BIDAMINNA PROJECT

DETAILED FAUNA ASSESSMENT

PREPARED FOR: PRESTON CONSULTING | IMAGE RESOURCES

Spectrum ECOLOGY & SPATIAL

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EXECUTIVE SUMMARY

Image Resources (Image) are planning for the potential development of the Bidaminna Project (1,968.6 ha Survey Area), a mineral sand mine located approximately 20 km east of Ledge Point in Western Australia (WA). Image commissioned Spectrum Ecology & Spatial (Spectrum) to undertake a terrestrial (vertebrate, short range endemic (SRE) invertebrate) fauna assessment, including a desktop assessment and two phase detailed fauna survey, which will be used to support relevant environmental impact assessments and EPA referral.

The field surveys were completed over three field events: SRE wet pitfall trap and long-term motion camera installation (6 – 9 September, 2021), phase one of the detailed fauna survey (12 – 22 October, 2021), and phase two of the detailed fauna survey (21 – 31 March, 2022). SRE wet pitfall traps and long-term motion cameras were collected during the phase one fauna survey. The surveys were completed in accordance with the EPA Technical Guidance during the period of peak fauna activity in the region.

The following survey effort was completed for the Bidaminna Project across all field events:

- eight trapping grids were established for both the first and second phase for seven nights comprising 2,352 systematic trap nights;
- 40.8 hours of bird surveys;
- 19.4 hours of diurnal active searches;
- 64 nights of bat recordings at eight locations were analysed;
- 6.9 hours of nocturnal active searches;
- 200 motion camera trap nights from 40 camera point locations;
- 1,212 nights of SRE wet pitfall trapping at seven locations; and
- 54 leaf litter samples from 10 sites were searched for SRE invertebrate fauna (three samples per site; eight sites were sampled in both phases one and two).

The key findings of the Bidaminna Project detailed fauna assessment are:

- Four fauna habitats were identified within the Survey Area – Banksia Woodland, Dune Crests, Seasonal Damplands and Parkland Cleared Woodland.
- A total of 94 vertebrate fauna species were recorded: five species of native non-volant mammals, eight species of bats, five introduced mammals, 55 bird species, 16 reptiles and five amphibians.
- Statistical analysis of systematically collected trapping and bird survey data recorded during the detailed survey suggests that most of the fauna species potentially occurring within the Survey Area have been recorded with approximately 93% of the trappable mammal, reptile and amphibian species, and 88% of bird species recorded.
- Two conservation significant fauna species were recorded inside the Survey Area:
  - Carnaby's Cockatoo (*Calyptorhynchus latirostris*) – EPBC Act/ BC Act Endangered; and
  - Bothriembryontid Land Snail (Moore River) (*Bothriembryon perobesus*) – DBCA Priority 1
- One species was assessed to have a high likelihood of occurring inside the Survey Area based on regional records and the habitat types recorded in the Survey Area:
  - Western Brush Wallaby (*Notamacropus irma*) – DBCA Priority 4.
- A further eight species were assessed to have a medium likelihood of occurring inside the Survey Area:
  - Western Quoll (*Dasyurus geoffroii*) – EPBC Act/ BC Act Vulnerable;

  - Quenda (*Isoodon fusciventer*) – DBCA Priority 4;
  - Fork-tailed Swift (*Apus pacificus*) – EPBC Act/ BC Act Migratory;
  - Peregrine Falcon (*Falco peregrinus*) – DBCA Specially Protected;
  - Western Swamp Tortoise (*Pseudemydura umbrina*) – EPBC Act/ BC Act Critically Endangered;
  - Woolybush Bee (*Hylaeus globuliferus)* – DBCA Priority 3;
  - *Leioproctus contrarius* (a short-tongued bee) – DBCA Priority 3; and
  - Graceful Sunmoth (*Synemon gratiosa*) – DBCA Priority 4.
- An assessment for Carnaby's Cockatoos found the Survey Area to contain very high quality foraging habitat. Evidence of Carnaby's Cockatoo foraging has been recorded in the Survey Area and the species has been well documented using similar habitats across the surrounding region. All fauna habitats identified contain suitable foraging habitat for Carnaby's Cockatoo.
- The SRE assessment recorded 37 invertebrate taxa of which 25 are potential SRE invertebrates. Of the remaining 12 species, one species is the Priority 1 listed Bothriembryontid Land Snail (Moore River) *(Bothriembryon perobesus),* four taxa are from non-target invertebrate groups, five are widespread, and two are introduced species.
- The potential SRE taxa recorded are considered data deficient due to a lack of sampling, taxonomic and/ or geographic resolution. Following the Precautionary Principle, all data deficient taxa from SRE target groups are considered potential SREs.

The desired objectives and outcomes were successfully reached during the current assessment. There were no significant limitations to the survey work, and the level of survey effort and number of species recorded is considered adequate for the Survey Area. All field work was completed in accordance with relevant government legislation, guidance, and standard operating procedures.

1. INTRODUCTION

1.1. Project Background

Image Resources (Image) are planning for the potential development of the Bidaminna Project (1,968.6 ha Survey Area), a mineral sand mine located approximately 20 km east of Ledge Point in Western Australia (WA; Map 1.1). The Bidaminna Project includes the following characteristics:

- The proposed mine pit is 7 km long, 500 – 600 m wide and 50-60 m deep;
- The ore body is located to the west of Moore River National Park; and
- The entire ore body is located on Unallocated Crown Land (UCL) which is largely uncleared native vegetation.

Image Resources plan to seek approval under Part IV of the *Environmental Protection Act 1986* (EP Act) for the Bidaminna Project and have identified fauna assessments that are currently required. In order to provide sufficient information for the planning and environmental impact assessment (EIA) process Image Resources has requested an initial terrestrial fauna (vertebrate and short range endemic (SRE) invertebrate) assessment of the Survey Area.

1.2. Scope of Work

Image commissioned Spectrum Ecology & Spatial (Spectrum) to undertake a terrestrial (vertebrate and SRE invertebrate) fauna assessment, which will be used to support relevant environmental impact assessments and EPA referral. The scope of works included the completion of the following:

- Terrestrial fauna desktop review;
- Detailed terrestrial fauna survey; and
- Targeted surveys for relevant conservation significant species.

1.3. Legislation & Guidelines

1.3.1. Threatened Fauna (EPBC Act)

Nationally threatened species (flora and fauna) and ecological communities are protected under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The EPBC Act provides for the identification and listing of species and ecological communities as threatened, development of conservation advice and recovery plans, development of a register of critical habitat, recognition of key threatening processes and the development of threat abatement plans. Listed threatened species and ecological communities are recognised under the EPBC Act as a matter of national environmental significance and must be referred to the Minister and undergo an environmental assessment and approval process if they are likely to be significantly impacted. The categories for listing under the EPBC Act are outlined in Appendix A.

1.3.2. Threatened Fauna (BC Act)

The Western Australian *Biodiversity Conservation Act 2016* (BC Act) provides for the conservation, protection and ecologically sustainable use of biodiversity and biodiversity components in Western Australia. Threatened species (both flora and fauna) and ecological communities that meet the conservation categories listed within the BC Act are protected and require authorisation by the Minister to take or disturb. Species listed as Threatened under the BC Act are publicly listed in the WA Government Gazette with the current list published on the 11 September 2018.

Fauna species may also be listed as being of special conservation interest if they have a naturally low population, restricted natural range, are subject to or recovering from a significant population decline or reduction of range or are of special interest, and the Minister considers that taking may result in depletion of the species. These are known as Specially Protected Species in the BC Act. The conservation categories covering State-listed threatened fauna species are aligned with those listed under the EPBC Act and are outlined in Appendix A.

1.3.3. Priority Fauna (DBCA)

Conservation significant species are listed by the Department of Biodiversity, Conservation and Attractions (DBCA) as Priority species where populations are geographically restricted or threatened by local processes, or where there is insufficient information to formally assign them to threatened fauna categories. Whilst Priority species are not specifically listed in the BC Act, they have a greater level of significance than other native species. The categories covering Priority Fauna species (DBCA 2019) are outlined in Appendix A.

1.3.4. Assessment Guidance

The terrestrial fauna assessment was conducted in accordance with the following Commonwealth and State legislation, as well as the Environmental Protection Authority (EPA) requirements for environmental surveys as outlined below.

- *Biodiversity and Conservation Act 2016 (*BC Act*);*
- *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act);
- Technical Guidance: Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment (EPA 2020);
- Technical Guidance: Sampling of Short Range Endemic Invertebrates (EPA 2016b); and
- Environmental Factor Guideline Terrestrial Fauna (EPA 2016a).

Relevant species-specific survey and assessment guidelines include:

- Survey Guidelines for Australia's Threatened Birds (DEWHA 2010b);
- Survey Guidelines for Australia's Threatened Mammals (DSEWPaC 2011a);
- Survey Guidelines for Australia's Threatened Reptiles (DSEWPaC 2011b);
- Survey Guidelines for Australia's Threatened Bats (DEWHA 2010a);
- Survey Guidelines for Australia's Threatened Frogs (DEWHA 2010c);
- EPBC Act referral guidelines for three threatened black cockatoo species: Carnaby's Cockatoo (endangered) *Calyptorhynchus latirostris*, Baudin's Cockatoo (vulnerable) *Calyptorhynchus baudinii*, Forest Red-tailed Black Cockatoo (vulnerable) *Calyptorhynchus banksii naso* (DSEWPaC 2012);
- Revised draft referral guidelines for three threatened black cockatoo species: Carnaby's Cockatoo (Endangered) *Calyptorhynchus latirostris*, Baudin's Cockatoo (Vulnerable) *Calyptorhynchus baudinii*, Forest Red-tailed Black Cockatoo (Vulnerable) *Calyptorhynchus banksii naso* (CoA 2017);
- Referral guideline for 3 WA threatened black cockatoo species: Carnaby's Cockatoo, Baudin's Cockatoo and the Forest Red-tailed Black-cockatoo (DAWE 2022).

The Black Cockatoo referral guidelines from 2012 and revised draft referral guidelines from 2016 were considered in this report as the most recent guidelines were published following the completion of the field assessment The revised draft guidelines include habitat assessment methods and criteria synonymous with the current guidelines.

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Location of the Survey Area

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MAP
1.1

2. EXISTING ENVIRONMENT

2.1. IBRA Bioregion

The Interim Biogeographic Regionalisation for Australia (IBRA) classifies Australia into regions based on dominant landscape, climate, lithology, geology, landform and vegetation (Thackway and Cresswell, 1995).

The Survey Area is located within the Swan Coastal Plain IBRA region (Figure 2.1). The soils of the Swan Coastal Plain are typically sandy with several dune systems running parallel north-south along the plain incorporating a complex series of seasonal fresh water wetlands, alluvial river flats, coastal limestones and offshore islands (Mitchell, Williams and Desmond, 2002).

The Swan Coastal Plain is made up of two sub regions: the Perth Coastal Plain and the Dandaragan Plateau, the Survey Area is located within the Perth Coastal Plain (Figure 2.1). The Perth Coastal Plain is a low-lying plain composed primarily of colluvium and aeolian sands, alluvial river flats and coastal limestone. Vegetation consists of heath and/or Tuart woodlands on limestone, *Banksia* and Jarrah-*Banksia* woodlands on marine dunes of various ages, Marri on colluvial and alluvial soils and includes a complex series of seasonal wetlands (Mitchell, Williams and Desmond, 2002).

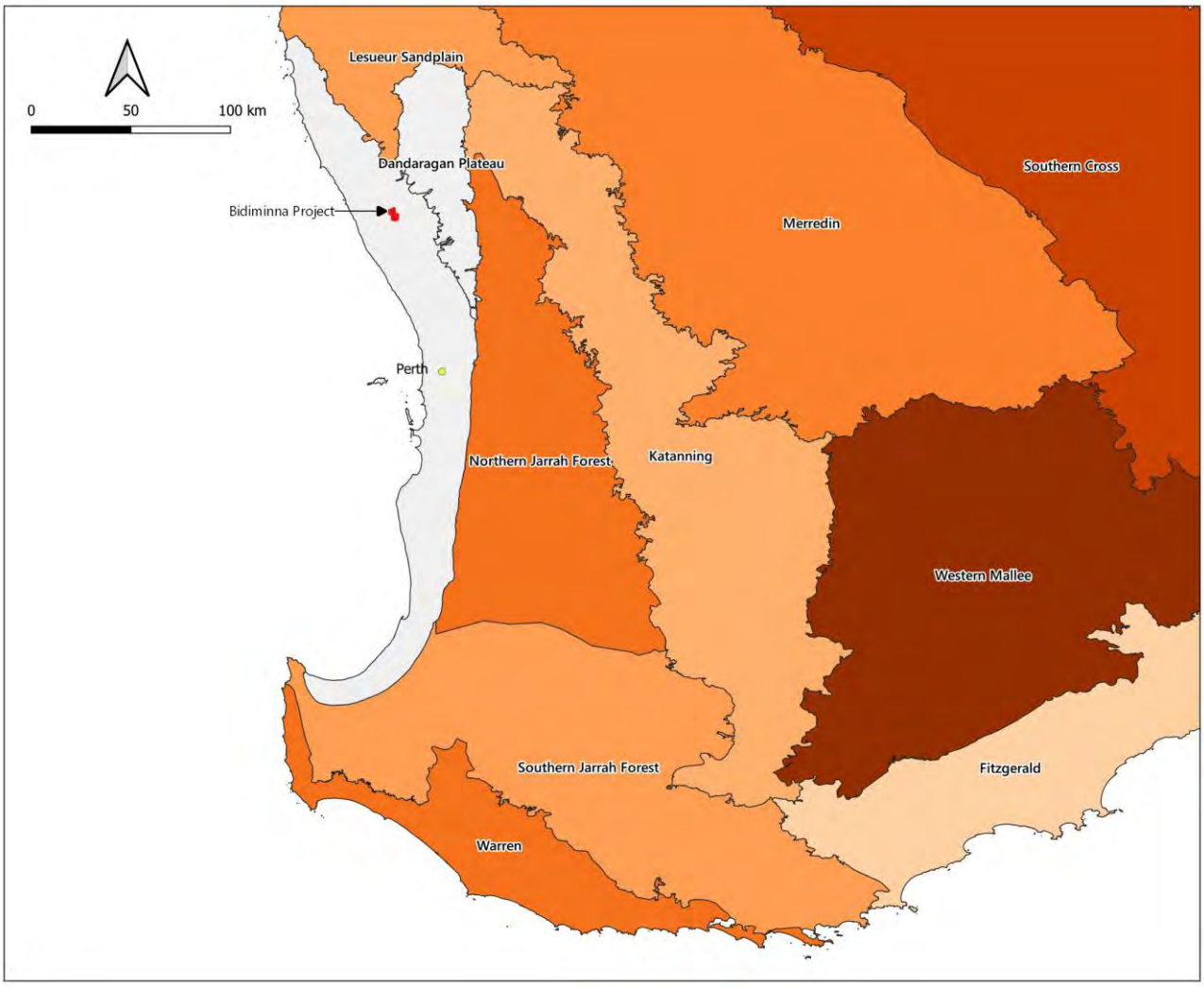


Figure 2.1: Swan Coastal Plain IBRA Region & the Survey Area

2.2. Climate

The climate of the Swan Coastal Plain is described as warm Mediterranean (warm wet winters and hot dry summers) with rainfall ranges between 600 mm and 1,000 mm annually. Nyoongar climatic information describes six seasons which include long hot dry periods from October to April (Kambarang, Birak & Bunuru) with cooler periods in April-May (Djeran) and August-September (Djilba) on either side of a short wet cold period in June-July (Makuru). Detailed climatic data is discussed in section 3.5.6.

2.3. Pre-European Vegetation

Pre-European vegetation mapping was originally undertaken by Beard at various scales across the state and has since been updated to be consistent with the National Vegetation Information System (NVIS) descriptions at a scale of 1:250,000 (DPIRD, 2019).

The Survey Area occurs on one vegetation unit (949.0) which is described as a low woodland; banksia, medium woodland; marri & river gum and low woodland; *Banksia attenuata* & *B. menziesii*. The vegetation association is summarised with the State-wide vegetation statistics (Government of Western Australia, 2019) in Table 2.1 and the occurrence in the region is shown in Map 2.1.

Table 2.1: Vegetation Association Mapped within the Survey Areas

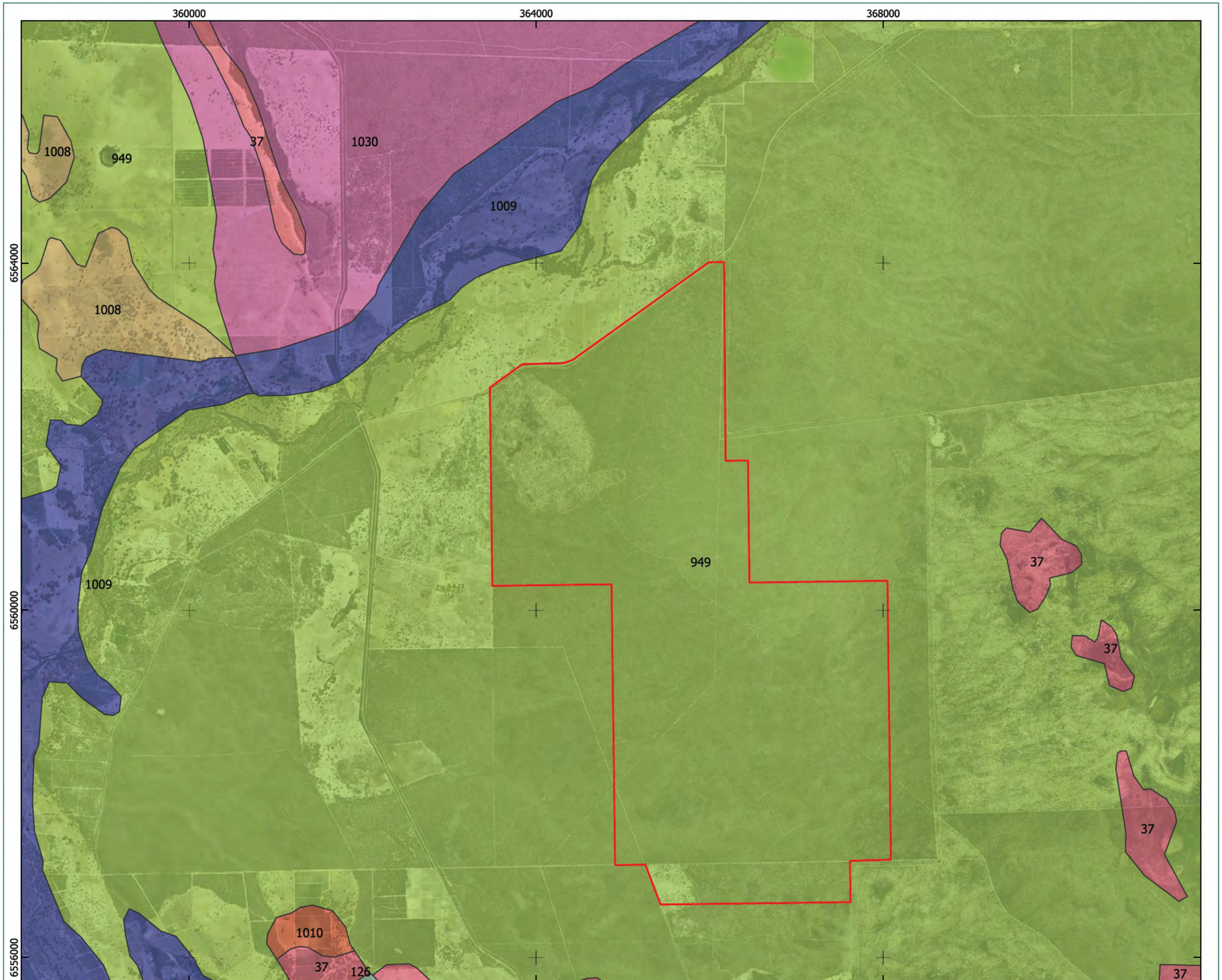
Association	Area in Survey Area (ha)	% of Survey Area	Pre-European Whole State (ha)	Current Extent State (ha)	% Remaining	% of Current Extent in DBCA Land
949.0	1,968.6	100	218,193.9	123,104.0	56.4	68,764.1
Flora Description						
949.0: U+ ^*Banksia attenuata, Banksia menziesii, Eucalyptus todtiana*\^tree\6\i;*G Conospermum incurvum, Verticordia nitens*\shrub\4\c						

2.4. Geology

The geology of Western Australia has been mapped at scales of 1:50,000, 1:100,000, 1:250,000, and 1:500,000. The Survey Area occurs in the central west of the 1:500,000 scale geological mapping and consists of a single geological unit; K-CYo-sll. This unit is associated with accumulated sand forming broad dune features running parallel to the west coast. The unit is listed in Table 2.2 and shown in Map 2.2.

Table 2.2: Geological Units of the Survey Area (1:500,000)

Code	Description	Area in Study Area (ha)	% of Study Area
K-CYo-sll	Interbedded sandstone, siltstone, shale, and claystone; characteristically glauconitic.	1,968.6	100



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- Bidaminna Survey Area

Pre European Vegeatation Units

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- 1009
- 1010
- 1030

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Projection transverse Mercator
Unit Meter

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Author MH Approved AH Date 09 03 2022

Pre-European Vegetation Units

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MAP 2.1

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Legend

Survey Area

Geology Unit (500k)

K CYl chl

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Coordinate System GDA 1994 MGA Zone 50
Projection Transverse Mercator
Unit Meter

Spectrum ECOLOGY + SPATIAL

Author MH Approved AH Date 19 05 2022

Geology

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MAP 2.2

2.5. Environmentally Significant Areas

2.5.1. Conservation Estates

The Western Australian conservation estate includes land and waters vested in the Conservation and Parks Commission under the Conservation and Land Management Act (1984). The conservation estate is generally managed by the Parks and Wildlife Service of DBCA to protect Western Australia's biodiversity, and includes National Parks, Nature Reserves, Conservation Reserves, and other areas managed primarily for biodiversity conservation (DoEE, 2016).

A search of the Collaborative Australian Protected Area Database (CAPAD) returned 30 conservation estates located within 40 km of the Survey Area. These protected areas and their approximate distance from the Survey Area are listed in Table 2.3. The Survey Area borders Moore River National Park along the north-eastern boundary and the south-eastern corner, in addition to being located within proximity of four other large conservation areas; Moore River Nature Reserve, Namming Nature Reserve, Nilgen Nature Reserve and Boonanarring Nature Reserve (Map 2.3).

2.5.2. Environmentally Sensitive Areas

Environmentally Sensitive Areas (ESA) are areas that are defined by the Department of Water and Environmental Regulation (DWER, 2019) as:

- A declared World Heritage property as defined in s 13 of the EPBC Act 1999
- An area that is included on the Register of the National Estate, because of its natural heritage value under the *Australian Heritage Council Act 2003*
- A defined wetland and the area within 50 m of the wetland;
- The area covered by vegetation within 50 m of Threatened flora, to the extent to which the vegetation is continuous with the vegetation in which the Threatened flora is located;
- The area covered by a TEC;
- A Bush Forever site;
- Areas covered by the Gnangara Mound Crown Land Policy and Western Swamp Tortoise Policy; and
- Areas covered by lakes, wetlands and fringing vegetation of the Swan Coastal Plain Lakes Policy, including South West Agricultural Zone Wetlands Policy and Swan and Canning Rivers Policy.
- Protected wetlands as defined in the Environmental Protection (South West Agricultural Zone Wetlands) Policy 1998

The Australian Wetlands Database includes nationally significant wetlands (as listed in the directory of important wetlands), wetlands listed under the Ramsar convention, wetlands that are representative, rare or unique, or wetlands that are considered of international importance (Department of the Environment and Energy, 2019).

The closest wetland to the Survey Area from this database is the Karakin Lakes (6°km W). A predominantly freshwater inland lake system consisting of two lakes, Karakin and Garagan in the north of the southwest agricultural region. The wetland areas do not intersect directly with the Survey Area.

Table 2.3: Environmentally Significant Areas in the Vicinity (30 km) of the Survey Area

Reserve Name (Protected Area ID)	Distance from Survey Area	Size (ha)
Conservation Estates		
Bartletts Well Nature Reserve (WA_01224)	19°km SW	116.8
Bashford Nature Reserve (WA_39221)	23°km NW	101.2
Boonanarring Nature Reserve (WA_41805)	22°km SE	9166.9
Bootine Nature Reserve (WA_45035)	19°km SW	70.9
Bundarra Nature Reserve (WA_23934)	24°km NE	212.8
Eneminga Nature Reserve (WA_27394)	23°km NW	740.7
Gingin Stock Route Nature Reserve (WA_34761)	21°km S	49.7
Lancelin And Edwards Islands Nature Reserve (WA_24979)	22°km W	27.4
Moochamulla Nature Reserve (WA_15816)	21°km NE	41.9
Moore River National Park (WA_28462)	0	17234.9
Moore River Nature Reserve (WA_41830)	5°km S	4740.9
Nabaroo Nature Reserve (WA_29905)	3°km W	8.1
Namming Nature Reserve (WA_28558)	6°km N	5290.0
Nilgen Nature Reserve (WA_31781)	14°km NW	5519.6
NTWA Bushland covenant (NTWA_0048)	20°km NE	96.4
NTWA Bushland covenant (NTWA_0057)	20°km NE	17.8
Quins Hill Nature Reserve (WA_43285)	19°km NE	8.5
Sand Spring Well Nature Reserve (WA_15928)	13°km SE	19.4
South Mimegarra Nature Reserve (WA_30618)	7°km NW	346.2
Unnamed WA21164 Reserve	1°km W	39.6
Unnamed WA25591 Nature Reserve	18°km NE	44.3
Unnamed WA27993 Nature Reserve	28°km N	20.9
Unnamed WA39571 Nature Reserve	29°km N	39.1
Unnamed WA46899 Nature Reserve	23°km NE	518.9
Unnamed WA47808 Nature Reserve	25°km E	414.8
Yurine Swamp Nature Reserve (WA_09676)	21°km SE	29.7
Wetlands		
Karakin Lakes (CR 7504)	6°km W	748
Guraga Lake (CR 31223)	17°km N	685

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Lancelin Defence Training Area
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Environmentally Significant Areas

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MAP
2.3

3. METHODS

3.1. Literature Review

A review of all relevant and available fauna data sources was undertaken prior to the field survey and incorporated into the desktop assessment. Eight databases and five previous survey reports were accessed to provide information to support the current assessment. A buffer area of 25 km was applied to the Threatened Fauna Database Search based on advice from the Department of Biodiversity, Conservation and Attractions (DBCA). A buffer of 12 km was applied for the Black Cockatoo Database Search as this is the distance specified in the species assessment guidelines (DSEWPaC 2012; CoA, 2017). The remaining database searches employed a 40 km buffer. Details of the completed database searches are listed in Table 3.1 and previous surveys listed in Table 3.2.

Table 3.1: Database Search Details

Custodian	Database	Species Group	Search Details
DAWE	Protected Matters Search	EPBC listed vertebrate and invertebrate fauna species	Date: 5/07/2021 Buffer: 40 km Centre point: -31.075, 115.588
DBCA	NatureMap	Vertebrate Fauna species	Date: 5/07/2021 Buffer: 40 km Centre point: 115° 35' 15" E, 31° 04' 31" S
	Threatened Fauna Database Search	Threatened and Priority Vertebrate and Invertebrate Fauna species	Date: 13/07/2021 Buffer: 25 km
WAM	Arachnida & Myriapoda Database	SRE invertebrate fauna species	Date: 15/07/2021 Buffer: 40 km NW corner: -30.798, 115.259 SE corner: -31.391, 115.886
	Crustacea Database		
	Mollusc Database		
Atlas of Living Australia	Atlas of Living Australia	Vertebrate Fauna Species	Date: 6/10/2021 Buffer: 40 km Centre point: 115° 35' 15" E, 31° 04' 31" S
Birdlife	Black Cockatoo Database Search	Black Cockatoos	Date: 18/05/2022 Buffer: 12 km Centre point: -31.075, 115.588

Surveys that have previously been conducted in the vicinity of the Survey Area were reviewed for records of fauna species, in particular significant fauna. Reports were incorporated if they were provided by the client or were publicly available. The reports incorporated into the desktop assessment are listed in Table 3.2 and the approximate location of the survey, where available, is shown in Map 3.1.

Table 3.2: Previous Survey Details

Author	Study Area / Location	Details	Distance to Survey Area (km)
Ecoedge (2019)	Orange Springs Road	Basic & Targeted Fauna Assessment	1.5
Astron Environmental Services (2016)	Indian Ocean Drive	Fauna, Flora and Vegetation Biological Survey	8.8
Dept. Parks & Wildlife (2015)	Boonanarring Nature Reserve	Detailed Fauna Survey	22.1
Bamford Consulting Ecologists (2015)	Cooljarloo West	Detailed Fauna Survey	43.3
Bennelongia Environmental Consultants (2013)	Cooljarloo West	SRE Fauna, Pilot and Targeted Surveys	43.4
GHD (2006)	Brand Highway	Reconnaissance Flora and Vegetation and Basic Fauna Survey	14.5

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Location of Previous Surveys

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MAP 3.1

3.2. Conservation Significant Fauna

Three conservation lists have been developed at the national (EPBC Act) and state level (BC Act and DBCA Priority list) (Appendix A). Fauna species that are listed under these legislative frameworks were identified during the literature review and summarised in the regional fauna list (Appendix C).

3.2.1. Likelihood of Occurrence Assessment

The likelihood of a conservation significant fauna species being present within the Survey Area was determined by examining the following:

- Suitability of fauna habitats known to exist within the Survey Area;
- Distribution of previously recorded conservation significant species;
- Frequency of occurrence of conservation significant species records in the region;
- Detectability of conservation significant species based on specific behavioural and ecological characteristics; and
- Temporal distribution of conservation significant species records, taking previous survey effort into consideration.

Each conservation significant species potentially occurring in the Survey Area, was assigned a likelihood of occurrence based on the below categories (Table 3.3). In accordance with the Precautionary Principle, the level of available information for each species was also taken into consideration so that species are not allocated a low likelihood of occurrence because of insufficient survey information.

Table 3.3: Criteria to Assess Likelihood of Occurrence

Likelihood	Criteria
Recorded	Species recorded within the Survey Area within the previous ten years.
High	Species recorded within or in proximity to the Survey Area within the previous 20 years. Suitable habitat occurs in the Survey Area.
Medium	Species recorded within or in proximity to the Survey Area more than 20 years ago. Species recorded outside the Survey Area but within 40 km. Suitable habitat occurs in the Survey Area.
Low	Species rarely or not recorded within 40 km of the Survey Area. Suitable habitat does not occur within or in proximity to the Survey Area.
Very Low	Species not recorded within 40 km despite multiple recent surveys. Suitable habitat does not occur within the Survey Area. Species considered locally extinct.

3.3. Short Range Endemic Invertebrate Fauna

SRE invertebrate fauna were first identified as species that were at high risk of significant impact due to their small areas of occurrence (Harvey, 2002).

3.3.1. SRE Target Groups

SRE invertebrates are collected in the field based on invertebrate groups that contain SRE taxa. These groups have developed based on a number of features (Harvey, 2002):

- Poor power of dispersal;
- Confinement to discontinuous habitats;
- Seasonality (activity is limited to cooler/wetter months);

- Slow growth; and
- Low levels of fecundity

In WA, SRE taxa are often under-sampled which makes it difficult to assess the distribution and status of a species or taxa. Invertebrate groups that include potential SRE taxa include the following (EPA 2016b)

- Arachnida (spiders and relatives).
  - Araneae (spiders), particularly Mygalomorphae (trap door spiders) and selected Araneomorphae (modern spiders);
  - Opiliones (harvestmen);
  - Pseudoscorpiones (false scorpions);
  - Scorpiones (true scorpions);
  - Schizomida (whip spiders) (although mostly troglobitic);
- Myriapoda (multipedes);
  - Chilopoda (centipedes), predominantly Geophilomorpha and Cryptopidae (Scolopendromorpha);
  - Diplopoda (millipedes);
- Crustacea (crustacean);
  - Isopoda (slaters);
- Molluscs (snails);
  - Eupulmonata (land snails); and
- Oligochaeta (earth worms).

Additional species groups have been proposed to contain potential range-restricted species; however, the taxonomy of these species groups is often unresolved and therefore those species groups are not targeted during SRE invertebrate fauna surveys (EPA 2016b).

3.3.2. SRE Habitat

Sheltered, isolated, and often relictual mesic habitats have an increased likelihood of hosting SRE taxa. The gradual aridification of the Australian continent that began in the early Miocene has resulted in the contraction and isolation of mesic habitats and by association those relictual faunal groups that utilise them (Harvey, 2002). Habitat types that have been recognised as potentially harbouring SRE species include (Harvey, 2002; Durrant, 2011; EPA 2016b):

- Deep gorges;
- Isolated ranges, mesas, and rock outcrops;
- Rainforest patches;
- Islands;
- Drainage systems;
- Vine thickets;
- Hillslopes with south west facing aspects; and
- Fire refuge areas such as cliffs and rock piles.

Many SRE species are associated with permanently moist, shaded, and sheltered microhabitats. In arid landscapes, these habitat types are typically limited and isolated by barriers of exposed, dry habitat not conducive to the dispersal of SRE species. This isolation restricts or eliminates gene flow between populations and may result in speciation via selective pressures, genetic drift, and mutation. Even where speciation has not yet occurred, the geographical distribution of these species has severely contracted and

fragmented. Isolated gorges and gullies that host complex microhabitats (heavy vegetation, deep leaf litter beds and varied rock cover) and protect relictual mesic habitat characteristics are more likely to host SRE taxa than simple widespread habitats exposed to climatic extremes. Isolated freshwater habitats associated with springs are also likely to provide conditions suitable for SRE taxa. Regionally extensive and exposed habitat types with high connectivity are unlikely to host SRE taxa (Durrant, 2011).

Vegetation, geological, land system, and topographic mapping as well as aerial imagery may be used as surrogates to estimate habitat connectivity and distributional boundaries of potential SRE species. This is to be considered in circumstances where further survey is deemed unlikely to yield more specimens and further taxonomic or distributional information is not available via the museum and subject matter specialists (EPA 2016b).

3.3.3. Determination of SRE Status

The SRE status of invertebrates is based on categories which were developed by the Western Australian Museum (WAM). For consistency purpose, identifications completed by Alacran followed the WAM categories (Table 3.4).

Following the Precautionary Principle, all data deficient species from known SRE target groups are regarded as potential short-range endemics.

Table 3.4: Western Australian Museum SRE Categories

Categories	Defining Characteristics
Confirmed SRE	• Known distribution of <10,000 km^2. • Taxonomy is well understood. • Species is well represented in collections. • Region of occurrence has been comprehensively sampled.
Potential SRE	• Limited sampling has resulted in incomplete knowledge of the species distribution. • Poor or limited taxonomic resolution. Species not well represented in collections.
Not SRE	• Known distribution of >10,000 km2. • Taxonomy is well understood. • Species is well represented in collections. • Region of occurrence has been comprehensively sampled.

In order to align with sub-categories used by the WAM, the following sub-categories will also be included to further clarify a species' ranking as a potential SRE (Table 3.5).

Table 3.5: WAM Sub-Categories Used to Justify Potential SRE Status

Sub-Category	Description
A: Data Deficient (DD)	• There is insufficient data available to determine SRE status. • Factors that fall under this category include: - Lack of geographic information (DDG) - Lack of taxonomic information (DDT) - The group may be poorly represented in collections; and - The individuals sampled (e.g., juveniles) may prevent identification to species level.
B: Habitat Indicators (H)	• It is becoming increasingly clear that habitat data can elucidate SRE status; and • Where habitat is known to be associated with SRE taxa and vice versa, it will be noted here.

Sub-Category	Description
C: Morphology Indicators (M)	• A suite of morphological characters are characteristic of SRE taxa; and • Where morphological characters are known to be associated with SRE taxa and vice- versa, it will be noted here.
D: Molecular Evidence (M)	• If molecular work has been done on this taxon (or a close relative), it may reveal patterns congruent or incongruent with SRE status.
E: Unpublished Research & Expertise (U)	• Previous research and/ or WAM expertise elucidates taxon SRE status; and • This category takes into account the expert knowledge held within the WAM.

3.4. Determination of Survey Design

3.4.1. Previous survey effort

The level of existing fauna and fauna habitat knowledge was assessed for the region within which the Survey Area was located. Information from five previous vertebrate fauna assessments and one SRE invertebrate fauna survey that were conducted in the local region of the Survey Area was available (Table 3.2).

3.4.2. Factors likely to influence survey design

Prior to the development of the survey methods, a review was undertaken of factors likely to influence the design and intensity of the field survey (Table 3.6). As there were few detailed surveys conducted in proximity with the Survey Area it was determined that a two phase detailed fauna assessment was required. Targeted fauna surveys were also recommended to provide additional information on the distribution and suitable habitat availability for conservation significant fauna species.

Table 3.6: Factors Likely to Influence Survey Design

Factor	Relevance
Bioregion – level of existing survey/knowledge of the region and associated ability to predict accurately.	The Swan Coastal Plain region has been extensively surveyed. The data collected as part of the associated environmental studies is mostly publicly available and covers all of the fauna habitat types that occur in this region. This allows an accurate prediction of the local and regional terrestrial fauna assemblages.
Landform special characteristics/specific fauna/specific context of the landform characteristics and their distribution and rarity in the region.	The landforms of the Survey Area are typical of the region and consist of stabilised sand dunes, plains and damplands. All landforms are considered common throughout the surrounding region
Lifeforms, life cycles, types of assemblages and seasonality (e.g., migration) of species likely to be present.	The Swan Coastal Plain region experiences warm, dry summers and cool, wet winters. The life cycles of most fauna include population increases, influx of nomadic species and breeding activity occurring after rainfall. Temperature also influences activity levels with reptiles and amphibians being most active during warm periods.
Level of existing knowledge and results of previous regional sampling (e.g., species accumulation curves, species/area curves).	One detailed vertebrate fauna survey has been conducted that was located within proximity to the Survey Area. An additional four basic and targeted terrestrial vertebrate fauna surveys and one SRE fauna survey have also been completed. Regional and local knowledge for the area is highly detailed, highly comparable and publicly available.
Number of different habitats or degree of similarity between habitats within a study area.	Two fauna habitat types were initially identified based on staff experience with the region, previous habitat mapping, and vegetation units. Following the field survey this was revised to four fauna habitats – Banksia Woodland, Dune Crests, Seasonal Damplands and Parkland Cleared Woodland

Climatic constraints (e.g. temperature or rainfall that preclude certain sampling methods).	The Swan Coastal Plain region experiences hot, dry summers, followed by cool, wet winters. Field surveys are generally conducted in Autumn and Spring to coincide with peak fauna activity and avoid climatic events that may preclude sampling. No climatic constraints were expected to influence the field surveys.
Sensitivity of the environment to the proposed activities.	The Survey Area contains habitat types which are well represented in the surrounding region. Highest impacts are associated with the areas of mining.
Size, shape and location of the proposed activities.	The Survey Area consists of the Bidaminna Project Area (approx. 1,968.6 ha) which is located approx. 20 km east of Ledge Point in Western Australia. The proposal is the development of a mineral sand mine with a pit to be 7 km long, 500-600 m wide and 50-60 m deep. The entire Survey Area was assessed at a detailed assessment level using available survey data and supplemented with additional sampling.
Scale and impact of the proposal.	The proposal is a sand mine pit and infrastructure with associated clearing.

3.5. Field Survey Methods

Based on the results of the literature review and previous survey effort in the local region, Spectrum Ecology completed a two-phase detailed terrestrial (vertebrate and SRE invertebrate) fauna survey of the Survey Area. Detailed descriptions for each sampling method are presented below, and all methods followed the state and federal legislations and guidelines listed in Section 1.3.4. Systematic sampling methods include standardised repeatable survey techniques that provide data that can be statistically analysed. Opportunistic surveys include a selection of supplementary sampling techniques that allow the collection of additional fauna records that may not be collected during systematic sampling. The combination of sampling methods enables the accurate identification of the local fauna assemblage that is present at the time of sampling.

3.5.1. Systematic Sampling

3.5.1.1. Vertebrate Fauna Systematic Site

Fauna trapping sites, which included a suite of trapping techniques designed to detect the local terrestrial fauna assemblage, were surveyed at eight locations within the Study Area. The trapping grids used during the field survey included the following:

- 20 L bucket and 50 cm PVC pipe pitfall traps: A trapping grid comprised of five alternating buckets and PVC pipes, dug into the ground to act as pitfall traps. A 10 m long, 30 cm high fence was also installed, passing across the top of each pit to direct fauna into it.
- Fraser-type funnel traps: similar to Yabbie traps, these were placed at the ends of each fence to capture fauna that are not readily caught in pitfall traps (10 per trapping grid). All funnel traps were covered with shades to reduce the likelihood of animals suffering from overheating.
- Elliott traps: aluminium box traps were baited with 'universal bait' to attract and capture smaller mammals (5 per trapping grid) and re-baited as required. All Elliott traps were covered by shades to reduce the likelihood of animals suffering from overheating.
- Cage traps: larger wire-frame box traps, also baited with 'universal bait', to capture medium-sized mammals (1 per trapping grid) and re-baited as required. All cage traps were covered by shades to reduce the likelihood of animals suffering from overheating.

The layout of each site is detailed diagrammatically in Figure 3.1. Trapping grids were set up in each major fauna habitat where possible, with each trapping grid surveyed over a seven-night period.

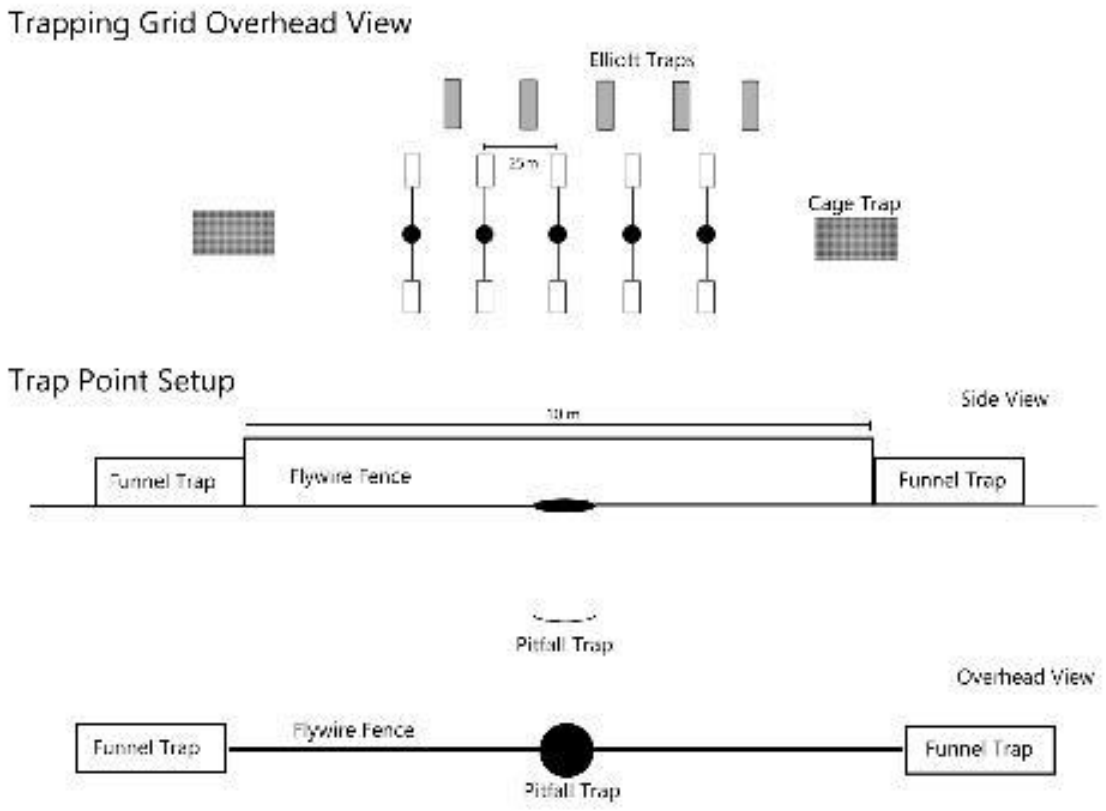

Figure 3.1: Diagram of standardised systematic fauna trapping grid layout

Bird Surveys: Area searches (20 minute set-time searches of 2 ha areas) were used to document the bird assemblage present at each of the systematic fauna trapping sites. During each area search an ornithologist recorded the number of individuals of each species observed while actively searching similar habitat within a 2 ha area surrounding the trapping site. Survey effort was concentrated within three hours of dawn or dusk, as these times are considered optimal for recording most bird species.

Bat Surveys: Bat echolocation calls were recorded from each fauna trapping site using Wildlife Acoustics Song Meter Mini Bat ultrasonic recorders (SM Mini). The SM Mini device records the full spectrum of calls allowing greater accuracy and sensitivity when identifying bat species. Each SM Mini device was programmed to record from 30 minutes pre-dusk to 30 minutes post-dawn for each night that was surveyed. All sites were surveyed for four nights to identify the bat assemblages present

3.5.1.2. SRE Invertebrate Fauna

SRE invertebrate fauna species were sampled using the below methods:

- Wet pitfall trapping: Wet pitfall traps consisted of a 120 mL plastic jar containing 110 mL of mixed preserving solution (active ingredients: Propylene-Glycol and Ethanol). All wet pitfall traps were covered with a bucket lid positioned approximately 1-2 cm above the surface of the ground to prohibit large vertebrate species from being trapped. Each wet pitfall site comprised four wet pitfall traps which were established in suitable microhabitats and left in-situ for 40 days.
- Leaf litter collection: Three 1 m^2 quadrats were collected from each site containing suitable leaf litter or soil. The samples were initially processed using a leaf litter reducer, with the smaller leaf litter

components placed into plastic zip-lock bags and transported back to Perth where they were placed under Tullgren funnels to extract the invertebrates.

- Dry pitfall trapping: Dry pitfalls used at systematic trapping sites for vertebrate fauna species (listed above) were concurrently utilised to collect SRE invertebrate species. The pitfalls were left open for seven nights and checked each morning.

3.5.2. Opportunistic Sampling

One limitation of systematic sampling sites is that some species and taxa are difficult to detect due to cryptic behaviours or other ecological considerations, such as fossorial or arboreal species. Systematic survey techniques were therefore supplemented with a suite of opportunistic sampling techniques that target specific species and habitats not normally covered by systematic trapping sites. These active survey techniques are listed below:

- Reptiles and Amphibians: Searches of 1 ha areas within the Survey Area by an experienced herpetologist. Microhabitats favoured by reptiles and amphibians were searched using various techniques including the raking of leaf litter and soil under shrubs, searching amongst rock piles, and searching under and inside fallen timber. Nocturnal species searches were also performed (when safe access was available) using spotlights and frog calls were recorded.
- Birds: Area searches (20 minute set-time searches of 2 ha areas) were used to document the bird assemblage present at bird-specific habitats, or habitats not already surveyed at systematic trapping sites. Bird species opportunistically observed inside the Survey Area that were not typically recorded during set time searches were also recorded, such as raptors, water birds and nocturnal species.
- Mammals: Mammals observed opportunistically within the Survey Area were also recorded. Tracks, scats and other traces of mammals were recorded and identified where possible.
- SRE Invertebrate Fauna: Suitable microhabitats were foraged for invertebrates that potentially represent SRE species. Leaf litter and the underside of rocks and logs were closely searched for molluscs, millipedes, isopods, pseudoscorpions and arachnids. If encountered, live snails were also collected from vegetation and trapdoor spider burrows were excavated.
- Motion Cameras: Motion sensitive cameras (Reconyx Hyperfire HF2X) capable of recording both normal (day) and infra-red (night) images were set up to record cryptic species not typically observed during field surveys.

3.5.3. Conservation Significant Fauna

A number of species listed under the EPBC Act and/or gazetted under the BC Act were identified by the literature review as having a moderate to high likelihood of occurrence in the Survey Area. These were specifically targeted using the following field survey techniques, whilst all other species were targeted using the methods mentioned above.

- Western Swamp Tortoise (*Pseudemydura umbrina)* – EPBC Act / BC Act Critically Endangered: Targeted searches were conducted for aestivating Western Swamp Tortoises and their burrows in areas of thick leaf litter, and under dense bushes and branches, in particular in low-lying landscapes that may be inundated after rainfall events.
- Carnaby's Cockatoo (*Calyptorhynchus latirostris*) – EPBC Act / BC Act Endangered: Habitat and potential breeding trees were recorded throughout the Survey Area. All bird species were targeted during all surveys and any opportunistic sightings or secondary evidence such as foraging debris were recorded.

- Woolybush Bee (*Hylaeus globuliferus*) and *Leioproctus contrarius* (a short-tongued bee) – DBCA Priority 3: Targeted searches were conducted in vegetation with known species associations e.g., *Adenanthos cygnorum* and *Banksia attenuata*. Habitat assessments were completed to assess the likelihood of the species occurring within the Survey Area.
- Graceful Sun-moth (*Synemon gratiosa*) – DBCA Priority 4: The species was targeted through active searches in vegetation containing the host plant *Lomandra hermaphrodita*. Habitat assessments were completed to assess the likelihood of the species occurring within the Survey Area.
- Western Brush Wallaby (*Notamacropus irma*) – DBCA Priority 4: Baited (non-food) motion cameras (Reconyx HF2X & HP2X) were installed within suitable habitat across the Survey Area. Long-term cameras were deployed six weeks prior to the detailed survey September 2021. Short-term motion cameras were deployed for five nights during each phase of the detailed survey. Any opportunistic sightings of the species were recorded including tracks, scats and other traces.
- Quenda (*Isoodon fusciventer*) – DBCA Priority 4: Baited (non-food) motion cameras (Reconyx HF2X & HP2X) were installed within suitable habitat across the Survey Area. Long-term cameras were deployed six weeks prior to the detailed survey in September 2021. Short-term motion cameras were deployed for five nights during each phase of the detailed survey. The species was also targeted during opportunistic searches including secondary evidence (tracks, scats, diggings, and other traces).

3.5.4. Site Selection

Prior to the selection of survey sites, previous survey information, pre-European vegetation mapping and aerial imagery were utilised to identify fauna habitats expected to occur within the Survey Area. Systematic and opportunistic survey sites were established across all representative habitat types. Locations of all survey sites are listed in Appendix B and displayed on Map 3.2.

3.5.5. Survey Effort

The terrestrial fauna survey was consistent with a detailed survey as described in Technical Guidance: Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment (EPA 2020). Eight systematic vertebrate fauna trapping sites were surveyed over seven nights during each phase of the survey. A minimum of four systematic bird surveys were completed at each of the trapping sites during each phase of the vertebrate fauna survey, and ultrasonic acoustic recordings for bats were completed at each trapping site for four nights during phase one and phase two of the vertebrate fauna survey. Habitat assessments and opportunistic surveys were conducted throughout the Survey Area.

SRE invertebrate fauna was surveyed using seven wet pitfall sites. Foraging and collection of leaf litter samples were completed at each systematic trapping site with three samples collected from each site during both phases of the survey. Additional foraging and sifting of leaf litter was conducted at opportunistic sites throughout and outside the Survey Area.

