505094	7682267	Potential
S65811	Camaenidae	*Rhagada convicta*	(Cox, 1870)	CENTRAL PILBARA	505819	7675461	Potential
S65812	Camaenidae	*Rhagada convicta*	(Cox, 1870)	CENTRAL PILBARA	501041	7705454	Potential
S65814	Camaenidae	*Rhagada convicta*	(Cox, 1870)	CENTRAL PILBARA	504991	7684359	Potential
S61495	Camaenidae	*Rhagada convicta*	(Cox, 1870)	QUARTZ HILL	495940	7704059	Potential
S81227	Camaenidae	*Rhagada convicta*	(Cox, 1870)	KARRATHA	477423	7696109	Potential
S81229	Camaenidae	*Rhagada convicta*	(Cox, 1870)	KARRATHA	476484	7697801	Potential
S81230	Camaenidae	*Rhagada convicta*	(Cox, 1870)	KARRATHA	487631	7679475	Potential
S81231	Camaenidae	*Rhagada convicta*	(Cox, 1870)	KARRATHA	489608	7677185	Potential
S81232	Camaenidae	*Rhagada convicta*	(Cox, 1870)	KARRATHA	479507	7693024	Potential
S81235	Camaenidae	*Rhagada convicta*	(Cox, 1870)	KARRATHA	478779	7693543	Potential
S59477	Camaenidae	*Rhagada convicta*	(Cox, 1870)	WHIM CREEK	582268	7710731	Potential
S60000	Camaenidae	*Rhagada convicta*	(Cox, 1870)	ANKETELL POINT	507079	7705364	Potential
S81258	Camaenidae	*Rhagada convicta*	(Cox, 1870)	KARRATHA	476484	7697801	Potential
S81259	Camaenidae	*Rhagada convicta*	(Cox, 1870)	KARRATHA	478779	7693543	Potential
S81264	Camaenidae	*Rhagada convicta*	(Cox, 1870)	KARRATHA	487631	7679475	Potential
S60019	Camaenidae	*Rhagada convicta*	(Cox, 1870)	ANKETELL POINT	501666	7706328	Potential
S14492	Camaenidae	*Rhagada convicta*	(Cox, 1870)	TAMBREY RUINS	562091	7607641	Potential
S12194	Camaenidae	*Rhagada convicta*	(Cox, 1870)	ROEBOURNE	503331	7705221	Potential
S12197	Camaenidae	*Rhagada convicta*	(Cox, 1870)	KARRATHA	482405	7707514	Potential
S12199	Camaenidae	*Rhagada convicta*	(Cox, 1870)	NICKOL RIVER	494692	7703306	Potential
S12203	Camaenidae	*Rhagada convicta*	(Cox, 1870)	KARRATHA	486152	7707429	Potential

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S12204	Camaenidae	*Rhagada convicta*	(Cox, 1870)	KARRATHA	486153	7707363	Potential
S12212	Camaenidae	*Rhagada convicta*	(Cox, 1870)	KARRATHA	486153	7707363	Potential
S12213	Camaenidae	*Rhagada convicta*	(Cox, 1870)	KARRATHA	483446	7707515	Potential
S12222	Camaenidae	*Rhagada convicta*	(Cox, 1870)	KARRATHA	486153	7707363	Potential
S61896	Camaenidae	*Rhagada convicta*	(Cox, 1870)	PILBARA	506974	7703892	Potential
S64493	Camaenidae	*Rhagada convicta*	(Cox, 1870)	ANKETELL POINT	508121	7707344	Potential
S64494	Camaenidae	*Rhagada convicta*	(Cox, 1870)	ANKETELL POINT	508328	7705695	Potential
S64496	Camaenidae	*Rhagada convicta*	(Cox, 1870)	ANKETELL POINT	508641	7706691	Potential
S64499	Camaenidae	*Rhagada convicta*	(Cox, 1870)	ANKETELL POINT	507912	7707256	Potential
S64502	Camaenidae	*Rhagada convicta*	(Cox, 1870)	ANKETELL POINT	506767	7707046	Potential
S64503	Camaenidae	*Rhagada convicta*	(Cox, 1870)	ANKETELL POINT	512392	7710352	Potential
S64506	Camaenidae	*Rhagada convicta*	(Cox, 1870)	ANKETELL POINT	508641	7706691	Potential
S64508	Camaenidae	*Rhagada convicta*	(Cox, 1870)	ANKETELL POINT	507601	7709680	Potential
S8505	Camaenidae	*Rhagada convicta*	(Cox, 1870)	KARRATHA	486153	7707363	Potential
S8806	Camaenidae	*Rhagada convicta*	(Cox, 1870)	KARRATHA	480430	7704435	Potential
S8927	Camaenidae	*Rhagada convicta*	(Cox, 1870)	KARRATHA	486153	7707363	Potential
S60026	Camaenidae	*Rhagada convicta*	(Cox, 1870)	ANKETELL POINT	501562	7706405	Potential
S64512	Camaenidae	*Rhagada convicta*	(Cox, 1870)	ANKETELL POINT	509058	7707499	Potential
S12235	Camaenidae	*Rhagada convicta*	(Cox, 1870)	NICKOL RIVER	494692	7703306	Potential
S42799	Camaenidae	*Rhagada convicta*	(Cox, 1870)	KARRATHA AREA	500625	7705188	Potential
S33123	Camaenidae	*Rhagada convicta*	(Cox, 1870)	KARRATHA	480742	7705100	Potential
S14920	Camaenidae	*Rhagada pilbarana*	Solem, 1997	MOUNT HERBERT	522088	7641503	Potential
S14921	Camaenidae	*Rhagada pilbarana*	Solem, 1997	MOUNT HERBERT	522088	7641503	Potential
S14922	Camaenidae	*Rhagada pilbarana*	Solem, 1997	MOUNT HERBERT	522088	7641503	Potential
S81228	Camaenidae	*Rhagada pilbarana*	Solem, 1997	KARRATHA	504567	7655285	Potential
S28055	Camaenidae	*Rhagada pilbarana*	Solem, 1997	ROEBOURNE	522088	7641503	Potential
S28119	Camaenidae	*Rhagada pilbarana*	Solem, 1997	HARDING RIVER	512165	7685296	Potential
S28120	Camaenidae	*Rhagada pilbarana*	Solem, 1997	MILLSTREAM	506936	7613360	Potential
S28121	Camaenidae	*Rhagada pilbarana*	Solem, 1997	MILLSTREAM	506936	7613360	Potential
S28122	Camaenidae	*Rhagada pilbarana*	Solem, 1997	MILLSTREAM	506936	7613360	Potential
S28123	Camaenidae	*Rhagada pilbarana*	Solem, 1997	MILLSTREAM	506936	7613360	Potential
S28124	Camaenidae	*Rhagada pilbarana*	Solem, 1997	MILLSTREAM	506936	7613360	Potential
S28125	Camaenidae	*Rhagada pilbarana*	Solem, 1997	MILLSTREAM	506936	7613360	Potential
S28126	Camaenidae	*Rhagada pilbarana*	Solem, 1997	MILLSTREAM	506936	7613360	Potential