A summary of the survey effort undertaken within the Survey Area is detailed in Table 3.7. The survey effort included:

- eight trapping grids were established for both the first and second phase for seven nights comprising 2,352 systematic trap nights;
- 40.8 hours of bird surveys;
- 19.4 hours of diurnal active searches;
- 64 nights of bat recordings at eight locations were analysed;
- 6.9 hours of nocturnal active searches;

- 20 motion camera trap nights from 40 camera point locations;
- 1,212 nights of SRE wet pitfall trapping at seven locations; and
- 54 leaf litter samples from 10 sites were searched for SRE invertebrate fauna (three samples per site; eight sites were sampled in both phases one and two).

Table 3.7: Survey Effort Completed Within the Survey Area

Survey	Survey Timing	Person Days	Trap nights							No. sites#	Survey effort (hours)		
			Pit trap/ bucket	Funnel	Elliot	Cage	SRE wet pitfall	Bat recorders	Motion cameras	Leaf litter	Diurnal searches	Bird surveys	Nocturnal searches
SRE wet pitfall setup	6 – 9 September 2021	8	-	-	-	-	1,212	-	-	2	-	-	-
Phase 1	12 – 22 October 2021	44	280	560	280	56	-	32	100	8*	10.6	21.3	1.2
Phase 2	21 -31 March 2022	44	280	560	280	56	-	32	100	8*	8.8	19.5	5.7
Total		**96**	**560**	**1,120**	**560**	**112**	**1,212**	**64**	**200**	**10**	**19.4**	**40.8**	**6.9**

#Three samples per site

*Leaf litter samples were collected from the same sites in phases one and two

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370000

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- Phase One Tracks
- Phase Two Tracks

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3.2

3.5.6. Survey Timing

The Survey Area is located within the Southwest Botanical Province as described by Beard (1980). The Technical Guidance (EPA 2020) recommends terrestrial fauna surveys in this region be completed October – December to coincide with peak reptile, bird and mammal activity. Migratory bird species typically arrive in large numbers between November and March and a secondary reptile survey is recommended in February – March to coincide with the appearance of hatchlings. Peak periods of amphibian activity are highly variable, typically rainfall driven, and can occur at any time of year dependent on the individual species ecology. Optimal timing for SRE surveys in the southwest is May – October due to the presence of adults in many key SRE groups such as millipedes, and enhanced activity in otherwise cryptic groups such as *Bothryembrion* land snails and mygalomorph spiders (EPA 2016b).

Climate data from Bureau of Meteorology Stations (Gingin station #9018 and Gingin Aero station #9178) indicate that the twelve months prior to the first phase survey were wetter than usual with 202 mm greater rainfall recorded than the long-term median. This was largely driven by high rainfall in July 2021 (100 mm greater rainfall than the long-term median). In contrast, the three months prior to the second phase survey were dry with only 1.8 mm recorded from December 2021 to February 2022 (10.2 mm less than the long-term median). Conditions were also warmer than average in the lead up to the second phase survey (Figure 3.2). Rainfall was recorded during phase 1 and 2 of the survey.

Rainfall data was collected from the Gingin station (Gingin #9018) as this station has accurate data from over 100 years. Temperature data was collected from Gingin Aero station (Gingin Aero #9178) as this is the nearest inland weather station collecting temperature data.

The field survey timing is summarised below with the first phase of the detailed fauna survey conducted in spring and the second phase conducted in autumn. SRE wet pitfall traps and long-term motion cameras were installed for five weeks post winter, before being collected during the first phase trapping survey.

- Installation survey - SRE wet pitfall trap / long-term motion cameras: 6 – 9 September 2021.
- Detailed terrestrial fauna survey phase one: 12 – 22 October 2021.
- Detailed terrestrial fauna survey phase two: 21 – 31 March 2022.

The detailed terrestrial fauna and SRE surveys were conducted during the recommended periods for all fauna groups except amphibians.

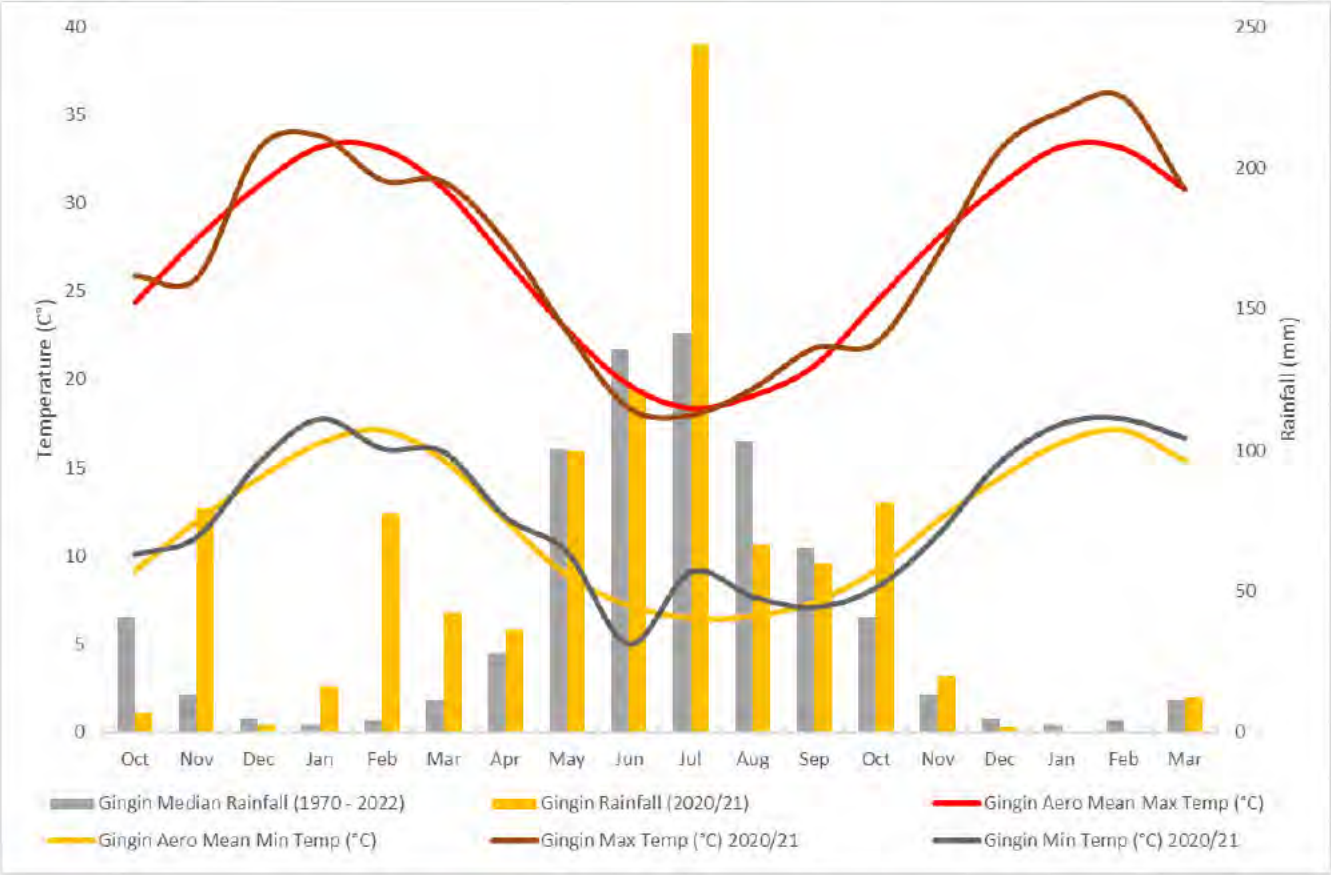

Figure 3.2 Rainfall and Temperature 12 Months Preceding the Survey

Table 3.8: Weather Observations from Phase one and two of the Fauna Survey (BOM Gingin #9018)

Date	Rainfall (mm)	Max Temp (°C)	Min Temp (°C)	Max Wind Speed (km/h)
Phase 1				
12/10/2021	3.8	18.3	7.0	44
13/10/2021	0	22.4	2.18.6	37
14/10/2021	0	34.2	12.3	41
15/10/2021	0	22.2	13.9	39
16/10/2021	0	22.9	14.3	43
17/10/2021	0	27.0	3.5	33
18/10/2021	0	21.7	15.0	35
19/10/2021	6.0	20.5	13.0	72
20/10/2021	15.8	20.7	11.9	56
21/10/2021	4.4	22.1	11.1	43
Phase 2				
21/03/2022	0	28.2	17.6	33
22/03/2022	0	27.7	14.3	44
23/03/2022	0	29.1	14.7	46
24/03/2022	0	31.6	15.8	43

Date	Rainfall (mm)	Max Temp (°C)	Min Temp (°C)	Max Wind Speed (km/h)
25/03/2022	0	36.2	18.0	48
26/03/2022	0	29.6	20.6	48
27/03/2022	0	24.3	20.7	52
28/03/2022	0	27.3	17.9	54
29/03/2022	11	30.6	19.6	44
30/03/2022	0	25.9	20.4	50
31/03/2022	0	31.8	20.0	44

3.5.7. Fauna Habitat Mapping

Fauna habitat mapping identifies areas of vegetation and land features that are distinguishable from other areas. Typically, each fauna habitat supports a characteristic fauna assemblage that is adapted to the features of the fauna habitat, although some generalist species can occupy several habitat types. Fauna habitat types are identified and mapped based on the following information:

- General vegetation type (Shepherd, Beeston and Hopkins, 2001);
- Vegetation Types mapped within the Survey Area;
- Vegetation structure;
- Landforms;
- Geological units;
- Soil substrate;
- Aerial imagery;
- Fauna assemblage; and
- Field observations.

The fauna habitat was recorded at each habitat assessment and survey site and opportunistically while traversing the Survey Area.

3.5.8. Black Cockatoo Habitat Assessment

The assessment of Black Cockatoo habitat followed the *Black Cockatoo referral guidelines* (DSEWPaC 2012) and the *revised draft referral guideline for three threatened black cockatoo species* (CoA, 2017).

The scoring tool included in these documents (Table 3.9) was used to determine if the Survey Area contains quality foraging habitat. Information on the following was collected:

- The presence of all plant species that provide foraging, including non-native food sources used by black cockatoos.
- The presence of tree species used for breeding.
- Use as a roosting site.
- The vegetation present in the surrounding area, i.e., at least 12 km from the impact area, including proximity to any breeding habitat, roosting sites and watering points.
- Breeding habitat, such as an estimate of the number of trees with a diameter of ≥ 500 mm or ≥ 300 mm for salmon gum or wandoo at breast height (1.3 m from the ground).
- Numbers of any known nesting trees.
- Presence of disease, such as *Phytophthora cinnamomi* or marri canker (*Quambalaria coyrecup*).

Searches were made for potential breeding trees at twenty locations throughout the Survey Area (Map 3.2). Each potential breeding tree was assessed for suitability for breeding and the presence or absence of suitable tree hollows was noted.

Table 3.9: Commonwealth foraging quality scoring tool (DoEE 2017)

Starting Score	Foraging habitat for Carnaby's Black-Cockatoo	Foraging habitat for Baudin's Black-Cockatoo	Foraging habitat for Forest Red-tailed Black-Cockatoo
10 (very high quality)	Foraging habitat that is being managed for black cockatoos such as habitat that is the focus of successful rehabilitation, and/or has some level of protection from clearing, and/or is quality habitat described below with attributes contributing to meet a sore of ≥10.	Foraging habitat that is being managed for black cockatoos such as habitat that is the focus of successful rehabilitation, and/or has some level of protection from clearing, and/or is quality habitat described below with attributes contributing to meet a sore of ≥10.	Foraging habitat that is being managed for black cockatoos such as habitat that is the focus of successful rehabilitation, and/or has some level of protection from clearing, and/or is quality habitat described below with attributes contributing to meet a sore of ≥10.
7 (High quality)	Native shrubland, kwongan heathland and woodland dominated by proteaceous plant species such as *Banksia* spp. (including *Dryandra* spp.), *Hakea* spp. And *Grevillea* spp., as well as native eucalypt woodland and forest that contains foraging species, including along roadsides. Does not include orchards, canola, or areas under a RFA.	Native eucalypt woodlands and forest, and proteaceous woodland and heath, particularly marri, including along roadsides. Does not include orchards or areas under a RFA.	Jarrah and marri woodlands and forest, and edges of karri forests, including wandoo and blackbutt, within the range of the subspecies, including along roadsides. Does not include areas under a RFA.
5 (Quality)	Pine plantation or introduced eucalypts.	Pine plantation or introduced eucalypts.	Pine plantation or introduced eucalypts.
1 (Low quality)	Individual foraging plants or small stand of foraging plants.	Individual foraging plants or small stand of foraging plants.	Individual foraging plants or small stand of foraging plants.
Additions	**Context adjustor – attributes improving functionality of foraging habitat**	**Context adjustor – attributes improving functionality of foraging habitat**	**Context adjustor – attributes improving functionality of foraging habitat**
+3	Is within the Swan Coastal Plain (important foraging area).	Is within the known foraging area (see guidelines).	Jarrah and/or marri show good recruitment (i.e. evidence of young trees).
+3	Contains trees with suitable nest hollows.	Contains trees with suitable nest hollows.	Contains trees with suitable nest hollows.
+2	Primarily contains marri.	Primarily contains marri.	Primarily contains marri and/or jarrah.
+2	Contains trees with potential to be used for breeding (dbh ≥ 500 mm or ≥ 300 mm dbh for salmon gum and wandoo).	Contains trees with potential to be used for breeding (dbh ≥ 500 mm or ≥ 300 mm dbh for salmon gum and wandoo).	Contains trees with potential to be used for breeding (dbh ≥ 500 mm or ≥ 300 mm dbh for salmon gum and wandoo).
+1	Is known to be a roosting site.	Is known to be a roosting site.	Is known to be a roosting site.

Starting Score	Foraging habitat for Carnaby's Black-Cockatoo	Foraging habitat for Baudin's Black-Cockatoo	Foraging habitat for Forest Red-tailed Black-Cockatoo
Subtractions	Context adjustor – attributes reducing functionality of foraging habitat	Context adjustor – attributes reducing functionality of foraging habitat	Context adjustor – attributes reducing functionality of foraging habitat
-2	No clear evidence of feeding debris.	No clear evidence of feeding debris.	No clear evidence of feeding debris.
-2	No other foraging habitat within 6 km.	No other foraging habitat within 6 km.	No other foraging habitat within 6 km.
-1	Is >12 km from a known breeding location.	Is >12 km from a known breeding location.	Is >12 km from a known breeding location.
-1	Is > 12 km from a known roosting location.	Is > 12 km from a known roosting location.	Is > 12 km from a known roosting location.
-1	Is >2 km from a watering point.	Is >2 km from a watering point.	Is >2 km from a watering point.
-1	Disease present (e.g. *Phytophthora cinnamomic* or marri canker).	Disease present (e.g. *Phytophthora cinnamomic* or marri canker).	Disease present (e.g. *Phytophthora cinnamomic* or marri canker).

3.5.9. Taxonomy and Nomenclature

Nomenclature for mammals, birds, reptiles and amphibians followed the Western Australian Museum Checklist of the Vertebrates of Western Australian (November 2021). Fauna species identifications were completed based on information in the references listed in Table 3.10.

Table 3.10: Species Identification References

Fauna Group	Reference
Mammals	Churchill (2009), Menkhorst and Knight (2001), van Dyck and Strahan (2008), van Dyck, Gynther and Baker (2013)
Birds	Menkhorst *et al.* (2019)
Reptiles	Wilson and Swan (2021), Cogger (2014)
Amphibians	Cogger (2014), Tyler and Doughty (2009)

3.5.10. Animal Ethics

Any disturbance of animals by the various capture of sampling methods used in this survey followed the state and federal legislation and guidelines. The survey methods also followed the DBCA Standard Operating Procedures (SOPs) listed below (DBCA 2019):

- Aluminium Box Traps for Capture of Terrestrial Vertebrates;
- Cage Traps for Live Capture of Terrestrial Vertebrates;
- Dry Pitfall Trapping for Vertebrates;
- Funnel Trapping for Terrestrial Fauna;
- Animal Handling and Restraint using Soft Containment;
- Hand Capture of Wildlife;
- Hand Restrain of Wildlife; and
- Transport and Temporary Holding of Wildlife.

Survey timing is also a significant factor when considering animal welfare. The survey must be completed at a time when the target fauna groups are active and detectable but extreme weather events are not likely. High temperatures and flooding can lead directly to fauna stress and/ or death or indirectly by restricting access to trapping sites. Vertebrate fauna was only handled as necessary for the purposes of species identification.

3.5.11. Survey Team and Licence

The field survey and assessment report were completed by the team listed in Table 3.11. The field surveys were conducted under DBCA Regulation 27 license BA27000498 and authorisation to take or disturb threatened species TFA 2021-099.

Table 3.11: Project Team

Staff	Qualification	Role	Years of Experience
Fauna			
Nicola Palmer	BSc (Hons)	Senior Zoologist (field survey, data analysis and reporting)	8 years
Jesse Harper	BSc (Hons)	Senior Zoologist (field survey and reporting)	9 years
Melinda Henderson	BSc (Hons)	Zoologist (field survey and reporting)	4 years
Lachlan Petersen	BSc	Invertebrate Zoologist (field survey, SRE specimen sorting and reporting)	2 years
Louise Ridgeway	BSc	Zoologist (field survey and reporting)	2 years
Sam Lostrom	BSc	Senior Zoologist (field survey)	10 years
Sarah Boys	BSc (Hons)	Ecologist (field survey)	4 years
Gabrielle Beca	PhD	Zoologist (data analysis and reporting)	1 year

3.6. Data Analysis

Only systematically collected data can be analysed because any mathematical comparison requires standardised sampling effort between variables. As such, only the results of the trapping grids or set-time bird surveys can be used for habitat analysis and survey adequacy tests. In this case, the variables are the seven trapping grid nights and eight surveys at each of the bird sites. The difference in systematic survey methods used between the trapping grids and bird surveys means that each of these data sets were analysed separately. For both the habitat and SAC analyses, opportunistic records such as those from motion cameras or active searches were excluded because the variables and sampling effort between sites are not standardised.

3.6.1. Habitat Analysis

Fauna habitat mapping enables the categorisation of each survey site into different habitats, and analysis of this data provides insight into how distinct or similar the fauna assemblages in each habitat type are. One method is non-metric multidimensional scaling (non-metric MDS), which is based on a distance matrix computed with a range of distance measures, whereby an algorithm attempts to place the data points in a theoretical two- or three-dimensional coordinate system whilst preserving the ranked differences in terms of their Euclidean distance from others (Hammer and Harper and Ryan, 2001). In this case, the Bray-Curtis similarity algorithm was used because it appropriately quantifies the compositional similarity/dissimilarity between two sites with abundance data.

Another habitat comparison method is the use of cluster analysis, whereby a hierarchical clustering routine creates a dendrogram showing how survey site data are clustered and whether this matches the respective habitat types (Hammer and Harper and Ryan, 2001). The algorithm used (Bray-Curtis as an index) effectively joins clusters (or sites) together based upon the average distance between data in the two groups. A group can be a single site or several, and the level (or value) at which they join indicates how similar the two groups are, where an index value of 1 equates to 100% similarity.

3.6.2. Survey Adequacy

Survey adequacy can, in part, be assessed by estimating species richness from sample data. Extrapolating Species Accumulation Curves (SACs), fitting parametric models or relative abundance and using non-parametric estimators (Bunge and Fitzpatrick, 1993; Colwell and Coddington, 1994; Gaston, 1996) are three generally accepted methods that achieve this. Species Accumulation Curves graphically illustrate the accumulation of species along a timeline and this method was used to analyse the data from the current field survey. At the point the horizontal asymptote is reached, it is estimated that no new species are present. In an effort to eliminate the impact of random or periodic temporal variation, the sample order was randomised 1,000 times using EstimateS (Colwell, 2016). As a stopping-rule technique, a Michaelis-Menten enzyme kinetic curve was calculated to estimate the theoretical maximum number of species present at each systematic survey site.

Data for fauna groups sampled using the same systematic technique was used for the analyses. An analysis was conducted for the mammals, reptiles and amphibians caught in trapping grids, and for the set-time bird surveys conducted at the systematic trap sites.

3.7. Survey Limitations

Survey limitations are unforeseen events that can limit the effectiveness of the field survey to achieve the required objectives. Overall, no significant limitations were experienced during the field survey. Specific potential limitations are addressed below in Table 3.12.

Table 3.12: Survey Limitations

Limitation	Constraint	Comment
Competency/experience of the consultant carrying out the survey.	No	The Zoologists that conducted the field survey had relevant experience surveying within the Swan Coastal Plain region.
Scope (what faunal groups were sampled and were some sampling methods not able to be employed because of constraints such as weather conditions).	No	Sampling techniques were designed for a detailed terrestrial fauna and SRE assessment. All fauna groups were sampled, and no survey constraints were experienced that limited sampling of specific groups.
Proportion of fauna identified, recorded and/or collected.	No	All mammal, bird and reptile fauna species encountered were identified in the field. Bat recordings were analysed by Specialised Zoological for species identification. All recordings were identified to species level, however one species was unable to be distinguished unambiguously between two species (Appendix G). Invertebrate fauna specimens were collected for identification by taxonomists at Alacran Environmental Consultants. Some female or juvenile specimens were unable to be identified to species level

Limitation	Constraint	Comment
		due to the lack of distinguishing morphological features (Appendix H).
Sources of information.	No	Database searches and previous survey reports provided a significant level of information, adequate to guide field survey design and effort.
The proportion of the task achieved and further work which might be needed.	No	All components of a detailed terrestrial fauna and SRE assessment were completed during the field survey providing a comprehensive understanding of the fauna values of the Survey Area.
Timing/weather/season/cycle.	Partial	The survey was conducted during the recommended season for a detailed terrestrial fauna and SRE assessment in the southwest region. Weather conditions during Phase 2 of the survey were not suitable to survey for Graceful Sun-moth (recommended survey timing) with overcast conditions, low temperatures and moderate to high winds.
Disturbances (e.g. fire, flood, accidental human intervention) which affected results of survey.	No	No disturbances were recorded during the survey.
Intensity (in retrospect, was the intensity adequate).	No	The completed detailed assessment was adequate to identify the fauna assemblages and habitats present within the Survey Area. Sufficient targeted searches for conservation significant fauna and SRE species were completed within areas of suitable habitat.
Completeness (was the relevant area fully surveyed.	No	All major fauna habitat types were sampled and defined. Habitat types that may host conservation significant fauna species were adequately surveyed.
Resources (degree of expertise available in animal identification to taxon level).	No	Resources available were adequate and did not compromise the outcome of the survey.
Remoteness and/or access problems.	No	No access restrictions were experienced within the Project
Availability of contextual (e.g. biogeographic) information on the region.	No	Background information about the region was available and sufficient.

4. RESULTS

4.1. Desktop Assessment

4.1.1. Vertebrate Fauna

Five fauna databases were accessed, and five fauna surveys were reviewed to provide information to support the current assessment of vertebrate fauna (Table 4.1). These sources identified 21 non-volant native mammals, seven introduced mammals, four bats, 212 birds, 63 reptiles and 11 amphibians from the area surrounding the Survey Area (Appendix C). Obligate marine species including 20 seabirds were excluded from the assessment as no habitat for these species exists inside the Survey Area (Appendix I).

Table 4.1: Summary of Vertebrate Fauna Species Previously Recorded

Data Source	Level of Survey	Mammals (Native/ Introduced)	Birds	Bats	Reptiles	Amphibians	Total
Literature							
Ecoedge (2019)	Basic and Targeted	1/0	24	-	-	-	25
Astron (2016)	Basic and Targeted	0/1	11	-	1	-	13
DPaW (2015) *	Detailed	7/6	73	-	33	5	124
BCE (2015)	Basic	7/1	33	-	19	6	66
GHD (2006)	Basic	0/1	3	-	1	-	5
Database							
DBCA Threatened Fauna Database	-	4	24	-	1	-	29
NatureMap	-	19/2	184	4	57	11	277
PMST	-	2/7	36	-	2	-	47
ALA		5/3	185	3	28	5	229
Total		**21/7**	**212**	**4**	**63**	**11**	**318**

*Includes results from surveys conducted in 2012 and 1986

4.1.2. Conservation Significant Fauna

During the desktop review, there were 51 conservation significant vertebrate fauna species identified that have the potential to occur within the Survey Area including nine mammals, 38 birds and four reptiles. Seven conservation significant invertebrates were identified in the database searches – two bees, one moth, one spider, one mussel, one cricket and one snail. Map 4.1 displays records returned by the DBCA Threatened Fauna Database Search. Carnaby's Cockatoo was recorded in four previous surveys (BCE 2015; Moore *et al.*, 2015; Astron 2016; Ecoedge, 2019) while the Western Brush Wallaby was recorded in one (BCE 2015).

One species of conservation significant bird, Carnaby's Cockatoo, has been recorded inside the Survey Area on two occasions (reference) in the past 20 years however, the Birdlife Black Cockatoo database search did not return any confirmed breeding or roosting sites within 12 km of the Survey Area.

340000 350000 360000 370000 380000 390000

6580000 6570000 6560000 6550000 6540000

Legend

Survey Area

Birds

- Aus ralasian bi ern
- Bar ailed godwi
- Blue billed duck
- Carnaby's cocka oo
- Caspian Tern
- Common greenshank
- Cres ed ern
- Curlew sandpiper
- Glossy ibis
- Grey plover
- Hooded plover
- esser Sand Plover
- i le curlew
- ong oed S in
- Mallee owl
- Pec oral sandpiper
- Red necked s in
- Ruddy urns one
- Ru
- Sanderling
- Sharp ailed sandpiper
- Whi e ailed black cocka oo
- Whi e winged black ern
- Wood sandpiper

Mamma s

- Wes ern quoll
- Quenda
- Wa er ra
- Wes ern brush wallaby

Repti es

- Black s riped snake

nvertebrates

- A Shor ongued bee
- Car er's reshwa er mussel
- Grace ul sunmo h
- Swan Coas al Plain shield backed rapdoor spider
- Woolybush bee

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DBCA database results

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MAP 4.1

4.1.3. SRE Invertebrate Fauna

The Western Australian Museum Invertebrate Database search identified 13 potential SRE species from the region surrounding the Survey Area. This included nine Arachnids (a mite, seven spiders and one scorpion), two Diplopods (millipedes), one Isopod (wood lice) and one Gastropod (land snail) (Table 4.2, Map 4.2). One additional millipede, *Antichiropus whistleri* has since been determined to be widespread (Car, Wojcieszek and Harvey, 2013).

Table 4.2: WAM Invertebrate Database Search Results

Family and Species	Previous Records	Additional Information
ARACHNIDA		
Acari		
Hydrodromidae		
Hydrodroma australis	Three records from Moore River, at the Brand Highway crossing, Regans Ford.	Water mite.
Araneae		
Anapidae		
Raveniella subcirrata	Two records from Seabird in 2007, 23 km west of the Survey Area.	Both specimens were collected in Acacia coastal dune shrubland.
Lycosidae		
Venator 'VWF sp. 140'	Three records, all from 700 m north of the Survey Area in 1971.	-
Malkaridae		
Westarchaea sinuosa	One record from Seabird in 2007, 23 km west of the Survey Area.	Specimen was collected in Acacia coastal dune shrubland.
Salticidae		
'Lycidas' 'chlorophthalmus'	One record 18 km southeast of the Survey Area.	-
Idiopidae		
Idiosoma sigillatum	Three records, the closest from Ledge Point, 19 km west of the Survey Area.	The Ledge Point specimen was collected in 1967; the most recent specimen is from Gingin in 2011, 38 km southeast of the Survey Area.
Nemesiidae		
Aname 'MYG496'	One record 18 km west of the Survey Area in 2012.	-
Proshermacha 'MYG362'	One record 14 km northeast of the Survey Area in 2007.	Burrow was located in sandy soil.
Scorpiones		
Urodacidae		
Urodacus 'SC0007, bullsbrook'	One record 18 km northeast of the Survey Area in 2000.	Specimen was collected in Banksia woodland over dense shrubs.

Family and Species	Previous Records	Additional Information
DIPLOPODA		
Polydesmida		
Paradoxosomatidae		
Antichiropus whistleri	Three records, north and northwest of the Survey Area, the most recent from 2014. The closest record is from 15 km northwest of the Survey Area.	This species has since been assessed as widespread (Car, Wojcieszek and Harvey, 2013).
Antichiropus `UBS2?`	One record from Boonanarring Nature Reserve, 23 km southeast of the Survey Area in 2007.	-
CRUSTACEA		
Isopoda		
Armadillidae		
Buddelundia cinerascens	One record from 20 km west of the Survey Area in 2005.	-
MOLLUSCA		
Gastropoda		
Bothriembryontidae		
Bothriembryon perobesus (Moore River)	Known from many locations surrounding the Survey Area; the closest and most recent records are from 2014, less than 100 m west of the Survey Area.	Records exist from between 1955 and 2014. The Moore River population is listed as Priority 1 by the DBCA. Most recent records are from Banksia woodland over white sand.

330000 340000 350000 360000 370000 380000 390000 400000

6590000 6580000 6570000 6560000 6550000 6540000 6530000

Legend

Survey Area

Arachnida

- ycidas chloroph halmus
- Aname MYG496
- An ichiropus UBS2
- An ichiropus whis leri
- Hydrodroma aus ralis
- diosoma sigilla um
- Proshermacha MYG362
- Raveniella arenacea
- Raveniella subcirra a
- Urodacus SCO007, bullsbrook
- Vena or VW sp 140
- Wes rarchaea sinuosa

Crustacea

- Naxia sp
- Buddelundia cinerascens
- ulimnadia vinculuma

Mo usca

- Bo hriembryon perobesus

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WAM SRE database results

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MAP 4.2

4.2. Fauna Habitats

Four fauna habitats were identified in the Survey Area. The extent of each habitat type is shown in Map 4.3 and listed in Table 4.3 with further details described in the sections below.

Table 4.3: Fauna Habitat Types at the Survey Area

Habitat Type	Extent (ha)	% of Survey Area	Associated Trap Sites
Banksia Woodland	1,567.4	79.6%	BIS1, BIS2, BIS5, BIS8
Dune Crests	225 2	11.4%	BIS4, BIS7
Seasonal Damplands	156.6	8%	BIS3, BIS6
Parkland Cleared Woodland	19.24	1%	-
	1,968.56		

4.2.1. Banksia Woodland

The Banksia Woodland was the dominant habitat type inside the Survey Area accounting for 1,567.4 ha or 79.6% of the Survey Area. It occurred on the plains and lower dune slopes comprised of white/grey sands across the Survey Area. It was characterised by a dominant tree layer of *Banksia attenuata*, *Banksia menziesii* and *Banksia ilicifolia* with scattered *Eucalyptus todtiana*. Moderately dense tall shrubs dominated by *Adenanthos cygnorum* and *Xanthorrhoea preissii* were present over a layer of moderately dense mixed low shrubs including *Verticordia nitens*, and *Stirlingia latifolia* over open sedges and sparse herbs.

Leaf litter and coarse woody debris was prevalent, leaf litter particularly so beneath mature *Adenanthos* sp., and *E. todtiana* where thick litter beds had accumulated. Small tree hollows have formed in mature *E. todtiana* trees. Flowering plants are abundant in the diverse assemblage of proteaceous and myrtaceous shrubs and trees.

Figure 4.1: Banksia Woodland Habitat

4.2.2. Dune Crests

The Dune Crests comprised 225.2 ha or 11.4% of the Survey Area. This habitat was found on white/grey sand on the crests and upper slopes of the stabilised sand dunes that cross the Survey Area. An open woodland of sparse to scattered *Eucalyptus todtiana*, *Banksia attenuata* and *Banksia menziesii* occurred over a moderately dense low shrub layer dominated by. *Eremaea pauciflora* var. *pauciflora* over scattered to sparse sedges and herbs. *Xanthorrhoea preissii* was scattered throughout the habitat. While the floristic assemblage was similar to the Banksia Woodland, the Dune Crests were characterised by sparser trees and a lower shrub layer.

Leaf litter and coarse woody debris were sparse, mainly occurring under mature trees and shrubs. Diverse myrtaceous and proteaceous shrubs provide an abundance of flowering plants throughout the year.

Figure 4.2: Dune Crests Habitat

4.2.3. Seasonal Damplands

The Seasonal Damplands habitat was found across 156.6 ha or 8% of the Survey Area. This habitat occurred on the light brown to grey sandy clay soils in depressions across the Survey Area. Vegetation was comprised of a dense shrubland of *Adenanthos cygnorum*, *Pericalymma ellipticum* var. *ellipticum* and/ or *Banksia sphaerocarpa* with scattered *Xanthorrhoea preissii* over a ground layer of *Patersonia occidentalis*, *Dasypogon bromeliifolius* and *Alexgeorgia nitens*. Trees were typically sparse; however, thickets of *Melaleuca* sp. were found in some areas and scattered *Nuytsia floribunda* and *Banksia* sp. trees were present. Trees and large shrubs are absent in some areas with sedges and rushes becoming dominant. The Seasonal Damplands do not become inundated, however the heavy soils retain moisture during the wetter months.

Coarse woody debris was limited to large logs under the sparse trees. Leaf litter, while present throughout the habitat, rarely formed dense litter beds. However, with the dense shrubs, sedges and rushes bare ground was sparse.

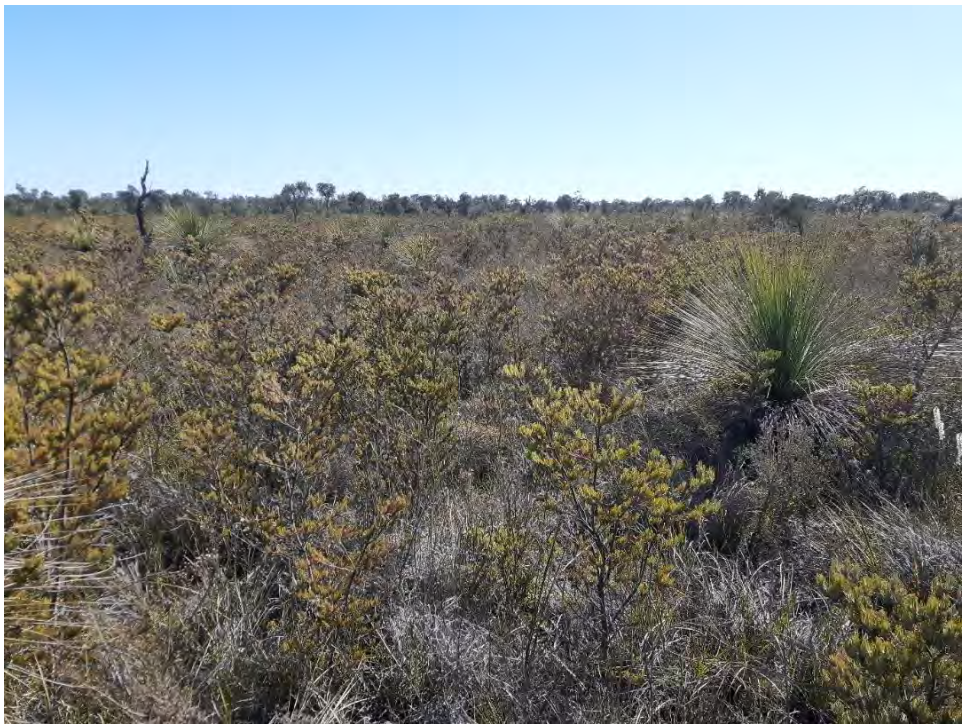

Figure 4.3: Seasonal Damplands Habitat

4.2.4. Parkland Cleared Woodland

The Parkland Cleared Woodland habitat is the smallest fauna habitat in the Survey Area representing 19.24 ha or 1 % of the Survey Area. This habitat type is comprised of an open woodland of scattered *Melaleuca* sp., *Nuytsia floribunda* and *Banksia* sp. over sparse *Xanthorrhoea preissii*, *Adenanthos cygnorum* shrubs. Much of the ground layer and understory has been cleared.

Figure 4.4: Parkland Cleared Woodland Habitat

4.2.5. Fauna Habitat Analysis

Fauna habitats were analysed using both non-metric MDS scatter plots and cluster analysis. Separate analyses were conducted for vertebrate fauna species caught in trapping grids (trappable fauna) and systematically sampled bird species. The data collected at each trapping site was summed into a single variable whereby aqua represents the Banksia Woodland habitat, purple represents the Seasonal Damplands and red represents the Dune Crests. The Parkland Cleared Woodland fauna habitat was not included in the analysis as systematic trapping was not conducted in that habitat type due to the disturbance recorded.

The fauna habitat analysis for the trappable fauna showed a clear grouping of sites in the Dune Crests habitat and the Banksia Woodland habitat with the closest similarity in sites occurring between the two Dune Crest sites.

Convex envelopes were not able to be applied the Dune Crest and Seasonal Dampland habitats as there were only two sites representing these habitats.

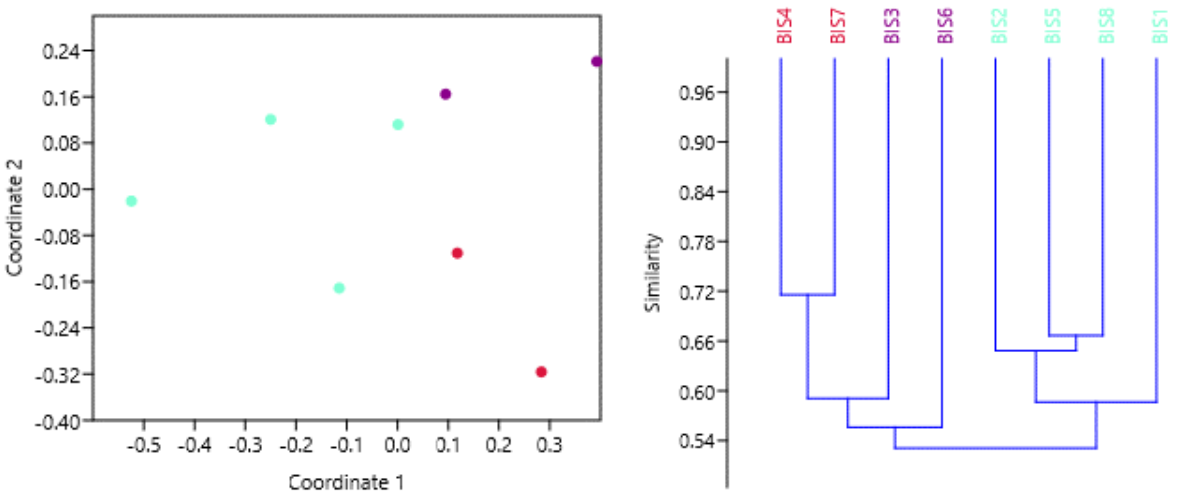

Figure 4.5: Non-metric MDS Scatter Plot and Cluster Analysis for Trappable Fauna

The systematic bird data did not show clear relationships between the Seasonal Dampland and Banksia Woodland habitat types, however the Dune Crest sites have been grouped together (Figure 4.6). Bird assemblages often don't differentiate cleanly as birds are highly mobile and many species are generalists.

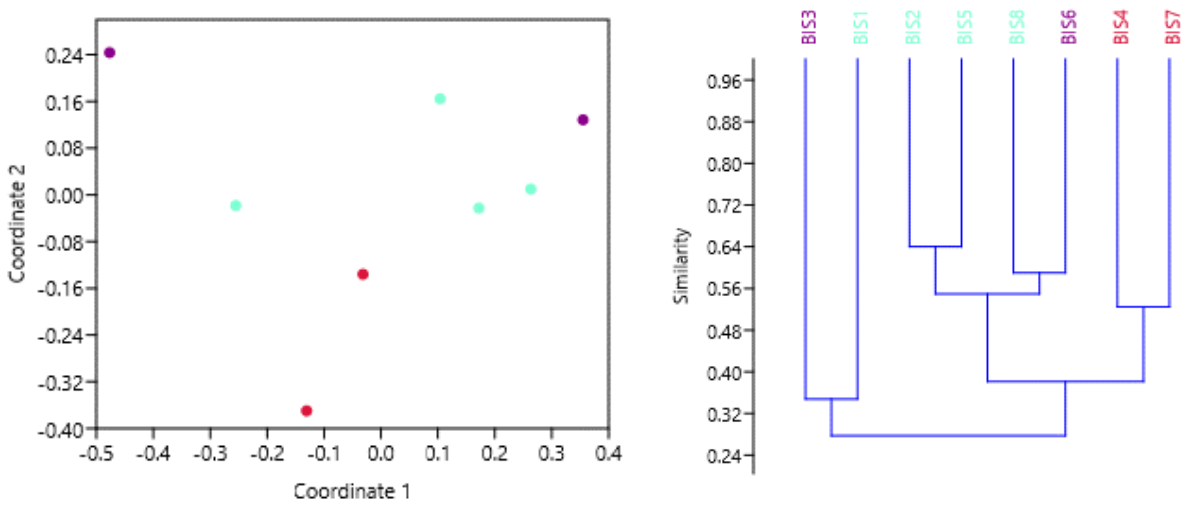

Figure 4.6: Non-metric MDS Scatter Plot and Cluster Analysis for Systematic Bird Survey Records

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Legend

- Survey Area
- Banksia Woodland
- Dune Cres s
- Seasonal Damplands
- Parkland Cleared

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Fauna habitats recorded in the Survey Area

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MAP 4.3

4.3. Vertebrate Fauna Assemblage

During the two phases of field work at the Bidaminna Survey Area, a total of 94 vertebrate fauna species were recorded: five species of native non-volant mammals, eight species of bats, five introduced mammals, 55 bird species, 16 reptiles and five amphibians. The details of the records and species are listed in Appendix E.

Bat calls from long-eared bats, genus *Nyctophilus*, were unable to be unambiguously identified and may be from the Lesser Long-eared Bat (*N. geoffroyi*), Holt's Long-eared Bat (*N. holtorum*) or the Western Long-eared Bat (*N. major major)*. It is likely that at least two species are present (Appendix G).

The native mammal and amphibian records were comparable across both phases of the survey with the same species assemblage recorded in during each survey event. House mice were undergoing a boom during phase two of the survey recording a 27-fold increase in captures. Reptile and avian species richness declined in phase two of the survey compared with phase one.

4.4. Conservation Significant Fauna

Two conservation significant species were recorded within the Survey Area during this survey (Map 4.4):

- Carnaby's Cockatoo (*Calyptorhynchus latirostris*) – EPBC/ BC Act Endangered; and
- Bothriembryontid Land Snail (Moore River) (*Bothriembryon perobesus*) – DBCA Priority 1.

The Carnaby's Cockatoo was recorded on four occasions inside the Survey Area: two records were made of the species flying over the Survey Area, foraging evidence was of foraging was found at two locations Two flocks of cockatoos were recorded opportunistically outside the Survey Area. This species had previously been recorded inside the Survey Area on five occasions and there are over 300 records from the area surrounding the Survey Area.

Seven specimens of the Bothriembryontid Land Snail (Moore River) were collected opportunistically during the survey. This species had previously been recorded 27 times in the area surrounding the Survey Area with six specimens collected within 100 m of the Survey Area.

Table 4.4: Conservation Significant Fauna Recorded

Species	Conservation Status			Site	Date	Abundance	Easting	Northing	Details
	EPBC Act	BC Act	DBCA						
Carnaby's Black Cockatoo (*Calyptorhynchus latirostris*)	EN	EN	-	[redacted]	17/10/2021	6	[redacted]	[redacted]	Regional sighting; observed flying past
				[redacted]	18/10/2021	-	[redacted]	[redacted]	Signs of foraging
				[redacted]	18/10/2021	12	[redacted]	[redacted]	Regional sighting; observed foraging in a paddock
				[redacted]	28/03/2022	10	[redacted]	[redacted]	Observed flying over
					30/3/2022	2			Observed flying over
				[redacted]	29/03/2022	-	[redacted]	[redacted]	Signs of foraging
Bothriembryontid Land Snail (Moore River) (*Bothriembryon perobesus*)	-	-	P1	[redacted]	8/9/2021	1	[redacted]	[redacted]	All specimens were hand collected from Banksia woodland
				[redacted]	26/03/2022	1	[redacted]	[redacted]	
				[redacted]	27/03/2022	2	[redacted]	[redacted]	
				[redacted]	16/10/2021	1	[redacted]	[redacted]	
				[redacted]	20/10/2021	1	[redacted]	[redacted]	
				[redacted]	12/10/2021	1	[redacted]	[redacted]	

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Legend

- Survey Area
- Carnaby's Cocka oo
- Carnaby's Cocka oo seocndary sign
- Bo hriembryon id and Snail (Moore River)

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Conservation significant species recorded

Bidaminna Project

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MAP 4.4

4.5. Carnaby's Cockatoo Habitat Assessment

Using the scoring tool outlined in the draft referral guidelines and listed in Table 3.9, the identified foraging habitat for the Carnaby's Cockatoo was assessed as follows:

Starting score:

- 7 (High Quality): proteaceous woodland and heathland dominated by Banksia species with Eucalyptus todtiana woodland present.

Additions:

- +3 Is within the Swan Coastal Plain (important foraging area).

Subtractions:

- -1 Is >12 km from a known breeding location.

The overall scoring of the foraging habitat for the Carnaby's Cockatoo has been rated as 9 (very high quality) based on the above criteria. Evidence of Carnaby's Cockatoo foraging has been recorded in the Survey Area and the species has been well documented using similar habitats across the surrounding region. The closest known roost site is approximately 14.5 km from the Survey Area and the

Potential Carnaby's Cockatoo habitat was defined and assessed during the field survey. Suitable foraging habitat occurred across the entirety of the Survey Area. Plant species that are known to provide foraging food sources for Carnaby's Cockatoo identified in the Survey Area include *Banksia attenuata*, *B. dallaneyi*, *B. ilicifolia*, *B. menziesii*, *Eucalyptus todtiana* and *Xanthorrhoea preissii*.

No known favoured tree species for breeding (salmon gum, wandoo, tuart, jarrah, flooded gum, York gum, powderbark, karri or marri) were recorded inside the Survey Area. Area searches identified 45 trees with a potential to become breeding trees (DBH > 500 mm). No trees had suitable hollows for Carnaby's Cockatoo to nest in however eight had hollows forming (Appendix F). The Survey Area is not a known roosting or nesting site. Discussions with Birdlife staff indicate that the closest confirmed roosting site is approximately 14.5 km from the Survey Area and the closest known confirmed breeding site is approximately 16.5 km from the Survey Area (M. Pryor pers comm). Potential roosting sites and watering points are present along Moore River, 1 km north of the Survey Area.

Six conservation estates with 12 km provide foraging habitat for Carnaby's Cockatoos:

- Moore River National Park;
- Moore River Nature Reserve;
- Nabaroo Nature Reserve;
- Namming Nature Reserve;
- South Mimegarra Nature Reserve; and
- Unnamed WA21164 5(1)(g) Reserve.

4.6. SRE Invertebrate Fauna

A total of 237 specimens from 37 invertebrate taxa were collected during the SRE fauna assessment. Four taxa are from non-target invertebrate groups, five are widespread, and two are introduced species. One taxon is a DBCA Priority 1 listed species (*Bothriembryon perobesus*), while 25 were assessed to be potential SRE due to a lack of taxonomic or geographic resolution (Appendix H). Each taxon from target SRE groups and its associated details are shown in Table 4.5.

Table 4.5: Species from SRE Target Groups Recorded

Class/ Order & Family	Species	Abundance	Site	Trap Type	Fauna Habitats	Details	SRE Status
ARACHNIDA							
Araneae							
Anamidae	*Anamae* sp.	1	AAOQ	Hand collection	Banksia Woodland	Female specimens collected only. Morphological assessment of adult males is required for identification of Anamidae to species and genus level.	Potential SRE: DDT
Anamidae	*Anamidae* sp.	1	BIOPPNOC06NP	Hand collection	Dune crests		Potential SRE: DDT
Opiliones							
Triaenonychidae	*Nunciella* sp.	1	SRE13	Hand collection, wet pitfall	Seasonal damplands	The taxonomy of this family is complicated and undergoing revision. Species delineation is heavily dependent on DNA sequencing.	Potential SRE: DDT
Pseudoscorpiones							
Chthoniidae	*Austrochthonius* sp.	44	LL5, BIS02, BIS03, BIS04, BIS06, BIS07, BIS08, SRE14, SRE15	Leaf litter	Banksia woodland, seasonal damplands, dune crests	Some specimens are juvenile and species identification was not possible based on morphology. DNA assessment is recommended. Many *Austrochthonius* species are widespread. These morphospecies are classified Potential SRE due to a lack of taxonomic resolution.	Potential SRE: DDT
Chthoniidae	*Austrochthonius* 'PSE188, similis'	3	BIS5, SRE11, SRE15	Wet pitfall, leaf litter	Banksia woodland, seasonal damplands	Morphospecies is known to be widespread.	Widespread
Chthoniidae	*Austrochthonius* 'PSE191, grandis'	1	SRE10	Wet pitfall	Banksia woodland	Morphospecies is known to be widespread.	Widespread
Olpiidae	*Beierolpium* sp.	5	BIOPP12NP, BIOPPMH02, BIP2OPPMH01 BIS08	Hand collection, leaf litter	Banksia woodland, seasonal damplands	Juvenile specimens – species level identity not possible using morphology. DNA assessment may achieve greater taxonomic resolution.	Potential SRE: DDT

Class/ Order & Family	Species	Abundance	Site	Trap Type	Fauna Habitats	Details	SRE Status
Olpiidae	*Beierolpium* sp. '8/4'	8	LL6, SRE15, BIS06, SRE14, BIS01	Leaf litter wet pitfall	Banksia woodland, seasonal damplands	Some specimens are possibly females of *Beierolpium* sp. '8/4-NA05'. DNA sequencing recommended for unambiguous identification.	Potential SRE: DDT
Olpiidae	*Beierolpium* sp. '8/4-NA05'	4	BIS03, BIS06, BIS07	Leaf litter	Seasonal damplands, dune crests	Tentative identification: DNA sequencing is recommended for unambiguous identification.	Potential SRE: DDT
Olpiidae	*Beierolpium* sp. '8/4-NA06'	1	BIOPP12NP	Hand collection	Seasonal damplands		Potential SRE: DDT
Scorpiones							
Urodacidae	*Urodacus* sp.	5	BIS06, BIS02	Dry pitfall, scorpion cup trap	Banksia woodland, seasonal damplands	Juvenile samples that may represent *Urodacus* "SC007, bullsbrook' or *Urodacus* 'armatus spp. group'. Adult males are required for morphological identification to species level. DNA sequencing may provide greater taxonomic resolution.	Potential SRE: DDT
Urodacidae	*Urodacaus novaehollandiae*	6	BIS8, SCORP1JH, S07, BIS04, BIOPPNOC06NP	Hand collection dry pitfall, scorpion cup trap	Banksia woodland, dune crests	The species is common in the Swan Coastal Plain, Jarrah Forest and south coast bioregions. These specimens represent the most northerly records for the species.	Widespread
Urodacidae	*Urodacaus* 'SCO007, bullsbrook'	6	BIS02	Hand collection, scorpion cup trap	Banksia woodland	This species is known from two populations – one near Bullsbrook and one in the vicinity of Lancelin.	Potential SRE: DDG

Class/ Order & Family	Species	Abundance	Site	Trap Type	Fauna Habitats	Details	SRE Status
CHILOPODA							
Geophilomorpha							
Geophilidae	Geophilidae sp. CO1	1	SRE15	Leaf litter	Seasonal damplands	Little is known about the taxonomy of Western Australian Geophilidae. DNA sequencing is recommended if further taxonomic resolution is required.	Potential SRE: DDT
Geophilidae	*Sepedonophilus* sp.	5	BIS01, BIS06, BIS07	Leaf litter	Banksia woodland, seasonal damplands, dune crests	Species level identity is only possible using DNA sequencing. Most WA *Sependophilus* morphospecies are thought to be SRE.	Potential SRE: DDT
Mecistocephalidae	*Mecistocephalus* 'Na01'	3	BIOPP02NP, BIS6, WOOLLYBEEBUSH	Hand collection	Banksia woodland, seasonal damplands	There are many undescribed species of Mecistocephalidae and no widespread species are known. Species level identification is only possible with DNA sequencing.	Potential SRE: DDG
Scolopendromorpha							
Scolopendridae	Scolopendridae sp.	3	BIS02, BIS06, BIOPPNOC06NP	Hand collection	Banksia woodland, seasonal damplands, dune crests	All samples were larger specimens and therefore represent widespread species.	Widespread
DIPLOPODA							
Julida							
Julidae	*Ommatoiulus moreletii.*	1	SRE08	Wet pitfall	Banksia woodland		Introduced

Class/ Order & Family	Species	Abundance	Site	Trap Type	Fauna Habitats	Details	SRE Status
Polydesmida							
Paradoxosomatidae	*Antichiropus* sp.	20	LL5, LL6, BIS03, BIS06, BIS01, BIS02, BIS08, SRE08, SRE11, SRE12	Leaf litter, hand collection, wet pitfall, dry pitfall	Banksia woodland, seasonal damplands	Female and juvenile samples. Adult male specimens are required for identification of *Antichiropus*. DNA sequencing of these samples would be required for further taxonomic resolution.	Potential SRE: DDT
Paradoxosomatidae	*Antichiropus whistleri*	1	BIS03	Dry pitfall	Seasonal damplands	One male was able to be identified to *A. whistleri*. This is known to be a widespread species.	Widespread
Spirostreptida							
Iulomorphidae	Iulomorphidae sp.	1	BIS01	Leaf litter	Banksia woodland	Old, poorly preserved specimen. Live specimens are required to confirm genus and species level identity.	Potential SRE: DDT
Iulomorphidae	*Podykipus* sp.	9	LL5, LL6	Leaf litter	Banksia woodland	Genus has not been scrutinised using DNA or morphology. Other similar genus's in the family are comprised of SRE species.	Potential SRE: DDT
MALACOSTRACA							
Isopoda							
Armadillidae	*Buddelundia* '7'	2	BIOPP03NP	Hand collection	Banksia woodland	Morphospecies is known from the Perth area of the northern Swan Coastal Plain. This specimen may be conspecific with *Buddenlundia subinermis* Budde-Lund 1912 from the Geraldton area however further work is required to confirm this.	Potential SRE: DDG

Class/ Order & Family	Species	Abundance	Site	Trap Type	Fauna Habitats	Details	SRE Status
Armadillidae	*Spherillo* '2'	25	BIOPP03NP, BIS04, BIS07, SRE08, SRE09, SRE11, SRE12, SRE13, BIS02, BIS03, BIS06,	Hand collection, wet pitfall, leaf litter	Banksia woodland, seasonal damplands, dune crests	Complex taxon occurring in the northern Jarrah Forest and Swan Coastal Plain. Sequencing is recommended if further taxonomic resolution is required.	Potential SRE: DDG
Philosciidae	*Laevophiloscia* sp	7	SRE15, BIS04, LL5	Leaf litter, hand collection, wet pitfall	Banksia woodland, seasonal damplands, dune crests	Damaged or juvenile specimens that could not be identified to species level. DNA sequencing is recommended if greater taxonomic resolution is required.	Potential SRE: DDT
Philosciidae	*Laevophiloscia* 'Na01'	32	BIOPP02NP, BIS03, BIS04, BIS07, BIS08, SRE10, SRE11	Hand collection, dry pitfall, leaf litter, wet pitfall	Banksia woodland, seasonal damplands, dune crests	Two morphospeices are tentatively identified. DNA sequencing is recommended if greater resolution is required and to confirm wider distribution if necessary.	Potential SRE: DDT
Philosciidae	*Laevophiloscia* 'Na02'	13	BIS08, SRE09	Wet pitfall, dry pitfall, funnel trap	Banksia woodland		Potential SRE: DDT
Philosciidae	Philosciidae 'Na03'	8	BIS01, SRE08, SRE09, SRE10, SRE12, SRE13	Wet pitfall, leaf litter	Banksia woodland, seasonal damplands	Genus is unknown but markedly different to *Laevophiloscia*. It is possible that more than one species is represented by this morphospecies. DNA sequencing is recommended if further taxonomic resolution is required.	Potential SRE: DDT
GASTROPODA							
Hygromiidae	*Prietocella barbara*	1	SRE14	Wet pitfall	Banksia woodland		Introduced

Class/ Order & Family	Species	Abundance	Site	Trap Type	Fauna Habitats	Details	SRE Status
Eupulmonata							
Bothriembryontidae	*Bothriembryon perobesus*	7	OPP1Hand collection, BIMC30, BIS02, BIOPP2JH, BIOPPNOC05NP	Hand collection	Banksia woodland	Priority 1 species is discussed in detail in Section 5.3.4.1.	Priority 1
RHABDITOPHORA							
Tricladida							
Geoplanidae	*Caenoplana* 'Na01'	4	SRE08, SRE12	Wet pitfall	Banksia woodland	There is potential for these samples to represent multiple species.	Potential SRE: DDG
Geoplanidae	*Caenoplana* 'Na02'	1	SRE09	Wet pitfall	Banksia woodland		Potential SRE: DDG
CLITELLATA							
Oligochaeta							
	Oligochaeta sp.	4	BIS04, BIS06	Leaf litter, wet pitfall	Dune crests, seasonal damplands	Taxonomy is unresolved. Earthworms are thought to have potential to be SRE.	Potential SRE: DDT

370000

6560000

Legend

Survey Area

Potentia SRE taxa recorded

- Aname sp
- Anamidae sp
- Nunciella sp
- Aus roch honius sp
- Beierolpium sp
- Beierolpium '8/4'
- Beierolpium '8/4 Na05'
- Beierolpium '8/4 Na06'
- Urodacus sp
- Urodacus 'SCO007, bullsbrook'
- Geophilidae sp
- Sepedonophilus sp
- Mecis ocephalus 'Na01'
- An ichiropus sp
- ulomorphidae sp
- Podykipus sp
- Buddelundia '7'
- Spherillo '2'
- aevophiloscia sp
- aevophiloscia 'Na01'
- aevophiloscia 'Na02'
- Philosciidae 'Na03'
- Caenoplana 'Na01'
- Caenoplana 'Na02'
- Oligochae a sp

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Coordinate Sy tem GDA 1994 MGA Zone 50
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Potential SRE taxa recorded

Bidaminna Project

Prepared for
PRESTON CONSULT NG
MAGE RESOURCES

MAP 4.5

4.7. Survey Adequacy

Analyses of both the vertebrate trapping grid and bird data produced flattening species accumulation curves approaching the horizontal asymptote. The graphs below display two data sets; species observed during the survey (S(est)) and the Michaelis-Menten curve (MM Means) that serves as an estimator of total species richness (Figure 4.7, Figure 4.8). Comparison of these two curves shows that approximately 93% of the estimated total number of combined mammal, reptile and amphibian species (Figure 4.7), and 88% of the potential bird species (Figure 4.8) were sampled. These results indicate that with further trapping effort an additional two mammal, reptile or amphibian species may be detected, and another six bird species.

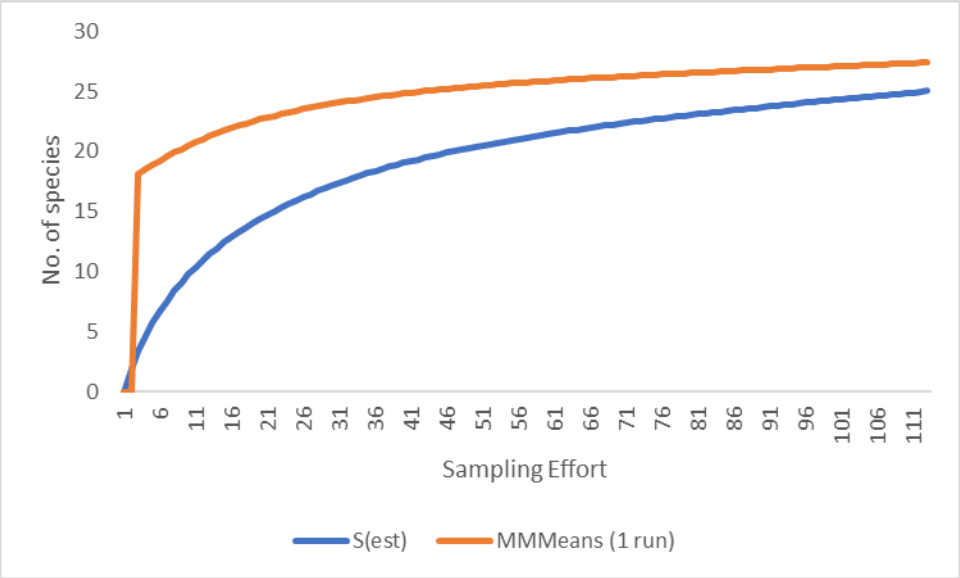

Figure 4.7: Species accumulation curve for trappable fauna

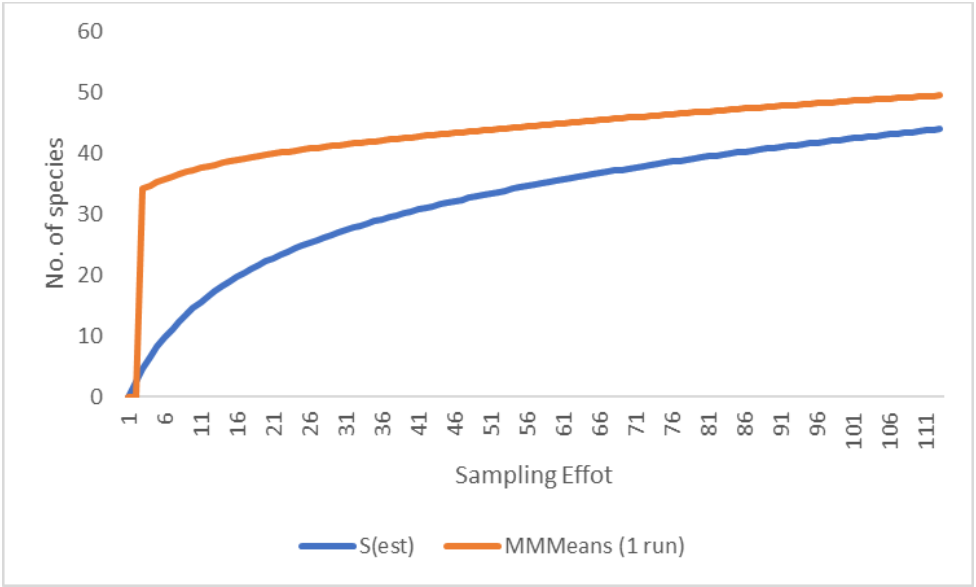

Figure 4.8: Species accumulation curve for birds

5. DISCUSSION

5.1. Fauna Habitats

5.1.1. Banksia Woodland

The Banksia Woodland habitat type was the most extensive within the Survey Area, accounting for approximately 80% of the total area. This habitat has been recorded in the region (Moore *et al.*, 2015; Ecoedge, 2019).

An estimated 60% of native Banksia Woodland has been cleared within the Swan Coastal Plain resulting in the vegetation community's listing as a nationally Threatened Ecological Community (CoA, 2016) and a Priority Ecological Community under the BC Act (DBCA, 2021). Patches of Banksia Woodland are listed when they are greater than 0.5 ha and of excellent or pristine condition, greater than 1 ha and of very good condition, or greater than 2 ha and of good condition (CoA, 2016). Listing of the Banksia Woodland ecological community as nationally threatened indicates that "*impacts should be avoided and if they are unavoidable, must be mitigated, reduced or, as a last resort, offset*" (CoA, 2016).

Avifauna species associated with Banksia Woodland habitat inside the Survey Area included generalist species such as the Australian Raven (*Corvus coronoides*), Grey Shrikethrush (*Colluricincla harmonica*), Rufous Whistler (*Pachycephala rufiventris*) and Singing Honeyeater (*Gavicalis virescens*). Nectivorous species such as New Holland Honeyeater (*Phylidonyris novaehollandiae*) and Brown Honeyeaters (*Lichmera indistincta*) were also abundant, likely due to the nectar provided by flowering *Banksia menziesii* and *B. attenuata*. A pair of Brown Falcons (*Falco berigora*) were observed hunting over the Banksia Woodland habitat.

The most regularly encountered reptile species in the Banksia Woodland habitat were the West Coast Ctenotus (*Ctenotus fallens*) and Western Heath Dragon (*Ctenophorus adelaidensis*) both restricted to sand plains and sand dunes, and the Common Dwarf Skink (*Menetia greyii*), a generalist. The Turtle Frog (*Myobatrachus gouldii*), Western Banjo Frog (*Limnodynastes dorsalis*), Moaning Frog (*Heleioporus eyrei*) and Crawling Toadlet (*Pseudophryne guentheri*) were recorded throughout the Banksia Woodland following rain during both phases of the survey.

Native mammal species recorded during the systematic surveys included the Ash Grey Mouse (*Pseudomys albocinereus*), Little Long-tailed Dunnart (*Sminthopsis dolichura*), and Honey Possum (*Tarsipes rostratus*). House Mice (*Mus musculus*) were booming during the second phase of the survey and captures were very high in comparison to phase one. Western Grey Kangaroos (*Macropus fuliginosus*) were recorded throughout the Banksia Woodland habitat. The Western Free-tailed Bat (*Ozimops kitcheneri)* was recorded in the Banksia Woodland, and the Gould's Wattled Bat (*Chalinolobus gouldii*), Inland Forest Bat (*Vespadelus baverstocki*) and Southern Forest Bat (*Vespadelus regulus*) were common.

Signs of Carnaby's Cockatoo (*Calyptorhynchus latirostris;* EPBC/ BC Act Endangered) foraging were observed in the Banksia Woodland habitat and seven specimens of the Bothriembryontid Land Snail (Moore River) (*Bothriembryon perobesus;* DBCA Priority 1) were collected from this habitat. The habitat provides shelter and foraging vegetation for the Western Brush Wallaby (*Notamacropus irma;* DBCA Priority 4), assigned a high likelihood of occurrence.

The Banksia Woodland contains suitable habitat for the Western Quoll (*Dasyurus geoffroii)* and Quenda (*Isoodon fusciventer*) and may be used by aestivating Western Swamp Tortoises (*Pseudemydura umbrina)*. Associate vegetation for the Woolybush Bee (*Hylaeus globuliferus*), Graceful Sun-month (*Synemon gratiosa*)

and *Leioproctus contrarius (*a short-tongued bee), all assessed to have a medium likelihood of occurring in the Survey Area, is found in the Banksia Woodland fauna habitat.

5.1.2. Dune Crests

The Dune Crests habitat is floristically similar to the Banksia Woodland and also forms part of the Banksia Woodlands of the Swan Coastal Plain Threatened Ecological Community and Priority Ecological Community.

The avifauna of the Dune Crests was dominated by nectarivores including Brown Honeyeaters (*Lichmera indistincta*) and Tawny-crowned Honeyeaters (*Gliciphila melanops*), however generalist species including the Australian Raven (*Corvus coronoides*), Rainbow Bee-eater (*Merops ornatus*) and Rufous Whistler (*Pachycephala rufiventris*) were regularly encountered. Splendid Fairywrens (*Malurus splendens*) were resident at the systematic trapping sites and Southern Emu Wrens (*Stipiturus malachurus*) were also recorded.

Reptile diversity was similar to the Banksia Woodland habitat with Western Heath Dragons (*Ctenophorus adelaidensis*) and West Coast Ctenotus *(Ctenotus fallens*) regularly recorded. Western Bearded Dragons (*Pogona minor*) and West Coast Keeled Legless Geckos (*Pletholax gracilis*) make use of the low shrub vegetation.

Ash Grey Mice (*Pseudomys albocinereus)* were abundant in the Dune Crests making use of the low vegetation. Little Long-tailed Dunnarts (*Sminthopsis dolichura)* and Honey Possums (*Tarsipes rostratus*) were also recorded in the systematic trapping. The Chocolate Wattled Bat (*Chalinolobus morio*) and Inland Broad-nosed Bat (*Scotorepens balstoni*) were recorded in the Dune Crests habitat.

The Dune Crests provide habitat for conservation significant species recorded, or potentially occurring in the Survey Area including the Carnaby's Cockatoo (*Calyptorhynchus latirostris*) that forage on the *Banksia* spp. and *Eucalyptus todtiana* trees and the Western Brush Wallaby (*Notamacropus irma*) that may shelter within and forage on the vegetation. The habitat is also suitable for the Western Quoll (*Dayurus geoffroii*) and contains substrate and vegetation for the Bothriembryontid Land Snail (Moore River) (*Bothriembryon perobesus*).

5.1.3. Seasonal Damplands

The Seasonal Damplands contained a dense heath of proteaceous and myrtaceous shrubs that provide shelter and abundant nectar when in flower, along with sedges and rushes resulting in continuous vegetation with little bare ground. Patches of thick leaf litter and the underside of large logs in this habitat may retain moisture year round to provide microhabitats for SRE invertebrates.

Generalist bird species such as the Grey Fantail (*Rhipidura albiscapa*), Western Whistler (*Pachycephala occidentalis*), Willie Wagtail (*Rhipidura leucophrys*) and the Black-faced Cuckoo-Shrike (*Coracina novaehollandiae*) were regularly recorded. Nectarivores such as Silvereye (*Zosterops lateralis*), Western Spinebill (*Acanthorhynchus superciliosus*) and White-cheeked Honeyeaters (*Phylidonyris niger*) were recorded feeding on the flowering shrubs. Birds of prey including the Australian Kestrel (*Falco cenchroides*), Australian Hobby (*Falco longipennis*) and Brown Falcon (*Falco berigora*) were observed in this habitat.

The reptiles encountered were typically generalist species including Burton's Legless Lizard (*Lialis burtonis*), Western Bearded Dragon (*Pogona minor*), Common Dwarf Skink (*Menetia greyii*) and the Shrubland Pale-flecked Morethia (*Morethia obscura*). The low heath vegetation provided shelter for Bardick (*Echiopsis curta*).

Frog species that burrow in sandy and swampy substrates including Moaning Frog (*Heleioporus eyrei*), Western Banjo Frog (*Limnodynastes dorsalis*) and Turtle Frog (*Myobatrachus gouldii*) emerged following rain

Honey Possums (*Tarsipes rostratus*) were abundant in the Seasonal Damplands habitat, making use of the thick flowering proteaceous and myrtaceous heath. Gould's Wattled Bat (*Chalinolobus gouldii*), Inland Forest Bat (*Vespadelus baverstocki*) and Southern Forest Bat (*Vespadelus regulus*) were regularly recorded in the Seasonal Damplands.

Foraging habitat for the Carnaby's Cockatoo (*Calyptorhynchus latirostris*) was present and the species was recorded in this habitat. One conservation significant species, the Western Brush Wallaby (*Notamacropus irma*) was assigned a high likelihood of occurring within this habitat with the diverse vegetation providing foraging habitat for the species. Three species, the Western Quoll (*Dasyurus geoffroii*), Quenda (*Isoodon fusciventer*) and the Woolybush Bee (*Hylaeus globuliferus*) were assessed to have a medium likelihood of occurring in the Seasonal Damplands.

5.1.4. Parkland Cleared Woodland

The Parkland Cleared Woodland habitat within the Survey was comprised of large patches of open ground between large shrubs and trees, sparsely vegetated with annual herbs. Clearing has resulted in the loss of important habitat characteristics such as leaf litter and woody debris with lower small mammal, reptile and amphibian abundance and richness expected. Large mammals such as Western Grey Kangaroos moved through the habitat grazing on annual herbs. Moist microhabitats for SRE invertebrates were not present.

Trees and large shrubs provided habitat for generalist bird species such as Brown Honeyeaters (*Lichmera indistincta*), Willie Wagtails (*Rhipidura leucophrys*), New Holland Honeyeaters (*Phylidonyris novaehollandiae*), Horsefield's Bronze Cuckoos (*Chalcites basalis*), Magpie Larks (*Grallina cyanoleuca*) and Brown Falcons (*Falco berigora*).

Foraging habitat is present for Carnaby's Cockatoo with species such as *Banksia* sp. and *Xanthorrhoea preissii*. present.

5.2. Vertebrate Fauna Assemblage

The second phase of this survey saw lower avian and reptile species richness and abundance recorded. Temperatures during the second phase of the survey were warmer than the first phase (Table 3.8) and greater reptile activity was expected. However, the summer preceding that phase of the survey was very hot and dry (Figure 3.2) potentially reducing resources for these species.

Rainfall was recorded during both phases of this survey (30 mm during phase 1 and 11 m during phase 2; Table 3.8) resulting good amphibian captures.

There have been few detailed fauna surveys in the vicinity of the Bidaminna Project (Table 3.2) so the vertebrate fauna assemblage recorded during this survey can only be compared with one other study – The Fauna of Boonanarring Reserve (Moore *et al.*, 2015) located 22 km east of the Survey Area. A greater number of native non-volant mammals, birds, and reptiles were recorded in that assessment. Boonanarring Reserve has a greater diversity of vegetation types including marri, wandoo and jarrah-marri woodlands, and riverine vegetation that are not found inside the Survey Area. (Moore *et al.*, 2015). Captures in this assessment were not reported against habitat types so comparisons cannot be made.

5.3. Conservation Significant Fauna

The literature review, database searches and survey results indicate two species of conservation significant fauna have been recorded from the Survey Area – Carnaby's Cockatoo and Bothriembryontid Land Snail (Moore River). Both species were recorded during this survey. Carnaby's Cockatoo has previously been recorded five times inside the Survey Area and on 389 occasions in the area surrounding the Survey Area.

The Bothriembryontid Land Snail (Moore River) has previously been recorded in close proximity to the Survey Area on multiple occasions.

One species (Western Brush Wallaby) was assessed to have a high likelihood of occurrence based on previous records and the habitat types present within the Survey Area, while a further eight species (two mammals, two birds, one reptile and three invertebrates) were assessed to have a medium likelihood of occurring in the Survey Area. The likelihood ranking assigned to each species is discussed in Table 5.1. The recorded species and those with a high or medium likelihood of occurrence are discussed in the following sections.

Table 5.1: Likelihood of Occurrence Criteria for Significant Species

Species	Conservation Status			Preferred Habitats	Previous Records	Likelihood of Occurrence
	EPBC Act	BC Act	DBCA			
Mammals						
Western Ringtail Possum *Pseudocheirus occidentalis*	CR	CR	-	Within the Swan Coastal Plain the species is found in peppermint woodlands and peppermint/tuart forests extending from Bunbury to Augusta (DPaW 2014).	NatureMap database only.	**Very Low**: The species is considered locally extinct.
Dibbler *Parantechinus apicalis*	EN	EN	-	Mainland habitat is characterised by long unburnt heath and mallee vegetation on sandy substrates (DoEE 2019a).	PMST database only – species or species habitat may occur in the area.	**Very Low**: The species is considered locally extinct on the mainland.
Heath Mouse *Pseudomys shortridgei*	EN	VU		Heathlands and woodlands with high species richness and complexity on the south coast of Western Australia and on the southern border of South Australia and Victoria (Menkhorst, Cockburn and Cancilla, 2008).	NatureMap database only.	**Very Low**: The species is considered locally extinct.
Western Quoll, Chuditch *Dasyurus geoffroii*	VU	VU	-	Inhabits sclerophyll forest, drier woodlands, heath and mallee shrubland (van Dyck and Strahan, 2008).	One record, 13 km from the Survey Area in 2001 (DBCA database).	**Medium**: Suitable habitat occurs within the Survey Area however there have not been any records within the last 20 years.

Species	Conservation Status			Preferred Habitats	Previous Records	Likelihood of Occurrence
	EPBC Act	BC Act	DBCA			
Greater Bilby, Dalgyte *Macrotis lagotis*	VU	VU	-	A variety of habitats with suitable soil substrates and plant species that are fed on directly or host insect larvae. Habitats can include spinifex hummock grassland, acacia shrubland, open woodland and cracking clays (Dziminski and Carpenter, 2018). Current distribution includes the western deserts region of Western Australia and the Northern Territory and south-western Queensland (Pavey, 2006).	NatureMap database only.	**Very Low:** The species is considered locally extinct
Brush-tailed Phascogale, Wambenger *Phascogale tapoatafa*	-	-	CD	Dry sclerophyll forests and woodlands containing hollow bearing trees with sparse ground cover (Soderquist and Rhind, 2008).	NatureMap database only.	**Low:** Suitable habitat occurs in the Survey Area however the species has not been recorded from the vicinity of the Survey Area in the past 20 years.
Quenda *Isoodon fusciventer*	-	-	P4	Woodland, heath and areas with dense vegetation in the lower stratum (van Dyck and Strahan, 2008).	One record, 22 km west of the Survey Area in 2007 (DBCA database).	**Medium:** Suitable habitat occurs within the Survey Area however recent records are scarce.
Western Brush Wallaby *Notamacropus irma*	-	-	P4	Open forest or woodland, open seasonally wet flats with low grasses and scrubby thickets, mallee and heathland occasionally utilised (van Dyck and Strahan, 2008).	Eleven records in proximity to the Survey Area the most recent from 2017 (21 km northwest of the Survey Area). The nearest record is from 5 km east of the Survey Area in 1978 (DBCA database).	**High:** Suitable habitat occurs within the Survey Area and the species has been recorded in proximity to the Survey Area.
Water Rat, Rakali *Hydromys chrysogaster*	-	-	P4	Habitats with permanent bodies of fresh or brackish water including lakes, rivers and coastal areas (Olson, 2008).	One record from 1972 on the Moore River, 17 km northeast of the Survey Area (DBCA database).	**Very Low:** Suitable riparian habitat does not occur in the Survey Area. The species has not been recorded in proximity to the Survey Area since 1972.

Species	Conservation Status EPBC Act	BC Act	DBCA	Preferred Habitats	Previous Records	Likelihood of Occurrence
Birds						
Curlew Sandpiper *Calidris ferruginea*	CR	CR		Most records are from intertidal mudflats and coastal wetlands. Inland records include ephemeral and permanent lakes (DAWE 2021b).	Two records 21 km northeast of the Survey Area from 1977 and 1978 (DBCA database).	**Low**: Suitable lakes do not occur within the Survey Area.
Far Eastern Curlew (Eastern Curlew) *Numenius madagascariensis*	CR & MI	CR	-	Inhabit coastal areas, particularly tidal flats. Some species may also inhabit mangroves, ocean beaches and rocky shorelines (Menkhorst *et al.*, 2019).	PMST database only – species or species habitat may occur in the area.	**Low**: Suitable habitat for the species does not occur within the Survey Area.
Lesser Sand Plover *Charadrius mongolus*	EN & MI	EN	-	Prefers coastal habitats including sheltered sand flats, mudflats, bays and estuaries though may infrequently utilise coastal salt lakes (Menkhorst *et al.*, 2019.	One record, 15 km south of the Survey Area (DBCA database).	**Low**: Suitable salt lake habitat does not occur within the Survey Area.
Carnaby's Cockatoo *Calyptorhynchus latirostris*	EN	EN	-	Breeds in tree hollows of Wandoo, Tuart, Jarrah, York Gum, Karri and Marri. Foraging habitat includes proteaceous woodland, forests, riparian vegetation, heath and introduced species (DSEWPaC 2012).	Total of 389 species records from the area surrounding the Survey Area including five records inside the Survey Area (DBCA database).	**Recorded**: The species has been recorded inside the Survey Area on four occasions less than 20 years prior to this assessment. The Survey Area contains high quality foraging habitat.
Australian Painted Snipe *Rostratula australis*	EN	EN	-	Freshwater wetlands including lakes, swamps, claypans (DAWE 2021).	PMST database only – species or species habitat may occur in the area.	**Low**: Suitable habitat does not occur within the Survey Area.
Australian Bittern *Botaurus poiciloptilus*	EN	EN	-	Shallow terrestrial freshwater wetlands, lakes and swamps, typically with low, dense fringing vegetation. Favours sites with shallow water and exposed mud (Menkhorst *et al.*, 2019)	Three records, the closest and most recent are from 15 km south of the Survey Area in 1977.	**Low**: Suitable habitat does not occur within the Survey Area.

Species	Conservation Status			Preferred Habitats	Previous Records	Likelihood of Occurrence
	EPBC Act	BC Act	DBCA			
Forest Red-tailed Black Cockatoo *Calyptorhynchus banksii naso*	VU	VU	-	Dense Jarrah, Marri and Karri forest receiving above 600 mm annual rainfall, however also recorded from a variety of other forest and woodland types. Also recently recorded from agricultural areas and the Perth metropolitan area, including breeding records (DSEWPaC 2012).	PMST database only – species or species habitat may occur in the area.	**Low:** The Survey Area is outside the known distribution of the species.
Malleefowl *Leipoa ocellata*	VU	VU	-	Semi-arid and arid mallee, shrubland, mulga and other habitats with dense litter forming vegetation (Benshemesh, 2007)	Three records in the vicinity of the Survey Area, the nearest and most recent record is from 17 km north from 1993 (DBCA database).	**Low:** Habitat inside the Survey Area is marginal for the species; there are no recent records in the vicinity.
Red Knot *Calidris canutus*	EN & MI	MI	-	Prefers coastal habitats including sheltered sand flats, mudflats, bays and estuaries though may infrequently utilise coastal salt lakes (Birdlife 2022).	PMST database only – species or species habitat known to occur in the area.	**Low:** Suitable habitat does not occur within the Survey Area.
Grey-tailed Tattler *Tringa brevipes*	MI	MI	P4	Prefers sheltered coastal areas with rock platforms, reef or intertidal mudflats (DAWE 2021).	NatureMap record only. No location information associated with the record.	**Low:** Suitable coastal habitat for the species does not occur within the Survey Area.
Fork-tailed Swift *Apus pacificus*	MI	MI	-	Displays almost entirely aerial behaviour while in Australia. Utilises air space over a wide variety of habitat types including open plains, woodlands, salt marsh, rainforest, pasture and urban areas. Associated with storm fronts (DAWE 2020).	NatureMap and PMST databases only.	**Medium:** The species may occur infrequently due to its association with storm fronts. Use of the Survey Area would be limited to flying over for foraging.

Species	Conservation Status			Preferred Habitats	Previous Records	Likelihood of Occurrence
	EPBC Act	BC Act	DBCA			
Little Curlew *Numenius minutus*	MI	MI	-	Foraging occurs on grasslands and plains with short grass and scattered pools. Daytime roosting occurs around pools, riverbeds, and shallow water or in grassy, open woodlands and flood plains (DAWE 2021).	One record, 14 km southeast of the Survey Area from 2003 (DBCA database).	**Low:** Suitable habitat for the species does not occur within the Survey Area.
Bar-tailed Godwit *Limosa lapponica*	MI	MI	-	Prefers coastal habitats including sand flats, mudflats, bays and estuaries though may infrequently utilise coastal salt lakes and marshes (Menkhorst *et al.*, 2019)	One record 14 km west of the Survey Area in 1977. Information provided with the record indicates an association with Karakin Lakes (DBCA database).	**Low:** Suitable salt lake habitat for foraging does not occur within the Survey Area.
Northern Siberian Bar-tailed Godwit *Limosa lapponica menzbieri*	CR & MI	CR & MI	-		PMST database only – species or species habitat known to occur in the area.	**Low:** Suitable habitat for the species does not occur within the Survey Area.
Ruff *Philomachus pugnax*	MI	MI	-	A variety of open moist habitats such as grasslands, agricultural land and freshwater wetlands (Menkhorst *et al.*, 2019)	One record 9 km west of the Survey Area at Karakin Lakes in 2001.	**Low:** Suitable habitat for the species does not occur within the Survey Area.
Pacific Golden Plover *Pluvialis fulva*	MI	MI	-	Habitat including sheltered sand flats, mudflats, bays, sandy beaches, estuaries and salt lakes (Menkhorst *et al.*, 2019).	NatureMap database only.	**Low:** Suitable salt lake habitat does not occur within the Survey Area.
Grey Plover *Pluvialis squatarola*	MI	MI	-		Two records from 14 km west of the Survey Area from 1981. Information provided with the records indicates an association with Karakin Lakes (DBCA database).	

Species	Conservation Status EPBC Act	BC Act	DBCA	Preferred Habitats	Previous Records	Likelihood of Occurrence
Ruddy Turnstone *Arenaria interpres*	MI	MI	-	Habitat including sheltered sand flats, mudflats, bays, sandy beaches, estuaries and salt lakes (Menkhorst *et al.*, 2019)	Two records, the closest to the Survey Area is from 14 km west of the Survey Area in 1977. Information provided with the record indicates an association with Karakin Lakes. A more recent record from 1999 is in coastal habitat (DBCA database).	**Low:** Suitable salt lake habitat does not occur within the Survey Area.
Sharp-tailed Sandpiper *Calidris acuminata*	MI	MI	-		Three records 14 km west of the Survey Area in 1977. Information provided with the records indicates an association with Karakin Lakes (DBCA database).	
Long-toed Stint *Calidris subminuta*	MI	MI	-		Two records 14 km west of the Survey Area in 1977. Information provided with the records indicates an association with Karakin Lakes (DBCA database).	
Red-necked Stint *Calidris ruficollis*	MI	MI	-		Six records, the nearest from 14 km west of the Survey Area in 1981. Information provided with the record indicates an association with Karakin Lakes. The most recent record is from Lake Guraga in 1999 (DBCA database).	
Sanderling *Calidris alba*	MI	MI	-		One record 14 km west of the Survey Area in 1977. Information provided with the records indicates an association with Karakin Lakes (DBCA database).	

Species	Conservation Status EPBC Act	BC Act	DBCA	Preferred Habitats	Previous Records	Likelihood of Occurrence
Pectoral Sandpiper *Calidris melanotos*	MI	MI	-	Habitat including sheltered sand flats, mudflats, bays, sandy beaches, estuaries and salt lakes (Menkhorst *et al.*, 2019).	Two records 14 km west of the Survey Area in 1977. Information provided with the records indicates an association with Karakin Lakes (DBCA database).	**Low:** Suitable salt lake habitat does not occur within the Survey Area.
Common Sandpiper *Actitis hypoleucos*	MI	MI	-		NatureMap and PMST databases only. Species or species habitat known to occur in the area.	
Common Greenshank *Tringa nebularia*	MI	MI	-		Eleven records, the most recent being from 2010, 18 km from the Survey Area at Beermullah Lake (DBCA database).	
Caspian Tern *Hydroprogne caspia*	MI	MI	-		Two records 18 km southeast of the Survey Area, the most recent form 1991 (DBCA database).	
Wood Sandpiper *Tringa glareola*	MI	MI	-	Primarily freshwater river and pool habitat, occasionally associated with brackish, salt lake and estuary environments (DoEE 2018).	One record, 21 km northeast of the Survey Area in 1978.	**Low:** Suitable freshwater or brackish habitat does not occur within the Survey Area.
Fairy Tern *Sternula nereis*	VU	VU		Islands, beaches and estuarine systems (DAWE 2021).	NatureMap and PMST databases only. Foraging, feeding or related behaviour known to occur within area	**Low:** Suitable coastal or estuarine habitat does not occur within the Survey Area.
Bridled Tern *Onychoprion anaethetus*	MI	MI	-	Breeds on islands and forages offshore (DAWE 2021).	NatureMap and PMST databases only. Breeding known to occur within area	**Low:** Suitable coastal habitat does not occur within the Survey Area.
Roseate Tern *Sterna dougallii*	MI	MI	-	Rocky and sandy beaches, coral reefs and islands (DAWE 2021).	NatureMap and PMST databases only. Breeding known to occur within area	**Low:** Suitable coastal habitat does not occur within the Survey Area.

Species	Conservation Status			Preferred Habitats	Previous Records	Likelihood of Occurrence
	EPBC Act	BC Act	DBCA			
Greater Crested Tern *Thalasseus bergii*	MI	MI	-	Coastal foraging over water. Nesting occurs on sandbars, spits, and rocky islands. Roosting on ocean beaches, rock platforms and man-made structures (Menkhorst *et al.*, 2019)	Six records, the nearest two from 14 km west of the Survey Area in 1977. Information provided with the records indicates an association with Karakin Lakes. The remaining records are from 1999 in coastal habitat (DBCA database).	**Low:** Suitable habitat does not occur inside the Survey Area.
White-winged Black Tern *Chlidonias leucopterus*	MI	MI	-	Found on fresh to saline wetlands (DAWE 2021a)	Two records 14 km west of the Survey Area in 1977. Information provided with the records indicates an association with Karakin Lakes (DBCA database).	**Low:** Suitable habitat does not occur inside the Survey Area.
Glossy Ibis *Plegadis falcinellus*	MI	MI	-	Foraging habitat consists of shallow saline and freshwater lakes, flooded pasture and samphire as well as man-made water bodies such as sewerage ponds (DAWE 2021a).	Six records, the most recent from 9 km south of the Survey Area in 2004 (DBCA database).	**Low:** Suitable lake or pasture habitat does not occur within the Survey Area.
Eastern Osprey *Pandion haliaetus*	MI	MI	-	Littoral and coastal environments as well as terrestrial wetlands. Requires large areas of fresh, brackish or saline water for foraging (DAWE 2021b)	NatureMap and PMST databases only. Breeding known to occur within area.	**Low:** Suitable coastal or wetland habitat does not occur within the Survey Area.
Grey Wagtail *Motacilla cinerea*	MI	MI	-	Scarce visitor to Australia, preference for wet habitats – beaches and rock pools, fast flowing rocky waterways and waterfalls.	PMST database only – species or species habitat may occur within the Survey Area.	**Low:** Suitable habitat does not occur within the Survey Area.
Blue-billed Duck *Oxyura australis*	-	-	P4	Prefers deep and permanent freshwater wetlands that allow diving behaviour while foraging	Fourteen records in the vicinity of the Survey Area, the nearest from 2.7 km west from 1990. All records are associated with rivers and wetlands (DBCA database).	**Low:** Suitable freshwater wetlands do not occur within the Survey Area.

Species	Conservation Status EPBC Act	BC Act	DBCA	Preferred Habitats	Previous Records	Likelihood of Occurrence
Hooded Plover *Thinornis cucullatus*	-	-	P4	Forages on sandy ocean beaches and inland salt lakes. Breeding habitat consists sandy beaches above the high tide mark and coastal dunes	Two records from Karakin Lakes, 8 km west of the Survey Area from 1996 (DBCA database).	**Low:** Suitable salt lake habitat for foraging does not occur within the Survey Area.
Peregrine Falcon *Falco peregrinus*	-	-	OS	Widespread but uncommon; occurring in a variety of habitats ranging from urban areas, coastal cliffs, riverine gorges, wooded watercourses or margins of cleared lands (DOEE 2019b).	Recorded at Boonanarring Nature Reserve in 2012 (Moore *et al.*, 2015).	**Medium:** May utilise all habitat types for foraging purposes on an irregular basis. No nesting habitat present
Reptiles						
Western Swamp Tortoise *Pseudemydura umbrina*	CR	CR	-	Inhabits shallow, seasonally inundated swamps on clay or sand over clay during the winter months. Aestivates nearby in burrows, naturally occurring holes, and under leaf litter and branches from November to late April-May (Burbidge *et al.*, 2010).	PMST database only. A population has been translocated to Moore River Nature Reserve 5 km south of the Survey Area.	**Medium:** A translocated population of Western Swamp Tortoises is known from 5 km south of the Survey Area. The Survey Area does not contain suitable swamps for the species but may provide habitat for aestivating individuals. A targeted search at Bidaminna failed to find any evidence of aestivating Western Swamp Tortoises (Spectrum 2022).
Lancelin Island Ctenotus *Ctenotus lancelini*	VU	VU		Limestone outcrops on Lancelin and Favorite Islands (Cogger, 2014)	NatureMap and PMST databases only.	**Very Low:** The species is only known from Lancelin Island.
Gilled Slender Blue-tongue *Cyclodomorphus branchialis*	-	VU	-	Poorly understood. Recorded from both heavy red soils and on rocky habitats including banded ironstone ranges (Ecologia 2010; Ecoscape 2016).	NatureMap only – no location data associated with the record.	**Very Low:** Suitable habitat does not occur within the Survey Area and the Survey Area is outside the known distribution for the species.

Species	Conservation Status			Preferred Habitats	Previous Records	Likelihood of Occurrence
	EPBC Act	BC Act	DBCA			
Black-striped Snake *Neelaps calonotus*	-	-	P3	Dunes and sandplains vegetated with heaths and woodland (Cogger, 2014).	One record 21 km northwest of the Survey Area from 1966 (DBCA database). Recorded at Boonanarring Nature Reserve, 22 km south of the Survey Area in 1986 (Moore *et al.*, 2015).	**Low:** Suitable habitat occurs within the Survey Area in Banksia Woodland and Dune Crests; however the species has not been recorded from the proximity of the Survey Area within the last 20 years.
Invertebrates						
Carter's Freshwater Mussel *Westralunio carteri*	VU	VU	-	Flowing freshwater rivers, streams and reservoirs of coastal southwestern Australia (Ponder *et al.*, 2020).	Nine records, the most recent in 2010, 13 km south of the Survey Area (DBCA database).	**Very Low:** Suitable flowing water is not present within the Survey Area.
Bothriembryontid Land Snail (Moore River) *Bothriembryon perobesus*	-	-	P1	White sandy soils supporting *Banksia* and/ or *Eucalyptus todtiana* woodland (Whisson, 2019).	Known from many locations surrounding the Survey Area; the closest and most recent records are from 2014, less than 100 m west of the Survey Area (WAM SRE database).	**Recorded:** Seven specimens of the species were hand collected opportunistically from Banksia Woodland in the Survey Area.
Woolybush Bee *Hylaeus globuliferus*	-	-	P3	Associated with *Adenanthos cygnorum* and *Banksia attenuata* from north of Eneabba, the Swan Coastal Plain and south coast (Invertebrate Solutions, 2019)	Two records from Moore River National Park, 3 km east of the Survey Area, the most recent in 1996 (DBCA database).	**Medium:** Suitable vegetation is present inside the Survey Area however the species has not been recorded in the vicinity within the previous 20 years.
A short-tongued bee *Leioproctus contrarius*	-	-	P3	Associated with *Scaevola* sp. *repens* var. *repens* and *Leschenaultia* spp. (Invertebrate Solutions, 2019).	Three records from Moore River National Park, the most recent in 2001 9 km east of the Survey Area (DBCA database)	**Medium:** Suitable vegetation is present inside the Survey Area however the species has not been recorded in the vicinity within the previous 20 years.
Swan Coastal Plain Trapdoor Spider *Idiosoma sigillatum*	-	-	P3	*Banksia* woodland and heathland on sandy soils of the Swan Coastal Plain (Rix *et al.*, 2018).	One record from 1967, 19 km west of the Survey Area (DBCA database).	**Low:** Suitable habitat occurs within the Survey Area however there have not been any records in the vicinity within 50 years.

Species	Conservation Status			Preferred Habitats	Previous Records	Likelihood of Occurrence
	EPBC Act	BC Act	DBCA			
Mogumber Bush Cricket *Throscodectes xederoides*	-	-	P3	Limited habitat information is available for this species however it appears to have a limited distribution and is associated with heath and grassland (GHD, 2006)	NatureMap database only.	**Low:** Survey Area is outside the known distribution for the species.
Graceful Sun-moth *Synemon gratiosa*	-	-	P4	Coastal heath on secondary Quindalup Dunes hosting *Lomandra maritima*. Also present in *Banksia* woodland on Spearwood and Bassendean Dunes hosting *Lomandra hermaphrodita* (DoE 2019)	Thirteen records, the closest and most recent being from 18 km west of the Survey Area in 2011 (DBCA database).	**Medium:** Suitable vegetation is present inside the Survey Area however the species has not been recorded in the vicinity within the previous 20 years.

5.3.1. Mammals

5.3.1.1. Western Quoll (*Dasyurus geoffroii)*

Conservation status: EPBC Act/ BC Act: Vulnerable

Distribution, habitat, and ecology: Once a common quoll species across most of Australia, the Western Quoll is now restricted to the south-west of Western Australia. The species inhabits sclerophyll forests, dry woodlands, heath, and mallee shrubland (van Dyck and Strahan, 2008). Population density has been found to be highest in riparian forests where the numbers of den and refuge sites are high and sufficient prey is available (Orell and Morris, 1994). Western Quolls shelter in hollow logs, tree limbs, termite mounds or burrows in the soil during the day. The species is mostly nocturnal but may be active by day during periods of colder weather and the breeding season (van Dyck and Strahan, 2008). The diet consists of insects, mammals, lizards, frogs and freshwater crustaceans (Rayner *et al.*, 2012). The species is primarily solitary with large home ranges of up to 120 hectares. A typical brood of six young is born between May and September and left in the den at nine weeks of age. At 22 weeks, the young are weaned and typically disperse during summer (van Dyck and Strahan, 2008). Young Western Quolls disperse over distances greater than 10 km (Soderquist and Serena, 2000). Home ranges vary depending on sex and habitat and are much higher for males and in more arid locations (Rayner *et al.*, 2012).

Likelihood of occurrence - Medium: The Western Quoll has been assessed to have a medium likelihood of occurrence based on previous regional records and the habitats recorded within the Survey Area. The high home ranges and long distances covered by the species increase the likelihood of it occurring in the Survey Area. Suitable woodland and heath is found in the Banksia Woodland, Dune Crests and Seasonal Damplands habitats. There has been one previous record of a Western Quoll in proximity to the Survey Area in 2001.

5.3.1.2. Quenda (*Isoodon fusciventer)*

Conservation status: DBCA Priority 4

Distribution, habitat, and ecology: Quenda are present through much of the southwest of Western Australia, extending north to about Cervantes. Quenda are found in woodlands and heath, and thick vegetation with dense cover in the lower stratum (van Dyck and Strahan, 2008). Quenda feed in forest and woodland that is burnt on a regular basis and in areas of pasture and cropland lying close to dense cover digging into the substrate for invertebrates, fungi, edible plant parts and occasional small vertebrates (Braithwaite, 1995; DEC 2012). Quenda are primarily nocturnal and solitary. Breeding may occur during any season with a peak in spring. Nests are built in litter-covered depressions concealed under logs, shrubs, or debris (DEC 2012).

Likelihood of occurrence – Medium: The Quenda has been assessed to have a medium likelihood of occurrence in the Survey Area based on previous records and the habitats recorded. There has been one previous record of the species in the vicinity of the Survey Area from 2007. The Banksia Woodland and Seasonal Damplands habitats provide suitable foraging vegetation and cover for the species.

5.3.1.3. Western Brush Wallaby (*Notamacropus irma*)

Conservation status: DBCA Priority 4

Distribution, habitat, and ecology: The Western Brush Wallaby is restricted to the southwest of Western Australia occurring from Kalbarri to Cape Arid (van Dyck and Strahan, 2008). The species is found in open forest or woodland, favouring open, seasonally wet flats with low grasses and scrubby thickets. It is also found in some areas of mallee and heathland (DEC 2012b). It is thought that a dense understory may form a critical habitat component with individuals preferentially utilising areas with dense understory in Banksia

woodlands (Povh *et al.*, 2019). Western Brush Wallaby feed sparingly on a wide range of plant rather than extensively on a few species, indicating they require floristically diverse habitat for foraging (Wann and Bell, 1997). The home range has been calculated to be approximately 10 - 12 ha (Povh *et al.*, 2019). Foxes are thought to have also been a major factor in the species decline through predation on juveniles, with population increases observed in areas where fox control programs have been implemented (van Dyck and Strahan, 2008).

Likelihood of occurrence – High: The Western Brush Wallaby has been assigned a high likelihood of occurring in the Survey Area based on the available habitats and recent species records. The Banksia Woodland, Dune Crests and Seasonal Damplands habitats provide suitable foraging habitat and shelter for the species. There are eleven records of the species in proximity to the Survey Area, the most recent being from 2017, 21 km northwest of the Survey Area. The species was recorded within 5 km of the Survey Area in Moore River National Park in 1978.

5.3.2. Birds

5.3.2.1. Carnaby's Cockatoo (*Calyptorhynchus latirostris*)

Conservation status: EPBC Act/ BC Act: Endangered

Distribution, habitat, and ecology: The Carnaby's Cockatoo is endemic to the southwest of Western Australia. It occurs between the Murchison River to Esperance, and inland to Coorow, Kellerberrin and Lake Cronin (Cale, 2003). Following a shift to the west and the south since the middle of the 1900s the breeding range now located in the Jarrah-Marri forest of the Darling Scarp, and the Tuart forests of the Swan Coastal Plain. Breeding takes place from July to mid-December (Johnstone and Johnstone, 2006). Carnaby's Cockatoos pair for life and only one chick per year will be raised, remaining with the parents for up to 18 months (Shah, 2006). The Carnaby's Cockatoo utilises a variety of forests, shrublands and banksia woodlands. The species forages on native shrubland, kwongan heathland, proteaceous woodland, including banksia woodland and several introduced species. Roost sites are often associated with riparian vegetation, large trees such as pine trees or eucalypt trees with a closed canopy. Breeding habitat consists of woodland or forests that provide hollows in live or dead trees (any eucalypt species); Wandoo, Tuart, Jarrah, York gum, Karri and Marri are typical breeding trees (CoA 2017). Carnaby's Cockatoos often move up to 13 km a day with the greatest distances covered in the early morning and late evening (Shah, 2006). The birds then travel between roost sites, foraging sites, and wetlands for drinking.

Likelihood of occurrence – Recorded: Carnaby's Cockatoos were recorded on two occasions inside the Survey Area, and on two occasions outside the Survey Area. Evidence of foraging was recorded at two locations inside the Survey Area. A Black Cockatoo assessment of the Survey Area identified high quality foraging habitat across the entirety of the Survey Area.

The Survey Area is located within the breeding range of the species. While several trees that have the potential to become breeding trees were identified inside the Survey Area (DBH > 500 mm), none had hollows that were suitable for Carnaby's Cockatoos to nest in. There are no confirmed roost sites or breeding sites within 12 km of the Survey Area.

Three Important Bird Areas (IBA) for Carnaby's Cockatoo occur in the region surrounding the Survey Area (Dutson, Garnett and Gole, 2009; DEC 2012a):

- Bindoon-Julimar: located approximately 57 km southeast of the Survey Area. Supports at least 110 pairs in nesting and associated feeding habitat. This is the largest population of breeding birds in south-west Australia (DEC 2012a);

- Moora: located approximately 63 km northeast of the Survey Area. Supports up to 60 breeding pairs; and
- Northern Swan Coastal Plain: located approximately 24 km south of the Survey Area. Supports 4,600-15,000 birds in the non-breeding season and a small number of pairs of breeding birds; this is the largest population of non-breeding birds in south-west Australia (DEC 2012a).

There is suitable foraging vegetation for Carnaby's Cockatoo across all fauna habitats present in the Survey Area.

5.3.2.2. Fork-tailed Swift (*Apus pacificus*)

Conservation status: EPBC/ BC Act: Migratory

Ecology, Habitat and Distribution: The Fork-tailed swift is a migratory, non-breeding visitor to Australia. Within Western Australia, records are most abundant in coastal areas of the, southwest, Pilbara, and Kimberly regions. This medium sized swift is characterised by its forked tail and white rump, with back swept wings that taper to a fine point (Menkhorst *et al.*, 2019). The species is known to be highly nomadic, rarely landing, spending much of their time foraging in large flocks high above the canopy. The species is known to be insectivorous but its food source is relat(Menkhorst *et al.*, 2019)tralia (Menkhorst *et al.*, 2019).