WAM reg. no. (or other data source)	Family	Genus and species	Species author	Location (as provided by data source)	Easting (zone 50)	Northing (zone 50)	SRE rating
S8827	Camaenidae	*Rhagada pilbarana*	Solem, 1997	MOUNT HERBERT	522088	7641503	Potential
S8828	Camaenidae	*Rhagada pilbarana*	Solem, 1997	PYTHON POOL	524473	7641101	Potential
S65803	Camaenidae	*Rhagada radleyi*	Preston, 1908	CENTRAL PILBARA	528978	7609052	Potential
S81196	Camaenidae	*Rhagada radleyi*	Preston, 1908	ANKETELL RAIL	489548	7608300	Potential
S81198	Camaenidae	*Rhagada radleyi*	Preston, 1908	ANKETELL RAIL	489548	7608300	Potential
S81199	Camaenidae	*Rhagada radleyi*	Preston, 1908	ANKETELL RAIL	489548	7608300	Potential
S81215	Camaenidae	*Rhagada radleyi*	Preston, 1908	ANKETELL RAIL	493678	7633183	Potential
S6026	Camaenidae	*Rhagada radleyi*	Preston, 1908	MILLSTREAM HOMESTEAD	506936	7613293	Potential
S6027	Camaenidae	*Rhagada radleyi*	Preston, 1908	CHINDERWARRINER POOL	506936	7613293	Potential
S6028	Camaenidae	*Rhagada radleyi*	Preston, 1908	MILLSTREAM HOMESTEAD	506936	7613293	Potential
S6029	Camaenidae	*Rhagada radleyi*	Preston, 1908	MILLSTREAM HOMESTEAD	506936	7613293	Potential
S6031	Camaenidae	*Rhagada radleyi*	Preston, 1908	MILLSTREAM HOMESTEAD	506936	7613293	Potential
S6032	Camaenidae	*Rhagada radleyi*	Preston, 1908	MILLSTREAM NATIONAL PARK	508592	7613292	Potential
S6033	Camaenidae	*Rhagada radleyi*	Preston, 1908	MILLSTREAM HOMESTEAD	506936	7613293	Potential
S6034	Camaenidae	*Rhagada radleyi*	Preston, 1908	COOLAWANYAH STATION	582694	7589096	Potential
S6035	Camaenidae	*Rhagada radleyi*	Preston, 1908	MILLSTREAM HOMESTEAD	506936	7613293	Potential
S6036	Camaenidae	*Rhagada radleyi*	Preston, 1908	MILLSTREAM HOMESTEAD	506936	7613293	Potential
S6037	Camaenidae	*Rhagada radleyi*	Preston, 1908	MILLSTREAM HOMESTEAD	506936	7613293	Potential
S6038	Camaenidae	*Rhagada radleyi*	Preston, 1908	DEEP REACH POOL	510350	7609606	Potential
S6039	Camaenidae	*Rhagada radleyi*	Preston, 1908	MILLSTREAM HOMESTEAD	506936	7613293	Potential
S6041	Camaenidae	*Rhagada radleyi*	Preston, 1908	DOGGER GORGE	487884	7618824	Potential
S6043	Camaenidae	*Rhagada radleyi*	Preston, 1908	COOLAWANYAH STATION	582694	7589096	Potential
S6044	Camaenidae	*Rhagada radleyi*	Preston, 1908	MILLSTREAM HOMESTEAD	506936	7613293	Potential
S6045	Camaenidae	*Rhagada radleyi*	Preston, 1908	MILLSTREAM HOMESTEAD	506936	7613293	Potential
S12227	Camaenidae	*Rhagada radleyi*	Preston, 1908	DOGGER GORGE	491199	7616303	Potential
S28127	Camaenidae	*Rhagada radleyi*	Preston, 1908	MILLSTREAM	506936	7613360	Potential
S28128	Camaenidae	*Rhagada radleyi*	Preston, 1908	MILLSTREAM	506936	7613360	Potential
S28129	Camaenidae	*Rhagada radleyi*	Preston, 1908	MILLSTREAM	506936	7613360	Potential
S28130	Camaenidae	*Rhagada radleyi*	Preston, 1908	MILLSTREAM	506936	7613360	Potential
S28131	Camaenidae	*Rhagada radleyi*	Preston, 1908	MILLSTREAM	506936	7613360	Potential
S28132	Camaenidae	*Rhagada radleyi*	Preston, 1908	MILLSTREAM	506936	7613360	Potential
S28133	Camaenidae	*Rhagada radleyi*	Preston, 1908	MILLSTREAM	506936	7613360	Potential
S28134	Camaenidae	*Rhagada radleyi*	Preston, 1908	MILLSTREAM	506936	7613360	Potential
S28135	Camaenidae	*Rhagada radleyi*	Preston, 1908	MILLSTREAM	506936	7613360	Potential