Likelihood of occurrence – Medium: The species has been recorded in proximity with the Survey Area (NatureMap). Due to the aerial lifestyle of the Fork-tailed Swift the species is unlikely to directly utilise any terrestrial habitats within the Survey Area or to be negatively affected by on ground development.

5.3.2.3. Peregrine Falcon (*Falco peregrinus*)

Conservation status: BC Act: Other Specially Protected Fauna

Ecology, Habitat and Distribution:

The Peregrine Falcon is one of the most widespread birds in the world, breeding on all continents except Antarctica (Olsen *et al.*, 2006). It occurs across most of Australia though are an uncommon species and are rare in all states and territories (Birdlife Australia, 2012). They are known to be both a nomadic and sedentary species. Peregrine Falcons inhabit cliffs, coastal habitats, rivers, wooded water courses and lakes as well as urban environments. They usually nest by making a scrape on a high cliff edge but will also use stick nests of other large birds (Olsen *et al.*, 2006) some areas (Olsen *et al.*, 2006). The species primarily hunts during the day, feeding on small to medium sized birds caught in flight, often above drainage lines and rivers (Birdlife Australia, 2012).

Likelihood of occurrence – Medium: The Peregrine Falcon has been recorded from Boonanaring Nature Reserve, 22 km southeast of the Survey Area. No records were made during the survey; however, the species may forage across all habitat types on an irregular basis. Moore River, 1 km north of the Survey Area provides suitable foraging habitat for the species.

5.3.3. Reptiles

5.3.3.1. Western Swamp Tortoise (*Pseudemydura umbrina*)

Conservation status: EPBC/ BC Act: Critically Endangered

Ecology, Habitat and Distribution: The Western Swamp Tortoise was once presumed extinct but was rediscovered in two small reserves in the 1950's – Twin Swamps Nature Reserve and Ellen Brook Nature Reserve. A wild population is also known (Burbidge *et al.*, 2010) from the Perth Airport (Burbidge *et al.*,

2010). A captive breeding and translocation program has seen the species translocated to Moore River and Lake Wannamal Nature Reserves (Schmolz *et al.*, 2021).

The Western Swamp Tortoise occupies shallow, seasonally inundated swamps over the winter months where it feeds on a diet of macro invertebrates including aquatic crustacea, insects and insect larvae (Burbidge, 1981). As the swamps dry out in November, tortoises leave for areas of terrestrial vegetation and enter a period of aestivations whereby they seek refuge under thick leaf litter, branches, and burrows (Burbidge *et al.*, 2010).

Likelihood of occurrence – Medium: A translocated population of Western Swamp Tortoises is found at Moore River Nature Reserve, 5 km south of the Survey Area. Seasonally inundated swamps do not occur inside the Survey Area; however, the Banksia Woodland may provide habitat for aestivating individuals. A targeted survey for the Western Swamp Tortoise did not find any sign of the species aestivating (Spectrum 2022).

5.3.4. Invertebrates

5.3.4.1. Bothriembryontid Land Snail (Moore River) (*Bothriembryon perobesus*)

Conservation status: DBCA Priority 1

Ecology, Habitat and Distribution: The Bothriembryontid Land Snail (Moore River) is known to occupy stabilised sand dunes supporting *Banksia* and/or *Eucalyptus* woodland over heath. The species has a linear range of over 100 km, extending 50 km inland and spanning multiple habitat types (Bennelongia Environmental Consultants, 2013). The genus *Bothriembryon* comprises land snail species endemic to the southern half of Australia (Whisson, 2019). Little is known about the ecology and feeding habits of these snails, however there are strong links to the presence of *Bothriembryon* spp. and soil/ vegetation structure and composition. Snails belonging to this genus are thought to feed on encrusted plants by scraping and rasping in high moisture areas and some species are known to forage on trees (Whisson, 2019). Presence is typically best determined in winter months, after rainfall as aestivation takes place in summer where they remain dormant to avoid desiccation (Whisson, 2019).

Likelihood of occurrence – Recorded: Seven specimens of the Bothriembryontid Land Snail (Moore River) were collected during this assessment from the southeast of the Survey Area. Several specimens were also recorded within 100 m of the western boundary of the Survey Area in 2014. The Banksia Woodland and Dune Crests fauna habitats identified in the Survey Area provides suitable soil and vegetation structure for the species.

5.3.4.2. Woolybush Bee (*Hylaeus globuliferus*)

Conservation status: DBCA Priority 3

Ecology, Habitat and Distribution: The Woolybush Bee is found from north of Eneabba to the southern Wheatbelt and the Swan Coastal Plain, extending east along the south coast to Fitzgerald National Park (Invertebrate Solutions, 2019). Information on this species is limited but the species is known to be associated with the Common Woolybush (*Adenanthos cygnorum*) and Slender Banksia (*Banksia attenuata*) (Invertebrate Solutions, 2019).

Likelihood of occurrence – Medium: Suitable vegetation is found within the Survey Area including the associate species Common Woolybush (*Adenanthos cygnorum*) and Slender Banksia (*Banksia attenuata*) in the Banksia Woodland and Seasonal Damplands habitats. The species has not been recorded in the vicinity of the Survey Area for over 20 years however detection is difficult.

5.3.4.3. *Leioproctus contrarius* (a short-tongued bee)

Conservation status: DBCA Priority 3

Ecology, Habitat and Distribution: Bees of the genus *Leioproctus* are burrowing bees, building nests in the ground with depths up to 180 cm (Houston, 2018). They are known to form specialist associations with plant families or genera. *Leioproctus contrarius* is associated with *Scaevola* sp. *repens* var. *repens* and *Leschenaultia* spp. including *L. stenosepala* (Invertebrate Solutions, 2019; PaDIL, 2022).

Likelihood of occurrence – Medium: *L. contrarious* has been recorded from 9 km east of the Survey Area in Moore River National Park however there have not been any records in the past 20 years. The associate vegetation *Leschenaultia stenosepala* has been recorded inside the Survey Area in the Banksia Woodland habitat.

5.3.4.4. Graceful Sun-moth (*Synemon gratiosa*)

Conservation status: DBCA Priority 4

Ecology, Habitat and Distribution: The Graceful Sun-moth is a diurnal moth that is active in warm, sunny conditions. It has a near coastal distribution from Biningup in the south to Kalbarri in the north. (Williams *et al.*, 2016) The Graceful Sun-moth is found in sedgelands, heathlands, woodlands, and open forests. It has an obligate association with two species of *Lomandra* – *L. maritima*, and *L. hermaphrodita* – on which their caterpillars are adapted to feed (Williams *et al.*, 2016). Adult Graceful Sun-moths emerge from mid-February to early-April. Individuals only live between two and ten days, however, adults will emerge at a site over a four-to-six-week period. Eggs are laid at the base of their larval food plants. The larval lifestage is spent entirely within or alongside the underparts of the plant (Gamblin *et al.*, 2011; Williams *et al.*, 2016).

Likelihood of occurrence – Medium: Suitable habitat for the species is present in the Banksia Woodland habitat of the Survey Area in which one species of larval food plant, *Lomandra hermaphrodita* is confirmed. The Graceful Sun-moth has been recorded on thirteen occasions in the vicinity of the Survey Area however there have not been any records in the past twenty years however the species is difficult to detect (Bishop *et al.*, 2010).

5.4. SRE Invertebrate Fauna

The detailed fauna survey recorded 25 potential SRE taxa from within the Survey Area.: two spiders, one harvestman, five pseudoscorpions, two scorpions, three centipedes, three millipedes, six isopods, two flatworms and one earthworm. The potential SRE taxa recorded are considered data deficient due to lack of sampling, lack of taxonomic or geographic resolution and a lack of data consolidation between the Western Australian Museum (WAM) and private consultancies. Following the Precautionary Principle, all data deficient species from SRE target groups are considered potential SREs.

The desktop assessment identified 13 species of potential SRE invertebrates previously recorded in the vicinity of the Survey Area. Two of these taxa were subsequently recorded in this SRE field assessment – *Antichiropus whistleri* and *Urodacus* 'SCO007, bullsbrook'. The millipede *Antichiropus whistleri* has since been assessed as widespread (Car, Wojcieszek and Harvey, 2013). The scorpion *Urodacus* 'SCO007, bullsbrook' was previously only known from two localities – one near Bullsbrook (approximately 70 km southeast of the Survey Area), and one near Lancelin (approximately 18 km northeast of the Survey Area) (Alacran Environmental Science, 2022). The specimens collected in this survey therefore likely represent a new population for the species.

The discrepancy in the number and assemblage of potential SREs between those recorded during this survey and the desktop assessment are likely explained by a lack of sampling effort with little to no SRE surveys conducted in the vicinity of the Survey Area. Furthermore, the assessment of SRE status whereby all data deficient species from SRE target groups are considered potential SREs may have resulted in some widespread species classified as potential SRE.

For some taxa, identification to species level is not possible based on morphological traits or requirements to sample adult male specimens. In these cases, the taxa recorded may represent duplicates. For example, the *Austrochthonius* sp. specimens may be juveniles of the widespread morphospecies *Austrochthonius* 'PSE188, similis' or *Austrochthonius* 'PSE191, grandis'. Identification based on morphology is only possible from adult specimens. Similarly, specimens identified as *Beierolpium* sp. were all juveniles and unable to be identified to species level based on morphology. These samples may represent juvenile individuals of *Beierolpium* '8/4-Na05', *Beierolpium* '8/4-Na06', or *Beierolpium* '8/4 CO1'. DNA sequencing of these specimens may provide greater taxonomic resolution.

The fauna habitats of the Survey Area do not contain microhabitats considered typical of short range endemic invertebrates e.g., permanently moist, shaded microhabitats such as gorges and rocky outcrops that are isolated by areas of dry habitat or geographic barriers. Some patches of thick leaf litter and the underside of large logs within the Seasonal Damplands fauna habitat may withstand seasonal aridity and retain enough moisture to be suitable for moisture dependent species. However, within the remaining habitats, organic material is typically limited to thin layers that are unlikely to act as a buffer against the hot, dry summers. Furthermore, many of the potential SRE invertebrates were recorded across multiple habitats and are unlikely to have confined distributions.

5.5. Survey Adequacy

Interpretation of the species accumulation curves indicates that most of the trappable vertebrates and bird species were recorded by systematic survey efforts over both phases with 93% of mammal, reptiles and amphibian species, and 88% of bird species recorded. The corresponding estimates of total species richness (Michaelis-Menten curves) give a combined theoretical maximum of approximately 77 species compared with the 69 species recorded in the systematic trapping grids and bird surveys. This total is considerably lower than the 94 species recorded during this survey across all monitoring methods demonstrating the importance of non-systematic survey methods (camera traps, bat recorders and opportunistic searches) in better representing the vertebrate fauna present. Many species are unable to be surveyed by the systematic survey methods, e.g., larger macropods are not trappable, while other uncommon species may only be seen opportunistically. When these species are taken into account, the overall species richness exceeds that predicted by the Michaelis-Menten curves. The results of the current survey are therefore considered to be an adequate representation of the fauna present.

6. CONCLUSION

During the two phases of field work at the Bidaminna Survey Area, a total of 94 vertebrate fauna species were recorded: five species of native non-volant mammals, eight species of bats, five introduced mammals, 55 bird species, 16 reptiles and five amphibians. Statistical analysis of the systematically collected trapping and bird survey data recorded during the detailed survey suggests that 93% of trappable mammal, reptile and amphibian species, and 88% of bird species were recorded.

Four fauna habitats were identified inside the Survey Area – Banksia Woodland, Dune Crests, Seasonal Damplands and Parkland Cleared Woodland. The Banksia Woodland was the dominant fauna habitat comprising 80% of the Survey Area. All habitats have been recorded outside the Survey Area. The Dune Crests and Banksia Woodland habitats form part of the Banksia Woodlands of the Swan Coastal Plain threatened ecological community (EPBC Act: Endangered, DBCA Priority 3). This listing indicates that impacts should be avoided, and if unavoidable must be mitigated, reduced or offset.

Two conservation significant fauna species were recorded during the survey:

- Carnaby's Cockatoo (*Calyptorhynchus latirostris*) – EPBC Act/ BC Act Endangered; and
- Bothriembryontid Land Snail (Moore River) (*Bothriembryon perobesus*) – DBCA Priority 1.

An assessment for Carnaby's Cockatoo habitat found the Survey Area to be very high quality foraging habitat. Evidence of Carnaby's Cockatoo foraging has been recorded in the Survey Area and the species has been well documented using similar habitats across the surrounding region. All fauna habitats identified contain suitable foraging habitat for Carnaby's Cockatoo.

The SRE assessment recorded 25 species of potential SRE taxa. These species are data deficient based on a lack of sampling, taxonomic and/ or geographical resolution and considered potential SRE following the Precautionary Principle. Some taxa require adult male specimens for identification to species level based on morphological assessment and there may be duplicates included in the overall count. The majority of the Survey area does not contain microhabitats typical of SRE invertebrates with the exception of patches of leaf litter and the underside of large logs in the Seasonal Damplands.

The desired objectives and outcomes were successfully reached during the current assessment. There were no significant limitations to the survey work, and the level of survey effort and number of species recorded is considered adequate for the Survey Area. All field work was completed in accordance with relevant government legislation, guidance, and standard operating procedures.

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Appendix A: Conservation Codes

Appendix A1: Definitions of Conservation Categories under the EPBC Act

Category	Definition
Extinct	A native species is eligible to be included in the extinct category at a particular time if, at that time, there is no reasonable doubt that the last member of the species has died.
Extinct in the Wild	A native species is eligible to be included in the extinct in the wild category at a particular time if, at that time: (a) it is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; or (b) it has not been recorded in its known and/or expected habitat, at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.
Critically Endangered	A native species is eligible to be included in the critically endangered category at a particular time if, at that time, it is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria.
Endangered	A native species is eligible to be included in the endangered category at a particular time if, at that time: (a) it is not critically endangered; and (b) it is facing a very high risk of extinction in the wild in the near future, as determined in accordance with the prescribed criteria.
Vulnerable	A native species is eligible to be included in the vulnerable category at a particular time if, at that time: (a) it is not critically endangered or endangered; and (b) it is facing a high risk of extinction in the wild in the medium term future, as determined in accordance with the prescribed criteria.
Conservation Dependent	A native species is eligible to be included in the conservation dependent category at a particular time if, at that time: (a) the species is the focus of a specific conservation program the cessation of which would result in the species becoming vulnerable, endangered, or critically endangered; or (b) the following subparagraphs are satisfied: (i) the species is a species of fish; (ii) the species is the focus of a plan of management that provides for management actions necessary to stop the decline of, and support the recovery of, the species so that its chances of long term survival in nature are maximised; (iii) the plan of management is in force under a law of the Commonwealth or of a State or Territory; (iv) cessation of the plan of management would adversely affect the conservation status of the species.

Appendix A2: Definitions of Conservation Categories Under the BC Act

Code	Definition (BC Act)
Threatened Species (T) Listed by order of the Minister as Threatened in the category of critically endangered, endangered or vulnerable under section 19(1), or is a rediscovered species to be regarded as threatened species under section 26(2) of the Biodiversity Conservation Act 2016 (BC Act). **Threatened fauna** is that subset of 'Specially Protected Fauna' listed under schedules 1 to 3 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018 for Threatened Fauna. **Threatened flora** is that subset of 'Rare Flora' listed under schedules 1 to 3 of the Wildlife Conservation (Rare Flora) Notice 2018 for Threatened Flora. The assessment of the conservation status of these species is based on their national extent and ranked according to their level of threat using IUCN Red List categories and criteria as detailed below.	
Critically Endangered (CR)	Threatened species considered to be "facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with criteria set out in the ministerial guidelines". Listed as critically endangered under section 19(1)(a) of the BC Act in accordance with the criteria set out in section 20 and the ministerial guidelines. Published under **schedule 1** of the Wildlife Conservation (Specially Protected Fauna) Notice 2018 for critically endangered fauna or the Wildlife Conservation (Rare Flora) Notice 2018 for critically endangered flora.
Endangered (EN)	Threatened species considered to be "facing a very high risk of extinction in the wild in the near future, as determined in accordance with criteria set out in the ministerial guidelines". Listed as endangered under section 19(1)(b) of the BC Act in accordance with the criteria set out in section 21 and the ministerial guidelines. Published under **schedule 2** of the Wildlife Conservation (Specially Protected Fauna) Notice 2018 for endangered fauna or the Wildlife Conservation (Rare Flora) Notice 2018 for endangered flora.
Vulnerable (VU)	Threatened species considered to be "facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with criteria set out in the ministerial guidelines". Listed as vulnerable under section 19(1)(c) of the BC Act in accordance with the criteria set out in section 22 and the ministerial guidelines. Published under **schedule 3** of the Wildlife Conservation (Specially Protected Fauna) Notice 2018 for vulnerable fauna or the Wildlife Conservation (Rare Flora) Notice 2018 for vulnerable flora.

Code	Definition (BC Act)
Extinct species Listed by order of the Minister as extinct under section 23(1) of the BC Act as extinct or extinct in the wild.	
Extinct species (EX)	Species where "there is no reasonable doubt that the last member of the species has died", and listing is otherwise in accordance with the ministerial guidelines (section 24 of the BC Act). Published as presumed extinct under **schedule 4** of the Wildlife Conservation (Specially Protected Fauna) Notice 2018 for extinct fauna or the Wildlife Conservation (Rare Flora) Notice 2018 for extinct flora.
Extinct in the wild species (EW)	Species that "is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; and it has not been recorded in its known habitat or expected habitat, at appropriate seasons, anywhere in its past range, despite surveys over a time frame appropriate to its life cycle and form", and listing is otherwise in accordance with the ministerial guidelines (section 25 of the BC Act). Currently there are no threatened fauna or threatened flora species listed as extinct in the wild. If listing of a species as extinct in the wild occurs, then a schedule will be added to the applicable notice.
Specially protected species Listed by order of the Minister as specially protected under section 13(1) of the BC Act. Meeting one or more of the following categories: species of special conservation interest; migratory species; cetaceans; species subject to international agreement; or species otherwise in need of special protection. Species that are listed as threatened species (critically endangered, endangered or vulnerable) or extinct species under the BC Act cannot also be listed as Specially Protected species.	
Migratory species (MI)	Fauna that periodically or occasionally visit Australia or an external Territory or the exclusive economic zone; or the species is subject of an international agreement that relates to the protection of migratory species and that binds the Commonwealth; and listing is otherwise in accordance with the ministerial guidelines (section 15 of the BC Act). Includes birds that are subject to an agreement between the government of Australia and the governments of Japan (JAMBA), China (CAMBA) and The Republic of Korea (ROKAMBA), and fauna subject to the Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention), an environmental treaty under the United Nations Environment Program. Migratory species listed under the BC Act are a subset of the migratory animals, that are known to visit Western Australia, protected under the international agreements or treaties, excluding species that are listed as Threatened species. Published as migratory birds protected under an international agreement under **schedule 5** of the Wildlife Conservation (Specially Protected Fauna) Notice 2018.
Conservation Dependent (CD)	Fauna of special conservation need being species dependent on ongoing conservation intervention to prevent it becoming eligible for listing as threatened, and listing is otherwise in accordance with the ministerial guidelines (section 14 of the BC Act). Published as conservation dependent fauna under **schedule 6** of the Wildlife Conservation (Specially Protected Fauna) Notice 2018
Other specially protected fauna (OS)	Fauna otherwise in need of special protection to ensure their conservation, and listing is otherwise in accordance with the ministerial guidelines (section 18 of the BC Act). Published as other specially protected fauna under **schedule 7** of the Wildlife Conservation (Specially Protected Fauna) Notice 2018
Priority species (P) Possibly threatened species that do not meet survey criteria, or are otherwise data deficient, are added to the Priority Fauna or Priority Flora Lists under Priorities 1, 2 or 3. These three categories are ranked in order of priority for survey and evaluation of conservation status so that consideration can be given to their declaration as threatened fauna or flora. Species that are adequately known, are rare but not threatened, or meet criteria for near threatened, or that have been recently removed from the threatened species or other specially protected fauna lists for other than taxonomic reasons, are placed in Priority 4. These species require regular monitoring. Assessment of Priority codes is based on the Western Australian distribution of the species, unless the distribution in WA is part of a contiguous population extending into adjacent States, as defined by the known spread of locations.	
Priority 1: Poorly-known species (P1)	Species that are known from one or a few locations (generally five or less) which are potentially at risk. All occurrences are either: very small; or on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, road and rail reserves, gravel reserves and active mineral leases; or otherwise under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes. Such species are in urgent need of further survey.

Code	Definition (BC Act)
Priority 2: Poorly-known species (P2)	Species that are known from one or a few locations (generally five or less), some of which are on lands managed primarily for nature conservation, e.g. national parks, conservation parks, nature reserves and other lands with secure tenure being managed for conservation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes. Such species are in urgent need of further survey.
Priority 3: Poorly-known species (P3)	Species that are known from several locations, and the species does not appear to be under imminent threat, or from few but widespread locations with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several locations but do not meet adequacy of survey requirements and known threatening processes exist that could affect them. Such species are in need of further survey.
Priority 4: Rare, Near Threatened and other species in need of monitoring (P4)	(a) Rare. Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection but could be if present circumstances change. These species are usually represented on conservation lands. (b) Near Threatened. Species that are considered to have been adequately surveyed and that are close to qualifying for vulnerable but are not listed as Conservation Dependent. (c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.

Appendix B: Survey Site Locations

Appendix B1: Survey Site Locations

Site Name	Survey Type	Target Species	Zone	Easting	Northing
BI S1	Systematic trapping site, bat recorder, leaf litter	Vertebrate fauna and SRE	[redacted]		
BI S2	Systematic trapping site, bat recorder, leaf litter	Vertebrate fauna and SRE			
BI S3	Systematic trapping site, bat recorder, leaf litter	Vertebrate fauna and SRE			
BI S4	Systematic trapping site, bat recorder, leaf litter	Vertebrate fauna and SRE			
BI S5	Systematic trapping site, bat recorder, leaf litter	Vertebrate fauna and SRE			
BI S6	Systematic trapping site, bat recorder, leaf litter	Vertebrate fauna and SRE			
BI S7	Systematic trapping site, bat recorder, leaf litter	Vertebrate fauna and SRE			
BI S8	Systematic trapping site, bat recorder, leaf litter	Vertebrate fauna and SRE			
SRE08	SRE wet pitfall	SRE			
SRE09	SRE wet pitfall	SRE			
SRE10	SRE wet pitfall	SRE			
SRE11	SRE wet pitfall	SRE			
SRE 12	SRE wet pitfall	SRE			
SRE 13	SRE wet pitfall	SRE			
SRE 14	SRE wet pitfall	SRE			
SRE 15	SRE wet pitfall	SRE			
LL5 SEP	Leaf litter collection	SRE			
LL6 SEP	Leaf litter collection	SRE			
BI OPP01 NP	Opportunistic site	Vertebrate and invertebrate fauna, SRE			
BI OPP02 NP	Opportunistic site	Vertebrate and invertebrate fauna, SRE			
BI OPP03 NP	Opportunistic site	Vertebrate and invertebrate fauna, SRE			
BIOPP1JH	Opportunistic site	Vertebrate and invertebrate fauna, SRE			
BIOPP2JH	Opportunistic site	Vertebrate and invertebrate fauna, SRE			
BI Opp05 NP	Opportunistic site	Vertebrate and invertebrate fauna, SRE			
BI Opp06 NP	Opportunistic site	Vertebrate and invertebrate fauna, SRE			
BI OPP04 NP	Opportunistic site	Vertebrate and invertebrate fauna, SRE			
BI ROPP01 NP	Opportunistic site	Vertebrate and invertebrate fauna, SRE			
BIOPP3JH	Opportunistic site	Vertebrate and invertebrate fauna, SRE			
BIOPP4JH	Opportunistic site	Vertebrate and invertebrate fauna, SRE			
BIOPP5JH	Opportunistic site	Vertebrate and invertebrate fauna, SRE			
BIOPP6JH	Opportunistic site	Vertebrate and invertebrate fauna, SRE			
BI Opp07 NP	Opportunistic site	Vertebrate and invertebrate fauna, SRE			
BI Opp08 NP	Opportunistic site	Vertebrate and invertebrate fauna, SRE			
BI Opp09 NP	Opportunistic site	Vertebrate and invertebrate fauna, SRE			
BIOPP7JH	Opportunistic site	Vertebrate and invertebrate fauna, SRE	[redacted]		
BIP2OPPMH01	Opportunistic site	Vertebrate and invertebrate fauna, SRE			
BI OPP10 NP	Opportunistic site	Vertebrate and invertebrate fauna, SRE			
BI OPP11 NP	Opportunistic site	Vertebrate and invertebrate fauna, SRE			
BI ROPP02	Opportunistic site	Vertebrate and invertebrate fauna, SRE			
BI OPP12 NP	Opportunistic site	Vertebrate and invertebrate fauna, SRE			
BI OPP13 NP	Opportunistic site	Vertebrate and invertebrate fauna, SRE			
BI OPP14 NP	Opportunistic site	Vertebrate and invertebrate fauna, SRE			
BIP2OPPMH02	Opportunistic site	Vertebrate and invertebrate fauna, SRE			
BI OPP15 NP	Opportunistic site	Vertebrate and invertebrate fauna, SRE			
OPP1Hand collection	Opportunistic site	Vertebrate and invertebrate fauna, SRE			
OP2HC	Opportunistic site	Vertebrate and invertebrate fauna, SRE			

Site Name	Survey Type	Target Species	Zone	Easting	Northing
BI OPP NOC JH1	Nocturnal opportunistic site	Vertebrate fauna and SRE	[redacted]		
BI OPP NOC JH2	Nocturnal opportunistic site	Vertebrate fauna and SRE			
BI OPP NOC04 NP	Nocturnal opportunistic site	Vertebrate fauna and SRE			
BI OPP NOC05 NP	Nocturnal opportunistic site	Vertebrate fauna and SRE			
BI OPP NOC06 NP	Nocturnal opportunistic site	Vertebrate fauna and SRE			
BI OPP NOC07NP	Nocturnal opportunistic site	Vertebrate fauna and SRE			
MC24	Motion camera	Vertebrate fauna			
MC87	Motion camera	Vertebrate fauna			
BI MC126	Motion camera	Vertebrate fauna			
BI MC15	Motion camera	Vertebrate fauna			
BI MC30	Motion camera	Vertebrate fauna			
BI MC03	Motion camera	Vertebrate fauna			
BI MC89	Motion camera	Vertebrate fauna			
BI MC119	Motion camera	Vertebrate fauna			
BI MC86	Motion camera	Vertebrate fauna			
BI MC16	Motion camera	Vertebrate fauna			
MC17	Motion camera	Vertebrate fauna			
BIMCP2LPMH	Motion camera	Vertebrate fauna			
BI MC32	Motion camera	Vertebrate fauna			
BI MC65	Motion camera	Vertebrate fauna			
BIMCP2LPMH2	Motion camera	Vertebrate fauna			
CCHA03	Cockatoo habitat assessment	Black cockatoos			
CCHA16	Cockatoo habitat assessment	Black cockatoos			
CCHA18	Cockatoo habitat assessment	Black cockatoos			
CCHA08	Cockatoo habitat assessment	Black cockatoos			
CCHA02	Cockatoo habitat assessment	Black cockatoos			
CCHA19	Cockatoo habitat assessment	Black cockatoos			
CCHA10	Cockatoo habitat assessment	Black cockatoos			
CCHA09	Cockatoo habitat assessment	Black cockatoos			
CCHA11	Cockatoo habitat assessment	Black cockatoos			
CCHA15	Cockatoo habitat assessment	Black cockatoos			
CCHA06	Cockatoo habitat assessment	Black cockatoos			
CCHA14	Cockatoo habitat assessment	Black cockatoos			
CCHA04	Cockatoo habitat assessment	Black cockatoos			
CCHA17	Cockatoo habitat assessment	Black cockatoos			
CCHA12	Cockatoo habitat assessment	Black cockatoos			
CCHA07	Cockatoo habitat assessment	Black cockatoos			
CCHA13	Cockatoo habitat assessment	Black cockatoos			
CCHA20	Cockatoo habitat assessment	Black cockatoos			
CCHA01	Cockatoo habitat assessment	Black cockatoos			
CCHA05	Cockatoo habitat assessment	Black cockatoos			

Appendix C: Regional Fauna Records

Regional Fauna Records

Family and Species	Common Name	Conservation Status			DBCA Database	NatureMap	PMST	ALA	BCE (2015)	EcoEdge (2019)	DPaW (2015)		Astron (2016)
		EPBC Act	BC Act	DBCA							1986	20212	
MAMMALS													
Tachyglossidae													
Tachyglossus aculeatus	Short-beaked Echidna					•		•	•		•		
Dasyuridae													
Antechinus flavipes leucogaster	(Yellow-footed Antechinus					•							
Dasyurus geoffroii	Western Quoll, Chuditch	VU	VU		•	•	•						
Parantechinus apicalis	Dibbler	EN	EN				•						
Phascogale tapoatafa wambenger	Wambenger Brush-tailed Phascogale		CD			•							
Sminthopsis crassicaudata	Fat-tailed Dunnart					•							
Sminthopsis dolichura	Little long-tailed Dunnart					•			•				
Sminthopsis fuliginosus fuliginosus	Grey-bellied Dunnart					•			•		•	•	
Sminthopsis gilberti	Gilbert's Dunnart					•							
Sminthopsis granulipes	White-tailed Dunnart								•			•	
Peramelidae													
Isoodon fusciventer	Quenda			P4	•	•							
Thylacomyidae													
Macrotis lagotis	Bilby, Dalgyte	VU	VU			•							
Pseudocheiridae													
Pseudocheirus occidentalis	Western Ringtail Possum	CR	CR			•							
Tarsipedidae													
Tarsipes rostratus	Honey Possum, Noolbenger					•			•		•	•	
Macropodidae													
Macropus fuliginosus	Western Grey Kangaroo					•		•		•	•	•	
Notamacropus irma	Western Brush Wallaby			P4	•	•		•			•		
Osphranter robustus	Euro					•							
Muridae													
Hydromys chrysogaster	Water Rat, Rakali			P4	•	•		•					
Pseudomys albocinereus albocinereus	Ash-grey Mouse					•		•	•		•	•	
Pseudomys shortridgei	Heath Mouse	EN	VU			•							
Rattus fuscipes fuscipes	Western Bush Rat					•			•				
Vespertilionidae													
Chalinolobus gouldii	Gould's Wattled Bat					•		•					
Nyctophilus geoffroyi	Lesser Long-eared Bat					•		•					
Nyctophilus major major	Greater Long-eared Bat					•							
Vespadelus regulus	Southern Forest Bat					•		•					
Introduced Mammals													
**Mus musculus*	House Mouse					•	•	•	•		•	•	
**Rattus rattus*	Black Rat					•	•	•				•	
**Oryctolagus cuniculus*	Rabbit						•	•			•		•
**Canis familiaris familiaris*	Domestic Dog						•				•		
**Vulpes vulpes*	Red Fox						•				•	•	
**Felis catus*	Cat						•				•	•	
**Sus scrofa*	Pig						•						
BIRDS													
Casuariidae													
Dromaius novaehollandiae	Emu					•		•	•		•	•	
Anatidae													
Cygnus atratus	Black Swan					•		•					
Stictonetta naevosa	Freckled Duck					•		•					
Tadorna tadornoides	Australian Shelduck					•		•			•		
Malacorhynchus membranaceus	Pink-eared Duck					•		•					
Chenonetta jubata	Australian Wood Duck					•		•					
Spatula rhynchotis	Australian Shoveler					•		•					
Anas superciliosa	Pacific Black Duck					•		•					
Anas platyrhynchos	Mallard					•	•	•					
Anas gracilis	Grey Teal					•		•					
Anas castanea	Chestnut Teal							•					
Aythya australis	Hardhead					•		•					
Oxyura australis	Blue-billed Duck			P4	•	•		•					
Biziura lobata	Musk Duck					•		•					
Megapodiidae													

Family and Species	Common Name	Conservation Status			DBCA Database	NatureMap	PMST	ALA	BCE (2015)	EcoEdge (2019)	DPaW (2015)		Astron (2016)
		EPBC Act	BC Act	DBCA							1986	20212	
Leipoa ocellata	Malleefowl	VU	VU		•	•	•						
Phasianidae													
Cotornix pectoralis	Stubble Quail					•		•					
Coturnix ypsilophora	Brown Quail					•		•					
Podargidae													
Podargus strigoides	Tawny Frogmouth					•					•		
Caprimulgidae													
Eurostopodus argus	Spotted Nightjar					•		•					
Aegothelidae													
Aegotheles cristatus	Australian Owlet-nightjar										•		
Apodidae													
Apus pacificus	Fork-tailed Swift	MI	MI			•	•	•					
Otididae													
Ardeotis australis	Australian Bustard					•							
Cuculidae													
Chalcites basalis	Horsfield's Bronze Cuckoo							•	•		•		
Chalcites osculans	Black-eared Cuckoo						•	•					
Chalcites lucidus	Shining Bronze Cuckoo							•			•		
Heteroscenes pallidus	Pallid Cuckoo					•		•			•		
Cacomantis flabelliformis	Fan-tailed Cuckoo					•		•			•		
Columbidae													
**Columba livia*	Domestic Pigeon					•	•	•					
**Spilopelia chinensis*	Spotted Turtle-dove					•	•	•					
**Spilopelia senegalensis*	Laughing Turtle-dove					•		•					
Phaps chalcoptera	Common Bronzewing					•		•			•	•	
Phaps elegans	Brush Bronzewing					•							
Ocyphaps lophotes	Crested Pigeon					•		•	•		•		•
Rallidae													
Hypotaenidia philippensis	Buff-banded Rail					•							
Tribonyx ventralis	Black-tailed Native-hen					•		•					
Gallinula tenebrosa	Dusky Moorhen					•		•					
Porzana fluminea	Australian Spotted Crake					•							
Fulica atra	Eurasian Coot					•		•					
Porphyrio melanotus	Australasian Swamphen					•		•					
Zapornia tabuensis	Spotless Crake					•		•					
Podicipedidae													
Tachybaptus novaehollandiae	Australasian Grebe					•		•					
Poliocephalus poliocephalus	Hoary-headed Grebe					•		•					
Podiceps cristatus	Great Crested Grebe					•		•					
Turnicidae													
Turnix varius	Painted Buttonquail										•		
Turnix velox	Little Button-quail					•							
Haematopodidae													
Haematopus longirostris	Pied Oystercatcher					•		•					
Haematopus fuliginosus	Sooty Oystercatcher					•		•					
Recurvirostridae													
Himantopus himantopus	Black-winged Stilt					•		•					
Cladorrhynchus leucocephalus	Banded Stilt					•		•					
Recurvirostra novaehollandiae	Red-necked Avocet					•		•					
Charadriidae													
Vanellus tricolor	Banded Lapwing					•		•					
Erythrogonys cinctus	Red-kneed Dotterel					•		•					
Pluvialis fulva	Pacific Golden Plover	MI	MI			•		•					
Pluvialis squatarola	Grey Plover	MI	MI		•	•		•					
Charadrius ruficapillus	Red-capped Plover					•		•					
Charadrius mongolus	Lesser Sand Plover	EN & MI	EN		•			•					
Thinornis cucullatus	Hooded Plover			P4	•	•	•	•					
Elseyornis melanops	Black-fronted Dotterel					•		•					
Rostratulidae													
Rostratula australis	Australian Painted Snipe	EN	EN				•						
Scolopacidae													
Numenius minutus	Little Curlew	MI	MI		•	•		•					
Numenius madagascariensis	Far Eastern Curlew (Eastern Curlew)	CR & MI	CR				•						
Limosa lapponica	Bar-tailed Godwit	MI	MI		•	•	•	•					

Family and Species	Common Name	Conservation Status			DBCA Database	NatureMap	PMST	ALA	BCE (2015)	EcoEdge (2019)	DPaW (2015)		Astron (2016)
		EPBC Act	BC Act	DBCA							1986	20212	
Limosa lapponica menzbieri	Northern Siberian Bar-tailed Godwit	CR & MI	CR & MI				•						
Arenaria interpres	Ruddy Turnstone	MI	MI		•	•		•					
Philomachus pugnax	Ruff	MI	MI		•	•		•					
Calidris tenuirostris	Great Knot	MI	MI					•					
Calidris canutus	Red Knot	EN & MI	MI				•	•					
Calidris acuminata	Sharp-tailed Sandpiper	MI	MI		•	•	•	•					
Calidris ferruginea	Curlew Sandpiper	CR	CR		•	•	•	•					
Calidris subminuta	Long-toed Stint	MI	MI		•	•		•					
Calidris ruficollis	Red-necked Stint	MI	MI		•	•		•					
Calidris alba	Sanderling	MI	MI		•	•		•					
Calidris melanotos	Pectoral Sandpiper	MI	MI		•		•	•					
Actitis hypoleucos	Common Sandpiper	MI	MI			•	•						
Tringa brevipes	Grey-tailed Tattler	MI	MI	P4		•		•					
Tringa nebularia	Common Greenshank	MI	MI		•	•	•	•					
Tringa glareola	Wood Sandpiper	MI	MI		•	•		•					
Laridae													
Sternula nereis	Fairy Tern	VU	VU			•	•	•					
Onychoprion anaethetus	Bridled Tern	MI	MI			•	•	•					
Onychoprion fuscatus	Sooty Tern						•						
Sterna dougallii	Roseate Tern	MI	MI			•	•	•					
Larus novaehollandiae	Silver Gull					•	•	•					
Larus pacificus	Pacific Gull					•	•	•					
Hydroprogne caspia	Caspian Tern	MI	MI		•	•	•	•					
Thalasseus bergii	Greater Crested Tern	MI	MI		•	•	•	•					
Chlidonias leucopterus	White-winged Black Tern	MI	MI		•			•					
Chlidonias hybrida	Whiskered Tern							•					
Sulidae													
Morus serrator	Australasian Gannet					•		•					
Anhingidae													
Anhinga novaehollandiae	Australasian Darter					•		•					
Phalacrocoracidae													
Microcarbo melanoleucos	Little Pied Cormorant					•		•					
Phalacrocorax sulcirostris	Little Black Cormorant					•		•					
Phalacrocorax varius	Pied Cormorant					•		•					
Phalacrocorax carbo	Great Cormorant					•		•					
Threskiornithidae													
Threskiornis moluccus	Australian White Ibis							•					
Threskiornis spinicollis	Straw-necked Ibis					•		•					
Plegadis falcinellus	Glossy Ibis	MI	MI		•	•		•					
Platalea flavipes	Yellow-billed Spoonbill					•		•					
Ardeidae													
Botaurus poiciloptilus	Australasian Bittern	EN	EN		•	•	•	•					
Nycticorax caledonicus	Nankeen Night Heron (Rufous Night Heron)					•		•					
Bubulcus coromandus	Eastern Cattle Egret					•	•						
Ardea pacifica	White-necked Heron					•		•					
Ardea alba	Great Egret					•		•					
Egretta novaehollandiae	White-faced Heron					•		•					
Pelecanidae													
Pelecanus conspicillatus	Australian Pelican					•		•					
Pandionidae													
Pandion haliaetus	Osprey	MI	MI			•	•	•					
Accipitridae													
Elanus axillaris	Black-shouldered Kite					•		•			•		
Hamirostra isura	Square-tailed Kite					•		•					
Hiraaetus morphnoides	Little Eagle					•		•					
Aquila audax	Wedge-tailed Eagle					•		•			•		
Accipiter fasciatus	Brown Goshawk					•		•			•		
Accipiter cirrocephalus	Collared Sparrowhawk					•		•			•		
Circus approximans	Swamp Harrier					•		•					
Circus assimilis	Spotted Harrier					•		•					
Haliastur sphenurus	Whistling Kite					•		•		•	•		
Tytonidae													
Tyto javanica	Eastern Barn Owl							•			•		

Family and Species	Common Name	Conservation Status			DBCA Database	NatureMap	PMST	ALA	BCE (2015)	EcoEdge (2019)	DPaW (2015)		Astron (2016)
		EPBC Act	BC Act	DBCA							1986	20212	
Strigidae													
Ninox boobook	Boobook Owl							•			•		
Alcedinidae													
**Dacelo novaeguineae*	Laughing Kookaburra					•		•				•	
Todiramphus sanctus	Sacred Kingfisher					•		•			•		
Todiramphus pyrrhopgius	Red-backed Kingfisher							•					
Meropidae													
Merops ornatus	Rainbow Bee-eater					•	•	•			•		
Falconidae													
Falco cenchroides	Australian Kestrel					•		•			•		
Falco longipennis	Australian Hobby					•		•			•		
Falco berigora	Brown Falcon					•		•			•		
Falco peregrinus	Peregrine Falcon		OS			•						•	
Cacatuidae													
Calyptorhynchus banksii	Red-tailed Black Cockatoo					•							
Calyptorhynchus banksii naso	Forest Red-tailed Black Cockatoo	VU	VU				•	•					
Calyptorhynchus latirostris	Carnaby's Cockatoo	EN	EN		•	•	•	•		•	•		•
Eolophus roseicapilla	Galah					•		•	•		•		•
Cacatua pastinator	Western Long-billed Corella					•		•					
Cacatua sanguinea	Little Corella					•		•		•			•
Cacatua galerita	Sulphur-crested Cockatoo					•							
Psittaculidae													
Polytelis anthopeplus	Regent Parrot					•		•					
Purpureicephalus spurius	Red-capped Parrot					•		•	•		•		
Platycercus icterotis	Western Rosella					•		•					
Barnardius zonarius	Australian Ringneck					•		•	•	•	•	•	
Neophema elegans	Elegant Parrot					•			•				
Neophema petrophila	Rock Parrot					•		•					
Parvipsitta porphyrocephala	Purple-crowned Lorikeet										•		
**Trichoglossus moluccanus*	Rainbow Lorikeet					•		•					
Melopsittacus undulatus	Budgerigar					•							
Climacteridae													
Climaterus rufa	Rufous Treecreeper							•					
Maluridae													
Malurus assimilis	Purple-backed Fairywren					•		•					
Malurus pulcherrimus	Blue-breasted Fairy-wren					•		•					
Malurus elegans	Red-winged Fairywren					•		•					
Malurus splendens	Splendid Fairy-wren					•		•	•	•	•	•	
Malurus leucopterus	White-winged Fairy-wren					•		•		•	•		
Stipiturus malachurus	Southern Emu-wren					•		•					
Meliphagidae													
Acanthorhynchus superciliosus	Western Spinebill					•		•		•	•	•	
Epthianura tricolor	Crimson Chat					•		•					
Epthianura albifrons	White-fronted Chat					•		•			•		
Gliciphila melanops	Tawny-crowned Honeyeater					•		•	•		•		
Certhionyx variegatus	Pied Honeyeater					•		•					
Phylidonyris novaehollandiae	New Holland Honeyeater					•		•		•	•	•	
Phylidonyris niger	White-cheeked Honeyeater					•		•	•			•	
Lichmera indistincta	Brown Honeyeater					•		•	•	•	•		•
Nesoptilotis leucotis	White-eared Honeyeater					•							
Melithreptus brevirostris	Brown-headed Honeyeater					•		•			•		
Purnella albifrons	White-fronted Honeyeater								•				
Gavicalis virescens	Singing Honeyeater					•		•			•		•
Ptilotula ornata	Yellow-plumed Honeyeater							•			•		
Anthochaera lunulata	Western Little Wattlebird (Western Wattlebird)					•		•	•		•		
Anthochaera carunculata	Red Wattlebird					•		•	•		•		•
Acanthagenys rufogularis	Spiny-cheeked Honeyeater					•		•					
Manorina flavigula	Yellow-throated Miner					•		•			•		
Pardalotidae													
Pardalotus punctatus	Spotted Pardalote					•		•					
Pardalotus striatus	Striated Pardalote					•		•	•		•	•	
Acanthizidae													
Smicrornis brevirostris	Weebill					•		•			•	•	

Family and Species	Common Name	Conservation Status			DBCA Database	NatureMap	PMST	ALA	BCE (2015)	EcoEdge (2019)	DPaW (2015)		Astron (2016)
		EPBC Act	BC Act	DBCA							1986	20212	
Calamanthus campestris	Rufous Fieldwren					•		•	•				
Sericornis maculatus	Spotted Scrubwren					•		•	•				
Gerygone fusca	Western Gerygone					•		•	•	•	•	•	
Acanthiza apicalis	Inland Thornbill					•		•			•	•	
Acanthiza inornata	Western Thornbill					•		•	•		•	•	
Acanthiza chrysorrhoa	Yellow-rumped Thornbill					•		•	•	•	•		
Pomatostomidae													
Pomatostomus superciliosus	White-browed Babbler					•				•			
Artamidae													
Artamus personatus	Masked Woodswallow					•		•					
Artamus cinereus	Black-faced Woodswallow					•		•	•	•			
Artamus cyanopterus	Dusky Woodswallow					•		•	•		•		
Gymnorhina tibicen	Australian Magpie					•		•		•	•	•	•
Cracticus torquatus	Grey Butcherbird					•		•		•	•		
Cracticus nigrogularis	Pied Butcherbird					•		•		•			
Strepera versicolor	Grey Currawong					•		•					
Campephagidae													
Coracina novaehollandiae	Black-faced Cuckoo-shrike					•		•	•	•	•		
Lalage tricolor	White-winged Triller					•		•	•			•	
Neosittidae													
Daphoenositta chrysoptera	Varied Sittella					•		•	•		•		
Oreoicidae													
Oreoica gutturalis	Crested Bellbird					•		•	•				
Pachycephalidae													
Pachycephala fuliginosa	Western Golden Whistler (Western Whistler)							•			•		
Pachycephala rufiventris	Rufous Whistler					•		•	•	•	•		
Colluricincla harmonica	Grey Shrike-thrush					•		•		•		•	
Rhipiduridae													
Rhipidura leucophrys	Willie Wagtail					•		•	•	•		•	•
Rhipidura albiscapa	Grey Fantail					•		•		•	•	•	
Monarchidae													
Grallina cyanoleuca	Magpie-lark					•		•		•	•		
Myiagra inquieta	Restless Flycatcher					•		•					
Corvidae													
Corvus bennetti	Little Crow					•		•					
Corvus coronoides	Australian Raven					•		•		•	•	•	•
Petroicidae													
Quoyornis georgianus	White-breasted Robin					•		•					
Melanodryas cucullata	Hooded Robin					•		•			•		
Microeca fascinans	Jacky Winter					•		•					
Petroica boodang	Scarlet Robin					•		•	•		•		
Petroica goodenovii	Red-capped Robin					•		•			•		
Hirundinidae													
Cheramoeca leucosterna	White-backed Swallow					•		•			•	•	
Hirundo neoxena	Welcome Swallow					•		•			•		
Petrochelidon nigricans	Tree Martin					•		•	•	•	•		
Acrocephalidae													
Acrocephalus australis	Australian Reed Warbler					•		•					
Locustellidae													
Cincloramphus cruralis	Brown Songlark								•				
Cincloramphus mathewsi	Rufous Songlark							•	•		•	•	
Poodytes gramineus	Little Grassbird					•		•					
Zosteropidae													
Zosterops lateralis	Grey-breasted White-eye, Silvereye					•		•	•		•	•	•
Sturnidae													
**Sturnus vulgaris*	Common Starling						•						
Dicaeidae													
Dicaeum hirundinaceum	Mistletoebird					•		•			•		
Motacillidae													
Motacilla cinerea	Grey Wagtail	MI	MI				•						
Anthus australis	Australian Pipit					•		•			•		
REPTILES													
Cheluidae													

Family and Species	Common Name	Conservation Status			DBCA Database	NatureMap	PMST	ALA	BCE (2015)	EcoEdge (2019)	DPaW (2015)		Astron (2016)
		EPBC Act	BC Act	DBCA							1986	20212	
Chelodina oblonga	Oblong Turtle					•							
Pseudemydura umbrina	Western Swamp Tortoise	CR	CR				•						
Carphodactylidae													
Underwoodisaurus milii	Common Thick-tailed Gecko											•	
Diplodactylidae													
Crenadactylus ocellatus	South-western Clawless Gecko					•		•			•	•	
Diplodactylus polyophthalmus	Spotted Sandplain Gecko					•			•			•	
Lucasium alboguttatum	White-spotted Ground Gecko					•			•				
Strophurus spinigerus	Soft Spiny-tailed Gecko					•		•	•			•	
Gekkonidae													
Christinus marmoratus	Marbled Gecko					•		•					
Pygopodidae													
Aprasia pulchella	Granite Worm-lizard					•							
Aprasia repens	Sand-plain Worm-lizard					•					•	•	
Delma concinna	Javelin Legless Lizard					•		•					
Delma fraseri	Fraser's Delma					•		•			•	•	
Delma grayii	Side-barred Delma					•		•					
Lialis burtonis	Burton's Legless Lizard					•		•			•	•	
Pletholax gracilis	West Coast Keeled Legless Gecko					•			•		•		
Pygopus lepidopodus	Common Scaly-foot					•		•	•		•	•	
Agamidae													
Ctenophorus adelaidensis	Western Heath Dragon					•		•	•		•	•	
Pogona minor	Dwarf Bearded Dragon					•		•	•		•	•	
Scincidae													
Acritoscincus trilineatus	Western Three-lined Skink					•							
Cryptoblepharus buchananii	Buchanan's Snake-eyed Skink					•			•		•	•	
Cryptoblepharus plagiocephalus	Peron's Snake-eyed Skink					•							
Ctenotus australis	West Coast Long-tailed Ctenotus					•						•	
Ctenotus fallens	West Coast Ctenotus					•			•		•	•	
Ctenotus gemmula	Jewelled Sandplain Ctenotus								•				
Ctenotus impar	South-Western Odd-Striped Ctenotus								•				
Ctenotus lancelini	Lancelin Island Ctenotus	VU	VU			•	•	•					
Ctenotus schomburgkii	Barred Wedge-snouted Ctenotus					•						•	
Ctenotus pantherinus	Leopard Ctenotus					•							
Cyclodomorphus branchialis	Gilled Slender Blue-tongue		VU			•							
Cyclodomorphus celatus	Western Slender Blue-tongue					•		•					
Egernia kingii	King's Skink					•		•					
Egernia napoleonis	South-western Crevice-slink					•		•	•				
Hemiergis quadrilineata	Two-toed Earless Skink					•							
Lerista christinae	Bold-striped Four-toed Slider					•						•	
Lerista distinguenda	South-Western Four-toed Slider					•					•	•	
Lerista elegans	Elegant Slider					•			•			•	
Lerista lineopunctulata	Southern Dotted-line Robust Slider					•		•					
Lerista microtis	South Coast Five-toed Slider					•							
Lerista praepedita	West Coast Worm Slider					•			•		•	•	
Liopholis multiscutata	Bull Skink					•		•					
Menetia greyii	Common Dwarf Skink					•		•	•			•	
Morethia butleri	Woodland Dark-flecked Morethia											•	
Morethia lineoocellata	West Coast Pale-flecked Morethia					•						•	
Morethia obscura	Shrubland Pale-flecked Morethia					•			•		•	•	
Tiliqua occipitalis	Western Bluetongue					•							
Tiliqua rugosa	Bobtail					•		•			•	•	•
Varanidae													
Varanus gouldii	Bungarra or Sand Monitor					•			•				
Varanus tristis	Racehorse Goanna					•						•	
Typhlopidae													
Anilios australis	Southern Blind Snake							•	•			•	
Pythonidae													
Morelia spilota imbricata	Carpet Python					•						•	
Elapidae													
Brachyurophis fasciolatus	Narrow-banded Shovel-nosed Snake					•		•					
Brachyurophis semifasciatus	Southern Shovel-nosed Snake					•					•	•	
Demansia psammophis	Yellow-faced Whipsnake					•		•					

Family and Species	Common Name	Conservation Status			DBCA Database	NatureMap	PMST	ALA	BCE (2015)	EcoEdge (2019)	DPaW (2015)		Astron (2016)
		EPBC Act	BC Act	DBCA							1986	20212	
Echiopsis curta	Bardick					•		•					
Neelaps bimaculatus	Black-naped Snake					•		•			•	•	
Neelaps calonotos	Black-striped Snake			P3	•	•		•			•		
Notechis scutatus	Tiger Snake					•					•		
Pseudechis australis	Mulga Snake					•		•				•	
Pseudonaja affinis	Dugite					•		•			•		
Pseudonaja mengdeni	Western Brown Snake					•							
Simoselaps bertholdi	Jan's Banded Snake					•						•	
Suta gouldii	Gould's Hooded Snake					•		•	•				
Suta nigriceps	Black-backed Hooded Snake					•		•					
AMPHIBIANS													
Pelodryadidae													
Litoria adelaidensis	Slender Tree Frog					•		•			•		
Litoria moorei	Motorbike Frog					•		•					
Limnodynastidae													
Heleioporus eyrei	Moaning Frog					•			•		•		
Heleioporus psammophilus	Sand Frog								•				
Limnodynastes dorsalis	Western Banjo Frog					•		•	•		•	•	
Neobatrachus pelobatoides	Humming Frog					•			•				
Myobatrachidae													
Crinia glauerti	Clicking Frog					•		•			•		
Crinia insignifera	Squelching Froglet					•			•				
Crinia pseudinsignifera	Bleating Froglet					•							
Myobatrachus gouldii	Turtle Frog					•			•		•	•	
Pseudophryne guentheri	Crawling Toadlet					•		•					

Appendix D: Raw Database Search Results

Australian Government

Department of Agriculture, Water and the Environment

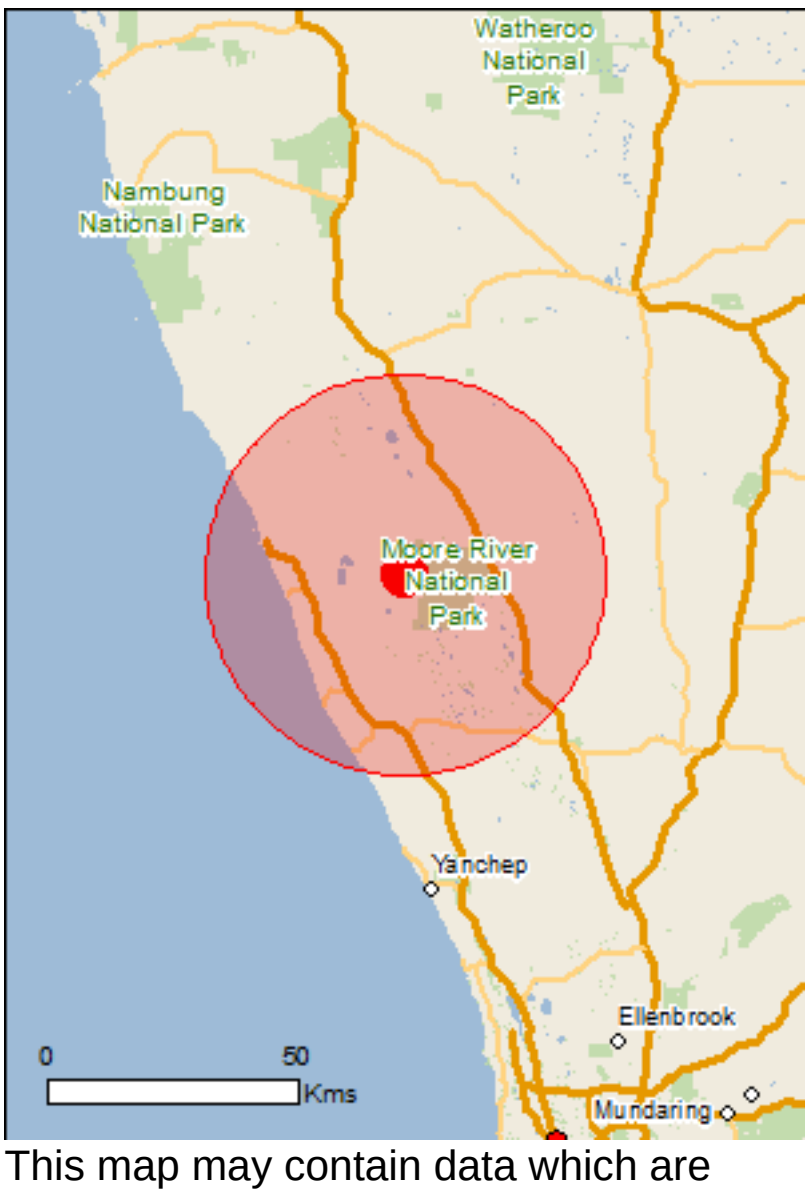
EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

Report created: 05/07/21 17:12:42



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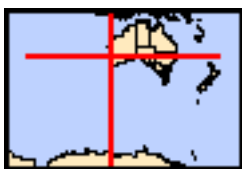

Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	1
Listed Threatened Ecological Communities:	5
Listed Threatened Species:	80
Listed Migratory Species:	46

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	4
Commonwealth Heritage Places:	1
Listed Marine Species:	75
Whales and Other Cetaceans:	12
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	28
Regional Forest Agreements:	None
Invasive Species:	23
Nationally Important Wetlands:	2
Key Ecological Features (Marine)	2

Details

Matters of National Environmental Significance

Commonwealth Marine Area [Resource Information]

Approval is required for a proposed activity that is located within the Commonwealth Marine Area which has, will have, or is likely to have a significant impact on the environment. Approval may be required for a proposed action taken outside the Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area. Generally the Commonwealth Marine Area stretches from three nautical miles to two hundred nautical miles from the coast.

Name
EEZ and Territorial Sea

Marine Regions [Resource Information]

If you are planning to undertake action in an area in or close to the Commonwealth Marine Area, and a marine bioregional plan has been prepared for the Commonwealth Marine Area in that area, the marine bioregional plan may inform your decision as to whether to refer your proposed action under the EPBC Act.

Name
South-west

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Name	Status	Type of Presence
Banksia Woodlands of the Swan Coastal Plain ecological community	Endangered	Community likely to occur within area
Clay Pans of the Swan Coastal Plain	Critically Endangered	Community likely to occur within area
Shrublands and Woodlands on Muchea Limestone of the Swan Coastal Plain	Endangered	Community known to occur within area
Subtropical and Temperate Coastal Saltmarsh	Vulnerable	Community likely to occur within area
Tuart (Eucalyptus gomphocephala) Woodlands and Forests of the Swan Coastal Plain ecological community	Critically Endangered	Community likely to occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Anous tenuirostris melanops Australian Lesser Noddy [26000]	Vulnerable	Species or species habitat may occur within area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area
Calyptorhynchus banksii naso Forest Red-tailed Black-Cockatoo, Karrak [67034]	Vulnerable	Species or species habitat may occur within

Name	Status	Type of Presence
		area
Calyptorhynchus latirostris Carnaby's Cockatoo, Short-billed Black-Cockatoo [59523]	Endangered	Breeding known to occur within area
Diomedea amsterdamensis Amsterdam Albatross [64405]	Endangered	Species or species habitat may occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area
Leipoa ocellata Malleefowl [934]	Vulnerable	Species or species habitat known to occur within area
Limosa lapponica menzbieri Northern Siberian Bar-tailed Godwit, Russkoye Bar-tailed Godwit [86432]	Critically Endangered	Species or species habitat known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pachyptila turtur subantarctica Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat likely to occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Species or species habitat may occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Foraging, feeding or related behaviour may occur within area
Thalassarche cauta Shy Albatross [89224]	Endangered	Species or species habitat may occur within area

Name	Status	Type of Presence
[Thalassarche impavida](#) Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
[Thalassarche melanophris](#) Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
[Thalassarche steadi](#) White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Fish		
[Nannatherina balstoni](#) Balston's Pygmy Perch [66698]	Vulnerable	Species or species habitat likely to occur within area
Mammals		
[Balaenoptera musculus](#) Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
[Dasyurus geoffroii](#) Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat known to occur within area
[Eubalaena australis](#) Southern Right Whale [40]	Endangered	Breeding known to occur within area
[Megaptera novaeangliae](#) Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
[Neophoca cinerea](#) Australian Sea-lion, Australian Sea Lion [22]	Endangered	Species or species habitat likely to occur within area
[Parantechinus apicalis](#) Dibbler [313]	Endangered	Species or species habitat may occur within area
Other		
[Westralunio carteri](#) Carter's Freshwater Mussel, Freshwater Mussel [86266]	Vulnerable	Species or species habitat known to occur within area
Plants		
[Acacia forrestiana](#) Forest's Wattle [17235]	Vulnerable	Species or species habitat known to occur within area
[Andersonia gracilis](#) Slender Andersonia [14470]	Endangered	Species or species habitat known to occur within area
[Anigozanthos viridis subsp. terraspectans](#) Dwarf Green Kangaroo Paw [3435]	Vulnerable	Species or species habitat known to occur within area
[Asterolasia nivea](#) Bindoon Starbush [8225]	Vulnerable	Species or species habitat likely to occur within area
[Banksia fuscobractea](#) Dark-bract Banksia [83059]	Critically Endangered	Species or species habitat known to occur within area
[Banksia mimica](#) Summer Honeypot [82765]	Endangered	Species or species habitat likely to occur within area

Name	Status	Type of Presence
Banksia serratuloides subsp. serratuloides Southern Serrate Dryandra [82768]	Vulnerable	Species or species habitat may occur within area
Caladenia huegelii King Spider-orchid, Grand Spider-orchid, Rusty Spider-orchid [7309]	Endangered	Species or species habitat may occur within area
Chamelaucium sp. Cataby (G.J.Keighery 11009) Griffin's Waxflower [82509]	Vulnerable	Species or species habitat known to occur within area
Chamelaucium sp. Gingin (N.G.Marchant 6) Gingin Wax [88881]	Endangered	Species or species habitat likely to occur within area
Chorizema varium Limestone Pea [16981]	Endangered	Species or species habitat known to occur within area
Conospermum densiflorum subsp. unicephalatum One-headed Smokebush [64871]	Endangered	Species or species habitat likely to occur within area
Darwinia foetida Muchea Bell [83190]	Critically Endangered	Species or species habitat may occur within area
Daviesia dielsii Diels' Daviesia [19617]	Endangered	Species or species habitat may occur within area
Diuris drummondii Tall Donkey Orchid [4365]	Vulnerable	Species or species habitat may occur within area
Diuris micrantha Dwarf Bee-orchid [55082]	Vulnerable	Species or species habitat may occur within area
Diuris purdiei Purdie's Donkey-orchid [12950]	Endangered	Species or species habitat may occur within area
Drakaea elastica Glossy-leafed Hammer Orchid, Glossy-leaved Hammer Orchid, Warty Hammer Orchid [16753]	Endangered	Species or species habitat known to occur within area
Eleocharis keigheryi Keighery's Eleocharis [64893]	Vulnerable	Species or species habitat known to occur within area
Eucalyptus absita Badgingarra Box [24260]	Endangered	Species or species habitat may occur within area
Eucalyptus argutifolia Yanchep Mallee, Wabling Hill Mallee [24263]	Vulnerable	Species or species habitat known to occur within area
Eucalyptus dolorosa Dandaragan Mallee, Mount Misery Mallee [56709]	Endangered	Species or species habitat likely to occur within area
Eucalyptus impensa Eneabba Mallee [56711]	Endangered	Species or species habitat may occur within area
Eucalyptus leprophloia Scaly Butt Mallee, Scaly-butt Mallee [56712]	Endangered	Species or species habitat may occur within area

Name	Status	Type of Presence
Goodenia arthrotricha [12448]	Endangered	Species or species habitat known to occur within area
Grevillea calliantha Foote's Grevillea, Cataby Grevillea, Black Magic Grevillea [56339]	Endangered	Species or species habitat known to occur within area
Grevillea curviloba subsp. incurva Narrow curved-leaf Grevillea [64909]	Endangered	Species or species habitat likely to occur within area
Hakea megalosperma Lesueur Hakea [10505]	Vulnerable	Species or species habitat likely to occur within area
Hemiandra gardneri Red Snakebush [7945]	Endangered	Species or species habitat may occur within area
Lepidosperma rostratum Beaked Lepidosperma [14152]	Endangered	Species or species habitat known to occur within area
Leucopogon obtectus Hidden Beard-heath [19614]	Endangered	Species or species habitat may occur within area
Macarthuria keigheryi Keighery's Macarthuria [64930]	Endangered	Species or species habitat likely to occur within area
Marianthus paralius [83925]	Endangered	Species or species habitat known to occur within area
Paracaleana dixonii Sandplain Duck Orchid [86882]	Endangered	Species or species habitat known to occur within area
Ptychosema pusillum Dwarf Pea [11268]	Vulnerable	Species or species habitat known to occur within area
Thelymitra dedmaniarum Cinnamon Sun Orchid [65105]	Endangered	Species or species habitat known to occur within area
Thelymitra stellata Star Sun-orchid [7060]	Endangered	Species or species habitat may occur within area
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Ctenotus lancelini Lancelin Island Skink [1482]	Vulnerable	Species or species habitat known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area

Name	Status	Type of Presence
Pseudemydura umbrina		
Western Swamp Tortoise [1760]	Critically Endangered	Translocated population known to occur within area
Sharks		
Carcharias taurus (west coast population)		
Grey Nurse Shark (west coast population) [68752]	Vulnerable	Species or species habitat known to occur within area
Carcharodon carcharias		
White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
Rhincodon typus		
Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area

Listed Migratory Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Migratory Marine Birds		
Anous stolidus		
Common Noddy [825]		Species or species habitat likely to occur within area
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardenna carneipes		
Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Foraging, feeding or related behaviour likely to occur within area
Ardenna pacifica		
Wedge-tailed Shearwater [84292]		Breeding known to occur within area
Diomedea amsterdamensis		
Amsterdam Albatross [64405]	Endangered	Species or species habitat may occur within area
Diomedea epomophora		
Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans		
Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi		
Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Hydroprogne caspia		
Caspian Tern [808]		Breeding known to occur within area
Macronectes giganteus		
Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli		
Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Onychoprion anaethetus		
Bridled Tern [82845]		Breeding known to occur within area
Phoebetria fusca		
Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area

Name	Threatened	Type of Presence
Sterna dougallii		
Roseate Tern [817]		Breeding known to occur within area
Thalassarche carteri		
Indian Yellow-nosed Albatross [64464]	Vulnerable	Foraging, feeding or related behaviour may occur within area
Thalassarche cauta		
Shy Albatross [89224]	Endangered	Species or species habitat may occur within area
Thalassarche impavida		
Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris		
Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche steadi		
White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Migratory Marine Species		
Balaena glacialis australis		
Southern Right Whale [75529]	Endangered*	Breeding known to occur within area
Balaenoptera edeni		
Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus		
Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Caperea marginata		
Pygmy Right Whale [39]		Species or species habitat may occur within area
Carcharhinus longimanus		
Oceanic Whitetip Shark [84108]		Species or species habitat may occur within area
Carcharodon carcharias		
White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
Caretta caretta		
Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
Chelonia mydas		
Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Dermochelys coriacea		
Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area
Lamna nasus		
Porbeagle, Mackerel Shark [83288]		Species or species habitat may occur within area
Manta alfredi		
Reef Manta Ray, Coastal Manta Ray, Inshore Manta Ray, Prince Alfred's Ray, Resident Manta Ray [84994]		Species or species habitat may occur within area
Manta birostris		
Giant Manta Ray, Chevron Manta Ray, Pacific Manta Ray, Pelagic Manta Ray, Oceanic Manta Ray [84995]		Species or species habitat may occur within area
Megaptera novaeangliae		
Humpback Whale [38]	Vulnerable	Species or species

Name	Threatened	Type of Presence
		habitat known to occur within area
[Natator depressus](#) Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
[Orcinus orca](#) Killer Whale, Orca [46]		Species or species habitat may occur within area
[Rhincodon typus](#) Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area
Migratory Terrestrial Species		
[Motacilla cinerea](#) Grey Wagtail [642]		Species or species habitat may occur within area
Migratory Wetlands Species		
[Actitis hypoleucos](#) Common Sandpiper [59309]		Species or species habitat known to occur within area
[Calidris acuminata](#) Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
[Calidris canutus](#) Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
[Calidris ferruginea](#) Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area
[Calidris melanotos](#) Pectoral Sandpiper [858]		Species or species habitat may occur within area
[Limosa lapponica](#) Bar-tailed Godwit [844]		Species or species habitat known to occur within area
[Numenius madagascariensis](#) Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
[Pandion haliaetus](#) Osprey [952]		Breeding known to occur within area
[Thalasseus bergii](#) Greater Crested Tern [83000]		Breeding known to occur within area
[Tringa nebularia](#) Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Name
Commonwealth Land -
Defence - LANCELIN - AIR SAFETY MARKER
Defence - LANCELIN TRAINING AREA
Defence - PEARCE ILS/TACAN SITE

Commonwealth Heritage Places [Resource Information]

Name	State	Status
Natural		
Lancelin Defence Training Area	WA	Listed place

Listed Marine Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Anous stolidus Common Noddy [825]		Species or species habitat likely to occur within area
Anous tenuirostris melanops Australian Lesser Noddy [26000]	Vulnerable	Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Catharacta skua Great Skua [59472]		Species or species habitat may occur within area
Chrysococcyx osculans Black-eared Cuckoo [705]		Species or species habitat likely to occur within area
Diomedea amsterdamensis Amsterdam Albatross [64405]	Endangered	Species or species habitat may occur within area

Name	Threatened	Type of Presence
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area
Larus novaehollandiae Silver Gull [810]		Breeding known to occur within area
Larus pacificus Pacific Gull [811]		Breeding known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pachyptila turtur Fairy Prion [1066]		Species or species habitat likely to occur within area
Pandion haliaetus Osprey [952]		Breeding known to occur within area
Pelagodroma marina White-faced Storm-Petrel [1016]		Breeding known to occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Species or species habitat may occur within area
Puffinus assimilis Little Shearwater [59363]		Foraging, feeding or related behaviour known to occur within area

Name	Threatened	Type of Presence
Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		Foraging, feeding or related behaviour likely to occur within area
Puffinus pacificus Wedge-tailed Shearwater [1027]		Breeding known to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat likely to occur within area
Sterna anaethetus Bridled Tern [814]		Breeding known to occur within area
Sterna bergii Crested Tern [816]		Breeding known to occur within area
Sterna caspia Caspian Tern [59467]		Breeding known to occur within area
Sterna dougallii Roseate Tern [817]		Breeding known to occur within area
Sterna fuscata Sooty Tern [794]		Breeding known to occur within area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Foraging, feeding or related behaviour may occur within area
Thalassarche cauta Shy Albatross [89224]	Endangered	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thinornis rubricollis Hooded Plover [59510]		Species or species habitat known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area
Fish		
Acentronura australe Southern Pygmy Pipehorse [66185]		Species or species habitat may occur within area
Campichthys galei Gale's Pipefish [66191]		Species or species habitat may occur within area
Choeroichthys suillus Pig-snouted Pipefish [66198]		Species or species habitat may occur within area
Halicampus brocki Brock's Pipefish [66219]		Species or species habitat may occur within area
Hippocampus angustus Western Spiny Seahorse, Narrow-bellied Seahorse		Species or species

Name	Threatened	Type of Presence
[66234]		habitat may occur within area
Hippocampus breviceps Short-head Seahorse, Short-snouted Seahorse [66235]		Species or species habitat may occur within area
Hippocampus subelongatus West Australian Seahorse [66722]		Species or species habitat may occur within area
Lissocampus fatiloquus Prophet's Pipefish [66250]		Species or species habitat may occur within area
Maroubra perserrata Sawtooth Pipefish [66252]		Species or species habitat may occur within area
Mitotichthys meraculus Western Crested Pipefish [66259]		Species or species habitat may occur within area
Nannocampus subosseus Bonyhead Pipefish, Bony-headed Pipefish [66264]		Species or species habitat may occur within area
Phycodurus eques Leafy Seadragon [66267]		Species or species habitat may occur within area
Phyllopteryx taeniolatus Common Seadragon, Weedy Seadragon [66268]		Species or species habitat may occur within area
Pugnaso curtirostris Pugnose Pipefish, Pug-nosed Pipefish [66269]		Species or species habitat may occur within area
Solegnathus lettiensis Gunther's Pipehorse, Indonesian Pipefish [66273]		Species or species habitat may occur within area
Stigmatopora argus Spotted Pipefish, Gulf Pipefish, Peacock Pipefish [66276]		Species or species habitat may occur within area
Stigmatopora nigra Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277]		Species or species habitat may occur within area
Syngnathoides biaculeatus Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area
Urocampus carinirostris Hairy Pipefish [66282]		Species or species habitat may occur within area
Vanacampus margaritifer Mother-of-pearl Pipefish [66283]		Species or species habitat may occur within area
Mammals		
Arctocephalus forsteri Long-nosed Fur-seal, New Zealand Fur-seal [20]		Species or species habitat may occur within area
Neophoca cinerea Australian Sea-lion, Australian Sea Lion [22]	Endangered	Species or species habitat likely to occur within area
Reptiles		

Name	Threatened	Type of Presence
Aipysurus pooleorum Shark Bay Seasnake [66061]		Species or species habitat may occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area
Disteira kingii Spectacled Seasnake [1123]		Species or species habitat may occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Pelamis platurus Yellow-bellied Seasnake [1091]		Species or species habitat may occur within area

Whales and other Cetaceans [Resource Information]

Name	Status	Type of Presence
Mammals		
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Caperea marginata Pygmy Right Whale [39]		Species or species habitat may occur within area
Delphinus delphis Common Dolphin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Breeding known to occur within area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Stenella attenuata Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area
Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted		Species or species

Name	Status	Type of Presence
Bottlenose Dolphin [68418] Tursiops truncatus s. str.		habitat likely to occur within area
Bottlenose Dolphin [68417]		Species or species habitat may occur within area

Extra Information

State and Territory Reserves	[Resource Information]
Name	State
Bartletts Well	WA
Bashford	WA
Boonanarring	WA
Bootine	WA
Bundarra	WA
Eneminga	WA
Gingin Stock Route	WA
Lancelin And Edwards Islands	WA
Moochamulla	WA
Moore River	WA
Moore River	WA
NTWA Bushland covenant (0048)	WA
NTWA Bushland covenant (0057)	WA
Nabaroo	WA
Namming	WA
Nilgen	WA
Quins Hill	WA
Sand Spring Well	WA
South Mimegarra	WA
Unnamed WA21164	WA
Unnamed WA25591	WA
Unnamed WA27993	WA
Unnamed WA39571	WA
Unnamed WA46899	WA
Unnamed WA47808	WA
Unnamed WA49994	WA
Yeal	WA
Yurine Swamp	WA

Invasive Species [Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Birds		
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Streptopelia senegalensis Laughing Turtle-dove, Laughing Dove [781]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Mammals		
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Brachiaria mutica Para Grass [5879]		Species or species habitat may occur within area
Cenchrus ciliaris Buffel-grass, Black Buffel-grass [20213]		Species or species habitat may occur within area
Chrysanthemoides monilifera Bitou Bush, Boneseed [18983]		Species or species habitat may occur within area
Genista linifolia Flax-leaved Broom, Mediterranean Broom, Flax Broom [2800]		Species or species habitat likely to occur within area
Genista sp. X Genista monspessulana Broom [67538]		Species or species habitat may occur within area
Lycium ferocissimum African Boxthorn, Boxthorn [19235]		Species or species habitat likely to occur within area
Olea europaea Olive, Common Olive [9160]		Species or species habitat may occur within

Name	Status	Type of Presence
		area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Tamarix aphylla Athel Pine, Athel Tree, Tamarisk, Athel Tamarisk, Athel Tamarix, Desert Tamarisk, Flowering Cypress, Salt Cedar [16018]		Species or species habitat likely to occur within area

Nationally Important Wetlands [Resource Information]

Name	State
Guraga Lake	WA
Karakin Lakes	WA

Key Ecological Features (Marine) [Resource Information]

Key Ecological Features are the parts of the marine ecosystem that are considered to be important for the biodiversity or ecosystem functioning and integrity of the Commonwealth Marine Area.

Name	Region
Commonwealth marine environment within and	South-west
Western rock lobster	South-west

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-31.07501 115.58794

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

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NatureMap
Mapping Western Australia's biodiversity

NatureMap Species Report

Created By Guest user on 05/07/2021

Current Names Only Yes
Core Datasets Only Yes
Method 'By Circle'
Centre 115° 35' 15" E,31° 04' 31" S
Buffer 40km
Group By Species Group

Species Group	Species	Records
Alga	52	78
Amphibian	10	211
Bird	215	9912
Bryopsid (Moss)	9	10
Dicotyledon	1162	6729
Fish	140	238
Fungus	10	26
Gymnosperm	5	19
Invertebrate	110	470
Lichen	13	18
Mammal	30	203
Monocotyledon	466	2018
Pteridophyte (Fern)	10	22
Reptile	66	1014
Slime Mould	2	2
TOTAL	**2300**	**20970**

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
Alga					
1.	26440	*Acanthophora dendroides*			
2.	26454	*Amansia serrata*			
3.	26457	*Amphiplexia racemosa*			Y
4.	26458	*Amphiroa anceps*			
5.	26481	*Apjohnia laetevirens*			
6.	26549	*Carpothamnion gunnianum*			
7.	26556	*Caulerpa cactoides*			
8.	26563	*Caulerpa flexilis*			
9.	48455	*Caulerpa geminata*			
10.	46993	*Caulerpa taxifolia var. distichophylla*			
11.	26712	*Curdiea obesa*			
12.	26751	*Dasyclonium flaccidum*			
13.	26761	*Dictyomenia harveyana*			
14.	26762	*Dictyomenia sonderi*			
15.	26764	*Dictyopteris australis*			
16.	29951	*Dictyopteris secundispiralis*			
17.	29537	*Dictyota fastigiata*			
18.	35216	*Dictyota paniculata*			
19.	26803	*Echinothamnion hystrix*			
20.	26854	*Gigartina disticha*			
21.	26859	*Gloiocladia australe*			
22.	26860	*Gloiocladia halymenioides*			
23.	36701	*Grateloupia subpectinata*			
24.	47213	*Halimeda versatilis*			
25.	48568	*Halopeltis australis*			
26.	26900	*Haloplegma preissii*			
27.	37640	*Halymenia floresii*			
28.	26922	*Herposiphonia versicolor*			
29.	26930	*Heterosiphonia crassipes*			
30.	49083	*Hymenena curdieana*			
31.	26965	*Hymenocladia usnea*			
32.	36141	*Jania pulchella*			
33.	26998	*Laurencia brongniartii*			
34.	48419	*Leiomenia cribrosa*			
35.	27053	*Macrothamnion pellucidum*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
36.	27066	*Mesophyllum incisum*			Y
37.	27079	*Mychodea carnosa*			
38.	27092	*Myriodesma tuberosum*			
39.	27118	*Padina sanctae-crucis*			
40.	27132	*Phacelocarpus apodus*			
41.	27144	*Platoma cyclocolpum*			
42.	27164	*Polycerea zostericola*			
43.	27173	*Polysiphonia decipiens*			
44.	27190	*Protokuetzingia australasica*			
45.	27195	*Pterocladia lucida*			
46.	27211	*Rhabdonia coccinea*			
47.	27274	*Sebdenia flabellata*			
48.	42785	*Sirophysalis trinodis*			
49.	48423	*Stauromenia lacerata*			
50.	27318	*Struvea plumosa*			
51.	27326	*Tanakaella itonoi*			
52.	27362	*Webervanbossea splachnoides*			
Amphibian					
53.	25399	*Crinia glauerti (Clicking Frog)*			
54.	25400	*Crinia insignifera (Squelching Froglet)*			
55.	25401	*Crinia pseudinsignifera (Bleating Froglet)*			
56.	25410	*Heleioporus eyrei (Moaning Frog)*			
57.	25415	*Limnodynastes dorsalis (Western Banjo Frog)*			
58.	25378	*Litoria adelaidensis (Slender Tree Frog)*			
59.	25388	*Litoria moorei (Motorbike Frog)*			
60.	25420	*Myobatrachus gouldii (Turtle Frog)*			
61.	25426	*Neobatrachus pelobatoides (Humming Frog)*			
62.	25433	*Pseudophryne guentheri (Crawling Toadlet)*			
Bird					
63.	24559	*Acanthagenys rufogularis (Spiny-cheeked Honeyeater)*			
64.	24260	*Acanthiza apicalis (Broad-tailed Thornbill, Inland Thornbill)*			
65.	24261	*Acanthiza chrysorrhoa (Yellow-rumped Thornbill)*			
66.	24262	*Acanthiza inornata (Western Thornbill)*			
67.	24560	*Acanthorhynchus superciliosus (Western Spinebill)*			
68.	25535	*Accipiter cirrocephalus (Collared Sparrowhawk)*			
69.	25536	*Accipiter fasciatus (Brown Goshawk)*			
70.	25755	*Acrocephalus australis (Australian Reed Warbler)*			
71.	41323	*Actitis hypoleucos (Common Sandpiper)*		IA	
72.	24312	*Anas gracilis (Grey Teal)*			
73.	24313	*Anas platyrhynchos (Mallard)*			
74.		*Anas platyrhynchos subsp. domesticus*			
75.	24315	*Anas rhynchotis (Australasian Shoveler)*			
76.	24316	*Anas superciliosa (Pacific Black Duck)*			
77.	47414	*Anhinga novaehollandiae (Australasian Darter)*			
78.	25634	*Anous stolidus (Common Noddy)*		IA	
79.	24561	*Anthochaera carunculata (Red Wattlebird)*			
80.	24562	*Anthochaera lunulata (Western Little Wattlebird)*			
81.	24599	*Anthus australis subsp. australis (Australian Pipit)*			
82.	25554	*Apus pacificus (Fork-tailed Swift, Pacific Swift)*		IA	
83.	24285	*Aquila audax (Wedge-tailed Eagle)*			
84.	25558	*Ardea ibis (Cattle Egret)*			
85.	41324	*Ardea modesta (great egret, white egret)*			
86.	24340	*Ardea novaehollandiae (White-faced Heron)*			
87.	24341	*Ardea pacifica (White-necked Heron)*			
88.	41326	*Ardenna carneipes (Flesh-footed Shearwater, Fleshy-footed Shearwater)*		T	
89.	48573	*Ardenna pacifica (Wedge-tailed Shearwater)*		IA	
90.	24610	*Ardeotis australis (Australian Bustard)*			
91.	25736	*Arenaria interpres (Ruddy Turnstone)*		IA	
92.	25566	*Artamus cinereus (Black-faced Woodswallow)*			
93.	24353	*Artamus cyanopterus (Dusky Woodswallow)*			
94.	24356	*Artamus personatus (Masked Woodswallow)*			
95.	24318	*Aythya australis (Hardhead)*			
96.		*Barnardius zonarius*			
97.	24319	*Biziura lobata (Musk Duck)*			
98.	24345	*Botaurus poiciloptilus (Australasian Bittern)*		T	
99.	25713	*Cacatua galerita (Sulphur-crested Cockatoo)*			
100.	25714	*Cacatua pastinator (Western Long-billed Corella)*			
101.	24723	*Cacatua pastinator subsp. butleri (Butler's Corella)*			
102.	25715	*Cacatua roseicapilla (Galah)*			

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103.	25716	*Cacatua sanguinea (Little Corella)*			
104.	25598	*Cacomantis flabelliformis (Fan-tailed Cuckoo)*			
105.	42307	*Cacomantis pallidus (Pallid Cuckoo)*			
106.	24269	*Calamanthus campestris (Rufous Fieldwren)*			
107.	24779	*Calidris acuminata (Sharp-tailed Sandpiper)*		IA	
108.	24780	*Calidris alba (Sanderling)*		IA	
109.	24784	*Calidris ferruginea (Curlew Sandpiper)*		T	
110.	24788	*Calidris ruficollis (Red-necked Stint)*		IA	
111.	24789	*Calidris subminuta (Long-toed Stint)*		IA	
112.	25717	*Calyptorhynchus banksii (Red-tailed Black-Cockatoo)*			
113.	24734	*Calyptorhynchus latirostris (Carnaby s Cockatoo, White-tailed Short-billed Black Cockatoo)*		T	
114.	48400	*Calyptorhynchus sp. (white-tailed black cockatoo)*		T	
115.	24564	*Certhionyx variegatus (Pied Honeyeater)*			
116.	24377	*Charadrius ruficapillus (Red-capped Plover)*			
117.	24321	*Chenonetta jubata (Australian Wood Duck, Wood Duck)*			
118.	47909	*Cheramoeca leucosterna (White-backed Swallow)*			
119.		*Chroicocephalus novaehollandiae*			
120.	24288	*Circus approximans (Swamp Harrier)*			
121.	24289	*Circus assimilis (Spotted Harrier)*			
122.	24774	*Cladorhynchus leucocephalus (Banded Stilt)*			
123.	25675	*Colluricincla harmonica (Grey Shrike-thrush)*			
124.	24399	*Columba livia (Domestic Pigeon)*	Y		
125.	25568	*Coracina novaehollandiae (Black-faced Cuckoo-shrike)*			
126.	24416	*Corvus bennetti (Little Crow)*			
127.	25592	*Corvus coronoides (Australian Raven)*			
128.	24671	*Coturnix pectoralis (Stubble Quail)*			
129.	25701	*Coturnix ypsilophora (Brown Quail)*			
130.	24420	*Cracticus nigrogularis (Pied Butcherbird)*			
131.	25595	*Cracticus tibicen (Australian Magpie)*			
132.	24422	*Cracticus tibicen subsp. dorsalis (White-backed Magpie)*			
133.	25596	*Cracticus torquatus (Grey Butcherbird)*			
134.	24322	*Cygnus atratus (Black Swan)*			
135.	30901	*Dacelo novaeguineae (Laughing Kookaburra)*	Y		
136.	25673	*Daphoenositta chrysoptera (Varied Sittella)*			
137.	24605	*Daphoenositta chrysoptera subsp. leucoptera (Varied Sittella, White-winged Sitella)*			
138.	24606	*Daphoenositta chrysoptera subsp. pileata (Varied Sittella, Black-capped Sitella)*			
139.	25607	*Dicaeum hirundinaceum (Mistletoebird)*			
140.	24470	*Dromaius novaehollandiae (Emu)*			
141.		*Egretta novaehollandiae*			
142.		*Elanus axillaris*			
143.	24290	*Elanus caeruleus subsp. axillaris (Australian Black-shouldered Kite)*			
144.	47937	*Elseyornis melanops (Black-fronted Dotterel)*			
145.		*Eolophus roseicapillus*			
146.	24652	*Eopsaltria georgiana (White-breasted Robin)*			
147.	24567	*Epthianura albifrons (White-fronted Chat)*			
148.	24570	*Epthianura tricolor (Crimson Chat)*			
149.	24379	*Erythrogonys cinctus (Red-kneed Dotterel)*			
150.	24368	*Eurostopodus argus (Spotted Nightjar)*			
151.	25621	*Falco berigora (Brown Falcon)*			
152.	25622	*Falco cenchroides (Australian Kestrel, Nankeen Kestrel)*			
153.	25623	*Falco longipennis (Australian Hobby)*			
154.	25624	*Falco peregrinus (Peregrine Falcon)*		S	
155.	24475	*Falco peregrinus subsp. macropus (Australian Peregrine Falcon)*		S	
156.	25727	*Fulica atra (Eurasian Coot)*			
157.	24761	*Fulica atra subsp. australis (Eurasian Coot)*			
158.	25729	*Gallinula tenebrosa (Dusky Moorhen)*			
159.	24763	*Gallinula tenebrosa subsp. tenebrosa (Dusky Moorhen)*			
160.	25730	*Gallirallus philippensis (Buff-banded Rail)*			
161.	42314	*Gavicalis virescens (Singing Honeyeater)*			
162.	25530	*Gerygone fusca (Western Gerygone)*			
163.	47962	*Glyciphila melanops (Tawny-crowned Honeyeater)*			
164.	24443	*Grallina cyanoleuca (Magpie-lark)*			
165.	25627	*Haematopus fuliginosus (Sooty Oystercatcher)*			
166.	24487	*Haematopus longirostris (Pied Oystercatcher)*			
167.	24293	*Haliaeetus leucogaster (White-bellied Sea-Eagle)*			
168.	24295	*Haliastur sphenurus (Whistling Kite)*			
169.	24689	*Halobaena caerulea (Blue Petrel)*			
170.	24296	*Hamirostra isura (Square-tailed Kite)*			
171.	47965	*Hieraaetus morphnoides (Little Eagle)*			

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172.	25734	*Himantopus himantopus (Black-winged Stilt)*			
173.	24491	*Hirundo neoxena (Welcome Swallow)*			
174.	48587	*Hydroprogne caspia (Caspian Tern)*		IA	
175.	24367	*Lalage tricolor (White-winged Triller)*			
176.	24511	*Larus novaehollandiae subsp. novaehollandiae (Silver Gull)*			
177.	25638	*Larus pacificus (Pacific Gull)*			
178.	24557	*Leipoa ocellata (Malleefowl)*		T	
179.	25659	*Lichenostomus leucotis (White-eared Honeyeater)*			
180.	25661	*Lichmera indistincta (Brown Honeyeater)*			
181.	24582	*Lichmera indistincta subsp. indistincta (Brown Honeyeater)*			
182.	30932	*Limosa lapponica (Bar-tailed Godwit)*		IA	
183.		*Lophoictinia isura*			
184.	24690	*Macronectes giganteus (Southern Giant Petrel)*		IA	
185.	24326	*Malacorhynchus membranaceus (Pink-eared Duck)*			
186.	25650	*Malurus elegans (Red-winged Fairy-wren)*			
187.	25651	*Malurus lamberti (Variegated Fairy-wren)*			
188.	24544	*Malurus lamberti subsp. assimilis (Variegated Fairy-wren)*			
189.	25652	*Malurus leucopterus (White-winged Fairy-wren)*			
190.	24551	*Malurus pulcherrimus (Blue-breasted Fairy-wren)*			
191.	25654	*Malurus splendens (Splendid Fairy-wren)*			
192.	24583	*Manorina flavigula (Yellow-throated Miner)*			
193.	25758	*Megalurus gramineus (Little Grassbird)*			
194.	47997	*Melanodryas cucullata (Hooded Robin)*			
195.	25663	*Melithreptus brevirostris (Brown-headed Honeyeater)*			
196.	24736	*Melopsittacus undulatus (Budgerigar)*			
197.	24598	*Merops ornatus (Rainbow Bee-eater)*			
198.		*Microcarbo melanoleucos*			
199.	25693	*Microeca fascinans (Jacky Winter)*			
200.	48008	*Morus serrator (Australasian Gannet)*			
201.	25610	*Myiagra inquieta (Restless Flycatcher)*			
202.	24738	*Neophema elegans (Elegant Parrot)*			
203.	24739	*Neophema petrophila (Rock Parrot)*			
204.	24799	*Numenius minutus (Little Curlew, Little Whimbrel)*		IA	
205.	25564	*Nycticorax caledonicus (Rufous Night Heron)*			
206.	24407	*Ocyphaps lophotes (Crested Pigeon)*			
207.	41347	*Onychoprion anaethetus (Bridled Tern)*		IA	
208.	24618	*Oreoica gutturalis (Crested Bellbird)*			
209.	34011	*Oreoica gutturalis subsp. gutturalis (Crested Bellbird (southern))*			
210.	24328	*Oxyura australis (Blue-billed Duck)*		P4	
211.	25680	*Pachycephala rufiventris (Rufous Whistler)*			
212.	24624	*Pachycephala rufiventris subsp. rufiventris (Rufous Whistler)*			
213.	48591	*Pandion cristatus (Osprey, Eastern Osprey)*		IA	
214.	25681	*Pardalotus punctatus (Spotted Pardalote)*			
215.	25682	*Pardalotus striatus (Striated Pardalote)*			
216.	24630	*Pardalotus striatus subsp. westraliensis (Striated Pardalote)*			
217.	24648	*Pelecanus conspicillatus (Australian Pelican)*			
218.	48061	*Petrochelidon nigricans (Tree Martin)*			
219.	48066	*Petroica boodang (Scarlet Robin)*			
220.	24659	*Petroica goodenovii (Red-capped Robin)*			
221.	25697	*Phalacrocorax carbo (Great Cormorant)*			
222.	25698	*Phalacrocorax melanoleucos (Little Pied Cormorant)*			
223.	24667	*Phalacrocorax sulcirostris (Little Black Cormorant)*			
224.	25699	*Phalacrocorax varius (Pied Cormorant)*			
225.	24409	*Phaps chalcoptera (Common Bronzewing)*			
226.	25587	*Phaps elegans (Brush Bronzewing)*			
227.	24802	*Philomachus pugnax (Ruff, reeve)*		IA	
228.	48071	*Phylidonyris niger (White-cheeked Honeyeater)*			
229.	24596	*Phylidonyris novaehollandiae (New Holland Honeyeater)*			
230.	24841	*Platalea flavipes (Yellow-billed Spoonbill)*			
231.	25720	*Platycercus icterotis (Western Rosella)*			
232.	24745	*Platycercus icterotis subsp. icterotis (Western Rosella)*			
233.	25721	*Platycercus zonarius (Australian Ringneck, Ring-necked Parrot)*			
234.	24750	*Platycercus zonarius subsp. semitorquatus (Twenty-eight Parrot)*			
235.	24751	*Platycercus zonarius subsp. zonarius (Port Lincoln Parrot)*			
236.	24843	*Plegadis falcinellus (Glossy Ibis)*		IA	
237.	24382	*Pluvialis fulva (Pacific Golden Plover)*		IA	
238.	24383	*Pluvialis squatarola (Grey Plover)*		IA	
239.	25703	*Podargus strigoides (Tawny Frogmouth)*			
240.	25704	*Podiceps cristatus (Great Crested Grebe)*			
241.	24681	*Poliocephalus poliocephalus (Hoary-headed Grebe)*			

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242.	25722	*Polytelis anthopeplus (Regent Parrot)*			
243.	24683	*Pomatostomus superciliosus (White-browed Babbler)*			
244.	25731	*Porphyrio porphyrio (Purple Swamphen)*			
245.	24767	*Porphyrio porphyrio subsp. bellus (Purple Swamphen)*			
246.	24771	*Porzana tabuensis (Spotless Crake)*			
247.		*Purpureicephalus spurius*			
248.	24776	*Recurvirostra novaehollandiae (Red-necked Avocet)*			
249.	48096	*Rhipidura albiscapa (Grey Fantail)*			
250.	25614	*Rhipidura leucophrys (Willie Wagtail)*			
251.	25534	*Sericornis frontalis (White-browed Scrubwren)*			
252.	24279	*Sericornis frontalis subsp. maculatus (White-browed Scrubwren)*			
253.	30948	*Smicrornis brevirostris (Weebill)*			
254.	25640	*Sterna dougallii (Roseate Tern)*		IA	
255.	48594	*Sternula nereis (Fairy Tern)*			
256.	24329	*Stictonetta naevosa (Freckled Duck)*			
257.	25655	*Stipiturus malachurus (Southern Emu-wren)*			
258.	24554	*Stipiturus malachurus subsp. westernensis (Southern Emu-wren)*			
259.	25597	*Strepera versicolor (Grey Currawong)*			
260.	25589	*Streptopelia chinensis (Spotted Turtle-Dove)*	Y		
261.	25590	*Streptopelia senegalensis (Laughing Turtle-Dove)*	Y		
262.	25705	*Tachybaptus novaehollandiae (Australasian Grebe, Black-throated Grebe)*			
263.	24682	*Tachybaptus novaehollandiae subsp. novaehollandiae (Australasian Grebe, Black-throated Grebe)*			
264.	24331	*Tadorna tadornoides (Australian Shelduck, Mountain Duck)*			
265.	48597	*Thalasseus bergii (Crested Tern)*		IA	
266.	48135	*Thinornis rubricollis (Hooded Plover, Hooded Dotterel)*		P4	
267.	24845	*Threskiornis spinicollis (Straw-necked Ibis)*			
268.	25549	*Todiramphus sanctus (Sacred Kingfisher)*			
269.	24309	*Todiramphus sanctus subsp. sanctus (Sacred Kingfisher)*			
270.	48141	*Tribonyx ventralis (Black-tailed Native-hen)*			
271.	25723	*Trichoglossus haematodus (Rainbow Lorikeet)*			
272.	24803	*Tringa brevipes (Grey-tailed Tattler)*		P4	
273.	24806	*Tringa glareola (Wood Sandpiper)*		IA	
274.	24808	*Tringa nebularia (Common Greenshank, greenshank)*		IA	
275.	24851	*Turnix velox (Little Button-quail)*			
276.	24386	*Vanellus tricolor (Banded Lapwing)*			
277.	25765	*Zosterops lateralis (Grey-breasted White-eye, Silvereye)*			
Bryopsid (Moss)					
278.	32327	*Breutelia affinis*			
279.	32328	*Bruchia brevipes*			
280.	32334	*Campylopus australis*			
281.	32338	*Campylopus introflexus*	Y		
282.	32353	*Entosthodon apophysatus*			
283.	32370	*Funaria hygrometrica*			
284.	32380	*Gemmabryum pachythecum*			
285.	32433	*Sematophyllum homomallum*			
286.	32451	*Triquetrella papillata*			
Dicotyledon					
287.	3200	*Acacia acuminata (Jam, Mangard)*			
288.	15430	*Acacia alata var. tetrantha*			
289.	15466	*Acacia applanata*			
290.	3231	*Acacia auronitens*			
291.	15470	*Acacia barbinervis subsp. borealis*			
292.	3237	*Acacia benthamii*		P2	
293.	3242	*Acacia blakelyi*			
294.	15471	*Acacia brumalis*			
295.	14061	*Acacia clydonophora*			
296.	3262	*Acacia cochlearis (Rigid Wattle)*			
297.	3271	*Acacia costata*			
298.	14066	*Acacia cummingiana*		P3	
299.	12672	*Acacia cupularis*			
300.	3282	*Acacia cyclops (Coastal Wattle)*			
301.	20435	*Acacia daphnifolia*			
302.	3293	*Acacia denticulosa (Sandpaper Wattle)*		T	
303.	3303	*Acacia dilatata*			
304.	11229	*Acacia drummondii subsp. affinis*		P3	
305.	11661	*Acacia drummondii subsp. drummondii*			
306.	11192	*Acacia drummondii subsp. elegans*			
307.	3341	*Acacia forrestiana (Forrest s Wattle)*		T	

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308.	3373	*Acacia horridula*		P3	
309.	3374	*Acacia huegelii*			
310.	3376	*Acacia idiomorpha*			
311.	3409	*Acacia lasiocarpa (Panjang)*			
312.	11611	*Acacia lasiocarpa var. lasiocarpa*			
313.	15721	*Acacia lasiocarpa var. sedifolia*			
314.	3412	*Acacia latipes*			
315.	15476	*Acacia latipes subsp. latipes*			
316.	11448	*Acacia leptospermoides subsp. leptospermoides*			
317.	3442	*Acacia microbotrya (Manna Wattle, Kalyang)*			
318.	3493	*Acacia plicata*		P3	
319.	3502	*Acacia pulchella (Prickly Moses)*			
320.	15481	*Acacia pulchella var. glaberrima*			
321.	15483	*Acacia pulchella var. pulchella*			
322.	15480	*Acacia pulchella var. reflexa*			
323.	14927	*Acacia pulchella var. reflexa acuminate bracteole variant (R.J. Cumming 882)*		P3	
324.	3506	*Acacia pyrifolia (Ranji Bush, Kandji)*			
325.	3525	*Acacia rostellifera (Summer-scented Wattle)*			
326.	3527	*Acacia saligna (Orange Wattle, Kudjong)*			
327.	30033	*Acacia saligna subsp. lindleyi*			
328.	30032	*Acacia saligna subsp. saligna*			
329.	3532	*Acacia scirpifolia*			
330.	3541	*Acacia sessilis*			
331.	3543	*Acacia shuttleworthii*			
332.		*Acacia sp.*			
333.	3550	*Acacia sphacelata*			
334.	15484	*Acacia sphacelata subsp. sphacelata*			
335.	15486	*Acacia sphacelata subsp. verticillata*			
336.	3557	*Acacia stenoptera (Narrow Winged Wattle)*			
337.	3584	*Acacia truncata*			
338.	3602	*Acacia willdenowiana (Grass Wattle)*			
339.	3604	*Acacia xanthina (White-stemmed Wattle)*			
340.	3184	*Acaena echinata (Sheep s Burr)*			
341.	6295	*Acrotriche cordata (Coast Ground Berry)*			
342.	6205	*Actinotus leucocephalus (Flannel Flower)*			
343.	1775	*Adenanthos cygnorum (Common Woollybush)*			
344.	11837	*Adenanthos cygnorum subsp. cygnorum (Common Woollybush)*			
345.	1779	*Adenanthos drummondii*			
346.	48513	*Aizoon pubescens*	Y		
347.	1729	*Allocasuarina grevilleoides*		P3	
348.	1731	*Allocasuarina huegeliana (Rock Sheoak, Kwowl)*			
349.	1732	*Allocasuarina humilis (Dwarf Sheoak)*			
350.	13908	*Allocasuarina lehmanniana subsp. lehmanniana*			
351.	1734	*Allocasuarina microstachya*			
352.	1739	*Allocasuarina thuyoides (Horned Sheoak)*			
353.	4905	*Alyogyne hakeifolia*			
354.	4906	*Alyogyne huegelii (Lilac Hibiscus)*			
355.	4585	*Amperea ericoides*			
356.	13267	*Amyema linophylla subsp. linophylla*			
357.	6305	*Andersonia brevifolia*			
358.	6309	*Andersonia gracilis*		T	
359.	6311	*Andersonia heterophylla*			
360.	6312	*Andersonia involucrata*			
361.	6314	*Andersonia lehmanniana*			
362.	11471	*Andersonia lehmanniana subsp. lehmanniana*			
363.	41738	*Andersonia sp. Mysosma (E.A. Griffin 2213)*			
364.	40908	*Androcalva pulchella*			
365.	7827	*Angianthus cunninghamii (Coast Angianthus)*			
366.	7833	*Angianthus preissianus*			
367.	7836	*Angianthus tomentosus (Camel-grass)*			
368.	6947	*Anthocercis ilicifolia*			
369.	11725	*Anthocercis ilicifolia subsp. ilicifolia*			
370.	6949	*Anthocercis littorea (Yellow Tailflower)*			
371.	12724	*Anthotium junciforme*			
372.	3688	*Aotus gracillima*			
373.	3692	*Aotus procumbens*			
374.	6210	*Apium annuum*			
375.	6211	*Apium prostratum (Sea Celery)*			
376.	12040	*Apium prostratum subsp. prostratum var. prostratum (Sea Celery)*			
377.	7838	*Arctotheca calendula (Cape Weed, African Marigold)*	Y		