WAM reg. no. (or other data source)	Family	Genus and species	Species author	Location (as provided by data source)	Easting (zone 50)	Northing (zone 50)	SRE rating
S28136	Camaenidae	*Rhagada radleyi*	Preston, 1908	MILLSTREAM	506936	7613360	Potential
S28137	Camaenidae	*Rhagada radleyi*	Preston, 1908	MILLSTREAM	506936	7613360	Potential
S28138	Camaenidae	*Rhagada radleyi*	Preston, 1908	MILLSTREAM	506936	7613360	Potential
S28139	Camaenidae	*Rhagada radleyi*	Preston, 1908	MILLSTREAM	506936	7613360	Potential
S28140	Camaenidae	*Rhagada radleyi*	Preston, 1908	MILLSTREAM	506936	7613360	Potential
S28141	Camaenidae	*Rhagada radleyi*	Preston, 1908	MILLSTREAM	506936	7613360	Potential
S28142	Camaenidae	*Rhagada radleyi*	Preston, 1908	MILLSTREAM	506936	7613360	Potential
S28143	Camaenidae	*Rhagada radleyi*	Preston, 1908	MILLSTREAM	506936	7613360	Potential
S28144	Camaenidae	*Rhagada radleyi*	Preston, 1908	MILLSTREAM	506936	7613360	Potential
S28145	Camaenidae	*Rhagada radleyi*	Preston, 1908	MILLSTREAM	506936	7613360	Potential
S28146	Camaenidae	*Rhagada radleyi*	Preston, 1908	MILLSTREAM	506936	7613360	Potential
S28147	Camaenidae	*Rhagada radleyi*	Preston, 1908	MILLSTREAM	506936	7613360	Potential
S28148	Camaenidae	*Rhagada radleyi*	Preston, 1908	MILLSTREAM	506936	7613360	Potential
S28149	Camaenidae	*Rhagada radleyi*	Preston, 1908	MILLSTREAM	506936	7613360	Potential
S28150	Camaenidae	*Rhagada radleyi*	Preston, 1908	MILLSTREAM	506936	7613360	Potential
S28151	Camaenidae	*Rhagada radleyi*	Preston, 1908	MILLSTREAM	506936	7613360	Potential
S28152	Camaenidae	*Rhagada radleyi*	Preston, 1908	MILLSTREAM	506936	7613360	Potential
S28153	Camaenidae	*Rhagada radleyi*	Preston, 1908	MILLSTREAM	506936	7613360	Potential
S28154	Camaenidae	*Rhagada radleyi*	Preston, 1908	MILLSTREAM	506936	7613360	Potential
S28156	Camaenidae	*Rhagada radleyi*	Preston, 1908	MILLSTREAM	506936	7613360	Potential
S28157	Camaenidae	*Rhagada radleyi*	Preston, 1908	MILLSTREAM	506936	7613360	Potential
S65784	Camaenidae	*Rhagada* sp. nov. "small banded"		CENTRAL PILBARA	553383	7541844	Potential
S61191	Camaenidae	*Rhagada* sp. nov. "small banded"		CROSSING BORE	536360	7533758	Potential
S65809	Camaenidae	*Rhagada* sp. nov. "small banded"		CENTRAL PILBARA	572163	7546828	Potential
S65815	Camaenidae	*Rhagada* sp. nov. "small banded"		CENTRAL PILBARA	573742	7553717	Potential
S65816	Camaenidae	*Rhagada* sp. nov. "small banded"		CENTRAL PILBARA	573742	7553717	Potential
S65771	Camaenidae	*Rhagada* sp. nov. "small banded"		CENTRAL PILBARA	565717	7533861	Potential
S65783	Camaenidae	*Rhagada* sp. nov. "small		CENTRAL PILBARA	549683	7545112	Potential

WAM reg. no. (or other data source)	Family	Genus and species	Species author	Location (as provided by data source)	Easting (zone 50)	Northing (zone 50)	SRE rating
		banded"					
S65825	Camaenidae	*Rhagada* sp. nov. "small banded"		NAMMULDI SILVERGRASS	563220	7527849	Potential
S65826	Camaenidae	*Rhagada* sp. nov. "small banded"		NAMMULDI SILVERGRASS	546120	7525198	Potential
S65827	Camaenidae	*Rhagada* sp. nov. "small banded"		NAMMULDI SILVERGRASS	539325	7525073	Potential
S65831	Camaenidae	*Rhagada* sp. nov. "small banded"		NAMMULDI SILVERGRASS	547666	7525769	Potential
S65832	Camaenidae	*Rhagada* sp. nov. "small banded"		NAMMULDI SILVERGRASS	546120	7525198	Potential
S65833	Camaenidae	*Rhagada* sp. nov. "small banded"		NAMMULDI SILVERGRASS	546120	7525198	Potential
S65835	Camaenidae	*Rhagada* sp. nov. "small banded"		NAMMULDI SILVERGRASS	546120	7525198	Potential
S28160	Camaenidae	*Rhagada* sp. indet.		MILLSTREAM	506936	7613360	Potential
S28161	Camaenidae	*Rhagada* sp. indet.		MILLSTREAM	506936	7613360	Potential
S28162	Camaenidae	*Rhagada* sp. indet.		MILLSTREAM	506936	7613360	Potential
S28163	Camaenidae	*Rhagada* sp. indet.		MILLSTREAM	506936	7613360	Potential
S28164	Camaenidae	*Rhagada* sp. indet.		MILLSTREAM	506936	7613360	Potential
S28165	Camaenidae	*Rhagada* sp. indet.		MILLSTREAM	506936	7613360	Potential
S28166	Camaenidae	*Rhagada* sp. indet.		MILLSTREAM	506936	7613360	Potential
S28167	Camaenidae	*Rhagada* sp. indet.		MILLSTREAM	506936	7613360	Potential
S28168	Camaenidae	*Rhagada* sp. indet.		MILLSTREAM	506936	7613360	Potential
S28169	Camaenidae	*Rhagada* sp. indet.		MILLSTREAM	506936	7613360	Potential
S28170	Camaenidae	*Rhagada* sp. indet.		MILLSTREAM	506936	7613360	Potential
S28171	Camaenidae	*Rhagada* sp. indet.		MILLSTREAM	506936	7613360	Potential
S28172	Camaenidae	*Rhagada* sp. indet.		MILLSTREAM	506936	7613360	Potential
S28173	Camaenidae	*Rhagada* sp. indet.		MILLSTREAM	506936	7613360	Potential
S28174	Camaenidae	*Rhagada* sp. indet.		MILLSTREAM	506936	7613360	Potential
S6175	Camaenidae	*Rhagada* sp. indet.		MOUNT HERBERT	522505	7642797	Potential
S6176	Camaenidae	*Rhagada* sp. indet.		ROEBOURNE	500000	7701835	Potential
S6177	Camaenidae	*Rhagada* sp. indet.		ROEBOURNE	515612	7701828	Potential
S6178	Camaenidae	*Rhagada* sp. indet.		HAMERSLEY STATION	570360	7535656	Potential

WAM reg. no. (or other data source)	Family	Genus and species	Species author	Location (as provided by data source)	Easting (zone 50)	Northing (zone 50)	SRE rating
S6206	Camaenidae	*Rhagada* sp. indet.		MILLSTREAM	500000	7622514	Potential
S6218	Camaenidae	*Rhagada* sp. indet.		KARRATHA	486153	7707363	Potential
S81244	Camaenidae	*Rhagada* sp. indet.		KARRATHA	491064	7674530	Potential
S59261	Camaenidae	*Rhagada* sp. indet.		DAWSON CREEK	511386	7611763	Potential
S30140	Camaenidae	*Rhagada* sp. indet.		MT BROCKMAN	530901	7533936	Potential
S30145	Camaenidae	*Rhagada* sp. indet.		BROCKMAN MINE	503709	7537387	Potential
S61634	Camaenidae	*Rhagada* sp. indet.		BALLA BALLA	575881	7703147	Potential
S6110	Camaenidae	*Rhagada* sp. indet.		MAITLAND RIVER WEST	479203	7687069	Potential
S28158	Camaenidae	*Rhagada* sp. indet.		MILLSTREAM	506936	7613360	Potential
S28159	Camaenidae	*Rhagada* sp. indet.		MILLSTREAM	506936	7613360	Potential
S8877	Camaenidae	*Rhagada* sp. indet.		KARRATHA	486153	7707363	Potential
S59478	Camaenidae	*Rhagada* sp. indet.		BALLA BALLA	581606	7702998	Potential
S59479	Camaenidae	*Rhagada* sp. indet.		BALLA BALLA	581502	7703109	Potential
S59480	Camaenidae	*Rhagada* sp. indet.		BALLA BALLA	580874	7702426	Potential
S59481	Camaenidae	*Rhagada* sp. indet.		BALLA BALLA	578286	7705416	Potential
S59482	Camaenidae	*Rhagada* sp. indet.		BALLA BALLA	581192	7703498	Potential
S59483	Camaenidae	*Rhagada* sp. indet.		WHIM CREEK	584694	7696132	Potential
S59484	Camaenidae	*Rhagada* sp. indet.		BALLA BALLA	582634	7700403	Potential
S59485	Camaenidae	*Rhagada* sp. indet.		BALLA BALLA	581816	7703407	Potential
S59486	Camaenidae	*Rhagada* sp. indet.		WHIM CREEK	584694	7696132	Potential
S59487	Camaenidae	*Rhagada* sp. indet.		BALLA BALLA	580463	7703568	Potential
S59488	Camaenidae	*Rhagada* sp. indet.		BALLA BALLA	581930	7705365	Potential
S59489	Camaenidae	*Rhagada* sp. indet.		BALLA BALLA	582227	7702320	Potential
S59490	Camaenidae	*Rhagada* sp. indet.		BALLA BALLA	581192	7703498	Potential
S59491	Camaenidae	*Rhagada* sp. indet.		BALLA BALLA	578286	7705416	Potential
S59492	Camaenidae	*Rhagada* sp. indet.		BALLA BALLA	581921	7703517	Potential
S59493	Camaenidae	*Rhagada* sp. indet.		BALLA BALLA	582227	7702320	Potential
S59494	Camaenidae	*Rhagada* sp. indet.		BALLA BALLA	582355	7707134	Potential
S59495	Camaenidae	*Rhagada* sp. indet.		BALLA BALLA	575881	7703147	Potential
S59496	Camaenidae	*Rhagada* sp. indet.		BALLA BALLA	580152	7703791	Potential
S59497	Camaenidae	*Rhagada* sp. indet.		WHIM CREEK	587285	7694226	Potential
S59498	Camaenidae	*Rhagada* sp. indet.		WHIM CREEK	587282	7693584	Potential
S59499	Camaenidae	*Rhagada* sp. indet.		WHIM CREEK	575464	7703027	Potential
S59500	Camaenidae	*Rhagada* sp. indet.		WHIM CREEK	586671	7696077	Potential