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378.	7839	*Arctotheca populifolia (Dune Arctotheca, Beach Pumpkin, Coast Capeweed, Beach Daisy)*	Y		
379.	7840	*Arctotis stoechadifolia (White Arctotis, Silver Arctotis)*	Y		
380.		*Astartea aff. fascicularis sthcst*			
381.	20350	*Astartea affinis (West-coast Astartea)*			
382.	20283	*Astartea scoparia (Common Astartea)*			
383.	7851	*Asteridea pulverulenta (Common Bristle Daisy)*			
384.	4397	*Asterolasia drummondii (Gairdner Range Starbush)*		P4	
385.	6328	*Astroloma glaucescens*			
386.	6330	*Astroloma macrocalyx (Swan Berry)*			
387.	6331	*Astroloma microcalyx (Native Cranberry)*			
388.	6332	*Astroloma microdonta (Sandplain Cranberry)*			
389.	42144	*Astroloma oblongifolium*			
390.	6334	*Astroloma pallidum (Kick Bush)*			
391.	6336	*Astroloma serratifolium (Kondrung)*			
392.	6337	*Astroloma stomarrhena (Red Swamp Cranberry)*			
393.	6339	*Astroloma xerophyllum*			
394.	2452	*Atriplex cinerea (Grey Saltbush)*			
395.	2463	*Atriplex isatidea (Coast Saltbush)*			
396.	2471	*Atriplex prostrata (Hastate Orache)*	Y		
397.	36441	*Babingtonia camphorosmae (Camphor Myrtle)*			
398.	45397	*Babingtonia cherticola*		P3	
399.	45395	*Babingtonia delicata*		P1	
400.	45416	*Babingtonia grandiflora (Large-flowered Babingtonia)*			
401.	45403	*Babingtonia pelloeae (Pelloe s Babingtonia)*			
402.	45402	*Babingtonia urbana (Coastal Plain Babingtonia)*		P3	
403.	5365	*Baeckea robusta*			
404.	34161	*Baeckea sp. Limestone (N. Gibson & M.N. Lyons 1425)*		P1	
405.	16815	*Baeckea sp. Mingenew (M.E. Trudgen 12029)*			
406.	32682	*Banksia armata var. armata*			
407.	1800	*Banksia attenuata (Slender Banksia, Piara)*			
408.	32679	*Banksia bipinnatifida subsp. multifida*			
409.	1807	*Banksia burdettii (Burdett s Banksia)*			
410.	1809	*Banksia candolleana (Propeller Banksia)*			
411.	32623	*Banksia carlinoides (Pink Dryandra)*			
412.	1810	*Banksia chamaephyton (Fishbone Banksia)*		P4	
413.	32576	*Banksia dallanneyi (Couch Honeypot)*			
414.	32580	*Banksia dallanneyi subsp. dallanneyi var. dallanneyi*			
415.	32577	*Banksia dallanneyi subsp. dallanneyi var. mellicula*			
416.	32578	*Banksia dallanneyi subsp. media*			
417.	32696	*Banksia dallanneyi subsp. pollosta*		P3	
418.	32556	*Banksia echinata*			
419.	32521	*Banksia fraseri*			
420.	32520	*Banksia fuscobractea*		T	
421.	1819	*Banksia grandis (Bull Banksia, Pulgarla)*			
422.	1820	*Banksia grossa*			
423.	32518	*Banksia hewardiana*			
424.	1822	*Banksia ilicifolia (Holly-leaved Banksia)*			
425.	1823	*Banksia incana*			
426.	32214	*Banksia kippistiana*			
427.	32215	*Banksia kippistiana var. kippistiana*			
428.	32216	*Banksia kippistiana var. paenepeccata*		P3	
429.	1826	*Banksia laricina (Rose Banksia)*			
430.	1828	*Banksia leptophylla*			
431.	11714	*Banksia leptophylla var. leptophylla*			
432.	11386	*Banksia leptophylla var. melletica*			
433.	1830	*Banksia littoralis (Swamp Banksia, Pungura)*			
434.	1834	*Banksia menziesii (Firewood Banksia)*			
435.	32211	*Banksia mimica (Summer Honeypot)*		T	
436.	32202	*Banksia nivea (Honeypot Dryandra, Pudjarn)*			
437.	32203	*Banksia nivea subsp. nivea*			
438.	32200	*Banksia nobilis subsp. nobilis*			
439.	32163	*Banksia platycarpa*			
440.	32159	*Banksia polycephala (Many-headed Dryandra)*			
441.	32157	*Banksia prionophylla*		P1	Y
442.	1842	*Banksia prionotes (Acorn Banksia)*			
443.	32138	*Banksia pteridifolia subsp. vernalis*		P3	
444.	32086	*Banksia sclerophylla*			
445.	32076	*Banksia sessilis (Parrot Bush, Pudjak)*			
446.	32077	*Banksia sessilis var. cygnorum*			
447.	32080	*Banksia sessilis var. sessilis*			

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448.	32074	*Banksia shuttleworthiana (Bearded Dryandra)*			
449.	12111	*Banksia sphaerocarpa var. sphaerocarpa (Fox Banksia)*			
450.	1852	*Banksia telmatiaea (Swamp Fox Banksia)*			
451.	32033	*Banksia tortifolia*			
452.	32031	*Banksia vestita (Summer Dryandra)*			
453.	5382	*Beaufortia elegans (Elegant Beaufortia)*			
454.	5384	*Beaufortia eriocephala (Woolly Bottlebrush, Woolly Beaufortia)*		P3	
455.	46793	*Beaufortia kwongkanicola (Lesueur Beaufortia)*			
456.	5393	*Beaufortia squarrosa (Sand Beaufortia, Sand Bottlebrush, Puno)*			
457.	7046	*Bellardia trixago (Bellardia)*	Y		
458.	48868	*Bellardia viscosa*	Y		
459.	4594	*Beyeria cinerea*			
460.	34236	*Beyeria cinerea subsp. cinerea*		P3	
461.	25788	*Billardiera fraseri (Elegant Pronaya)*			
462.	20026	*Blennospora doliiformis*		P3	
463.	7856	*Blennospora drummondii*			
464.	11274	*Boronia coerulescens subsp. spinescens*			
465.	4437	*Boronia purdieana (Winter Boronia)*			
466.	17665	*Boronia purdieana subsp. purdieana*			
467.	4438	*Boronia ramosa*			
468.	11381	*Boronia ramosa subsp. anethifolia*			
469.	11564	*Boronia ramosa subsp. ramosa*			
470.	16639	*Boronia scabra subsp. scabra*			
471.	4443	*Boronia subsessilis*			
472.	48782	*Bossiaea angustifolia*			
473.	3710	*Bossiaea eriocarpa (Common Brown Pea)*			
474.	3719	*Bossiaea spinescens*			
475.	6341	*Brachyloma preissii (Globe Heath)*			
476.	7867	*Brachyscome bellidioides*			
477.	7878	*Brachyscome iberidifolia*			
478.	11187	*Brassica barrelieri subsp. oxyrrhina (Smooth-stem Turnip)*	Y		
479.	3000	*Brassica tournefortii (Mediterranean Turnip)*	Y		
480.	3002	*Cakile maritima (Sea Rocket)*	Y		
481.	2845	*Calandrinia brevipedata (Short-stalked Purslane)*			
482.	2846	*Calandrinia calyptrata (Pink Purslane)*			
483.	2848	*Calandrinia corrigioloides (Strap Purslane)*			
484.	2853	*Calandrinia eremaea (Twining Purslane)*			
485.	2854	*Calandrinia granulifera (Pygmy Purslane)*			
486.	2856	*Calandrinia liniflora (Parakeelya)*			
487.	44226	*Calandrinia oraria*		P3	
488.	16365	*Calandrinia sp. Kenwick (G.J. Keighery 10905)*			
489.	40827	*Calandrinia tholiformis*			
490.	5396	*Calothamnus accedens*		P4	
491.	5411	*Calothamnus hirsutus*			
492.	5421	*Calothamnus pachystachyus*		P4	
493.	5426	*Calothamnus quadrifidus (One-sided Bottlebrush, Kwowdjard)*			
494.	35816	*Calothamnus quadrifidus subsp. quadrifidus*			
495.	5429	*Calothamnus sanguineus (Silky-leaved Blood flower, Pindak)*			
496.	7902	*Calotis erinacea (Tangled Burr-daisy)*			
497.	5439	*Calytrix angulata (Yellow Starflower)*			
498.	5441	*Calytrix aurea*			
499.	48450	*Calytrix cravenii*			
500.	19980	*Calytrix ecalycata subsp. brevis*		P3	
501.	5458	*Calytrix flavescens (Summer Starflower)*			
502.	5460	*Calytrix fraseri (Pink Summer Calytrix)*			
503.	5465	*Calytrix leschenaultii*			
504.	5476	*Calytrix sapphirina*			
505.		*Calytrix sp.*			
506.	5479	*Calytrix strigosa*			
507.	5481	*Calytrix sylvana*			
508.	5485	*Calytrix variabilis*			
509.	18134	*Cannabis sativa*	Y		
510.	7909	*Carduus pycnocephalus (Slender Thistle)*	Y		
511.	7910	*Carduus tenuiflorus (Slender Thistle, Winged Slender Thistle, Sheep Thistle)*	Y		
512.	2794	*Carpobrotus aequilaterus (Angular Pigface)*	Y		
513.	2795	*Carpobrotus edulis (Hottentot Fig)*	Y		
514.	2796	*Carpobrotus modestus (Inland Pigface)*			
515.	2798	*Carpobrotus virescens (Coastal Pigface, Kolboko, Bain)*			
516.	2948	*Cassytha aurea*			
517.	12073	*Cassytha aurea var. aurea*			

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518.	11351	*Cassytha aurea var. hirta*			
519.	2951	*Cassytha flava (Dodder Laurel)*			
520.	2952	*Cassytha glabella (Tangled Dodder Laurel)*			
521.	11211	*Cassytha glabella forma dispar*			
522.	2956	*Cassytha pomiformis (Dodder Laurel)*			
523.	2957	*Cassytha racemosa (Dodder Laurel)*			
524.	11799	*Cassytha racemosa forma racemosa*			
525.	7916	*Centaurea melitensis (Maltese Cockspur, Malta Thistle)*	Y		
526.	17800	*Centaurium pulchellum*	Y		
527.	6214	*Centella asiatica*			
528.	2889	*Cerastium glomeratum (Mouse Ear Chickweed)*	Y		
529.	18156	*Chamaecytisus palmensis (Tagasaste)*	Y		
530.	35619	*Chamelaucium sp. Cataby (G.J. Keighery 11009)*		T	Y
531.	5498	*Chamelaucium uncinatum (Geraldton Wax)*			
532.	3169	*Cheiranthera preissiana*			
533.	2491	*Chenopodium macrospermum*	Y		
534.	2494	*Chenopodium murale (Nettle-leaf Goosefoot)*	Y		
535.	13112	*Chorizema aciculare subsp. aciculare*			
536.	13111	*Chorizema aciculare subsp. laxum*			
537.	13114	*Chorizema racemosum*			
538.	3764	*Chorizema varium (Bush Flame Pea)*		T	Y
539.	6543	*Cicendia filiformis (Slender Cicendia)*	Y		
540.	7937	*Cirsium vulgare (Spear Thistle, Scotch Thistle)*	Y		
541.	48838	*Citrullus amarus*	Y		
542.	10804	*Clematis linearifolia*			
543.	2929	*Clematis pubescens (Common Clematis)*			
544.	4549	*Comesperma acerosum*			
545.	4550	*Comesperma calymega (Blue-spike Milkwort)*			
546.	4551	*Comesperma ciliatum*			
547.	4552	*Comesperma confertum*			
548.	4555	*Comesperma integerrimum*			
549.	4560	*Comesperma rhadinocarpum (Slender-fruited Comesperma)*		P3	
550.	4561	*Comesperma scoparium (Broom Milkwort)*			
551.	4564	*Comesperma virgatum (Milkwort)*			
552.	4566	*Comesperma volubile (Love Creeper)*			
553.	40872	*Commersonia borealis*			
554.	1857	*Conospermum acerosum (Needle-leaved Smokebush)*			
555.	15607	*Conospermum acerosum subsp. acerosum*			
556.	15512	*Conospermum boreale subsp. ascendens*			
557.	1859	*Conospermum brachyphyllum*			
558.	15041	*Conospermum canaliculatum*			
559.	15516	*Conospermum canaliculatum subsp. canaliculatum*			
560.	1864	*Conospermum crassinervium (Summer Smokebush)*			
561.	15518	*Conospermum filifolium subsp. filifolium*			
562.	1874	*Conospermum glumaceum (Hooded Smokebush)*			
563.	1876	*Conospermum incurvum (Plume Smokebush)*			
564.	1878	*Conospermum nervosum*			
565.	1880	*Conospermum polycephalum*			
566.	1881	*Conospermum scaposum*		P3	
567.	1882	*Conospermum stoechadis (Common Smokebush)*			
568.	15520	*Conospermum stoechadis subsp. sclerophyllum*			
569.	15611	*Conospermum stoechadis subsp. stoechadis (Common Smokebush)*			
570.	1885	*Conospermum triplinervium (Tree Smokebush)*			
571.	19026	*Conostephium magnum*		P4	
572.	6347	*Conostephium minus (Pink-tipped Pearl flower)*			
573.	6348	*Conostephium pendulum (Pearl Flower)*			
574.	6349	*Conostephium preissii*			
575.	5502	*Conothamnus trinervis*			
576.	7939	*Conyza bonariensis (Flaxleaf Fleabane)*	Y		
577.	17104	*Corymbia calophylla (Marri)*			
578.	7944	*Cotula bipinnata (Ferny Cotula)*	Y		
579.	7945	*Cotula coronopifolia (Waterbuttons)*	Y		
580.	7946	*Cotula cotuloides (Smooth Cotula)*			
581.	13354	*Craspedia variabilis*			
582.	17701	*Crassula closiana*			
583.	3137	*Crassula colorata (Dense Stonecrop)*			
584.	11709	*Crassula colorata var. acuminata*			
585.	11563	*Crassula colorata var. colorata*			
586.	3138	*Crassula decumbens (Rufous Stonecrop)*			
587.	11349	*Crassula decumbens var. decumbens*			

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588.	3139	*Crassula exserta*			
589.	3140	*Crassula glomerata*	Y		
590.	3142	*Crassula natans*	Y		
591.	15706	*Crassula natans var. minus*	Y		
592.	3144	*Crassula peduncularis (Purple Stonecrop)*			
593.	29054	*Crepis foetida subsp. foetida (Stinking Hawksbeard)*	Y		
594.	13527	*Croninia kingiana*			
595.	13470	*Cryptandra arbutiflora var. arbutiflora*			
596.	31571	*Cryptandra intermedia*			
597.	4802	*Cryptandra mutila*			
598.	9076	*Cryptandra myriantha*			
599.	4804	*Cryptandra nutans*			
600.	4809	*Cryptandra pungens*			
601.	4810	*Cryptandra scoparia*			
602.	6663	*Cuscuta epithymum (Lesser Dodder, Greater Dodder)*	Y		
603.	11021	*Cuscuta planiflora*	Y		
604.	7425	*Dampiera carinata (Summer Dampiera)*			
605.	7428	*Dampiera coronata (Wedge-leaved Dampiera)*			
606.	7449	*Dampiera juncea (Rush-like Dampiera)*			
607.	7451	*Dampiera lavandulacea*			
608.	7453	*Dampiera lindleyi*			
609.	7454	*Dampiera linearis (Common Dampiera)*			
610.	7459	*Dampiera oligophylla (Sparse-leaved Dampiera)*			
611.	7475	*Dampiera spicigera (Spiked Dampiera)*			
612.	7481	*Dampiera tephrea*		P2	
613.	7482	*Dampiera teres (Terete-leaved Dampiera)*			
614.	5504	*Darwinia acerosa (Fine-leaved Darwinia)*		T	
615.	5507	*Darwinia carnea (Mogumber Bell)*		T	
616.	5518	*Darwinia neildiana (Fringed Bell)*			
617.	5524	*Darwinia pinifolia*			
618.	6218	*Daucus glochidiatus (Australian Carrot)*			
619.	3793	*Daviesia angulata*			
620.	3805	*Daviesia decurrens (Prickly Bitter-pea)*			
621.	19747	*Daviesia decurrens subsp. decurrens*			
622.	19746	*Daviesia decurrens subsp. hamata*			
623.	3807	*Daviesia divaricata (Marno)*			
624.	18560	*Daviesia divaricata subsp. divaricata*			
625.	15505	*Daviesia incrassata subsp. incrassata*			
626.	15506	*Daviesia incrassata subsp. teres*			
627.	12329	*Daviesia nudiflora subsp. hirtella*			
628.	16585	*Daviesia nudiflora subsp. nudiflora*			
629.	3833	*Daviesia podophylla*			
630.	3835	*Daviesia preissii*			
631.	3845	*Daviesia triflora*			
632.	29279	*Dicrastylis globiflora*			
633.	3863	*Dillwynia dillwynioides*		P3	
634.	20367	*Dillwynia laxiflora*			
635.	4453	*Diplolaena angustifolia (Yanchep Rose)*			
636.	15275	*Diplolaena obovata*			
637.	18541	*Diplopeltis huegelii subsp. huegelii*			
638.	18589	*Diplopeltis huegelii subsp. lehmannii*			
639.	3011	*Diplotaxis muralis (Wall Rocket)*	Y		
640.	7054	*Dischisma arenarium*	Y		
641.	7055	*Dischisma capitatum (Woolly-headed Dischisma)*	Y		
642.	4754	*Dodonaea aptera (Coast Hop-bush)*			
643.	4761	*Dodonaea ericoides*			
644.	4763	*Dodonaea hackettiana (Hackett s Hopbush)*		P4	
645.	4775	*Dodonaea pinifolia*			
646.	3090	*Drosera barbigera*			
647.	13381	*Drosera citrina*			
648.	13203	*Drosera closterostigma*			
649.	48751	*Drosera drummondii*			
650.	13201	*Drosera eneabba*			
651.	3095	*Drosera erythrorhiza (Red Ink Sundew)*			
652.	3097	*Drosera gigantea (Giant Sundew)*			
653.	3098	*Drosera glanduligera (Pimpernel Sundew)*			
654.	3101	*Drosera heterophylla (Swamp Rainbow)*			
655.	48768	*Drosera hirsuta*			
656.	8910	*Drosera humilis*			
657.	13199	*Drosera leioblastus*		P1	

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658.	3105	*Drosera leucoblasta (Wheel Sundew)*			
659.	3106	*Drosera macrantha (Bridal Rainbow)*			
660.	48767	*Drosera magna*			
661.	3109	*Drosera menziesii (Pink Rainbow)*			
662.	48710	*Drosera micrantha*			
663.	15710	*Drosera miniata (Orange Sundew)*			
664.	48709	*Drosera minutiflora*			
665.	3113	*Drosera neesii (Jewel Rainbow)*			
666.	3115	*Drosera occidentalis (Western Sundew)*		P4	
667.	3118	*Drosera pallida (Pale Rainbow)*			
668.	19922	*Drosera pedicellaris*		P1	
669.	29178	*Drosera porrecta*			
670.	48789	*Drosera prophylla*		P3	
671.	3124	*Drosera pulchella (Pretty Sundew)*			
672.	3128	*Drosera ramellosa (Branched Sundew)*			
673.	8911	*Drosera rosulata*			
674.	49090	*Drosera sp. Branched styles (S.C. Coffey 193)*			
675.	13185	*Drosera spilos*			
676.	3131	*Drosera stolonifera (Leafy Sundew)*			
677.	3133	*Drosera subhirtella (Sunny Rainbow)*			
678.	8915	*Drosera thysanosepala (Fringed Rainbow)*			
679.	3135	*Drosera zonaria (Painted Sundew)*			
680.	6681	*Echium plantagineum (Paterson s Curse)*	Y		
681.	5187	*Elatine gratioloides (Waterwort)*			
682.	13949	*Eremaea asterocarpa*			
683.	13950	*Eremaea asterocarpa subsp. asterocarpa*			
684.	5537	*Eremaea beaufortioides*			
685.	5540	*Eremaea fimbriata*			
686.	5541	*Eremaea pauciflora*			
687.	14103	*Eremaea pauciflora var. calyptra*			
688.	13818	*Eremaea pauciflora var. lonchophylla*			
689.	14104	*Eremaea pauciflora var. pauciflora*			
690.	5542	*Eremaea purpurea*			
691.	7215	*Eremophila glabra (Tar Bush)*			
692.	17175	*Eremophila glabra subsp. albicans*			
693.	14193	*Eremophila glabra subsp. carnosa*			
694.	45244	*Ericomyrtus serpyllifolia*			
695.	45215	*Ericomyrtus tenuior*			
696.	4332	*Erodium botrys (Long Storksbill)*	Y		
697.	4333	*Erodium cicutarium (Common Storksbill)*	Y		
698.	41800	*Eryngium pinnatifidum subsp. Umbraphilum (G.J. Keighery 13967)*		P2	
699.		*Eryngium sp. Bashford JB28*			Y
700.	41810	*Eryngium sp. Subdecumbens (G.J. Keighery 5390)*		P3	
701.		*Eryngium sp. bashfords SAP*			Y
702.	12898	*Eucalyptus abdita*		P2	
703.	13092	*Eucalyptus annuliformis*		P1	Y
704.	13091	*Eucalyptus argutifolia (Wabling Hill Mallee)*		T	
705.	35345	*Eucalyptus camaldulensis subsp. obtusa (Blunt-budded River Red Gum)*			
706.	5615	*Eucalyptus decipiens (Limestone Marlock, Moit)*			
707.	5616	*Eucalyptus decurva (Slender Mallee)*			
708.	15494	*Eucalyptus diminuta*			
709.	5628	*Eucalyptus drummondii (Drummond s Gum)*			
710.	5649	*Eucalyptus foecunda (Narrow-leaved Red Mallee)*			
711.	5658	*Eucalyptus gittinsii (Northern Sandplain Mallee)*			
712.	18292	*Eucalyptus gittinsii subsp. illucida*			
713.	5659	*Eucalyptus gomphocephala (Tuart, Duart)*			
714.	5690	*Eucalyptus lane-poolei (Salmon White Gum)*			
715.	11295	*Eucalyptus loxophleba subsp. loxophleba (York Gum)*			
716.	13531	*Eucalyptus macrocarpa subsp. elachantha (Small-leaved Mottlecah)*		P4	
717.	13530	*Eucalyptus macrocarpa subsp. macrocarpa (Mottlecah)*			
718.	13548	*Eucalyptus marginata subsp. thalassica (Blue-leaved Jarrah)*			
719.	5717	*Eucalyptus myriadena*			
720.	13541	*Eucalyptus petrensis*			
721.	12867	*Eucalyptus pluricaulis*			
722.	12866	*Eucalyptus pluricaulis subsp. pluricaulis*			
723.	5763	*Eucalyptus rudis (Flooded Gum, Kulurda)*			
724.	13511	*Eucalyptus rudis subsp. rudis*			
725.	5790	*Eucalyptus todtiana (Coastal Blackbutt)*			
726.	5797	*Eucalyptus wandoo (Wandoo, Wondu)*			
727.	12905	*Eucalyptus wandoo subsp. pulverea*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
728.	12906	*Eucalyptus wandoo subsp. wandoo*			
729.	16915	*Eucalyptus x mundijongensis*		P1	
730.	3872	*Euchilopsis linearis (Swamp Pea)*			
731.	15137	*Euchiton sphaericus*			
732.	4636	*Euphorbia paralias (Sea Spurge)*	Y		
733.	4648	*Euphorbia terracina (Geraldton Carnation Weed)*	Y		
734.	3879	*Eutaxia parvifolia*			
735.	3880	*Eutaxia virgata*			
736.	10977	*Exocarpos aphyllus (Leafless Ballart)*			
737.	10765	*Exocarpos sparteus (Broom Ballart, Djuk)*			
738.	6221	*Foeniculum vulgare (Fennel)*	Y		
739.	5209	*Frankenia pauciflora (Seaheath)*			
740.	2969	*Fumaria capreolata (Whiteflower Fumitory)*	Y		
741.	7321	*Galium divaricatum*	Y		
742.	7323	*Galium murale (Small Goosegrass)*	Y		
743.	3887	*Gastrolobium acutum*			
744.	20515	*Gastrolobium axillare*			
745.	3894	*Gastrolobium callistachys (Rock Poison)*			
746.	20475	*Gastrolobium capitatum*			
747.	20505	*Gastrolobium celsianum*			
748.	3906	*Gastrolobium ilicifolium*			
749.	20483	*Gastrolobium linearifolium*			
750.	20482	*Gastrolobium nervosum*			
751.	20514	*Gastrolobium nudum*		P2	
752.	3910	*Gastrolobium obovatum (Boat-leaved Poison)*			
753.	3912	*Gastrolobium oxylobioides (Champion Bay Poison)*			
754.	3916	*Gastrolobium polystachyum (Horned Poison)*			
755.	3924	*Gastrolobium spinosum (Prickly Poison)*			
756.	3933	*Gastrolobium villosum (Crinkle-leaved Poison)*			
757.	4483	*Geleznowia verrucosa*			
758.	4339	*Geranium molle (Dove s Foot Cranesbill)*	Y		
759.	4340	*Geranium retrorsum*			
760.	4341	*Geranium solanderi (Native Geranium)*			
761.	46134	*Glebionis segetum*	Y		
762.	6143	*Glischrocaryon aureum (Common Popflower)*			
763.	7060	*Glossostigma diandrum*			
764.	7983	*Gnaphalium indutum (Tiny Cudweed)*			
765.	12624	*Gnephosis angianthoides*			
766.	7991	*Gnephosis drummondii*			
767.	8002	*Gnephosis tenuissima*			
768.		*Gnephosis tenuissima - drummondii complex*			
769.		*Gnephosis tenuissima-drummondii complex*			
770.	3945	*Gompholobium aristatum*			
771.	10909	*Gompholobium confertum*			
772.	3950	*Gompholobium knightianum*			
773.	3955	*Gompholobium preissii*			
774.	19295	*Gompholobium pungens*			
775.	11083	*Gompholobium scabrum*			
776.	3956	*Gompholobium shuttleworthii*			
777.	3957	*Gompholobium tomentosum (Hairy Yellow Pea)*			
778.	6149	*Gonocarpus cordiger*			
779.	6161	*Gonocarpus pithyoides*			
780.	7488	*Goodenia affinis (Silver Goodenia)*			
781.	7491	*Goodenia arthrotricha*		T	
782.	7495	*Goodenia berardiana*			
783.	29362	*Goodenia coerulea*			
784.	12516	*Goodenia convexa*			
785.	12520	*Goodenia fasciculata*			
786.	12522	*Goodenia glareicola*			
787.	12551	*Goodenia micrantha*			
788.	7538	*Goodenia pulchella*			
789.	19286	*Goodenia pulchella subsp. Coastal Plain A (M. Hislop 634)*			
790.	19284	*Goodenia pulchella subsp. Coastal Plain B (L.W. Sage 2336)*			
791.	7566	*Goodenia xanthotricha (Yellow-haired Goodenia)*		P2	
792.	7063	*Gratiola pedunculata (Stalked Brooklime)*		P2	
793.	14282	*Gratiola pubescens*			
794.	15763	*Grevillea biformis subsp. biformis*			
795.	1965	*Grevillea biternata*			
796.	12221	*Grevillea calliantha*		T	
797.	1982	*Grevillea crithmifolia*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
798.	1994	*Grevillea drummondii (Drummond s Grevillea)*		P4	
799.	1997	*Grevillea endlicheriana (Spindly Grevillea)*			
800.	2001	*Grevillea eriostachya (Flame Grevillea, Kaliny-kalinypa)*			
801.	15813	*Grevillea evanescens*		P1	
802.	19567	*Grevillea florida*		P3	
803.	8836	*Grevillea obtusifolia (Obtuse Leaved Grevillea)*			
804.	2054	*Grevillea olivacea (Olive Grevillea)*		P4	
805.	2066	*Grevillea pilulifera (Woolly-flowered Grevillea)*			
806.	2071	*Grevillea polybotrya*			
807.	15839	*Grevillea preissii subsp. preissii*			
808.	2086	*Grevillea rudis*		P4	
809.	2087	*Grevillea saccata (Pouched Grevillea)*		P4	
810.	17745	*Grevillea shuttleworthiana subsp. canarina*			
811.	17450	*Grevillea synapheae subsp. minyulo*		P1	
812.	14420	*Grevillea synapheae subsp. pachyphylla*			
813.	14421	*Grevillea synapheae subsp. synapheae*			
814.	14423	*Grevillea thyrsoides subsp. thyrsoides*		P3	
815.	2115	*Grevillea umbellulata*			
816.	2116	*Grevillea uncinulata (Hook-leaf Grevillea)*			
817.	19231	*Grevillea uncinulata subsp. Coomallo (S.J. Patrick 719)*			
818.	13900	*Grevillea uniformis*		P3	
819.	12824	*Grevillea vestita subsp. vestita*			
820.	13233	*Guichenotia alba*		P3	
821.	5011	*Guichenotia ledifolia*			
822.	5013	*Guichenotia micrantha (Small Flowered Guichenotia)*			
823.	5014	*Guichenotia sarotes*			
824.	2783	*Gyrostemon racemiger*			
825.	2784	*Gyrostemon ramulosus (Corkybark)*			
826.	16084	*Gyrostemon sp. Mogumber (T.J. Hawkeswood 250)*		P1	Y
827.	2788	*Gyrostemon subnudus*			
828.	17670	*Hakea anadenia*			
829.	2131	*Hakea auriculata*			
830.	12225	*Hakea brownii*			
831.	2135	*Hakea bucculenta (Red Pokers)*			
832.	2136	*Hakea candolleana*			
833.	2143	*Hakea conchifolia (Shell-leaved Hakea)*			
834.	2146	*Hakea costata (Ribbed Hakea)*			
835.	2164	*Hakea gilbertii*			
836.	2166	*Hakea incrassata (Marble Hakea)*			
837.	2175	*Hakea lissocarpha (Honey Bush)*			
838.	12230	*Hakea longiflora*		P3	
839.	2179	*Hakea marginata*			
840.	45333	*Hakea neospathulata*			
841.	13336	*Hakea obliqua subsp. parviflora*			
842.	35502	*Hakea oligoneura*		P2	
843.	2197	*Hakea prostrata (Harsh Hakea)*			
844.	12233	*Hakea psilorrhyncha*			
845.	2203	*Hakea ruscifolia (Candle Hakea)*			
846.	2205	*Hakea smilacifolia*			
847.	2206	*Hakea stenocarpa (Narrow-fruited Hakea)*			
848.	2212	*Hakea sulcata (Furrowed Hakea)*			
849.	2214	*Hakea trifurcata (Two-leaf Hakea)*			
850.	2215	*Hakea undulata (Wavy-leaved Hakea)*			
851.	2216	*Hakea varia (Variable-leaved Hakea)*			
852.	6168	*Haloragis aculeolata*		P2	
853.	3961	*Hardenbergia comptoniana (Native Wisteria)*			
854.	3016	*Heliophila pusilla*	Y		
855.	16933	*Hemiandra glabra*			
856.	6837	*Hemiandra leiantha*			
857.	6838	*Hemiandra linearis (Speckled Snakebush)*			
858.	6839	*Hemiandra pungens (Snakebush)*			
859.	38320	*Hemiandra sp. Jurien (B.J. Conn & M.E. Tozer BJC 3885)*			
860.	6842	*Hemigenia barbata*			
861.	6849	*Hemigenia diplanthera*			
862.	6855	*Hemigenia humilis*			
863.	6856	*Hemigenia incana (Silky Hemigenia)*			
864.	6871	*Hemigenia sericea (Silky Hemigenia)*			
865.	33796	*Hemigenia wandooana*			
866.	41020	*Hemiphora bartlingii (Woolly Dragon)*			
867.	41042	*Hemiphora uncinata*			

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868.	5108	*Hibbertia acerosa (Needle Leaved Guinea Flower)*			
869.	5112	*Hibbertia aurea*			
870.	5114	*Hibbertia commutata*			
871.	5116	*Hibbertia crassifolia*			
872.	5120	*Hibbertia desmophylla*			
873.	19778	*Hibbertia glomerata subsp. darlingensis*			
874.	19775	*Hibbertia glomerata subsp. ginginensis*		P2	
875.	20059	*Hibbertia hemignosta*			
876.	20046	*Hibbertia hibbertioides var. hibbertioides*			
877.	5134	*Hibbertia huegelii*			
878.	5135	*Hibbertia hypericoides (Yellow Buttercups)*			
879.	45534	*Hibbertia hypericoides subsp. hypericoides*			
880.	5148	*Hibbertia mylnei*			
881.	5157	*Hibbertia polystachya*			
882.	5162	*Hibbertia racemosa (Stalked Guinea Flower)*			
883.	43280	*Hibbertia sericosepala*			
884.		*Hibbertia sp.*			
885.	5171	*Hibbertia spicata*			
886.	11461	*Hibbertia spicata subsp. leptotheca*		P3	
887.	11481	*Hibbertia spicata subsp. spicata*			
888.	48696	*Hibbertia squarrosa*			
889.	5172	*Hibbertia stellaris (Orange Stars)*			
890.	19683	*Hibbertia stenophylla*			
891.	48381	*Hibbertia striata*			
892.	5173	*Hibbertia subvaginata*			
893.	5176	*Hibbertia vaginata*			
894.	6222	*Homalosciadium homalocarpum*			
895.	5816	*Homalospermum firmum*			
896.	18137	*Hornungia procumbens*	Y		
897.	3966	*Hovea pungens (Devil s Pins, Puyenak)*			
898.	3967	*Hovea stricta*			
899.	3968	*Hovea trisperma (Common Hovea)*			
900.	12859	*Hovea trisperma var. trisperma*			
901.	12741	*Hyalosperma cotula*			
902.	5216	*Hybanthus calycinus (Wild Violet)*			
903.	5221	*Hybanthus floribundus*			
904.	6223	*Hydrocotyle alata*			
905.	6229	*Hydrocotyle diantha*			
906.	6232	*Hydrocotyle hispidula*			
907.	11546	*Hydrocotyle pilifera var. glabrata*			
908.	6241	*Hydrocotyle tetragonocarpa*			
909.	5817	*Hypocalymma angustifolium (White Myrtle, Kudjid)*			
910.	35074	*Hypocalymma angustifolium subsp. Dandaragan plateau (S. Patrick 702A)*			
911.	35070	*Hypocalymma angustifolium subsp. Swan Coastal Plain (G.J. Keighery 16777)*			
912.	14080	*Hypocalymma serrulatum*		P2	
913.	14493	*Hypocalymma sp. Cataby (G.J. Keighery 5151)*		P2	
914.	31431	*Hypocalymma sp. Nambung (R. Spjut & R. Smith s.n. 22/09/1992)*			
915.	5828	*Hypocalymma tetrapterum*		P3	
916.	5829	*Hypocalymma xanthopetalum*			
917.	8086	*Hypochaeris glabra (Smooth Catsear)*	Y		
918.	2219	*Isopogon adenanthoides (Spider Coneflower)*			
919.	2221	*Isopogon asper*			
920.	2227	*Isopogon divergens (Spreading Coneflower)*			
921.	29775	*Isopogon drummondii*		P3	
922.	2229	*Isopogon dubius (Pincushion Coneflower)*			
923.	2232	*Isopogon linearis*			
924.	19996	*Isopogon sp. Darling Range (F. Hort 1662)*			
925.	2238	*Isopogon teretifolius (Nodding Coneflower)*			
926.	7396	*Isotoma hypocrateriformis (Woodbridge Poison)*			
927.	7398	*Isotoma pusilla (Small Isotome)*			
928.	7399	*Isotoma scapigera (Long-scaped Isotome)*			
929.	3992	*Isotropis cuneifolia (Granny Bonnets)*			
930.	19700	*Isotropis cuneifolia subsp. cuneifolia*			
931.	16317	*Isotropis cuneifolia subsp. glabra*		P3	
932.	3993	*Isotropis drummondii (Lamb Poison)*			
933.	3995	*Isotropis juncea (Slender Lamb Poison)*			
934.	14783	*Jacksonia calcicola*			
935.	4003	*Jacksonia carduacea*		P3	
936.	4010	*Jacksonia floribunda (Holly Pea)*			
937.	4012	*Jacksonia furcellata (Grey Stinkwood)*			

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938.	4015	*Jacksonia hakeoides*			
939.	4018	*Jacksonia lehmannii*			
940.	4019	*Jacksonia macrocalyx*			
941.	14778	*Jacksonia nutans*			
942.	4025	*Jacksonia restioides*			
943.	4029	*Jacksonia sternbergiana (Stinkwood, Kapur)*			
944.	4044	*Kennedia prostrata (Scarlet Runner)*			
945.	15498	*Kunzea glabrescens (Spearwood)*			
946.	5835	*Kunzea micrantha*			
947.	17461	*Kunzea micrantha subsp. micrantha*			
948.	17785	*Kunzea micrantha subsp. petiolata*			
949.	17505	*Kunzea praestans*			
950.	3664	*Labichea cassioides*			
951.	11289	*Labichea lanceolata subsp. lanceolata*			
952.	6777	*Lachnostachys albicans*			
953.	6780	*Lachnostachys eriobotrya (Lambswool)*			
954.	6781	*Lachnostachys ferruginea (Rusty Lambstail)*			
955.	18585	*Lagenophora huegelii*			
956.	14083	*Lambertia multiflora var. darlingensis*			
957.	15528	*Lambertia multiflora var. multiflora*			
958.	5031	*Lasiopetalum drummondii*			
959.	5036	*Lasiopetalum lineare*			
960.	45083	*Lasiopetalum venustum*		P3	Y
961.	4052	*Latrobea tenella*			
962.	7568	*Lechenaultia biloba (Blue Leschenaultia)*			
963.	7574	*Lechenaultia floribunda (Free-flowering Leschenaultia)*			
964.	7580	*Lechenaultia linarioides (Yellow Leschenaultia)*			
965.	7586	*Lechenaultia stenosepala (Narrow-sepaled Leschenaultia)*			
966.	7590	*Lechenaultia tubiflora (Heath Leschenaultia)*			
967.	8099	*Leontodon saxatilis (Hairy Hawkbit)*	Y		
968.	3027	*Lepidium foliosum (Leafy Peppercress)*			
969.	3044	*Lepidium rotundum (Veined Peppercress)*			
970.	2344	*Leptomeria empetriformis*			
971.	2350	*Leptomeria pauciflora (Sparse-flowered Currant Bush)*			
972.	2352	*Leptomeria preissiana*			
973.	17852	*Leptorhynchos scaber (Lanky Buttons)*			
974.	5847	*Leptospermum erubescens (Roadside Teatree)*			
975.	5857	*Leptospermum spinescens*			
976.	6354	*Leucopogon allittii*		P3	
977.	6360	*Leucopogon australis (Spiked Beard-heath)*			
978.	6369	*Leucopogon cinereus*			
979.	6370	*Leucopogon cochlearifolius*			
980.	6374	*Leucopogon conostephioides*			
981.	48179	*Leucopogon foliosus*		P3	
982.	6400	*Leucopogon gracillimus*			
983.	6405	*Leucopogon insularis*			
984.	6420	*Leucopogon oldfieldii*			
985.	6421	*Leucopogon oliganthus*			
986.	6425	*Leucopogon oxycedrus*			
987.	6427	*Leucopogon parviflorus (Coast Beard-heath)*			
988.	6430	*Leucopogon planifolius*			
989.	6434	*Leucopogon polymorphus*			
990.	6436	*Leucopogon propinquus*			
991.	6440	*Leucopogon racemulosus*			
992.	39501	*Leucopogon sp. Coomallo (R.J. Cranfield 1457)*			
993.	20086	*Leucopogon sp. Northern Scarp (M. Hislop 2233)*			
994.	19460	*Leucopogon sp. Yanchep (M. Hislop 1986)*		P3	
995.	6444	*Leucopogon sprengelioides*			
996.	6445	*Leucopogon squarrosus*			
997.	40804	*Leucopogon squarrosus subsp. trigynus*		P2	
998.	48184	*Leucopogon stenophyllus*			
999.	7673	*Levenhookia pauciflora (Deceptive Stylewort)*			
1000.	7677	*Levenhookia stipitata (Common Stylewort)*			
1001.	4362	*Linum marginale (Wild Flax)*			
1002.	36160	*Liparophyllum capitatum*			
1003.	9289	*Lobelia anceps (Angled Lobelia)*			
1004.	7403	*Lobelia heterophylla (Wing-seeded Lobelia)*			
1005.	36863	*Lobelia heterophylla subsp. heterophylla*			
1006.	7406	*Lobelia rhombifolia (Tufted Lobelia)*			
1007.	7407	*Lobelia rhytidosperma (Wrinkled-seeded Lobelia)*			

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1008.	7408	*Lobelia tenuior (Slender Lobelia)*			
1009.	6515	*Logania vaginalis (White Spray)*			
1010.	4059	*Lotus angustissimus (Narrowleaf Trefoil)*	Y		
1011.	8564	*Lotus subbiflorus*	Y		
1012.	4066	*Lupinus cosentinii*	Y		
1013.	2396	*Lysiana casuarinae*			
1014.	36375	*Lysimachia arvensis (Pimpernel)*	Y		
1015.	6456	*Lysinema ciliatum (Curry Flower)*			
1016.	6458	*Lysinema elegans*			
1017.	34736	*Lysinema pentapetalum*			
1018.	5281	*Lythrum hyssopifolia (Lesser Loosestrife)*	Y		
1019.	2838	*Macarthuria apetala*			
1020.	2839	*Macarthuria australis*			
1021.	17106	*Macarthuria keigheryi*		T	
1022.	4961	*Malva parviflora (Marshmallow)*	Y		
1023.	31351	*Malva preissiana*			
1024.	17633	*Marianthus erubescens*			
1025.	25819	*Marianthus paralius*		T	
1026.	6881	*Marrubium vulgare (Horehound)*	Y		
1027.	4079	*Medicago polymorpha (Burr Medic)*	Y		
1028.	37580	*Melaleuca acutifolia*			
1029.	19381	*Melaleuca caeca*			
1030.	19380	*Melaleuca calyptroides*			
1031.	5887	*Melaleuca cardiophylla (Tangling Melaleuca)*			
1032.	17982	*Melaleuca carrii*			
1033.	5888	*Melaleuca ciliosa*			
1034.	19387	*Melaleuca clavifolia*			
1035.	5893	*Melaleuca concreta*			
1036.	5900	*Melaleuca cuticularis (Saltwater Paperbark)*			
1037.	19952	*Melaleuca dichroma*			
1038.	5920	*Melaleuca huegelii (Chenille Honeymyrtle)*			
1039.	13271	*Melaleuca huegelii subsp. huegelii*			
1040.	13273	*Melaleuca incana subsp. incana*			
1041.	5925	*Melaleuca lateriflora (Gorada)*			
1042.	5926	*Melaleuca lateritia (Robin Redbreast Bush)*			
1043.	5952	*Melaleuca preissiana (Moonah)*			
1044.	5958	*Melaleuca radula (Graceful Honeymyrtle)*			
1045.	5959	*Melaleuca rhaphiophylla (Swamp Paperbark)*			
1046.	5964	*Melaleuca seriata*			
1047.	33022	*Melaleuca sp. Wanneroo (G.J. Keighery 16705)*		T	
1048.	18598	*Melaleuca systena*			
1049.	5978	*Melaleuca teretifolia (Banbar)*			
1050.	5981	*Melaleuca thyoides*			
1051.	5983	*Melaleuca trichophylla*			
1052.	5986	*Melaleuca urceolaris*			
1053.	5987	*Melaleuca viminea (Mohan)*			
1054.	13280	*Melaleuca viminea subsp. viminea*			
1055.	4085	*Melilotus indicus*	Y		
1056.	6884	*Mentha spicata (Spearmint)*	Y		
1057.	2813	*Mesembryanthemum crystallinum (Iceplant)*	Y		
1058.	15456	*Microcorys sp. Coomallo (L. Haegi 2677)*			
1059.	8105	*Millotia myosotidifolia*			
1060.	8106	*Millotia tenuifolia (Soft Millotia)*			
1061.	14344	*Millotia tenuifolia var. tenuifolia (Soft Millotia)*			
1062.	4091	*Mirbelia floribunda (Purple Mirbelia)*			
1063.	4100	*Mirbelia spinosa*			
1064.	4104	*Mirbelia trichocalyx*			
1065.	29418	*Monoculus monstrosus*	Y		
1066.	7410	*Monopsis debilis*	Y		
1067.	37440	*Monopsis debilis var. depressa*	Y		
1068.	4662	*Monotaxis grandiflora (Diamond of the Desert)*			
1069.	19585	*Monotaxis grandiflora var. grandiflora*			
1070.	4666	*Monotaxis occidentalis*			
1071.	2412	*Muehlenbeckia adpressa (Climbing Lignum)*			
1072.	2415	*Muehlenbeckia polybotrya*			
1073.	7289	*Myoporum caprarioides (Slender Myoporum)*			
1074.	7291	*Myoporum insulare (Blueberry Tree, boobialla)*			
1075.	8114	*Myriocephalus appendiculatus (White-tip Myriocephalus)*			
1076.	8117	*Myriocephalus helichrysoides*			
1077.	14187	*Myriocephalus occidentalis*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
1078.	17925	*Myriocephalus oldfieldii*			
1079.	6195	*Myriophyllum limnophilum*			
1080.	4366	*Nitraria billardierei (Nitre Bush)*			
1081.	2401	*Nuytsia floribunda (Christmas Tree, Mudja)*			
1082.	16390	*Oenothera drummondii subsp. drummondii*	Y		
1083.	6139	*Oenothera glazioviana (Evening Primrose)*	Y		
1084.	14293	*Oenothera indecora subsp. bonariensis*	Y		
1085.	2365	*Olax benthamiana*			
1086.	2367	*Olax scalariformis*			
1087.	8127	*Olearia axillaris (Coastal Daisybush)*			
1088.	32716	*Olearia lehmanniana*			
1089.	8143	*Olearia paucidentata (Autumn Scrub Daisy)*			
1090.	8149	*Olearia rudis (Rough Daisybush)*			
1091.	42024	*Olearia sp. Kennedy Range (G. Byrne 66)*			
1092.	8154	*Onopordum acaulon (Stemless Onopordon, Stemless Thistle)*	Y		
1093.	18256	*Opercularia spermacocea*			
1094.	18255	*Opercularia vaginata (Dog Weed)*			
1095.	46255	*Orianthera campanulata*			
1096.	46254	*Orianthera spermacocea*			
1097.	36177	*Ornduffia albiflora*			
1098.	4113	*Ornithopus compressus (Yellow Serradella)*	Y		
1099.	7122	*Orobanche minor (Lesser Broomrape)*	Y		
1100.	4355	*Oxalis perennans*			
1101.	7089	*Parentucellia latifolia (Common Bartsia)*	Y		
1102.	1762	*Parietaria debilis (Pellitory)*			
1103.	4346	*Pelargonium littorale*			
1104.	6006	*Pericalymma ellipticum (Swamp Teatree)*			
1105.	16477	*Pericalymma ellipticum var. ellipticum*			
1106.	16478	*Pericalymma ellipticum var. floridum*			
1107.	13911	*Persicaria decipiens*			
1108.	11052	*Persicaria prostrata*			
1109.	2258	*Persoonia comata*			
1110.	2262	*Persoonia elliptica (Spreading Snottygobble)*			
1111.	2270	*Persoonia quinquenervis*			
1112.	2271	*Persoonia rudis*		P3	
1113.	15632	*Persoonia stricta*			
1114.	2281	*Persoonia trinervis*			
1115.	20368	*Petrophile axillaris*			
1116.	2285	*Petrophile biternata*		P3	
1117.	2286	*Petrophile brevifolia*			
1118.	48780	*Petrophile brevifolia subsp. rosea*			
1119.	2288	*Petrophile chrysantha*			
1120.	2292	*Petrophile divaricata*			
1121.	2297	*Petrophile heterophylla (Variable-leaved Cone Bush)*			
1122.	20391	*Petrophile juncifolia*			
1123.	2299	*Petrophile linearis (Pixie Mops)*			
1124.	2301	*Petrophile macrostachya*			
1125.	16874	*Petrophile recurva*			
1126.	2306	*Petrophile rigida*			
1127.	10784	*Petrophile scabriuscula*			
1128.	2308	*Petrophile seminuda*			
1129.	2309	*Petrophile serruriae*			
1130.	2310	*Petrophile shuttleworthiana*			
1131.	2312	*Petrophile striata*			
1132.	19825	*Petrorhagia dubia*	Y		
1133.	18529	*Philotheca spicata (Pepper and Salt)*			
1134.	19417	*Philotheca spicata subsp. Moore River National Park (G. & D. Woodman Op 47)*			Y
1135.	16825	*Phyllangium divergens*			
1136.	16177	*Phyllangium paradoxum*			
1137.	4675	*Phyllanthus calycinus (False Boronia)*			
1138.	4141	*Phyllota gracilis*			
1139.	6983	*Physalis peruviana (Cape Gooseberry)*	Y		
1140.	6985	*Physalis pubescens*	Y		
1141.	6009	*Pileanthus filifolius (Summer Coppercups)*			
1142.	33460	*Pilostyles coccoidea*			
1143.	2408	*Pilostyles hamiltonii*			
1144.	5231	*Pimelea angustifolia (Narrow-leaved Pimelea)*			
1145.	5232	*Pimelea argentea (Silvery Leaved Pimelea)*			
1146.	11667	*Pimelea brevistyla subsp. brevistyla*			
1147.	5237	*Pimelea calcicola*		P3	

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
1148.	5243	*Pimelea ferruginea*			
1149.	5244	*Pimelea floribunda*			
1150.	5246	*Pimelea gilgiana*			
1151.	11404	*Pimelea imbricata var. major*			
1152.	11402	*Pimelea imbricata var. piligera*			
1153.	5254	*Pimelea leucantha*			
1154.	12041	*Pimelea suaveolens subsp. suaveolens*			
1155.	5268	*Pimelea sulphurea (Yellow Banjine)*			
1156.	5269	*Pimelea sylvestris*			
1157.	42281	*Pithocarpa cordata*			
1158.	18353	*Pithocarpa pulchella var. pulchella*			
1159.	19744	*Pittosporum angustifolium*			
1160.	19745	*Pittosporum ligustrifolium*			
1161.	7297	*Plantago coronopus (Buckshorn Plantain)*	Y		
1162.	7304	*Plantago major (Greater Plantain)*	Y		
1163.	6255	*Platysace juncea*			
1164.	11132	*Platysace ramosissima*		P3	
1165.	6260	*Platysace teres*			
1166.	6262	*Platysace xerophila*			
1167.	4524	*Platytheca galioides*			
1168.	45237	*Podolepis aristata subsp. aristata*			
1169.	8175	*Podolepis gracilis (Slender Podolepis)*			
1170.	8177	*Podolepis lessonii*			
1171.	8182	*Podotheca angustifolia (Sticky Longheads)*			
1172.	8183	*Podotheca chrysantha (Yellow Podotheca)*			
1173.	8184	*Podotheca gnaphalioides (Golden Long-heads)*			
1174.	12733	*Podotheca pritzelii*		P3	
1175.		*Podotheca sp.*			
1176.	8188	*Pogonolepis stricta*			
1177.	29919	*Polianthion wichurae*			
1178.	2905	*Polycarpon tetraphyllum (Fourleaf Allseed)*	Y		
1179.	4689	*Poranthera ericoides (Heath Poranthera)*			
1180.	4691	*Poranthera microphylla (Small Poranthera)*			
1181.	8189	*Pseudognaphalium luteoalbum (Jersey Cudweed)*			
1182.	13255	*Pterochaeta paniculata*			
1183.	2718	*Ptilotus drummondii (Narrowleaf Mulla Mulla)*			
1184.	11260	*Ptilotus drummondii var. drummondii (Pussytail)*			
1185.	2733	*Ptilotus humilis*			
1186.	2742	*Ptilotus manglesii (Pom Poms, Mulamula)*			
1187.	2751	*Ptilotus polystachyus (Prince of Wales Feather)*			
1188.	2763	*Ptilotus stirlingii (Stirling s Mulla Mulla)*			
1189.	40841	*Ptilotus stirlingii subsp. stirlingii*			
1190.	4161	*Ptychosema pusillum (Dwarf Pea)*		T	
1191.	8195	*Quinetia urvillei*			
1192.	41060	*Quoya dilatata*			
1193.	11190	*Ranunculus pumilio var. pumilio*			
1194.	2937	*Ranunculus sessiliflorus (Smallflower Buttercup)*			
1195.	11927	*Ranunculus sessiliflorus var. sessiliflorus*			
1196.	3061	*Raphanus raphanistrum (Wild Radish)*	Y		
1197.	6012	*Regelia ciliata*			
1198.	18547	*Rhadinothamnus anceps*			
1199.	2578	*Rhagodia baccata (Berry Saltbush)*			
1200.	11341	*Rhagodia baccata subsp. baccata*			
1201.	11930	*Rhagodia baccata subsp. dioica (Sea Berry Saltbush)*			
1202.	11254	*Rhagodia preissii subsp. preissii*			
1203.	13241	*Rhodanthe chlorocephala subsp. rosea*			
1204.	13300	*Rhodanthe citrina*			
1205.	13234	*Rhodanthe manglesii*			
1206.	19942	*Ricinocarpos undulatus*			
1207.	48891	*Roepera fruticulosa*			
1208.	48901	*Roepera similis*			
1209.	2430	*Rumex brownii (Swamp Dock)*	Y		
1210.	2433	*Rumex crispus (Curled Dock)*	Y		
1211.	2435	*Rumex drummondii*		P4	
1212.	2440	*Rumex pulcher (Fiddle Dock)*	Y		
1213.	2908	*Sagina maritima*	Y		
1214.	48433	*Salicornia blackiana*			
1215.	48430	*Salicornia quinqueflora*			
1216.	30434	*Salsola australis*			
1217.	6483	*Samolus junceus*			

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1218.	6484	*Samolus repens (Creeping Brookweed)*			
1219.	6485	*Samolus valerandi (Water Pimpernel)*	Y		
1220.	2356	*Santalum acuminatum (Quandong, Warnga)*			
1221.	17543	*Sarcozona bicarinata*		P3	
1222.	7595	*Scaevola anchusifolia*			
1223.	7603	*Scaevola canescens (Grey Scaevola)*			
1224.	7606	*Scaevola crassifolia (Thick-leaved Fan-flower)*			
1225.	7613	*Scaevola glandulifera (Viscid Hand-flower)*			
1226.	7614	*Scaevola globulifera*			
1227.	7619	*Scaevola lanceolata (Long-leaved Scaevola)*			
1228.	7626	*Scaevola nitida (Shining Fanflower)*			
1229.	7634	*Scaevola phlebopetala (Velvet Fanflower)*			
1230.	12585	*Scaevola repens*			
1231.	29356	*Scaevola repens subsp. Northern Sandplains (R.J. Cranfield & P.J. Spencer 8445)*			
1232.	13181	*Scaevola repens var. angustifolia*			
1233.	13182	*Scaevola repens var. repens*			
1234.	7646	*Scaevola striata (Royal Robe)*			
1235.	7647	*Scaevola thesioides*			
1236.	13152	*Scaevola thesioides subsp. thesioides*			
1237.	12588	*Scaevola virgata*			
1238.	6263	*Schoenolaena juncea*			
1239.	6033	*Scholtzia involucrata (Spiked Scholtzia)*			
1240.	49121	*Scholtzia laciniata (Ragged-leaved Scholtzia)*		P2	Y
1241.	6037	*Scholtzia parviflora*			
1242.	20382	*Scholtzia sp. Wongonderrah (M.E. & M.R. Trudgen MET 12000)*			
1243.	6039	*Scholtzia teretifolia*			
1244.	20161	*Senecio pinnatifolius*			
1245.	25884	*Senecio pinnatifolius var. latilobus*			
1246.	25889	*Senecio spanomerus*			
1247.	7362	*Sherardia arvensis (Field Madder)*	Y		
1248.	15972	*Silene gallica var. gallica*	Y		
1249.	8224	*Siloxerus filifolius*			
1250.	8225	*Siloxerus humifusus (Procumbent Siloxerus)*			
1251.	14583	*Siloxerus multiflorus*			
1252.	3070	*Sisymbrium irio (London Rocket)*	Y		
1253.	3072	*Sisymbrium orientale (Indian Hedge Mustard)*	Y		
1254.	7013	*Solanum hoplopetalum (Thorny Solanum)*			
1255.	7018	*Solanum lasiophyllum (Flannel Bush, Mindjulu)*			
1256.	47173	*Solanum lycopersicum (Tomato)*	Y		
1257.	7022	*Solanum nigrum (Black Berry Nightshade)*	Y		
1258.	7025	*Solanum oldfieldii*			
1259.	7035	*Solanum sisymbriifolium (Viscid Nightshade)*	Y		
1260.	7037	*Solanum symonii*			
1261.	8230	*Sonchus asper (Rough Sowthistle)*	Y		
1262.	9367	*Sonchus hydrophilus (Native Sowthistle)*			
1263.	8231	*Sonchus oleraceus (Common Sowthistle)*	Y		
1264.	2914	*Spergularia diandra (Lesser Sand Spurry)*	Y		
1265.	17551	*Sphaerolobium drummondii*			
1266.	4205	*Sphaerolobium linophyllum*			
1267.	4207	*Sphaerolobium medium*			
1268.	10800	*Sphaerolobium pulchellum*			
1269.	4828	*Spyridium globulosum (Basket Bush)*			
1270.	4713	*Stachystemon axillaris (Leafy Stachystemon)*			
1271.	20537	*Stachystemon virgatus*			
1272.	9069	*Stackhousia huegelii*			
1273.	4733	*Stackhousia monogyna*			
1274.	9070	*Stackhousia pubescens (Downy Stackhousia)*			
1275.	2918	*Stellaria media (Chickweed)*	Y		
1276.	16197	*Stenanthemum emarginatum*			
1277.	13475	*Stenanthemum humile*			
1278.	15066	*Stenanthemum notiale subsp. chamelum*			
1279.	15065	*Stenanthemum notiale subsp. notiale*			
1280.	14240	*Stenanthemum reissekii*			
1281.	3076	*Stenopetalum filifolium*			
1282.	19403	*Stenopetalum gracile*			
1283.	3080	*Stenopetalum robustum*			
1284.	2316	*Stirlingia latifolia (Blueboy)*			
1285.	2317	*Stirlingia simplex*			
1286.	2319	*Strangea cynanchicarpa (Heath Strangea)*			
1287.	18564	*Stylidium aceratum*		P3	

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1288.	7679	*Stylidium adpressum (Trigger-on-stilts)*			
1289.	7680	*Stylidium aeonioides*		P4	
1290.	12846	*Stylidium albolilacinum*			
1291.	30278	*Stylidium androsaceum*			
1292.	25831	*Stylidium araeophyllum (Stilt Walker)*			
1293.	30276	*Stylidium bicolor*			
1294.	48457	*Stylidium bindoon*			
1295.	7693	*Stylidium brunonianum (Pink Fountain Triggerplant)*			
1296.	7694	*Stylidium bulbiferum (Circus Triggerplant)*			
1297.	17187	*Stylidium burbidgeanum*			
1298.	7696	*Stylidium calcaratum (Book Triggerplant)*			
1299.	12845	*Stylidium carlquistii*			
1300.	7709	*Stylidium crossocephalum (Posy Triggerplant)*			
1301.	7710	*Stylidium cygnorum*			
1302.	7712	*Stylidium despectum (Dwarf Triggerplant)*			
1303.	7713	*Stylidium dichotomum (Pins-and-needles)*			
1304.	19211	*Stylidium diplectroglossum*		P1	
1305.	7716	*Stylidium diuroides (Donkey Triggerplant)*			
1306.	11808	*Stylidium diuroides subsp. diuroides*			
1307.	7717	*Stylidium divaricatum (Daddy-long-legs)*			
1308.	7719	*Stylidium ecorne (Foot Triggerplant)*			
1309.	19251	*Stylidium eriopodum*			
1310.	18420	*Stylidium flagellum*			
1311.	25801	*Stylidium hesperium*			
1312.	7736	*Stylidium hispidum (White Butterfly Triggerplant)*			
1313.	20701	*Stylidium hymenocraspedum*		P3	
1314.	7742	*Stylidium inundatum (Hundreds and Thousands)*			
1315.	7745	*Stylidium junceum (Reed Triggerplant)*			
1316.	7749	*Stylidium leptophyllum (Needle-leaved Triggerplant)*			
1317.	7756	*Stylidium longitubum (Jumping Jacks)*		P4	
1318.	13127	*Stylidium maritimum*		P3	
1319.	7762	*Stylidium miniatum (Pink Butterfly Triggerplant)*			
1320.	25829	*Stylidium neurophyllum (Coastal Plain Triggerplant)*			
1321.	7766	*Stylidium nonscandens*		P3	
1322.	7768	*Stylidium obtusatum (Pinafore Triggerplant)*			
1323.	7771	*Stylidium periscelianthum (Pantaloon Triggerplant)*		P3	
1324.	7772	*Stylidium perpusillum (Tiny Triggerplant)*			
1325.	7773	*Stylidium petiolare (Horn Triggerplant)*			
1326.	7774	*Stylidium piliferum (Common Butterfly Triggerplant)*			
1327.	48472	*Stylidium ponticulus*			
1328.	25837	*Stylidium purpureum (Purple Fountain Triggerplant)*			
1329.	7785	*Stylidium repens (Matted Triggerplant)*			
1330.	20521	*Stylidium rigidulum*			
1331.		*Stylidium roseo-alatum*			
1332.	7790	*Stylidium roseoalatum (Pink-wing Triggerplant)*			
1333.	25806	*Stylidium scariosum*			
1334.	7798	*Stylidium schoenoides (Cow Kicks)*			
1335.		*Stylidium sp.*			
1336.	33081	*Stylidium sp. Moora (J.A. Wege 713)*		P2	
1337.	25836	*Stylidium spiciforme (Spiciform Triggerplant)*			
1338.	20608	*Stylidium stenosepalum*			
1339.	7806	*Stylidium utricularioides (Pink Fan Triggerplant)*			
1340.	48462	*Stylidium vinosum*		P1	
1341.	3181	*Stylobasium australe*			
1342.	48293	*Styphelia ciliosa*			
1343.	48297	*Styphelia filifolia*		P3	
1344.	6476	*Styphelia tenuiflora (Common Pinheath)*			
1345.	16882	*Synaphea aephynsa*			
1346.	16867	*Synaphea grandis*		P4	
1347.	16761	*Synaphea interioris*			
1348.	16768	*Synaphea panhesya*		P1	
1349.	2324	*Synaphea petiolaris (Synaphea)*			
1350.	16764	*Synaphea sparsiflora*		P2	
1351.	2329	*Synaphea spinulosa*			
1352.	15532	*Synaphea spinulosa subsp. spinulosa*			
1353.	20135	*Taxandria linearifolia*			
1354.	4256	*Templetonia retusa (Cockies Tongues)*			
1355.	2791	*Tersonia cyathiflora (Button Creeper)*			
1356.	2820	*Tetragonia decumbens (Sea Spinach)*	Y		
1357.	2824	*Tetragonia tetragonoides (New Zealand Spinach)*			

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1358.	46437	*Tetrapora preissiana*			
1359.	4528	*Tetratheca confertifolia*			
1360.	4535	*Tetratheca hirsuta (Black Eyed Susan)*			
1361.	48340	*Tetratheca hirsuta subsp. boonanarring*		P2	
1362.	4539	*Tetratheca paucifolia*			
1363.	4540	*Tetratheca pilifera*		P3	
1364.	5077	*Thomasia cognata*			
1365.	5080	*Thomasia foliosa*			
1366.	5105	*Thomasia triphylla*			
1367.	2644	*Threlkeldia diffusa (Coast Bonefruit)*			
1368.	6057	*Thryptomene hyporhytis*			
1369.	6060	*Thryptomene mucronulata*			
1370.	17266	*Thryptomene sp. Lancelin (M.E. Trudgen 14000)*		P3	
1371.	8248	*Tolpis barbata (Yellow Hawkweed)*	Y		
1372.	19253	*Trachymene ceratocarpa*			
1373.	6266	*Trachymene coerulea (Blue Lace Flower)*			
1374.	19041	*Trachymene coerulea subsp. coerulea*			
1375.	6280	*Trachymene pilosa (Native Parsnip)*			
1376.	8251	*Trichocline spathulata (Native Gerbera)*			
1377.	17145	*Trifolium angustifolium var. angustifolium*	Y		
1378.	4291	*Trifolium arvense (Hare s Foot Clover)*	Y		
1379.	4292	*Trifolium campestre (Hop Clover)*	Y		
1380.	17763	*Trifolium campestre var. campestre (Hop Clover)*	Y		
1381.	4293	*Trifolium cernuum (Drooping Flower Clover)*	Y		
1382.	4295	*Trifolium dubium (Suckling Clover)*	Y		
1383.	4297	*Trifolium glomeratum (Cluster Clover)*	Y		
1384.	4298	*Trifolium hirtum (Rose Clover)*	Y		
1385.	15659	*Trifolium lappaceum var. lappaceum*	Y		
1386.	4309	*Trifolium scabrum (Rough Clover)*	Y		
1387.	15509	*Trifolium tomentosum var. tomentosum*	Y		
1388.	4737	*Tripterococcus brunonis (Winged Stackhousia)*			
1389.	44444	*Tripterococcus sp. Brachylobus (A.S. George 14234)*		P4	
1390.	32758	*Trithuria austinensis*			
1391.	33019	*Trithuria australis*		P4	
1392.	1139	*Trithuria bibracteata*			
1393.	1141	*Trithuria submersa*			
1394.	4839	*Trymalium angustifolium*			
1395.	11665	*Trymalium ledifolium var. ledifolium*			
1396.	13479	*Trymalium ledifolium var. rosmarinifolium*			
1397.	33418	*Trymalium odoratissimum subsp. odoratissimum*			
1398.	8254	*Urospermum picroides (False Hawkbit)*	Y		
1399.	8255	*Ursinia anthemoides (Ursinia)*	Y		
1400.	38388	*Ursinia anthemoides subsp. anthemoides*	Y		
1401.	1767	*Urtica urens (Small Nettle)*	Y		
1402.	7148	*Utricularia multifida*			
1403.	7153	*Utricularia tenella*			
1404.	7157	*Utricularia violacea (Violet Bladderwort)*			
1405.	7158	*Utricularia volubilis (Twining Bladderwort)*			
1406.	30716	*Vachellia farnesiana (Mimosa Bush)*	Y		
1407.	7665	*Velleia trinervis*			
1408.	8257	*Vellereophyton dealbatum (White Cudweed)*	Y		
1409.	15725	*Verbesina encelioides*	Y		
1410.	7666	*Verreauxia reinwardtii (Common Verreauxia)*			
1411.	15431	*Verticordia acerosa var. acerosa*			
1412.	12388	*Verticordia acerosa var. preissii*			
1413.	12396	*Verticordia blepharophylla*			
1414.	12402	*Verticordia chrysanthella*			
1415.	12411	*Verticordia densiflora var. cespitosa*			
1416.	15432	*Verticordia densiflora var. densiflora*			
1417.	6077	*Verticordia drummondii (Drummond s Featherflower)*			
1418.	15620	*Verticordia endlicheriana var. manicula*			
1419.	6083	*Verticordia grandis (Scarlet Featherflower)*			
1420.	15433	*Verticordia huegelii var. huegelii*			
1421.	12430	*Verticordia huegelii var. stylosa*			
1422.	12437	*Verticordia laciniata*			
1423.	14714	*Verticordia lindleyi subsp. lindleyi*		P4	
1424.	12439	*Verticordia lindleyi subsp. purpurea*			
1425.	6101	*Verticordia nitens (Morrison Featherflower, Kodjeningara)*			
1426.	10822	*Verticordia nobilis*			
1427.	6103	*Verticordia ovalifolia*			

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1428.	12446	*Verticordia paludosa*		P4	
1429.	6105	*Verticordia patens*			
1430.	6107	*Verticordia pennigera*			
1431.	12449	*Verticordia plumosa var. brachyphylla*			
1432.	6113	*Verticordia pritzelii (Pritzel s Featherflower)*			
1433.	12458	*Verticordia serrata var. ciliata*			
1434.	4325	*Viminaria juncea (Swishbush, Koweda)*			
1435.	7384	*Wahlenbergia capensis (Cape Bluebell)*	Y		
1436.	7386	*Wahlenbergia gracilenta (Annual Bluebell)*			
1437.	7389	*Wahlenbergia preissii*			
1438.		*Wahlenbergia sp.*			
1439.	13328	*Waitzia nitida*			
1440.	8281	*Waitzia podolepis*			
1441.	8282	*Waitzia suaveolens (Fragrant Waitzia)*			
1442.	13332	*Waitzia suaveolens var. flava*			
1443.	13333	*Waitzia suaveolens var. suaveolens*			
1444.	6939	*Westringia dampieri*			
1445.	6660	*Wilsonia rotundifolia (Round-leaf Wilsonia)*			
1446.	6285	*Xanthosia ciliata*			
1447.	6289	*Xanthosia huegelii*			
1448.	44861	*Xerochrysum macranthum*			

Fish

1449.		*? ?*			
1450.		*Acanthaluteres brownii?*			Y
1451.		*Acanthistius serratus*			
1452.		*Acanthopagrus butcheri*			
1453.		*Acentrogobius bifrenatus*			
1454.		*Achoerodus gouldii*			
1455.		*Afurcagobius suppositus*			
1456.		*Aldrichetta forsteri*			
1457.		*Allenichthys glauerti*			
1458.		*Anoplocapros amygdaloides?*			
1459.		*Anoplocapros lenticularis*			
1460.		*Antennarius nummifer*			
1461.		*Apogon victoriae*			
1462.		*Aracana aurita*			
1463.		*Arripis georgiana*			
1464.		*Atherinomorus endrachtensis*			
1465.		*Atherinomorus vaigiensis*			
1466.		*Atherinosoma elongata*			
1467.		*Atherinosoma sp.*			
1468.		*Austrolabrus maculatus*			
1469.		*Batrachomoeus rubricephalus*			
1470.		*Bodianus vulpinus*			
1471.		*Bostockia porosa*			
1472.		*Callanthias australis*			
1473.		*Carassius auratus*			
1474.		*Carcharhinus falciformis*			Y
1475.	34034	*Carcharias taurus (Grey Nurse Shark)*		T	
1476.		*Centroberyx gerrardi*			
1477.		*Chaetodermis penicilligera*			
1478.		*Cheilodactylus gibbosus*			
1479.		*Chelidonichthys kumu*			
1480.		*Chelmonops curiosus*			
1481.		*Chiloscyllium punctatum*			
1482.		*Choerodon rubescens*			
1483.		*Cirrhimuraena calamus*			
1484.		*Cnidoglanis macrocephalus*			
1485.		*Conger sp.*			
1486.		*Coris auricularis*			
1487.		*Coris sp.*			
1488.		*Crapatalus arenarius*			
1489.		*Cristiceps aurantiacus*			
1490.		*Cristiceps australis*			
1491.		*Diodon nicthemerus*			
1492.		*Edelia vittata*			
1493.		*Enoplosus armatus*			
1494.		*Epinephelides armatus*			
1495.		*Epinephelus rivulatus*			
1496.		*Eupetrichthys angustipes*			

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1497.		*Fistularia petimba*			
1498.	34028	*Galaxias occidentalis (Western Minnow)*			
1499.		*Gambusia affinis*			
1500.		*Girella zebra*			
1501.		*Glaucosoma hebraicum*			
1502.		*Glossogobius sp.*			
1503.		*Gnathophis longicaudatus*			
1504.		*Gymnothorax prasinus*			
1505.		*Gymnothorax woodwardi*			
1506.		*Haletta semifasciata*			
1507.		*Halichoeres brownfieldi*			
1508.		*Heteroclinus heptaeolus*			
1509.		*Heteroclinus roseus*			
1510.		*Heteroclinus whitleyi (ms)*			
1511.		*Hippocampus tuberculatus*			
1512.		*Hypnos monopterygium*			
1513.		*Hypoplectrodes nigroruber*			
1514.		*Kyphosus cornelii*			
1515.		*Kyphosus sydneyanus*			
1516.		*Lagocephalus sceleratus*			
1517.		*Liopropoma sp.*			
1518.		*Liza vaigiensis*			
1519.		*Lotella rhacinus*			
1520.		*Megalaspis cordyla*			
1521.		*Meuschenia flavolineata*			
1522.		*Meuschenia galii*			
1523.		*Meuschenia hippocrepis*			
1524.		*Microcanthus strigatus*			
1525.		*Monacanthus chinensis*			
1526.		*Mugil cephalus*			
1527.		*Muraenichthys australis*			
1528.	34033	*Nannatherina balstoni (Balston s Pygmy Perch)*		T	
1529.		*Neatypus obliquus*			
1530.		*Neopataecus waterhousii*			
1531.		*Notolabrus celidotus*			Y
1532.		*Notolabrus parilus*			
1533.		*Notopogon xenosoma*			
1534.		*Odax acroptilus*			
1535.		*Odax cyanomelas*			
1536.		*Ophiclinus gracilis*			
1537.		*Orectolobus hutchinsi*			
1538.		*Othos dentex*			
1539.		*Paraplesiops meleagris*			
1540.		*Paraplesiops sinclairi*			
1541.		*Paraplotosus albilabris*			
1542.		*Parma mccullochi*			
1543.		*Parma microlepis*			
1544.		*Parupeneus spilurus*			
1545.		*Pelates octolineatus*			
1546.		*Pelsartia humeralis*			
1547.		*Pempheris klunzingeri*			
1548.		*Pempheris multiradiata*			
1549.		*Petroscirtes breviceps*			
1550.		*Phyllopteryx taeniolatus*			
1551.		*Pictilabrus viridis*			
1552.		*Platycephalus bassensis?*			
1553.		*Platycephalus speculator*			
1554.		*Plectorhinchus flavomaculatus*			
1555.		*Pomatomus saltatrix*			
1556.		*Pristipomoides sieboldii*			
1557.		*Psammoperca waigiensis*			
1558.		*Pseudocaranx dentex*			
1559.		*Pseudocaranx georgianus*			
1560.		*Pseudogobius olorum*			
1561.		*Pseudorhombus jenynsii*			
1562.		*Pterois volitans*			
1563.		*Rachycentron canadum*			
1564.		*Rhabdosargus sarba*			
1565.		*Rhycherus gloveri*			
1566.		*Scaevius milii*			

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1567.		*Schuettea woodwardi*			
1568.		*Scobinichthys granulatus*			
1569.		*Scorpaena sumptuosa*			
1570.		*Scorpis aequipinnis*			
1571.		*Scorpis georgianus*			
1572.		*Seriola dumerili*			
1573.		*Seriola hippos*			
1574.		*Siganus fuscescens*			
1575.		*Sillago bassensis*			
1576.		*Sillago schomburgkii*			
1577.		*Sphyraena flavicauda*			
1578.		*Sphyraena obtusata*			
1579.		*Stigmatopora argus*			
1580.		*Sutorectus tentaculatus*			
1581.		*Tandanus bostocki*			
1582.		*Thalassoma septemfasciata*			
1583.		*Threpterius maculosus*			
1584.		*Thunnus maccoyii*			
1585.		*Torquigener pleurogramma*			
1586.		*Trachichthys australis*			
1587.		*Trachinocephalus myops*			
1588.		*Upeneichthys lineatus*			
Fungus					
1589.	48599	*Amanita arenaria*			
1590.	38755	*Amanita ochroterrea*			
1591.	38757	*Amanita xanthocephala*			
1592.		*Boletus sp.*			
1593.		*Gyroporus cyanescens*			
1594.	38808	*Limacella pitereka*			
1595.	45806	*Moreaua mesomelaenae*			
1596.		*Panus fasciatus*			
1597.		*Phytophthora cinnamomi*			
1598.	48835	*Pycnoporus coccineus*			
Gymnosperm					
1599.	92	*Callitris canescens*			
1600.	36600	*Callitris pyramidalis (Swamp Cypress)*			
1601.	18119	*Macrozamia fraseri*			
1602.	85	*Macrozamia riedlei (Zamia, Djiridji)*			
1603.	87	*Pinus pinaster (Pinaster Pine)*	Y		
Invertebrate					
1604.		*Acariformes sp.*			
1605.		*Acercella falcipes*			
1606.		*Aeshnidae sp.*			
1607.		*Alboa worooa*			
1608.		*Allothereua maculata*			
1609.		*Amblyomma triguttatum*			
1610.		*Aname mainae*			
1611.		*Ancylidae sp.*			
1612.		*Araneus cyphoxis*			
1613.		*Argiope protensa*			
1614.		*Artoriopsis expolita*			
1615.		*Austracantha minax*			
1616.		*Baetidae sp.*			
1617.		*Bennelongia cygnus*			
1618.	34057	*Bothriembryon perobesus (a bothriembryontid land snail (Moore River), land snail)*		P1	
1619.		*Caenidae sp.*			
1620.		*Calamoecia tasmanica subattenuata*			
1621.		*Candonocypris novaezelandiae*			
1622.		*Ceinidae sp.*			
1623.		*Celaenia calotoides*			
1624.		*Ceratopogonidae sp.*			
1625.		*Cercophonius granulosus*			
1626.		*Cercophonius sulcatus*			
1627.		*Cherax quinquecarinatus*			
1628.		*Chironominae sp.*			
1629.		*Coenagrionidae sp.*			
1630.		*Corduliidae sp.*			
1631.		*Corixidae sp.*			
1632.		*Cormocephalus aurantiipes*			

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1633.		*Culicidae sp.*			
1634.		*Cypretta baylyi*			
1635.		*Daphnia carinata*			
1636.		*Daphnia sp.*			
1637.		*Dytiscidae sp.*			
1638.		*Ecnomidae sp.*			
1639.		*Ephydridae sp.*			
1640.		*Gomphidae sp.*			
1641.		*Gripopterygidae sp.*			
1642.		*Gyrinidae sp.*			
1643.		*Haliplidae sp.*			
1644.		*Heterocypris incongruens*			
1645.		*Hydraenidae sp.*			
1646.		*Hydrobiidae sp.*			
1647.		*Hydrodroma australis*			Y
1648.		*Hydrometridae sp.*			
1649.		*Hydrophilidae sp.*			
1650.		*Hydropsychidae sp.*			
1651.	33977	*Hylaeus globuliferus (woolybush bee)*		P3	
1652.	48935	*Idiosoma sigillatum (Swan Coastal Plain shield-backed trapdoor spider)*		P3	
1653.		*Kangarosa properipes*			
1654.		*Lampona cylindrata*			
1655.		*Latrodectus hasseltii*			
1656.	33982	*Leioproctus contrarius (a short-tongued bee)*		P3	
1657.		*Leptoceridae sp.*			
1658.		*Leptophlebiidae sp.*			
1659.		*Libellulidae sp.*			
1660.		*Limbodessus shuckhardi*			
1661.		*Limnocythere dorsosicula*			
1662.		*Limnocythere mowbrayensis*			
1663.		*Lycosa australicola*			
1664.		*Lycosa godeffroyi*			
1665.		*Maratus pavonis*			
1666.		*Missulena granulosa*			
1667.		*Missulena occatoria*			
1668.		*Nephila edulis*			
1669.		*Nicodamus mainae*			
1670.		*Notonectidae sp.*			
1671.		*Ogyris amaryllis meridionalis*			Y
1672.		*Oligochaeta sp.*			
1673.		*Oniscidae sp.*			
1674.		*Ornithonyssus praedo*			
1675.		*Orthocladiinae sp.*			
1676.		*Palaemonidae sp.*			
1677.		*Paralimnocythere sp. 275 (south-west, CB)*			
1678.		*Parastacidae sp.*			
1679.		*Perthiidae sp.*			
1680.		*Pholcus phalangioides*			
1681.		*Physidae sp.*			
1682.		*Pinkfloydia harveii*			
1683.		*Planorbidae sp.*			
1684.		*Platynectes aenescens*			
1685.		*Protochelifer cavemarum*			
1686.		*Raveniella arenacea*			
1687.		*Raveniella cirrata*			
1688.		*Raveniella subcirrata*			
1689.		*Rhopalorhynchus sibogae*			
1690.		*Richardsonianidae sp.*			
1691.		*Sarscypridopsis aculeata*			
1692.		*Scirtidae sp.*			
1693.		*Scolopendra morsitans*			
1694.		*Simuliidae sp.*			
1695.		*Staphylinidae sp.*			
1696.		*Stratiomyidae sp.*			
1697.	33992	*Synemon gratiosa (Graceful Sunmoth)*		P4	
1698.		*Tabanidae sp.*			
1699.		*Tanypodinae sp.*			
1700.		*Tasmanicosa leuckartii*			
1701.		*Temnocephalidea sp.*			
1702.		*Tetralycosa oraria*			

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1703.	33993	*Throscodectes xederoides (Mogumber Bush Cricket, Northern Throsco)*		P3	
1704.		*Tipulidae sp.*			
1705.		*Troglochernes dewae*			
1706.		*Urodacus hartmeyeri*			
1707.		*Urodacus novaehollandiae*			
1708.		*Veliidae sp.*			
1709.		*Venator immansueta*			
1710.		*Venator koyuga*			
1711.		*Venatrix pullastra*			
1712.	34113	*Westralunio carteri (Carter s Freshwater Mussel)*		T	
1713.		*Westrarchaea sinuosa*			

Lichen

1714.	27602	*Buellia georgei*			
1715.	41242	*Buellia homophylia*			
1716.	27625	*Caloplaca cinnabarina*			
1717.	43884	*Carbonicola foveata*			
1718.	27663	*Cladia aggregata*			
1719.	48177	*Cladia muelleri*			
1720.	27748	*Flavoparmelia rutidota*			
1721.	27813	*Lecanora pseudistera*			
1722.	27825	*Lecidea ochroleuca*			
1723.	28224	*Ramalina inflata subsp. australis*			
1724.	28105	*Xanthoparmelia antleriformis*			
1725.	28326	*Xanthoparmelia incantata*			
1726.	44326	*Xanthoparmelia rimalis*			

Mammal

1727.	25449	*Antechinus flavipes (Yellow-footed Antechinus)*			
1728.	24161	*Bettongia lesueur subsp. graii (Boodie (inland), Burrowing Bettong (inland))*		X	
1729.	24186	*Chalinolobus gouldii (Gould s Wattled Bat)*			
1730.	24092	*Dasyurus geoffroii (Chuditch, Western Quoll)*		T	
1731.	24056	*Grampus griseus (Risso s Dolphin)*			
1732.	24215	*Hydromys chrysogaster (Water-rat, Rakali)*		P4	
1733.	48588	*Isoodon fusciventer (Quenda, southwestern brown bandicoot)*		P4	
1734.	24132	*Macropus fuliginosus (Western Grey Kangaroo)*			
1735.	24135	*Macropus robustus subsp. erubescens (Euro, Biggada)*			
1736.	24168	*Macrotis lagotis (Bilby, Dalgyte, Ninu)*		T	
1737.	24078	*Mesoplodon grayi (Gray s Beaked Whale)*			
1738.	24223	*Mus musculus (House Mouse)*	Y		
1739.	48022	*Notamacropus irma (Western Brush Wallaby)*		P4	
1740.	24194	*Nyctophilus geoffroyi (Lesser Long-eared Bat)*			
1741.	24195	*Nyctophilus gouldi (Gould s Long-eared Bat)*			
1742.	48070	*Phascogale tapoatafa subsp. wambenger (South-western Brush-tailed Phascogale, Wambenger)*		S	
1743.	24073	*Physeter macrocephalus (Sperm Whale)*		T	
1744.	24164	*Potorous platyops (Broad-faced Potoroo)*		X	
1745.	24166	*Pseudocheirus occidentalis (Western Ringtail Possum, ngwayir)*		T	
1746.	24230	*Pseudomys albocinereus (Ash-grey Mouse)*			
1747.	24241	*Pseudomys shortridgei (Heath Mouse, Heath Rat, Dayang)*		T	
1748.	24243	*Rattus fuscipes (Western Bush Rat)*			
1749.	24245	*Rattus rattus (Black Rat)*	Y		
1750.	24108	*Sminthopsis crassicaudata (Fat-tailed Dunnart)*			
1751.	24109	*Sminthopsis dolichura (Little long-tailed Dunnart)*			
1752.	24111	*Sminthopsis gilberti (Gilbert s Dunnart)*			
1753.	25515	*Sminthopsis griseoventer (Grey-bellied Dunnart)*			
1754.	24207	*Tachyglossus aculeatus (Short-beaked Echidna)*			
1755.	24167	*Tarsipes rostratus (Honey Possum, Noolbenger)*			
1756.	24206	*Vespadelus regulus (Southern Forest Bat)*			

Monocotyledon

1757.	1205	*Acanthocarpus canaliculatus*			
1758.	1208	*Acanthocarpus preissii*			
1759.	20797	*Acanthocarpus sp. Ajana (C.A. Gardner 8596)*			
1760.	184	*Aira caryophyllea (Silvery Hairgrass)*	Y		
1761.	185	*Aira cupaniana (Silvery Hairgrass)*	Y		
1762.	187	*Aira praecox (Early Hairgrass)*	Y		
1763.	1056	*Alexgeorgea nitens*			
1764.	20755	*Alstroemeria psittacina*	Y		
1765.	48621	*Althenia patentifolia*			
1766.	13380	*Amphibromus nervosus*			
1767.	12025	*Amphipogon caricinus var. caricinus*			

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1768.	197	*Amphipogon debilis*			
1769.	199	*Amphipogon strictus (Greybeard Grass)*			
1770.	200	*Amphipogon turbinatus*			
1771.	1058	*Anarthria gracilis*			
1772.	1059	*Anarthria humilis*			
1773.	1409	*Anigozanthos humilis (Catspaw)*			
1774.	29437	*Anigozanthos humilis subsp. Badgingarra (S.D. Hopper 7114)*		P2	
1775.	11957	*Anigozanthos humilis subsp. chrysanthus (Golden Catspaw)*		P4	
1776.	11434	*Anigozanthos humilis subsp. humilis*			
1777.	1411	*Anigozanthos manglesii (Mangles Kangaroo Paw, Kurulbrang)*			
1778.	11261	*Anigozanthos manglesii subsp. manglesii*			
1779.	1414	*Anigozanthos pulcherrimus (Yellow Kangaroo Paw)*			
1780.	29436	*Anigozanthos viridis subsp. Cataby (S.D. Hopper 1786)*			
1781.	13891	*Anigozanthos viridis subsp. terraspectans (Dwarf Green Kangaroo Paw)*		T	
1782.	1117	*Aphelia cyperoides*			
1783.	1118	*Aphelia drummondii*			
1784.	1119	*Aphelia nutans*			
1785.	43548	*Aphelia sp. Albany (B.G. Briggs 596)*			
1786.		*Aristida sp.*			
1787.	1264	*Arnocrinum preissii*			
1788.	1265	*Arthropodium curvipes*			
1789.	1201	*Asparagus officinalis (Asparagus)*	Y		
1790.	17233	*Austrostipa campylachne*			
1791.	17234	*Austrostipa compressa*			
1792.	17237	*Austrostipa elegantissima*			
1793.	17240	*Austrostipa flavescens*			
1794.	17241	*Austrostipa hemipogon*			
1795.	17244	*Austrostipa macalpinei*			
1796.	19959	*Austrostipa sp. Cairn Hill (M.E. Trudgen 21176)*		P3	
1797.	17257	*Austrostipa variabilis*			
1798.	231	*Avellinia michelii*	Y		
1799.	233	*Avena barbata (Bearded Oat)*	Y		
1800.	19458	*Babiana tubulosa var. tubiflora*	Y		
1801.	739	*Baumea acuta (Pale Twig-rush)*			
1802.	740	*Baumea arthrophylla*			
1803.	741	*Baumea articulata (Jointed Rush)*			
1804.	743	*Baumea juncea (Bare Twigrush)*			
1805.	745	*Baumea preissii*			
1806.	1417	*Blancoa canescens (Winter Bell)*			
1807.	749	*Bolboschoenus caldwellii (Marsh Club-rush)*			
1808.	1267	*Borya constricta*			
1809.	1272	*Borya scirpoidea*			
1810.	1273	*Borya sphaerocephala (Pincushions)*			
1811.	8661	*Brachypodium distachyon (False Brome)*	Y		
1812.	244	*Briza maxima (Blowfly Grass)*	Y		
1813.	245	*Briza minor (Shivery Grass)*	Y		
1814.	247	*Bromus arenarius (Sand Brome)*			
1815.	249	*Bromus diandrus (Great Brome)*	Y		
1816.	1366	*Bulbine semibarbata (Leek Lily)*			
1817.	1383	*Burchardia bairdiae*			
1818.	12770	*Burchardia congesta*			
1819.	1385	*Burchardia multiflora (Dwarf Burchardia)*			
1820.	1277	*Caesia occidentalis*			
1821.	29439	*Caesia sp. Wongan (K.F. Kenneally 8820)*			
1822.	11136	*Caladenia denticulata*			
1823.	44900	*Caladenia denticulata subsp. rubella*			
1824.	1586	*Caladenia discoidea (Dancing Orchid)*			
1825.	1592	*Caladenia flava (Cowslip Orchid)*			
1826.	15348	*Caladenia flava subsp. flava*			
1827.	15502	*Caladenia footeana*			
1828.	15354	*Caladenia hirta subsp. hirta*			
1829.	15355	*Caladenia hirta subsp. rosea*			
1830.	1599	*Caladenia latifolia (Pink Fairy Orchid)*			
1831.	15358	*Caladenia longicauda subsp. albella*			
1832.	15360	*Caladenia longicauda subsp. borealis*			
1833.	15361	*Caladenia longicauda subsp. calcigena*			
1834.	15363	*Caladenia longicauda subsp. eminens*			
1835.	15365	*Caladenia longicauda subsp. longicauda*			
1836.	17760	*Caladenia nobilis*			
1837.	15503	*Caladenia paludosa*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
1838.	1609	*Caladenia pectinata (King Spider Orchid)*			
1839.	18026	*Caladenia pendens subsp. pendens*			
1840.		*Caladenia sp.*			
1841.	13862	*Caladenia speciosa*		P4	
1842.	1213	*Calectasia cyanea (Blue Tinsel Lily)*		T	
1843.	45757	*Calectasia elegans (Elegant Tinsel Lily)*		P2	
1844.	19309	*Calectasia narragara*			
1845.	753	*Carex appressa (Tall Sedge)*			
1846.	43241	*Carex thecata*			
1847.	1162	*Cartonema philydroides*			
1848.	760	*Caustis dioica*			
1849.	41564	*Cenchrus clandestinus (Kikuyu Grass)*	Y		
1850.	259	*Cenchrus echinatus (Burrgrass)*	Y		
1851.	41566	*Cenchrus longisetus (Feathertop)*	Y		
1852.	1121	*Centrolepis aristata (Pointed Centrolepis)*			
1853.	1125	*Centrolepis drummondiana*			
1854.	1129	*Centrolepis glabra (Smooth Centrolepis)*			
1855.	1131	*Centrolepis inconspicua*			
1856.	1132	*Centrolepis mutica*			
1857.	1133	*Centrolepis pilosa*			
1858.	1134	*Centrolepis polygyna (Wiry Centrolepis)*			
1859.		*Centrolepis sp. Muck02 (#39)*			Y
1860.	17685	*Chaetanthus aristatus*			
1861.	1280	*Chamaescilla corymbosa (Blue Squill)*			
1862.	11299	*Chamaescilla corymbosa var. corymbosa*			
1863.	11878	*Chamaescilla corymbosa var. paradoxa*			
1864.	19338	*Chamaescilla gibsonii*		P3	
1865.	8788	*Chamaescilla versicolor*			
1866.	267	*Chloris gayana (Rhodes Grass)*	Y		
1867.	17833	*Chordifex microcodon*			
1868.	17706	*Chordifex sinuosus*			
1869.	17834	*Chordifex sphacelatus*			
1870.	763	*Chorizandra enodis (Black Bristlerush)*			
1871.	1418	*Conostylis aculeata (Prickly Conostylis)*			
1872.	11826	*Conostylis aculeata subsp. aculeata*			
1873.	11414	*Conostylis aculeata subsp. breviflora*			
1874.	11552	*Conostylis aculeata subsp. bromelioides*			
1875.	12109	*Conostylis aculeata subsp. preissii*			
1876.	11977	*Conostylis aculeata subsp. spinuligera (Spiny Conostylis)*			
1877.	1420	*Conostylis androstemma (Trumpets)*			
1878.	1421	*Conostylis angustifolia*			
1879.	1423	*Conostylis aurea (Golden Conostylis)*			
1880.	1425	*Conostylis bracteata*		P3	
1881.	1427	*Conostylis candicans (Grey Cottonhead)*			
1882.	12027	*Conostylis candicans subsp. calcicola*			
1883.	11438	*Conostylis candicans subsp. candicans*			
1884.	48452	*Conostylis crassinerva subsp. absens*			
1885.	11695	*Conostylis festucacea subsp. festucacea*			
1886.	1435	*Conostylis hiemalis*			
1887.	1436	*Conostylis juncea*			
1888.	1437	*Conostylis latens*			
1889.	1443	*Conostylis pauciflora (Dawesville Conostylis)*			
1890.	11388	*Conostylis pauciflora subsp. euryrhipis*		P4	
1891.	1446	*Conostylis prolifera (Mat Cottonheads)*			
1892.	1451	*Conostylis seminuda*			
1893.	1454	*Conostylis setigera (Bristly Cottonhead)*			
1894.	11597	*Conostylis setigera subsp. setigera*			
1895.		*Conostylis sp.*			
1896.	11543	*Conostylis teretifolia subsp. planescens*			
1897.	11870	*Conostylis teretifolia subsp. teretifolia*			
1898.	1458	*Conostylis teretiuscula*			
1899.	33437	*Corynephorus fasciculatus*	Y		
1900.	1285	*Corynotheca micrantha (Sand Lily)*			
1901.	11834	*Corynotheca micrantha var. acanthoclada*			
1902.	11883	*Corynotheca micrantha var. elongata*			
1903.	11283	*Corynotheca micrantha var. micrantha*			
1904.	15114	*Cyanicula gemmata*			
1905.	15404	*Cyanicula sericea*			
1906.	768	*Cyathochaeta avenacea*			
1907.	40660	*Cycnogeton huegelii*			

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1908.	40661	*Cycnogeton lineare*			
1909.	283	*Cynodon dactylon (Couch)*	Y		
1910.	771	*Cyperus alterniflorus*			
1911.	783	*Cyperus congestus (Dense Flat-sedge)*	Y		
1912.	794	*Cyperus gymnocaulos (Spiny Flat-sedge)*			
1913.	795	*Cyperus hamulosus*	Y		
1914.	815	*Cyperus tenellus (Tiny Flatsedge)*	Y		
1915.	816	*Cyperus tenuiflorus (Scaly Sedge)*	Y		
1916.	10916	*Cyrtostylis huegelii*			
1917.	10964	*Cyrtostylis robusta*			
1918.	1218	*Dasypogon bromeliifolius (Pineapple Bush)*			
1919.	1220	*Dasypogon obliquifolius*			
1920.	17663	*Desmocladus asper*			
1921.	16593	*Desmocladus biformis*		P3	
1922.	16595	*Desmocladus flexuosus*			
1923.	46362	*Desmocladus lateriflorus*			
1924.	17662	*Desmocladus lateriticus*			
1925.	46364	*Desmocladus microcarpus*		P2	
1926.	16471	*Desmocladus myriocladus*			
1927.	46365	*Desmocladus nodatus*		P3	
1928.	17846	*Desmocladus parthenicus*			
1929.	16455	*Desmocladus virgatus*			
1930.	1259	*Dianella revoluta (Blueberry Lily)*			
1931.	11636	*Dianella revoluta var. divaricata*			
1932.	17838	*Dielsia stenostachya*			
1933.	1509	*Dioscorea hastifolia (Warrine, Wararn)*			
1934.	19649	*Disa bracteata*	Y		
1935.	12943	*Diuris brumalis*			
1936.	11049	*Diuris corymbosa*			
1937.	1634	*Diuris laxiflora (Bee Orchid)*			
1938.	1635	*Diuris longifolia (Common Donkey Orchid)*			
1939.	42182	*Diuris perialla*			
1940.	43300	*Diuris refracta*			
1941.	42229	*Diuris segregata*			
1942.	42228	*Diuris septentrionalis*			
1943.	1638	*Diuris setacea (Bristly Donkey Orchid)*			
1944.	44162	*Diuris tinkeri*			
1945.	1639	*Drakaea elastica (Glossy-leaved Hammer Orchid)*		T	
1946.	1640	*Drakaea glyptodon (King-in-his-carriage)*			
1947.	15406	*Drakaea gracilis*			
1948.	1066	*Ecdeiocolea monostachya*			
1949.	347	*Ehrharta calycina (Perennial Veldt Grass)*	Y		
1950.	349	*Ehrharta longiflora (Annual Veldt Grass)*	Y		
1951.	351	*Ehrharta villosa (Pyp Grass)*	Y		
1952.	822	*Eleocharis acuta (Common Spikerush)*			
1953.	17605	*Eleocharis keigheryi*		T	
1954.	1643	*Elythranthera brunonis (Purple Enamel Orchid)*			
1955.	1644	*Elythranthera emarginata (Pink Enamel Orchid)*			
1956.	1645	*Epiblema grandiflorum (Babe-in-a-cradle)*			
1957.	376	*Eragrostis curvula (African Lovegrass)*	Y		
1958.	379	*Eragrostis elongata (Clustered Lovegrass)*			
1959.	415	*Eriachne ovata*			
1960.	1646	*Eriochilus dilatatus (White Bunny Orchid)*			
1961.	15414	*Eriochilus helonomos*			
1962.	15415	*Eriochilus scaber subsp. scaber*			
1963.		*Eriochilus sp. Muck-2 (no flower)*			Y
1964.	10802	*Eriochilus tenuis*			
1965.	20216	*Ficinia nodosa (Knotted Club Rush)*			
1966.	18392	*Freesia alba x leichtlinii*	Y		
1967.	907	*Gahnia trifida (Coast Saw-sedge)*			
1968.	18404	*Georgeantha hexandra*			
1969.	1520	*Gladiolus caryophyllaceus (Wild Gladiolus)*	Y		
1970.	17043	*Glyceria declinata*	Y		
1971.	1465	*Haemodorum discolor*			
1972.	1468	*Haemodorum laxum*			
1973.	1469	*Haemodorum loratum*		P3	
1974.	1470	*Haemodorum paniculatum (Mardja)*			
1975.	1472	*Haemodorum simplex*			
1976.	1473	*Haemodorum simulans*			
1977.	1475	*Haemodorum spicatum (Mardja)*			

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1978.	1476	*Haemodorum venosum*			
1979.	438	*Hainardia cylindrica (Common Barbgrass)*	Y		
1980.	439	*Hemarthria uncinata (Matgrass)*			
1981.	1292	*Hensmania stoniella*		P3	
1982.	1293	*Hensmania turbinata*			
1983.	8476	*Hordeum hystrix (Mediterranean Region Barley Grass)*	Y		
1984.	449	*Hordeum leporinum (Barley Grass)*	Y		
1985.	452	*Hyparrhenia hirta (Tambookie Grass)*	Y		
1986.	1070	*Hypolaena exsulca*			
1987.	17622	*Hypolaena robusta*		P4	
1988.	910	*Isolepis cernua (Nodding Club-rush)*			
1989.	20199	*Isolepis cernua var. cernua*			
1990.	20200	*Isolepis cernua var. setiformis*			
1991.	911	*Isolepis congrua*			
1992.	912	*Isolepis cyperoides*			
1993.	14540	*Isolepis hystrix*	Y		
1994.	917	*Isolepis marginata (Coarse Club-rush)*			
1995.	919	*Isolepis oldfieldiana*			
1996.	921	*Isolepis producta*			
1997.	924	*Isolepis stellata (Star Club-rush)*			
1998.	19632	*Johnsonia pubescens subsp. pubescens*			
1999.	20454	*Juncus acutus subsp. acutus*	Y		
2000.	1178	*Juncus bufonius (Toad Rush)*	Y		
2001.	1179	*Juncus caespiticius (Grassy Rush)*			
2002.	1180	*Juncus capitatus (Capitate Rush)*	Y		
2003.	11922	*Juncus kraussii subsp. australiensis*			
2004.	1188	*Juncus pallidus (Pale Rush)*			
2005.	1195	*Juncus subsecundus (Finger Rush)*			
2006.	20019	*Lachnagrostis filiformis*			
2007.	19955	*Lachnagrostis plebeia*			
2008.	467	*Lagurus ovatus (Hare s Tail Grass)*	Y		
2009.	468	*Lamarckia aurea (Goldentop)*	Y		
2010.	11815	*Laxmannia grandiflora subsp. grandiflora*			
2011.	1305	*Laxmannia omnifertilis*			
2012.	1307	*Laxmannia ramosa (Branching Lily)*			
2013.	11911	*Laxmannia ramosa subsp. ramosa*			
2014.	1308	*Laxmannia sessiliflora (Nodding Lily)*			
2015.	11464	*Laxmannia sessiliflora subsp. australis*			
2016.	11732	*Laxmannia sessiliflora subsp. sessiliflora*			
2017.	1309	*Laxmannia squarrosa*			
2018.	1073	*Lepidobolus chaetocephalus (Bristle-headed Chaff Rush)*			
2019.	13774	*Lepidobolus densus*		P4	
2020.	1075	*Lepidobolus preissianus*			
2021.	18074	*Lepidobolus preissianus subsp. preissianus*			
2022.	13775	*Lepidobolus quadratus*		P3	
2023.		*Lepidosperma aff. scabrum (#198)*			Y
2024.		*Lepidosperma aff. scabrum (Muck02. #203)*			Y
2025.	925	*Lepidosperma angustatum*			
2026.	42741	*Lepidosperma apricola*			
2027.	41620	*Lepidosperma asperatum*			
2028.	42742	*Lepidosperma calcicola*			
2029.	930	*Lepidosperma costale*			
2030.	933	*Lepidosperma gladiatum (Coast Sword-sedge, Kerbin)*			
2031.	936	*Lepidosperma leptostachyum*			
2032.	937	*Lepidosperma longitudinale (Pithy Sword-sedge)*			
2033.	940	*Lepidosperma pubisquameum*			
2034.	942	*Lepidosperma rostratum*		T	
2035.	944	*Lepidosperma scabrum*			
2036.		*Lepidosperma sp.*			
2037.	30440	*Lepidosperma sp. Gingin (M.A. Langley & P.M. Smith MAL 2193)*			Y
2038.	945	*Lepidosperma squamatum*			
2039.	946	*Lepidosperma striatum*			
2040.	1653	*Leporella fimbriata (Hare Orchid)*			
2041.	1077	*Leptocarpus canus (Hoary Twine-rush)*			
2042.	1078	*Leptocarpus coangustatus*			
2043.	1080	*Leptocarpus scariosus*			
2044.	15418	*Leptoceras menziesii*			
2045.	19241	*Lepyrodia curvescens*		P2	
2046.	1090	*Lepyrodia muirii*			
2047.	8682	*Lolium loliaceum (Stiff Ryegrass)*	Y		