WAM reg. no. (or other data source)	Family	Genus and species	Species author	Location (as provided by data source)	Easting (zone 50)	Northing (zone 50)	SRE rating
S59501	Camaenidae	*Rhagada* sp. indet.		WHIM CREEK	611113	7694339	Potential
S59502	Camaenidae	*Rhagada* sp. indet.		WHIM CREEK	581504	7703486	Potential
S59503	Camaenidae	*Rhagada* sp. indet.		WHIM CREEK	579838	7703494	Potential
S59504	Camaenidae	*Rhagada* sp. indet.		WHIM CREEK	575475	7705351	Potential
S59505	Camaenidae	*Rhagada* sp. indet.		WHIM CREEK	581504	7703486	Potential
S59506	Camaenidae	*Rhagada* sp. indet.		WHIM CREEK	579838	7703494	Potential
S59507	Camaenidae	*Rhagada* sp. indet.		WHIM CREEK	579843	7704412	Potential
S59508	Camaenidae	*Rhagada* sp. indet.		WHIM CREEK	581482	7698870	Potential
S59509	Camaenidae	*Rhagada* sp. indet.		WHIM CREEK	579843	7704412	Potential
S59510	Camaenidae	*Rhagada* sp. indet.		WHIM CREEK	579830	7701645	Potential
S59511	Camaenidae	*Rhagada* sp. indet.		WHIM CREEK	581495	7701637	Potential
S59512	Camaenidae	*Rhagada* sp. indet.		WHIM CREEK	577240	7704424	Potential
S59513	Camaenidae	*Rhagada* sp. indet.		WHIM CREEK	581495	7701637	Potential
S59514	Camaenidae	*Rhagada* sp. indet.		WHIM CREEK	575475	7705351	Potential
S59515	Camaenidae	*Rhagada* sp. indet.		WHIM CREEK	575475	7705351	Potential
S59516	Camaenidae	*Rhagada* sp. indet.		WHIM CREEK	586661	7694229	Potential
S59517	Camaenidae	*Rhagada* sp. indet.		WHIM CREEK	575475	7705351	Potential
S59518	Camaenidae	*Rhagada* sp. indet.		WHIM CREEK	577240	7704424	Potential
S59519	Camaenidae	*Rhagada* sp. indet.		WHIM CREEK	575475	7705351	Potential
S59520	Camaenidae	*Rhagada* sp. indet.		WHIM CREEK	579843	7704412	Potential
S59521	Camaenidae	*Rhagada* sp. indet.		WHIM CREEK	581495	7701637	Potential
S59522	Camaenidae	*Rhagada* sp. indet.		WHIM CREEK	579838	7703494	Potential
S59523	Camaenidae	*Rhagada* sp. indet.		WHIM CREEK	581504	7703486	Potential
S59524	Camaenidae	*Rhagada* sp. indet.		WHIM CREEK	579843	7704412	Potential
S59525	Camaenidae	*Rhagada* sp. indet.		WHIM CREEK	579838	7703494	Potential
S59526	Camaenidae	*Rhagada* sp. indet.		WHIM CREEK	577240	7704424	Potential
S59527	Camaenidae	*Rhagada* sp. indet.		WHIM CREEK	581482	7698870	Potential
S59528	Camaenidae	*Rhagada* sp. indet.		WHIM CREEK	577240	7704424	Potential
S59529	Camaenidae	*Rhagada* sp. indet.		WHIM CREEK	575475	7705351	Potential
S59530	Camaenidae	*Rhagada* sp. indet.		WHIM CREEK	579838	7703494	Potential
S6109	Camaenidae	*Rhagada* sp. indet.		WHIM CREEK	593601	7688657	Potential
S6112	Camaenidae	*Rhagada* sp. indet.		MOUNT NEGRI	588469	7701602	Potential
S6114	Camaenidae	*Rhagada* sp. indet.		WHIM CREEK	591843	7690515	Potential
S6116	Camaenidae	*Rhagada* sp. indet.		TOM PRICE	581333	7668433	Potential

WAM reg. no. (or other data source)	Family	Genus and species	Species author	Location (as provided by data source)	Easting (zone 50)	Northing (zone 50)	SRE rating
S6118	Camaenidae	*Rhagada* sp. indet.		KARRATHA	486153	7707363	Potential
S6119	Camaenidae	*Rhagada* sp. indet.		KARRATHA	486153	7707363	Potential
S6121	Camaenidae	*Rhagada* sp. indet.		KARRATHA	486153	7707363	Potential
S6130	Camaenidae	*Rhagada* sp. indet.		MOUNT HERBERT	522505	7642797	Potential
S8859	Camaenidae	*Rhagada* sp. indet.		KARRATHA	486153	7707363	Potential
S9586	Camaenidae	Camaenidae sp. indet.		KARRATHA	486153	7707363	Potential
S9587	Camaenidae	Camaenidae sp. indet.		MILLSTREAM	506936	7613293	Potential
S9588	Camaenidae	Camaenidae sp. indet.		MILLSTREAM	506936	7613293	Potential
S9589	Camaenidae	Camaenidae sp. indet.		KARRATHA	486153	7707363	Potential
S9592	Camaenidae	Camaenidae sp. indet.		KARRATHA	486153	7707363	Potential
S30038	Camaenidae	Camaenidae sp. indet.		MILLARS GORGE	591104	7559538	Potential
S61080	Succineidae	*Succinea*? sp. indet.		ROEBOURNE	509772	7682254	Potential
S59995	Succineidae	*Succinea* sp. indet.		ANKETELL POINT	501666	7706328	Potential
S64534	Succineidae	*Succinea* sp. indet.		ANKETELL POINT	507912	7707256	Potential
S65828	Succineidae	*Succinea* sp. indet.		NAMMULDI SILVERGRASS	558872	7521634	Potential
S81222	Succineidae	*Succinea* sp. indet.		KARRATHA	484092	7684552	Potential
S81238	Succineidae	*Succinea* sp. indet.		KARRATHA	484092	7684552	Potential
S81243	Succineidae	*Succinea* sp. indet.		KARRATHA	491064	7674530	Potential
S81282	Succineidae	*Succinea* sp. indet.		KARRATHA	484092	7684552	Potential
S81291	Succineidae	*Succinea* sp. indet.		KARRATHA	479507	7693024	Potential
S81303	Succineidae	*Succinea* sp. indet.		KARRATHA	491064	7674530	Potential
S81306	Succineidae	*Succinea* sp. indet.		KARRATHA	500000	7674532	Potential
S81872	Succineidae	*Succinea* sp. indet.		TOM PRICE	565695	7528669	Potential
S12249	Succineidae	*Succinea* sp. indet.		DAWSON CREEK	511696	7610523	Potential
S81884	Succineidae	*Succinea* sp. indet.		WITTENOOM	634441	7559083	Potential
S65760	Succineidae	*Succinea* sp. indet.		CENTRAL PILBARA	563750	7531622	Potential
S65772	Succineidae	*Succinea* sp. indet.		CENTRAL PILBARA	563750	7531622	Potential
S81861	Succineidae	*Succinea* sp. indet.		TOM PRICE	563941	7527824	Potential
S65794	Succineidae	*Succinea* sp. indet.		CENTRAL PILBARA	501041	7705454	Potential
S65813	Succineidae	*Succinea* sp. indet.		CENTRAL PILBARA	501041	7705454	Potential
S60431	Succineidae	*Succinea* sp. indet.		WHIM CREEK	575464	7703027	Potential
S60432	Succineidae	*Succinea* sp. indet.		BALLA BALLA	582227	7702320	Potential
S60497	Succineidae	*Succinea* sp. indet.		MILLSTREAM	527712	7655694	Potential
S60499	Succineidae	*Succinea* sp. indet.		KARRATHA	484381	7709209	Potential

WAM reg. no. (or other data source)	Family	Genus and species	Species author	Location (as provided by data source)	Easting (zone 50)	Northing (zone 50)	SRE rating
S61508	Succineidae	*Succinea* sp. indet.		KARRATHA	484381	7709209	Potential
S61512	Succineidae	*Succinea* sp. indet.		KARRATHA	484381	7709209	Potential
S61516	Succineidae	*Succinea* sp. indet.		MALLINA STATION	579843	7704412	Potential
S61517	Succineidae	*Succinea* sp. indet.		MALLINA STATION	581482	7698870	Potential
S61518	Succineidae	*Succinea* sp. indet.		MALLINA STATION	579843	7704412	Potential
S61519	Succineidae	*Succinea* sp. indet.		MALLINA STATION	581495	7701637	Potential
S61520	Succineidae	*Succinea* sp. indet.		SHERLOCK STATION	575475	7705351	Potential
S61521	Succineidae	*Succinea* sp. indet.		MALLINA STATION	581482	7698870	Potential
S61522	Succineidae	*Succinea* sp. indet.		SHERLOCK STATION	575475	7705351	Potential
S61524	Succineidae	*Succinea* sp. indet.		MALLINA STATION	579830	7701645	Potential
S61525	Succineidae	*Succinea* sp. indet.		SHERLOCK STATION	575475	7705351	Potential
S61526	Succineidae	*Succinea* sp. indet.		MALLINA STATION	581495	7701637	Potential
S61527	Succineidae	*Succinea* sp. indet.		MALLINA STATION	581482	7698870	Potential
S61528	Succineidae	*Succinea* sp. indet.		MALLINA STATION	579843	7704412	Potential
S61529	Succineidae	*Succinea* sp. indet.		MILLSTREAM-CHICHESTER NP	508592	7613292	Potential
S61530	Succineidae	*Succinea* sp. indet.		CAMP CURLEWIS	515546	7631738	Potential
S61531	Succineidae	*Succinea* sp. indet.		MILLSTREAM	527712	7655694	Potential
S61561	Succineidae	*Succinea* sp. indet.		PALM POOL	503417	7615143	Potential
S61593	Succineidae	*Succinea* sp. indet.		BALLA BALLA	582355	7707134	Potential
S61596	Succineidae	*Succinea* sp. indet.		KARRATHA	484381	7709209	Potential
S61632	Succineidae	*Succinea* sp. indet.		WHIM CREEK	580155	7704389	Potential
S61633	Succineidae	*Succinea* sp. indet.		BALLA BALLA	575881	7703147	Potential
S61641	Succineidae	*Succinea* sp. indet.		BALLA BALLA	581930	7705365	Potential
S61642	Succineidae	*Succinea* sp. indet.		BALLA BALLA	578279	7703933	Potential
S61644	Succineidae	*Succinea* sp. indet.		BALLA BALLA	581921	7703517	Potential

Appendix 5 Location of conservation significant vertebrate fauna recorded during the Level 1 field survey

Species	Conservation status				Record type	Easting (zone 50k)	Northing (zone 50k)
	EPBC Act[1]	EPBC Migratory[1]	WC Act[2]	DPaW			
Lined Soil-crevice Skink *Notoscincus butleri*				P4	Direct observation	591295	7613409
Lined Soil-crevice Skink *Notoscincus butleri*				P4	Direct observation	591299	7613406
Lined Soil-crevice Skink *Notoscincus butleri*				P4	Direct observation	591289	7613415
Australian Bustard *Ardeotis australis*				P4	Tracks	592565	7677198
Australian Bustard *Ardeotis australis*				P4	Tracks	592328	7677339
Australian Bustard *Ardeotis australis*				P4	Tracks	596705	7652717
Australian Bustard *Ardeotis australis*				P4	Tracks	583124	7669155
Australian Bustard *Ardeotis australis*				P4	Tracks	577216	7676434
Australian Bustard *Ardeotis australis*				P4	Tracks	577085	7676297
Australian Bustard *Ardeotis australis*				P4	Tracks	577054	7676336
Rainbow Bee-eater *Merops ornatus*		●	S3		Direct Observation	594917	7613292
Rainbow Bee-eater *Merops ornatus*		●	S3		Direct Observation	580503	7624937
Rainbow Bee-eater *Merops ornatus*		●	S3		Direct Observation	591221	7642437
Rainbow Bee-eater *Merops ornatus*		●	S3		Direct Observation	555278	7564698
Rainbow Bee-eater *Merops ornatus*		●	S3		Direct Observation	593043	7644357
Rainbow Bee-eater *Merops ornatus*		●	S3		Call	595409	7618668
Rainbow Bee-eater *Merops ornatus*		●	S3		Direct Observation	579116	7684643
Northern Quoll *Dasyurus hallucatus*	EN		S1	EN	Scat	594773	7624928
Northern Quoll *Dasyurus hallucatus*	EN		S1	EN	Scat	589381	7601242
Northern Quoll *Dasyurus hallucatus*	EN		S1	EN	Scat	589620	7601204
Northern Quoll *Dasyurus hallucatus*	EN		S1	EN	Scat	589580	7601111
Northern Quoll *Dasyurus hallucatus*	EN		S1	EN	Scat	591298	7613401
Northern Quoll *Dasyurus hallucatus*	EN		S1	EN	Scat	591299	7613407
Northern Quoll *Dasyurus hallucatus*	EN		S1	EN	Bones	591254	7613253

Species	Conservation status				Record type	Easting (zone 50k)	Northing (zone 50k)
	EPBC Act[1]	EPBC Migratory[1]	WC Act[2]	DPaW			
Northern Quoll *Dasyurus hallucatus*	EN		S1	EN	Camera trap	594733	7624960
Northern Quoll *Dasyurus hallucatus*	EN		S1	EN	Camera trap	591298	7613401
Northern Quoll *Dasyurus hallucatus*	EN		S1	EN	Camera trap	591295	7613406
Northern Quoll *Dasyurus hallucatus*	EN		S1	EN	Camera trap	595018	7624901
Northern Quoll *Dasyurus hallucatus*	EN		S1	EN	Camera trap	589386	7601225
Northern Quoll *Dasyurus hallucatus*	EN		S1	EN	Camera trap	591269	7613260
Northern Quoll *Dasyurus hallucatus*	EN		S1	EN	Camera trap	596998	7649485
Western Pebble-mound Mouse *Pseudomys chapmani*				P4	Inactive mound	577805	7688712

[1] *Environmental Protection and Biodiversity Act 1999*; [2] *Wildlife Conservation Act of Western Australia 1950*; [3] Department of Environment and Conservation, WA. CR – Critically Endangered; EN – Endangered; VU – Vulnerable; S1 – Schedule 1; S3 – Schedule 3; S4 – Schedule 4; P1 – Priority 1; P4 – Priority 4.

Appendix 6 Invertebrate taxa recorded during survey

Higher taxon	Species (Family)	SRE status	Rail corridor sites	Non-rail corridor sites	No. of specimens [corridor/non-corridor]	Habitat							
						Hummock and tussock grassland	Open and closed shrubland	Rocky hill slope	Minor creek and drainage line	Woodland	Gully	Isolated sand dune	Sandplain
Araneae (spiders)	*Karaops* sp. indet. (Selenopidae)	Potential	01, 10, 11, 13, 33	06	12/1		✓	✓	✓		✓		
	Conothele sp. indet. (Ctenizidae)	Potential		21	0/1		✓						
Opiliones (harvestmen)	*Dampetrus* sp. indet.	Likely	02	19	5/5		✓	✓					
Pseudoscorpiones (pseudoscorpions)	*Oratemnus* sp. indet. (Atemnidae)	Not an SRE	12, 38	05, 06	4/8				✓				
	Austrohorus sp. indet. (Olpiidae)	Not an SRE	41	09, 14	1/2	✓	✓		✓				
	Beierolpium sp. indet. (Olpiidae)	Not an SRE	28		1/0		✓						
	Indolpium sp. indet. (Olpiidae)	Not an SRE	01, 02, 03, 41	09, 15	16/2	✓		✓	✓				
Scorpiones (scorpions)	*Lychas* 'bituberculatus' (Buthidae)	Not an SRE	11		1/0			✓					
	Lychas 'multipunctatus' (Buthidae)	Not an SRE	11, 56	06	4/1			✓	✓	✓			
Chilopoda (centipedes)	*Sepedonophilus* sp. indet. (Chilenophilidae)	Potential	01	05	1/1			✓	✓				
	Cryptops sp. indet. (Cryptopidae)	Likely	48, 49, 51	04	4/1		✓		✓		✓		
	Orphnaeus brevilabiatus (Newport, 1845) (Oryidae)	Not an SRE	51		2/0						✓		

Higher taxon	Species (Family)	SRE status	Rail corridor sites	Non-rail corridor sites	No. of specimens [corridor/non-corridor]	Habitat							
						Hummock and tussock grassland	Open and closed shrubland	Rocky hill slope	Minor creek and drainage line	Woodland	Gully	Isolated sand dune	Sandplain
Diplopoda (millipedes)	*Austrostrophus stictopygus* Hoffman, 2003 (Trigoniulidae)	Not an SRE	01		1/0			✓					
Isopoda (slaters)	*Buddelundia* '10 1016a' (Armadillidae)	Potential		19, 31	0/6	✓	✓						
	Buddelundia '14mw' (Armadillidae)	Not an SRE	01, 02, 03, 08, 10, 11, 29, 39, 43, 48, 52	04, 05, 06, 30	50/35	✓	✓	✓	✓		✓		
	Buddelundia '30' (Armadillidae)	Not an SRE	51		1/0						✓		
	Buddelundia '60' (Armadillidae)	Not an SRE		20	0/3			✓					
	Buddelundia '92' (Armadillidae)	Potential	03		1/0			✓					
	Buddelundia '93' (Armadillidae)	Potential	30		1/0	✓							
	Buddelundia '94' (Armadillidae)	Potential		31	0/3	✓							
	Buddelundia '95' (Armadillidae)	Potential	51		2/0						✓		
	Buddelundiinae sp. indet. (Armadillidae)	Not an SRE	11		2/0			✓					
Eupulmonata (land snails)	*Rhagada* sp. indet. (Camaenidae)	Not an SRE	02, 03, 11, 13, 33, 37, 38, 40, 43, 45, 52	04, 06, 17, 31	38/13	✓	✓	✓	✓				

Higher taxon	Species (Family)	SRE status	Rail corridor sites	Non-rail corridor sites	No. of specimens [corridor/non-corridor]	Habitat							
						Hummock and tussock grassland	Open and closed shrubland	Rocky hill slope	Minor creek and drainage line	Woodland	Gully	Isolated sand dune	Sandplain
	Quistrachia sp. indet. (Camaenidae)	Potential	37	05, 06	1/2	✓			✓				
	Stenopylis coarctata (Moellendorff, 1894) (Helicodiscidae)	Not an SRE	43		1/0		✓						
	Austropeplea lessoni (Deshayes, 1830) (Lymnaeidae)	Not an SRE	07, 12	06	8/8				✓				
	Gastrocopta sp. indet. (Pupillidae)	Not an SRE	38, 43		2/0		✓		✓				
	Gyraulus sp. indet. (Planorbidae)	Not an SRE	10, 12 ,52	06	15/3		✓		✓		✓		
	Isidorella sp. indet. (Planorbidae)	Not an SRE	10		2/0						✓		
	Pupoides pacificus (Pfeiffer, 1846) (Pupillidae)	Not an SRE	02, 03, 10, 43, 44, 47, 55		18/0		✓	✓	✓	✓	✓		
	Pupillidae sp. indet. (Pupillidae)	Not an SRE	11, 12	30	4/1	✓		✓	✓				
	Eremopeas interioris (Tate, 1894) (Subulinidae)	Not an SRE		05	0/1				✓				
Sum					**198/97**								

a – Species categorised as potential SREs are shaded green and likely SREs are shaded blue.

Appendix 7 Northern Quoll capture and measurement data from the targeted survey

Date	Site number	Trap type	Trap number	Capture / recapture	Microchip ID	Tissue sample taken	Specimen weight (g)	General condition	Age	Sex	Pouch condition
29/08/2014	3	Elliot	3	Capture	93464	✓	355	Good	Adult	Female	Developed
29/08/2014	4	Elliot	9	Capture	80231	✓	315	Good	Adult	Female	Developed
29/08/2014	5	Cage	5	Capture	545955	✓	330	Good	Adult	Female	-
29/08/2014	5	Cage	6	Capture	546200	✓	385	Good	Adult	Male	-
29/08/2014	5	Cage	10	Capture	545250	✓	525	Good	Adult	Male	-
29/08/2014	5	Elliot	15	Capture	545679	✓	500	Good	Adult	Female	Developed
30/08/2014	4	Elliot	17	Capture	91229	✓	600	Good	Adult	Male	Developed
30/08/2014	5	Cage	3	Recapture	545955	-	-	Good	Adult	Female	-
30/08/2014	5	Cage	10	Capture	546715	✓	580	Good	Adult	Male	-
30/08/2014	5	Cage	13	Capture	546287	✓	415	Good	Adult	Female	u/developed
30/08/2014	5	Cage	17	Capture	545203	✓	335	Good	Adult	Female	-
31/08/2014	4	Cage	28	Capture	87132	✓	695	Good	Adult	Male	-
31/08/2014	4	Cage	29	Capture	91345	✓	340	Good	Adult	Female	-
31/08/2014	5	Cage	5	Recapture	545250	-	515	Good	Adult	Male	-
31/08/2014	5	Cage	7	Capture	93604	✓	450	Good	Adult	Male	-
31/09/2014	5	Cage	8	Recapture	545203	-	-	Good	Adult	Female	-
1/09/2014	4	Cage	33	Capture	81245	✓	400	Good	Adult	Male	-
1/09/2014	5	Cage	1	Recapture	545250	-	500	Good	Adult	Male	-
1/09/2014	5	Cage	3	Recapture	93604	-	425	Good	Adult	Male	-
1/09/2014	5	Cage	8	Capture	81599	✓	485	Good	Adult	Male	-
1/09/2014	5	Cage	18	Capture	92848	✓	535	Good	Adult	Male	-
2/09/2014	4	Cage	33	Recapture	-	-	-	Good	Adult	-	-
2/09/2014	5	Cage	1	Recapture	545250	-	480	Good	Adult	Male	-
2/09/2014	5	Cage	3	Capture	80905	✓	380	Good	Adult	Male	-
2/09/2014	5	Cage	4	Recapture	545955	-	320	Good	Adult	Female	-
2/09/2014	5	Cage	5	Recapture	93604	-	430	Good	Adult	Male	-

Date	Site number	Trap type	Trap number	Capture / recapture	Microchip ID	Tissue sample taken	Specimen weight (g)	General condition	Age	Sex	Pouch condition
2/09/2014	5	Cage	6	Recapture	545203	-	305	Good	Adult	Female	-
2/09/2014	5	Cage	8	Recapture	81599	-	405	Good	Adult	Male	-
3/09/2014	5	Cage	18	Capture	92766	✓	485	Good	Adult	Male	-
3/09/2014	4	Cage	25	Capture	90417	✓	305	Good	Adult	Female	-
3/09/2014	4	Cage	27	Capture	-	-	-	Poor	Adult	-	-
3/09/2014	4	Cage	28	Capture	354690	✓	440	Good	Adult	Male	-
3/09/2014	5	Cage	4	Recapture	93604	-	405	Good	Adult	Male	-
3/09/2014	5	Cage	9	Recapture	545203	-	330	Good	Adult	Female	-
3/09/2014	5	Cage	12	Recapture	81599	-	440	Good	Adult	Male	-
3/09/2014	5	Cage	14	Recapture	546715	-	520	Good	Adult	Male	-
3/09/2014	5	Cage	18	Recapture	92766	-	-	Good	Adult	Male	
4/09/2014	4	Cage	27	Recapture	354690	-	-	Good	Adult	Male	-
4/09/2014	4	Cage	30	Recapture	91345	-	-	Good	Adult	Female	-
4/09/2014	4	Cage	31	Recapture	81245	-	-	Good	Adult	Male	-
4/09/2014	5	Cage	6	Recapture	546715	-	550	Good	Adult	Male	-
4/09/2014	5	Cage	12	Recapture	81599	-	-	Good	Adult	Male	-
4/09/2014	5	Cage	14	Recapture	545679	-	465	Good	Adult	Female	-
4/09/2014	5	Cage	16	Recapture	92848	-	-	Good	Adult	Male	-
4/09/2014	5	Cage	19	Recapture	545679	-	-	Good	Adult	Female	-