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2048.	476	*Lolium perenne (Perennial Ryegrass)*	Y		
2049.	478	*Lolium rigidum (Wimmera Ryegrass)*	Y		
2050.		*Lolium sp.*			
2051.	479	*Lolium temulentum (Drake)*	Y		
2052.	1223	*Lomandra caespitosa (Tufted Mat Rush)*			
2053.	1228	*Lomandra hermaphrodita*			
2054.	1231	*Lomandra maritima*			
2055.	14542	*Lomandra micrantha subsp. micrantha*			
2056.	1234	*Lomandra nigricans*			
2057.	1239	*Lomandra preissii*			
2058.	1243	*Lomandra sericea (Silky Mat Rush)*			
2059.	1246	*Lomandra suaveolens*			
2060.	17837	*Loxocarya gigas*		P2	
2061.	1097	*Lyginia barbata*			
2062.	18049	*Lyginia imberbis*			
2063.	1477	*Macropidia fuliginosa (Black Kangaroo Paw)*			
2064.	953	*Mesomelaena graciliceps*			
2065.	954	*Mesomelaena preissii*			
2066.	955	*Mesomelaena pseudostygia*			
2067.	957	*Mesomelaena tetragona (Semaphore Sedge)*			
2068.	485	*Microlaena stipoides (Weeping Grass)*			
2069.	10954	*Microtis media (Tall Mignonette Orchid)*			
2070.	12761	*Microtis media subsp. densiflora*			
2071.	15419	*Microtis media subsp. media*			
2072.	1660	*Microtis orbicularis (Dark Mignonette Orchid)*			
2073.	138	*Najas marina (Prickly Water Nymph)*			
2074.	492	*Neurachne alopecuroidea (Foxtail Mulga Grass)*			
2075.	1537	*Orthrosanthus laxus (Morning Iris)*			
2076.	11749	*Orthrosanthus laxus var. laxus (Morning Iris)*			
2077.	168	*Ottelia ovalifolia (Swamp Lily)*			
2078.	13867	*Paracaleana dixonii*		T	
2079.	1667	*Paracaleana nigrita (Flying Duck Orchid)*			
2080.	516	*Parapholis incurva (Coast Barbgrass)*	Y		
2081.	1546	*Patersonia juncea (Rush Leaved Patersonia)*			
2082.	1550	*Patersonia occidentalis (Purple Flag, Koma)*			
2083.	30476	*Patersonia occidentalis var. latifolia*			
2084.	30472	*Patersonia occidentalis var. occidentalis*			
2085.	43763	*Pauridia glabella*			
2086.	43762	*Pauridia occidentalis var. quadriloba*			
2087.	40423	*Pentameris airoides (False Hairgrass)*	Y		
2088.	40424	*Pentameris airoides subsp. airoides*	Y		
2089.	40422	*Pentameris pallida*	Y		
2090.	551	*Phalaris minor (Lesser Canary Grass)*	Y		
2091.	20460	*Pheladenia deformis*			
2092.	1172	*Philydrella drummondii*			
2093.	1173	*Philydrella pygmaea (Butterfly Flowers)*			
2094.	14306	*Philydrella pygmaea subsp. pygmaea*			
2095.	1478	*Phlebocarya ciliata*			
2096.	1479	*Phlebocarya filifolia*			
2097.	11557	*Phlebocarya pilosissima subsp. pilosissima*		P3	
2098.	571	*Poa annua (Winter Grass)*	Y		
2099.	573	*Poa drummondiana (Knotted Poa)*			
2100.	577	*Poa poiformis (Coastal Poa)*			
2101.	578	*Poa porphyroclados*			
2102.	582	*Polypogon monspeliensis (Annual Beardgrass)*	Y		
2103.	583	*Polypogon tenellus*			
2104.	110	*Potamogeton drummondii*			
2105.	1668	*Prasophyllum brownii*			
2106.	1672	*Prasophyllum fimbria (Fringed Leek Orchid)*			
2107.	16688	*Prasophyllum gracile*			
2108.	1677	*Prasophyllum macrostachyum (Laughing Leek Orchid)*			
2109.	1679	*Prasophyllum ovale (Little Leek Orchid)*			
2110.	1680	*Prasophyllum parvifolium (Autumn Leek Orchid)*			
2111.	10853	*Prasophyllum plumiforme*			
2112.		*Pterostylis aff. nana*			
2113.	15426	*Pterostylis aspera*			
2114.	1687	*Pterostylis dilatata*			
2115.	48677	*Pterostylis ectypha*			
2116.	48674	*Pterostylis orbiculata*			
2117.	45343	*Pterostylis platypetala*			

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2118.	1693	*Pterostylis recurva (Jug Orchid)*			
2119.	12217	*Pterostylis sanguinea*			
2120.	45344	*Pterostylis scitula*			
2121.	49034	*Pterostylis sp. Bloated snail orchid (W. Jackson BJ 486)*			
2122.	18655	*Pterostylis sp. crinkled leaf (G.J. Keighery 13426)*			
2123.	1698	*Pterostylis vittata (Banded Greenhood)*			
2124.	16367	*Pyrorchis nigricans (Red beaks, Elephants ears)*			
2125.	1555	*Romulea obscura*	Y		
2126.	1556	*Romulea rosea (Guildford Grass)*	Y		
2127.	11544	*Romulea rosea var. australis (Guildford Grass)*	Y		
2128.	40431	*Rytidosperma acerosum*			
2129.	40425	*Rytidosperma caespitosum*			
2130.	40426	*Rytidosperma occidentale*			
2131.	48356	*Schoenoplectus tabernaemontani*			
2132.	973	*Schoenus asperocarpus (Poison Sedge)*			
2133.	975	*Schoenus bifidus*			
2134.	978	*Schoenus brevisetis*			
2135.	979	*Schoenus caespititius*			
2136.	982	*Schoenus clandestinus*			
2137.	984	*Schoenus curvifolius*			
2138.	985	*Schoenus discifer*			
2139.	986	*Schoenus efoliatus*			
2140.	992	*Schoenus grandiflorus (Large Flowered Bogrush)*			
2141.	17606	*Schoenus griffinianus*		P4	
2142.	17617	*Schoenus insolitus*			
2143.	997	*Schoenus lanatus (Woolly Bog-rush)*			
2144.	998	*Schoenus latitans*			
2145.	999	*Schoenus loliaceus*		P2	
2146.	1000	*Schoenus minutulus*			
2147.	1002	*Schoenus nanus (Tiny Bog Rush)*			
2148.	1003	*Schoenus natans (Floating Bog-rush)*		P4	
2149.	1006	*Schoenus odontocarpus*			
2150.	1007	*Schoenus pedicellatus*			
2151.	1008	*Schoenus pennisetis*		P3	
2152.	1009	*Schoenus pleiostemoneus*			
2153.	17614	*Schoenus plumosus*			
2154.	1011	*Schoenus rigens*			
2155.		*Schoenus sp. Muck2 (no fruits)*			Y
2156.	1018	*Schoenus subfascicularis*			
2157.	16252	*Schoenus subflavus subsp. subflavus*			
2158.	1020	*Schoenus sublateralis*			
2159.	1023	*Schoenus tenellus*			
2160.	1026	*Schoenus unispiculatus*			
2161.	1312	*Sowerbaea laxiflora (Purple Tassels)*			
2162.	1558	*Sparaxis bulbifera*	Y		
2163.	625	*Spinifex longifolius (Beach Spinifex)*			
2164.	1260	*Stypandra glauca (Blind Grass)*			
2165.	1036	*Tetraria octandra*			
2166.	35581	*Tetraria sp. Chandala (G.J. Keighery 17055)*		P2	
2167.		*Thelymitra aff. pauciflora*			
2168.		*Thelymitra aff. pauciflora scps*			
2169.	1701	*Thelymitra antennifera (Vanilla Orchid)*			
2170.	11032	*Thelymitra apiculata*		P4	
2171.	10856	*Thelymitra benthamiana (Leopard Orchid)*			
2172.	1702	*Thelymitra campanulata (Shirt Orchid)*			
2173.	13687	*Thelymitra dedmaniarum (Cinnamon Sun Orchid, Bronze Orchid)*		T	
2174.	1708	*Thelymitra fuscolutea (Chestnut Sun Orchid)*			
2175.	11053	*Thelymitra macrophylla*			
2176.	10862	*Thelymitra stellata (Star Orchid)*		T	
2177.	20731	*Thelymitra vulgaris*			
2178.	10874	*Thinopyrum distichum*	Y		
2179.	1318	*Thysanotus arbuscula*			
2180.	1319	*Thysanotus arenarius*			
2181.	1320	*Thysanotus asper (Hairy Fringe Lily)*			
2182.	1334	*Thysanotus glaucus*		P4	
2183.	1338	*Thysanotus manglesianus (Fringed Lily)*			
2184.		*Thysanotus manglesianus/patersonii complex*			
2185.	1339	*Thysanotus multiflorus (Many-flowered Fringe Lily)*			
2186.	1343	*Thysanotus patersonii*			
2187.	1348	*Thysanotus rectantherus*			

	Name ID	Species Name	Naturalised	Conservation Code	Endemic To Query Area
2188.		*Thysanotus sp.*			
2189.	1351	*Thysanotus sparteus*			
2190.	1353	*Thysanotus spiniger*			
2191.	1357	*Thysanotus thyrsoideus*			
2192.	1358	*Thysanotus triandrus*			
2193.	1368	*Trachyandra divaricata*	Y		
2194.	1481	*Tribonanthes australis (Southern Tiurndin)*			
2195.	1483	*Tribonanthes longipetala (Branching Tiurndin)*			
2196.	8798	*Tribonanthes uniflora (Woolly Tiurndin)*			
2197.	8799	*Tribonanthes variabilis (Hairy-stigma Tiurndin)*			
2198.	1485	*Tribonanthes violacea (Violet Tiurndin)*			
2199.	1361	*Tricoryne elatior (Yellow Autumn Lily)*			
2200.	29481	*Tricoryne sp. Eneabba (E.A. Griffin 1200)*			
2201.	1363	*Tricoryne tenella*			
2202.	1038	*Tricostularia neesii*			
2203.	33677	*Triglochin centrocarpa*			
2204.	33276	*Triglochin isingiana*			
2205.	148	*Triglochin muelleri*			
2206.	18587	*Triglochin nana*			
2207.	151	*Triglochin striata*			
2208.	152	*Triglochin trichophora*			
2209.	722	*Vulpia bromoides (Squirrel Tail Fescue)*	Y		
2210.	11137	*Vulpia fasciculata*	Y		
2211.	724	*Vulpia myuros (Rat s Tail Fescue)*	Y		
2212.	12052	*Vulpia myuros forma megalura*	Y		
2213.	33101	*Vulpia myuros forma myuros*	Y		
2214.		*Vulpia sp.*			
2215.	1394	*Wurmbea dioica (Early Nancy)*			
2216.	12072	*Wurmbea dioica subsp. alba*			
2217.	1398	*Wurmbea monantha*			
2218.	1401	*Wurmbea pygmaea*			
2219.	1252	*Xanthorrhoea drummondii*			
2220.	1256	*Xanthorrhoea preissii (Grass tree, Palga)*			
2221.		*Xanthorrhoea sp.*			
2222.	1049	*Zantedeschia aethiopica (Arum Lily)*	Y		
Pteridophyte (Fern)					
2223.	42902	*Azolla rubra*			
2224.	31	*Cheilanthes austrotenuifolia*			
2225.		*Cheilanthes sp.*			
2226.	54	*Cyclosorus interruptus*			
2227.	74	*Marsilea drummondii (Common Nardoo)*			
2228.	77	*Marsilea mutica*			
2229.	17	*Ophioglossum lusitanicum (Adders Tongue)*			
2230.	4	*Phylloglossum drummondii (Pigmy Clubmoss)*			
2231.	41651	*Ptendium esculentum subsp. esculentum*			
2232.	24	*Schizaea fistulosa (Narrow Comb Fern)*			
Reptile					
2233.	42368	*Acritoscincus trilineatus (Western Three-lined Skink)*			
2234.	24990	*Aprasia pulchella (Granite Worm-lizard)*			
2235.	24991	*Aprasia repens (Sand-plain Worm-lizard)*			
2236.	42373	*Brachyurophis fasciolatus (Narrow-banded Shovel-nosed Snake)*			
2237.	42380	*Brachyurophis fasciolatus subsp. fasciolatus (Narrow-banded Shovel-nosed Snake)*			
2238.	42381	*Brachyurophis semifasciatus (Southern Shovel-nosed Snake)*			
2239.	43380	*Chelodina colliei (South-western Snake-necked Turtle)*			
2240.	24980	*Christinus marmoratus (Marbled Gecko)*			
2241.	25456	*Crenadactylus ocellatus (Clawless Gecko)*			
2242.	24918	*Crenadactylus ocellatus subsp. ocellatus (Clawless Gecko)*			
2243.	30893	*Cryptoblepharus buchananii*			
2244.	25020	*Cryptoblepharus plagiocephalus*			
2245.	30899	*Ctenophorus adelaidensis (Southern Heath Dragon, Western Heath Dragon)*			
2246.	25027	*Ctenotus australis*			
2247.	25039	*Ctenotus fallens*			
2248.	25051	*Ctenotus lancelini (Lancelin Island Skink, Lancelin Island Ctenotus)*		T	
2249.	25065	*Ctenotus pantherinus subsp. pantherinus (Leopard Ctenotus)*			
2250.	25074	*Ctenotus schomburgkii*			
2251.	25086	*Cyclodomorphus branchialis (Gilled Slender Blue-tongue Skink)*		T	
2252.	25087	*Cyclodomorphus celatus (Western Slender Blue-tongue)*			
2253.	30905	*Delma concinna subsp. concinna (Javelin Legless Lizard)*			
2254.	25766	*Delma fraseri (Fraser s Legless Lizard)*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
2255.	24999	*Delma grayii*			
2256.	25468	*Demansia psammophis (Yellow-faced Whipsnake)*			
2257.	25296	*Demansia psammophis subsp. reticulata (Yellow-faced Whipsnake)*			
2258.	24939	*Diplodactylus polyophthalmus*			
2259.	25251	*Echiopsis curta (Bardick)*			
2260.	25096	*Egernia kingii (King s Skink)*			
2261.	25100	*Egernia napoleonis*			
2262.	25119	*Hemiergis quadrilineata*			
2263.	43384	*Hydrophis platurus (Yellow-bellied Seasnake)*			
2264.	25128	*Lerista christinae*			
2265.	25131	*Lerista distinguenda*			
2266.	25133	*Lerista elegans*			
2267.	25148	*Lerista lineopunctulata*			
2268.	25154	*Lerista microtis subsp. microtis*			
2269.	25165	*Lerista praepedita*			
2270.	25005	*Lialis burtonis*			
2271.	41413	*Liopholis multiscutata (Bull Skink)*			
2272.	42414	*Lucasium alboguttatum*			
2273.	25184	*Menetia greyii*			
2274.	25240	*Morelia spilota subsp. imbricata (Carpet Python)*			
2275.	25191	*Morethia lineoocellata*			
2276.	25192	*Morethia obscura*			
2277.	25248	*Neelaps bimaculatus (Black-naped Snake)*			
2278.	25249	*Neelaps calonotos (Black-striped Snake, black-striped burrowing snake)*		P3	
2279.	25252	*Notechis scutatus (Tiger Snake)*			
2280.	25253	*Parasuta gouldii*			
2281.	25255	*Parasuta nigriceps*			
2282.	25007	*Pletholax gracilis subsp. gracilis (Keeled Legless Lizard)*			
2283.	25510	*Pogona minor (Dwarf Bearded Dragon)*			
2284.	24907	*Pogona minor subsp. minor (Dwarf Bearded Dragon)*			
2285.	25261	*Pseudechis australis (Mulga Snake)*			
2286.	25511	*Pseudonaja affinis (Dugite)*			
2287.	25259	*Pseudonaja affinis subsp. affinis (Dugite)*			
2288.	42416	*Pseudonaja mengdeni (Western Brown Snake)*			
2289.	25008	*Pygopus lepidopodus (Common Scaly Foot)*			
2290.	25266	*Simoselaps bertholdi (Jan s Banded Snake)*			
2291.	25518	*Strophurus spinigerus*			
2292.	24943	*Strophurus spinigerus subsp. inornatus*			
2293.	24942	*Strophurus spinigerus subsp. spinigerus*			
2294.	25203	*Tiliqua occipitalis (Western Bluetongue)*			
2295.	25519	*Tiliqua rugosa*			
2296.	25207	*Tiliqua rugosa subsp. rugosa*			
2297.	25218	*Varanus gouldii (Bungarra or Sand Monitor)*			
2298.	25227	*Varanus tristis subsp. tristis (Racehorse Monitor)*			

Slime Mould

2299.	38969	*Arcyria minuta*			
2300.	39097	*Trichia decipiens*			

Conservation Codes
T - Rare or likely to become extinct
X - Presumed extinct
IA - Protected under international agreement
S - Other specially protected fauna
1 - Priority 1
2 - Priority 2
3 - Priority 3
4 - Priority 4
5 - Priority 5

[1] For NatureMap's purposes, species flagged as endemic are those whose records are wholely contained within the search area. Note that only those records complying with the search criterion are included in the calculation. For example, if you limit records to those from a specific datasource, only records from that datasource are used to determine if a species is restricted to the query area.

Appendix E: Fauna Species Recorded

Scientific Name	Common Name	Conservation Status			Trapping Site																Opportunistic Ph 1	Opportunistic Ph 2	Motion Camera	SRE By-catch	Regional opp
		EPBC Act	BC Act	DBCA	BI S01 Ph 1	BI S02 Ph 1	BI S03 Ph 1	BI S04 Ph 1	BI S05 Ph 1	BI S06 Ph 1	BI S07 Ph 1	BI S08 Ph 1	BI S01 Ph 2	BI S02 Ph 2	BI S03 Ph 2	BI S04 Ph 2	BI S05 Ph 2	BI S06 Ph 2	BI S07 Ph 2	BI S08 Ph 2					
Amphibians																									
Limnodynastidae																									
Heleioporus eyrei	Moaning Frog											1	3				1	1		4					
Limnodynastes dorsalis	Western Banjo Frog											1	2		1			2	1	3		2			
Myobatrachidae																									
Crinia insignifera	Squelching Froglet											5													
Myobatrachus gouldii	Turtle Frog							3	1				1	1			6	2	1	3					
Pseudophryne guentheri	Crawling Toadlet											5								1					
Birds																									
Dromaiidae																									
Dromaius novaehollandiae	Emu																				6		3		
Anatidae																									
Anas superciliosa	Pacific Black Duck																						1		
Phasianidae																									
Aegotheles cristatus	Stubble Quail																						1		
Aegothelidae																									
Coturnix pectoralis	Australian Owlet Nightjar																				1				
Cuculidae																									
Chrysococcyx basalis	Horsfield's Bronze Cuckoo				1		3														1				
Chalcites lucidus	Shining Bronze-cuckoo				1				1	4	2										1				
Columbidae																									
Phaps chalcoptera	Common Bronzewing						1																1		
Ocyphaps lophotes	Crested Pigeon											2													
Alcedinidae																									
**Dacelo novaeguineae*	Laughing Kookaburra												2								2				
Todiramphus sanctus	Sacred Kingfisher					2																			
Meropidae																									
Merops ornatus	Rainbow Bee-eater						3		1		5	1									4				
Falconidae																									
Falco cenchroides	Australian Kestrel (Nankeen Kestrel)									1															
Falco longipennis	Australian Hobby						1															1			
Falco berigora	Brown Falcon					2	2														2				
Cacatuidae																									
Calyptorhynchus latirostris	Carnaby's Cockatoo	EN	EN															12			1				18
Cacatua roseicapilla	Galah									11															1
Cacatua sanguinea	Little Corella				3																				

Scientific Name	Common Name	Conservation Status			Trapping Site																Opportunistic Ph 1	Opportunistic Ph 2	Motion Camera	SRE By-catch	Regional opp
		EPBC Act	BC Act	DBCA	BI S01 Ph 1	BI S02 Ph 1	BI S03 Ph 1	BI S04 Ph 1	BI S05 Ph 1	BI S06 Ph 1	BI S07 Ph 1	BI S08 Ph 1	BI S01 Ph 2	BI S02 Ph 2	BI S03 Ph 2	BI S04 Ph 2	BI S05 Ph 2	BI S06 Ph 2	BI S07 Ph 2	BI S08 Ph 2					
Psittaculidae																									
Polytelis anthopeplus	Regent Parrot																			8					
Purpureicephalus spurius	Red-capped Parrot									2		1					5								
Barnardius zonarius	Australian Ringneck																				10				
Maluridae																									
Malurus splendens	Splendid Fairy-wren					6		7	4	11	4		1					4	2		17		1		1
Malurus leucopterus	White-winged Fairy-wren																					1			
Stipiturus malachurus	Southern Emu-wren																				6				
Meliphagidae																									
Acanthorhynchus superciliosus	Western Spinebill					9		1		6	6	5		15		1		3		2	7	5			
Glyciphila melanops	Tawny-crowned Honeyeater					1	1	5	2	2	15	1	1			2	1	1	3		11	2			
Lichmera indistincta	Brown Honeyeater				11	46	11	12	62	57	25	43		12		4		9		3	56	4			1
Melithreptus brevirostris	Brown-headed Honeyeater																2								
Phylidonyris novaehollandiae	New Holland Honeyeater									12		3						5		5	2		1		
Phylidonyris niger	White-cheeked Honeyeater						17													4					
Anthochaera lunulata	Western Little Wattlebird (Western Wattlebird)						1					4			1			4		3	1				
Anthochaera carunculata	Red Wattlebird									2	2										5		1		
Gavicalis virescens	Singing Honeyeater					5	2	1	3	2	3			4						1	8	1	1		
Pardalotidae																									
Pardalotus punctatus	Spotted Pardalote																								1
Pardalotus striatus	Striated Pardalote																								1
Acanthizidae																									
Gerygone fusca	Western Gerygone					2	1														4				1
Acanthiza apicalis	Broad-tailed Thornbill (Inland Thornbill)															3					1	11			
Acanthiza inornata	Western Thornbill				8	11								6							17				
Artamidae																									
Artamus cinereus	Black-faced Woodswallow				2		3				1				2						4				
Cracticus torquatus	Grey Butcherbird						1													1					
Cracticus nigrogularis	Pied Butcherbird																		1	1					
Cracticus tibicen	Australian Magpie				4				2	7		5		2								4			1
Campephagidae																									
Coracina novaehollandiae	Black-faced Cuckoo-shrike				4	1	3		1	2		1								1	1				
Neosittidae																									
Daphoenositta chrysoptera	Varied Sitella																				9				
Pachycephalidae																									
Pachycephala rufiventris	Rufous Whistler				2				4		3	1									6				
Pachycephala occidentalis	Western Whistler						2																		

Scientific Name	Common Name	Conservation Status			Trapping Site																Opportunistic Ph 1	Opportunistic Ph 2	Motion Camera	SRE By-catch	Regional opp
		EPBC Act	BC Act	DBCA	BI S01 Ph 1	BI S02 Ph 1	BI S03 Ph 1	BI S04 Ph 1	BI S05 Ph 1	BI S06 Ph 1	BI S07 Ph 1	BI S08 Ph 1	BI S01 Ph 2	BI S02 Ph 2	BI S03 Ph 2	BI S04 Ph 2	BI S05 Ph 2	BI S06 Ph 2	BI S07 Ph 2	BI S08 Ph 2					
Colluricincla harmonica	Grey Shrike-thrush				1				1	3	1	2									1				
Rhipiduridae																									
Rhipidura leucophrys	Willie Wagtail									1															
Rhipidura albiscapa	Grey Fantail									1						2					4				1
Corvidae																									
Corvus bennetti	Little Crow					1															1				
Corvus coronoides	Australian Raven				3	2	2		4	2	4	4	3	1			1		3		1				
Petroicidae																									
Microeca fascinans	Jacky Winter																				1				
Petroica boodang	Scarlet Robin				3	1			5					2		3				1	3	1			
Petroica goodenovii	Red-capped Robin					2	1																		
Hirundinidae																									
Petrochelidon nigricans	Tree Martin														7										
Zosteropidae																									
Zosterops lateralis	Grey-breasted White-eye (Silvereye)								2	15	1									7					
Mammals																									
Tachyglossidae																									
Tachyglossus aculeatus	Short-beaked Echidna																						1		
Dasyuridae																									
Sminthopsis fuliginosus	Little long-tailed Dunnart								3			1				1	1		2						
Tarsipedidae																									
Tarsipes rostratus	Honey Possum, Noolbenger						9	1	1	1		1			1	3	1	2	4	1		1	1		
Macropodidae																									
Macropus fuliginosus	Western Grey Kangaroo					2															22	3	41		
Muridae																									
Pseudomys albocinereus	Ash-grey Mouse							3			2			1					1						
Vespertilionidae																									
Chalinolobus gouldii	Gould's Wattled Bat				4	3	4	4	4	4	4	4	4	4	4	4	4	3	4	4					
Chalinolobus morio	Chocolate Wattled Bat				1								1	1		1		2	2						
Scotorepens balstoni	Inland Broad-nosed Bat								1					1		1	1								
Vespadelus baverstocki	Inland Forest Bat				4	4	4	4	4	4	4	4	4	4	3	4	4	4	4	2					
Vespadelus regulus	Southern Forest Bat				4	4	4	4	4	4	4	4	4	4	3	2	1	4	4						
Nyctophilus sp.#					4	4	2	4	4	4	4	4	1	4			1	3		2					
Molossidae																									
Austronomus australis	White-striped Free-tailed Bat				2	3	1	2	1	2	1	2	4	2	2	3	4	4	2	4					
Ozimops kitcheneri	Western Free-tailed Bat								1	1		3													
Introduced Mammals																									

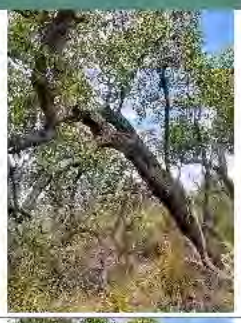
Scientific Name	Common Name	Conservation Status			Trapping Site																Opportunistic Ph 1	Opportunistic Ph 2	Motion Camera	SRE By-catch	Regional opp
		EPBC Act	BC Act	DBCA	BI S01 Ph 1	BI S02 Ph 1	BI S03 Ph 1	BI S04 Ph 1	BI S05 Ph 1	BI S06 Ph 1	BI S07 Ph 1	BI S08 Ph 1	BI S01 Ph 2	BI S02 Ph 2	BI S03 Ph 2	BI S04 Ph 2	BI S05 Ph 2	BI S06 Ph 2	BI S07 Ph 2	BI S08 Ph 2					
Muridae																									
**Mus musculus*	House Mouse					1	2		1	1		1	35	25	17	19	21	9	13	26			5		
Leporidae																									
**Oryctolagus cuniculus*	Rabbit											1													
Canidae																									
**Vulpes vulpes*	Red Fox																				1		17		
Felidae																									
**Felis catus*	Cat																					1	4		
Suidae																									
**Sus scrofa*	Pig																						2		
Reptiles																									
Diplodactylidae																									
Strophurus spinigerus	Soft Spiny-tailed Gecko						1														1	1			
Pygopodidae																									
Lialis burtonis	Burton's Legless Lizard							1	1					1			1	1							
Pletholax gracilis	West Coast Keeled Legless Gecko					1		2	2											1					
Agamidae																									
Ctenophorus adelaidensis	Western Heath Dragon				1	6		4	2		10	2				5					1				
Pogona minor	Western Bearded Dragon				1		3	1		1				2	1				1		2				
Scincidae																									
Cryptoblepharus buchananii	Buchanan's Snake-eyed Skink								2	1		1						1			2				1
Cryptoblepharus placgiocephalus	Peron's Snake-eyed Skink																				4				
Ctenotus fallens	West-coast Laterite Ctenotus					4	2	2	7	3	1	1		1	3	2	1	1		4	1				1
Menetia greyii	Common Dwarf Skink					3	2	1	1	2	3	1							1						
Morethia butleri	Woodland Dark-flecked Morethia																1	1						1	
Morethia obscura	Shrubland Morethia Skink					2	2	3	2																
Tiliqua rugosa	Bobtail				1											1							1		
Varanidae																									
Varanus gouldii	Bungarra or Sand Goanna																				1				
Elapidae																									
Brachyurophis fasciolatus	Narrow-banded Shovel-nosed Snake					1																			
Demansia psammophis	Yellow-faced Whipsnake																				1				
Echiopsis curta	Bardick						1	1	2																

Ambiguous identification between *Nycotphilus geoffroyi, N. holtorum and N. major major.*

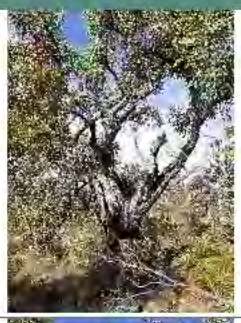
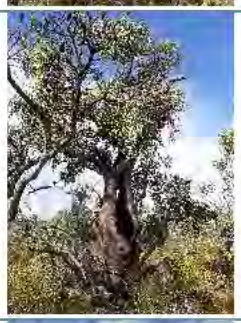
* Introduced species

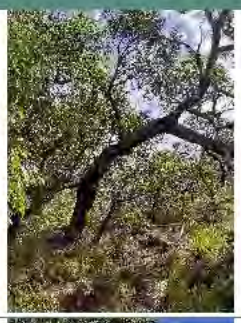
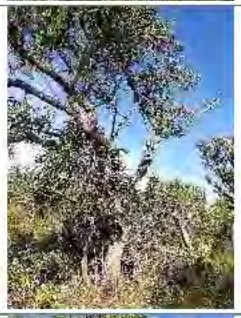
Appendix F: Potential Cockatoo Breeding Trees

Tree ID	Species	Comments	Location		Photo
			Easting	Northing	
PBT16NP	Pricklybark (*E. todtiana*)	No hollows	365889	6557833	
PBT17NP	Pricklybark (*E. todtiana*)	One hollow forming	365853	6557853	
PBT01NP	Pricklybark (*E. todtiana*)	One potential hollow	363895	6560318	
PBT02NP	Pricklybark (*E. todtiana*)	No hollows	363905	6560308	
PBT03NP	Pricklybark (*E. todtiana*)	No hollows	363910	6560296	

Tree ID	Species	Comments	Location		Photo
			Easting	Northing	
PBT04NP	Pricklybark (*E. todtiana*)	No hollows	363943	6560305	
PBT05NP	Pricklybark (*E. todtiana*)	No hollows	363960	6560323	
PBTMH01	Pricklybark (*E. todtiana*)		364581	6562716	
PBTMH02	Pricklybark (*E. todtiana*)		364573	6562704	
PBTMH03	Pricklybark (*E. todtiana*)		364645	6562695	

Tree ID	Species	Comments	Location		Photo
			Easting	Northing	
PBTMH04	Pricklybark (*E. todtiana*)		364625	6562742	
PBT18NP	Pricklybark (*E. todtiana*)		366368	6557182	
PHTMH26	Pricklybark (*E. todtiana*)		365403	6557223	
CCMH09	Pricklybark (*E. todtiana*)		364749	6561902	
CCMH10	Pricklybark (*E. todtiana*)		364764	6561904	
CCMH11	Pricklybark (*E. todtiana*)		364787	6561910	

Tree ID	Species	Comments	Location		Photo
			Easting	Northing	
CCMH12	Pricklybark (*E. todtiana*)		364803	6561905	
CCMH13	Pricklybark (*E. todtiana*)		364804	6561921	
CCMH14	Pricklybark (*E. todtiana*)	Potential hollows x2	364742	6561936	
CCMH15	Pricklybark (*E. todtiana*)		364732	6561863	
CCMH16	Pricklybark (*E. todtiana*)		364749	6561855	

Tree ID	Species	Comments	Location		Photo
			Easting	Northing	
CCMH17	Pricklybark (*E. todtiana*)		364726	6561867	
PBT10NP	Pricklybark (*E. todtiana*)		365964	6559976	
PBT11NP	Pricklybark (*E. todtiana*)	No hollows	365950	6560016	
PBT12NP	Pricklybark (*E. todtiana*)		365895	6559997	
PBT07NP	Pricklybark (*E. todtiana*)		365988	6560622	

Tree ID	Species	Comments	Location		Photo
			Easting	Northing	
PBT08NP	Pricklybark (*E. todtiana*)	No hollows	365957	6560632	
PBT09NP	Pricklybark (*E. todtiana*)	No hollows	365908	6560633	
PHTMH24	Pricklybark (*E. todtiana*)		365346	6559026	
PHTMH25	Pricklybark (*E. todtiana*)		365324	6558993	
PBT13NP	Pricklybark (*E. todtiana*)	No hollows	365896	6563256	

Tree ID	Species	Comments	Location		Photo
			Easting	Northing	
PBT14NP	*Melaleuca* sp.	Melaleuca, no hollows	365858	6563284	
PBT15NP	Pricklybark (*E. todtiana)*	No hollows	365860	6563258	
PHTMH18	Pricklybark (*E. todtiana)*	1 potential hollow	364314	6561396	
PHTMH05	Pricklybark (*E. todtiana)*	Hollows present	363954	6562445	
PHTMH21	Pricklybark (*E. todtiana)*	Potential hollow	367707	6558135	
PHTMH22	Pricklybark (*E. todtiana)*		367740	6558166	

Tree ID	Species	Comments	Location		Photo
			Easting	Northing	
PHTMH23	Pricklybark (*E. todtiana*)		367750	6558187	
PBTMH09	Christmas Tree (*Nuytsia floribunda*)		364144	6561897	
PHTMH06	*Melaleuca* sp.		364130	6561855	
PHTMH07	*Melaleuca* sp.	Melaleuca with potential hollow	364130	6561855	
PHTMH08	*Melaleuca* sp.		364153	6561877	
PBT06NP	Pricklybark (*E. todtiana*)	No hollows	365543	6561040	

Tree ID	Species	Comments	Location		Photo
			Easting	Northing	
PHTMH19	Pricklybark (*E. todtiana*)		367675	6558184	
PHTMH20	Pricklybark (*E. todtiana*)	Potential hollow	367693	6558184	

Appendix G: Bat Call Analysis Reports

Specialised Zoological

Acoustic analysis and bat call identification from Bidaminna, Western Australia

Prepared for **Spectrum Ecology Pty Ltd**

Version **28 November 2021**

SZ project reference **SZ587**

Prepared by **Dr Kyle Armstrong and Yuki Konishi**

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

Specialised Zoological (2021). Acoustic analysis and bat call identification from Bidaminna, Western Australia. Unpublished report by Specialised Zoological for Spectrum Ecology Pty Ltd, 28 November 2021, project reference SZ587.

Summary

Bat identifications from acoustic recordings are provided from Bidaminna, near Moore River, north of Perth, Western Australia. The identification of bat species from full spectrum WAV-format recordings of their echolocation calls was based on measurements of characteristic frequency, observation of pulse shape, and the pattern of harmonics. At least eight species of bat were identified as being present (**Tables 1** and **2**). Representative echolocation calls for each identification are illustrated (**Figure 1**), as recommended by the Australasian Bat Society (ABS 2006). Further details are available should verification be required.

Methods

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

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

1. undertook a Discriminant Function Analysis on training data from representative calls from southern Australia;

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

3. facilitated an inspection in a spectrogram of multiple examples of each call type for each recording night by opening the original WAV files containing pulses of interest in Adobe Audition CS6 version 22.

Species were identified based on information in Churchill (2008); and nomenclature follows Jackson and Groves (2015).

Comments on ambiguous identifications

Most species were identified unambiguously, but some call types have more than one possibility for their source. It is difficult to make an unambiguous identification of long-eared bats *Nyctophilus* spp., and here call sequences could be derived from the Lesser Long-eared Bat *Nyctophilus geoffroyi* or Holt's Long-eared Bat *N. holtorum*, or the Western Long-eared Bat *N. major major*. At least two species were likely to be present.

The sites surveyed are at the edge of the ranges of two *Vespadelus* species that have partly overlapping echolocation call characteristics (characteristic frequency), and both species appear to be present at all sites.

Limitations

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

1. The identifications made herein were based on the ultrasonic acoustic data recorded and provided by a 'third party' (the client named on the front of this report).
2. The scope of this report extended to providing information on the identification of bat species in bulk ultrasonic recordings. Further comment on these species and the possible impacts of a planned project on bat species were not part of the scope.
3. In the case of the present report, the recording equipment was not set up and supplied by Specialised Zoological. The equipment was operated by the third party during the survey.
4. Other than the general location of the study area, Specialised Zoological has not been provided with detailed information of the survey area, has not made a visit to observe the habitats available for bats, nor have we visited the specific project areas on a previous occasion.
5. Specialised Zoological has had no input into the overall design and timing of this bat survey, recording site placement, nor the degree of recording site replication.
6. While Specialised Zoological has made identifications to the best of our ability given the available materials, and reserves the right to re-examine the data and revise any identification following a query, it is the client's and / or proponent's responsibility to provide supporting evidence for any identification, which might require follow-up trapping effort or non-invasive methods such as video recordings. Specialised Zoological bears no liability for any follow-up work that may be required to support an identification based initially on the analysis of acoustic recordings undertaken and reported on here.
7. There are a variety of factors that affect the 'detectability' of each bat species, given the frequency, power and shape characteristics of their calls. Further information on the analysis and the various factors that can impinge on the reliability of identifications can be provided upon request.
8. The analysis of ultrasonic recordings is one of several methods that can be used to survey for bats, and comprehensive surveys typically employ more than one method. If an identification in the present report is ambiguous or in question, a trapping programme would help to resolve the presence of the possibilities in the project area.

References

ABS (2006). Recommendations of the Australasian Bat Society Inc for reporting standards for insectivorous bat surveys using bat detectors. *The Australasian Bat Society Newsletter* 27: 6–9. [ISSN 1448-5877]

Armstrong K.N., Broken-Brow J., Hoye G., Ford G., Thomas M. and Corben C. (2021a). Effective detection and identification of sheath-tailed bats of Australian forests and woodlands. *Australian Journal of Zoology* https://doi.org/10.1071/ZO20044

Armstrong K.N., Clarke S., Linke A., Scanlon A., Roetman P., Hitch, A.T. and Donnellan S.C. (2021b). Citizen science implements the first intensive acoustics-based survey of insectivorous bat species across the Murray-Darling Basin of South Australia. *Australian Journal of Zoology*. https://doi.org/10.1071/ZO20051

Churchill, S.K. (2008). *Australian bats*. 2nd ed. Allen and Unwin, Crows Nest, NSW.

Jackson, S.M. and Groves, C.P. (2015). *Taxonomy of Australian mammals*. CSIRO Publishing, Victoria.

Table 1. Species identified in the present survey from all sites combined.

VESPERTILIONIDAE	
Gould's Wattled Bat	*Chalinolobus gouldii*
Chocolate Wattled Bat	*Chalinolobus morio*
Inland Broad-nosed Bat	*Scotorepens balstoni*
Inland Forest Bat	*Vespadelus baverstocki*
Southern Forest Bat	*Vespadelus regulus*
Ambiguous identifications	
Unidentified long-eared bat	*Nyctophilus* sp.
MOLOSSIDAE	
White-striped Free-tailed Bat	*Austronomus australis*
Western Free-tailed Bat	*Ozimops kitcheneri*

Table 2. Species identifications, with the degree of confidence indicated by a code. Date and recording unit number correlates with site; see *Table 1* for full species names.

	A. australis	*C. gouldii*	*C. morio*	*Nyctophilus sp.*	*O. kitcheneri*	*S. balstoni*	*V. baverstocki*	*V. regulus*
SM4BAT 1004								
12/10/2021	—	X	X	NC	—	—	X	X
13/10/2021	—	X	—	NC	—	—	X	X
14/10/2021	X	X	—	NC	—	—	X	X
15/10/2021	X	X	—	NC	—	—	X	X
SM4BAT 1029								
13/10/2021	—	X	—	NC	—	—	X	X
14/10/2021	X	X	—	NC	—	—	X	X
15/10/2021	X	X	NC	NC	—	—	X	X
16/10/2021	—	X	—	NC	—	—	X	X
SM4BAT 1035								
13/10/2021	—	X	—	—	—	—	X	X
14/10/2021	X	X	—	NC	—	—	X	X
15/10/2021	—	X	—	—	—	—	X	X
16/10/2021	—	X	—	NC	—	—	X	X
SM4BAT 1107								
12/10/2021	—	—	—	NC	—	—	X	X
13/10/2021	X	X	—	NC	—	—	X	X
14/10/2021	X	X	—	NC	—	—	X	X
15/10/2021	X	X	—	NC	—	—	X	X
SM4BAT 1227								
14/10/2021	X	X	—	NC	—	—	X	X
15/10/2021	X	X	—	NC	X	—	X	X
16/10/2021	—	X	—	NC	X	—	X	X
17/10/2021	—	X	—	NC	X	—	X	X
SM4BAT 1230								
13/10/2021	—	X	—	NC	—	—	X	X
14/10/2021	X	X	—	NC	—	X	X	X
15/10/2021	—	X	—	NC	X	—	X	X
16/10/2021	—	X	—	NC	—	—	X	X
SM4BAT 1238								
13/10/2021	—	X	—	NC	—	—	X	X
14/10/2021	X	X	—	NC	X	—	X	X
15/10/2021	X	X	—	NC	—	—	X	X
16/10/2021	—	X	—	NC	—	—	X	X
SM4BAT 1275								
13/10/2021	—	X	—	NC	NC	—	X	X
14/10/2021	—	X	—	NC	—	—	X	X
15/10/2021	X	X	—	NC	—	—	X	X
16/10/2021	—	X	—	NC	—	—	X	X

Definition of confidence level codes

— Not detected.

X Unambiguous identification of the species at the site based on measured call characteristics and comparison with available reference material. Greater confidence in this ID would come only after capture and supported by morphological measurements or a DNA sequence.

NC Needs Confirmation. Either call quality was poor, or the species cannot be distinguished reliably from another that makes similar calls. Alternative identifications are indicated in the *Comments on identifications* section of this report. If this is a species of conservation significance, further survey work might be required to confirm the record.

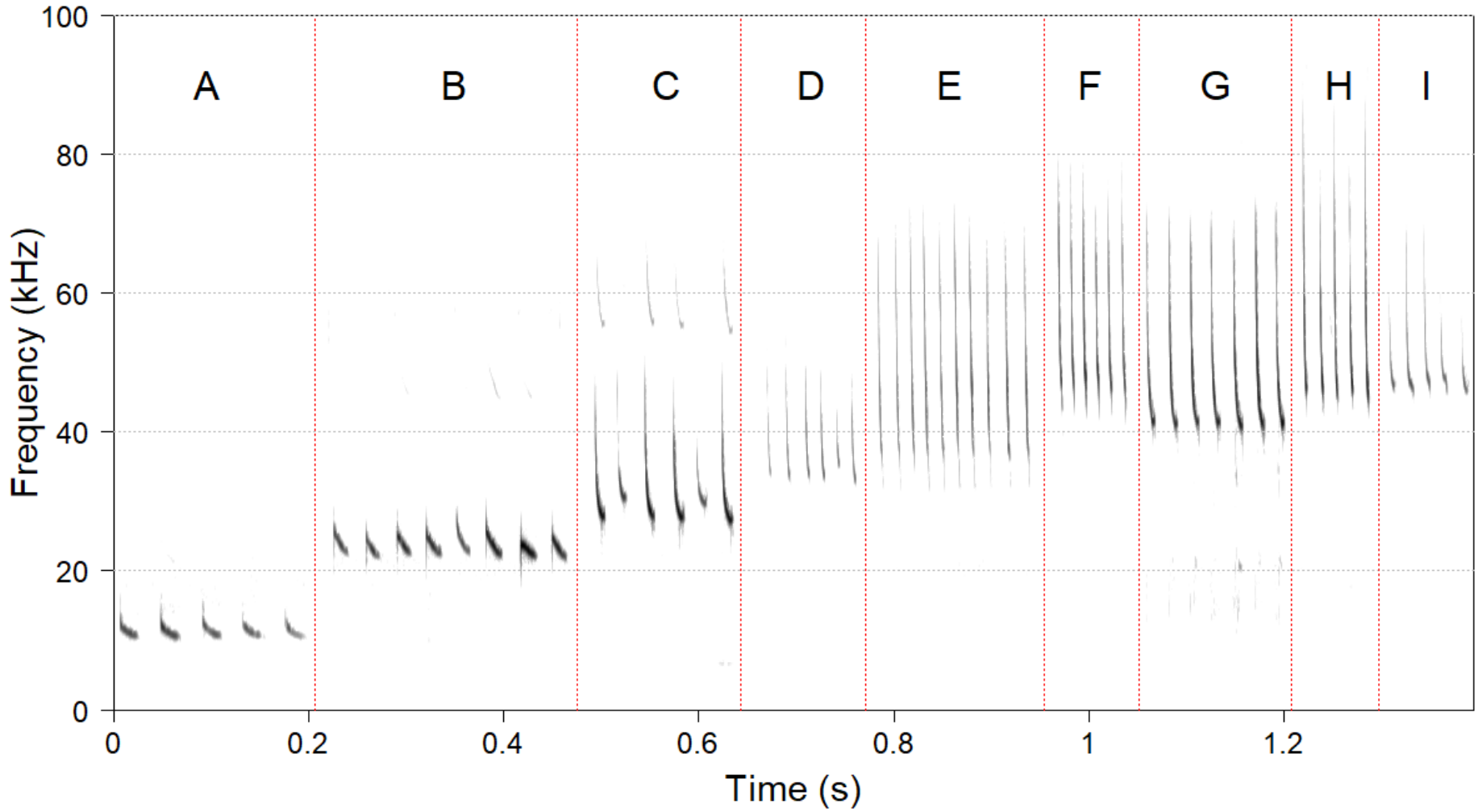

Figure 1. Representative echolocation call sequence portions of the species identified (**A**: *Austronomus australis*; **B**: *Ozimops kitcheneri*; **C**: *Chalinolobus gouldii*; **D**: *Scotorepens balstoni*; **E,F**: *Nyctophilus* sp.; **G**: *Vespadelus regulus*; **H**: *Vespadelus baverstocki*; **I**: *Chalinolobus morio*; time between pulses has been compressed).

Specialised Zoological

Acoustic analysis and bat call identification from Bidaminna, Western Australia

Prepared for **Spectrum Ecology Pty Ltd**

Version **9 May 2022**

SZ project reference **SZ610**

Prepared by **Dr Kyle Armstrong and Yuki Konishi**

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

Specialised Zoological (2022). Acoustic analysis and bat call identification from Bidaminna, Western Australia. Unpublished report by Specialised Zoological for Spectrum Ecology Pty Ltd, 9 May 2022, project reference SZ610.

Summary

Bat identifications from acoustic recordings are provided from Bidaminna, near Moore River, north of Perth, Western Australia. The identification of bat species from full spectrum WAV-format recordings of their echolocation calls was based on measurements of characteristic frequency, observation of pulse shape, and the pattern of harmonics. At least eight species of bat were identified as being present (**Tables 1** and **2**). Representative echolocation calls for each identification are illustrated (**Figure 1**), as recommended by the Australasian Bat Society (ABS 2006). Further details are available should verification be required.

Methods

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

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

1. undertook a Discriminant Function Analysis on training data from representative calls from southern Australia;

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

3. facilitated an inspection in a spectrogram of multiple examples of each call type for each recording night by opening the original WAV files containing pulses of interest in Adobe Audition CS6 version 22.

Species were identified based on information in Churchill (2008); and nomenclature follows Jackson and Groves (2015).

Comments on ambiguous identifications

Not all species were identified unambiguously—some call types have more than one possibility for their source. It is difficult to make an unambiguous identification of long-eared bats *Nyctophilus* spp., and here call sequences could be derived from the Lesser Long-eared Bat *Nyctophilus geoffroyi*, Holt's Long-eared Bat *N. holtorum*, or the Western Long-eared Bat *N. major major*.

The sites surveyed are at the edge of the ranges of two *Vespadelus* species that have partly overlapping echolocation call characteristics (characteristic frequency), and both species appear to be present on all recording units.

Echolocation sequences from Gould's Wattled Bat *Chalinolobus gouldii* were identified based on the alternating high and low characteristic frequency in successive pulses, but there were some sequences within the same frequency band that were from either the Inland Free-tailed Bat *Ozimops petersi* or the Western Free-tailed Bat *Ozimops kitcheneri*.

Limitations

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

1. The identifications made herein were based on the ultrasonic acoustic data recorded and provided by a 'third party' (the client named on the front of this report).
2. The scope of this report extended to providing information on the identification of bat species in bulk ultrasonic recordings. Further comment on these species and the possible impacts of a planned project on bat species were not part of the scope.
3. In the case of the present report, the recording equipment was not set up and supplied by Specialised Zoological. The equipment was operated by the third party during the survey.
4. Other than the general location of the study area, Specialised Zoological has not been provided with detailed information of the survey area, has not made a visit to observe the habitats available for bats, nor have we visited the specific project areas on a previous occasion.
5. Specialised Zoological has had no input into the overall design and timing of this bat survey, recording site placement, nor the degree of recording site replication.
6. While Specialised Zoological has made identifications to the best of our ability given the available materials, and reserves the right to re-examine the data and revise any identification following a query, it is the client's and / or proponent's responsibility to provide supporting evidence for any identification, which might require follow-up trapping effort or non-invasive methods such as video recordings. Specialised Zoological bears no liability for any follow-up work that may be required to support an identification based initially on the analysis of acoustic recordings undertaken and reported on here.
7. There are a variety of factors that affect the 'detectability' of each bat species, given the frequency, power and shape characteristics of their calls. Further information on the analysis and the various factors that can impinge on the reliability of identifications can be provided upon request.
8. The analysis of ultrasonic recordings is one of several methods that can be used to survey for bats, and comprehensive surveys typically employ more than one method. If an identification in the present report is ambiguous or in question, a trapping programme would help to resolve the presence of the possibilities in the project area.

References

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Table 1. Species identified in the present survey from all sites combined.

VESPERTILIONIDAE	
Gould's Wattled Bat	*Chalinolobus gouldii*
Chocolate Wattled Bat	*Chalinolobus morio*
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Inland Forest Bat	*Vespadelus baverstocki*
Southern Forest Bat	*Vespadelus regulus*
Ambiguous identifications	
Unidentified long-eared bat	*Nyctophilus* sp.
MOLOSSIDAE	
White-striped Free-tailed Bat	*Austronomus australis*
Ambiguous identifications	
Western Free-tailed Bat **and/or** Inland Free-tailed Bat	*Ozimops kitcheneri* **and/or** *Ozimops petersi*

Table 2. Species identifications, with the degree of confidence indicated by a code. Date and recording unit number correlates with site; see *Table 1* for full species names.

	A. australis	*C. gouldii*	*C. morio*	*Nyctophilus* sp.	*Ozimops* sp.	*S. balstoni*	*V. baverstocki*	*V. regulus*
SM4BAT 6081 BI S8								
22/03/2022	X	X	—	NC	—	—	X	—
23/03/2022	X	X	—	NC	NC	—	X	—
24/03/2022	X	X	—	—	NC	—	—	—
25/03/2022	X	X	—	—	NC	—	—	—
SM4BAT 6174 BI S5								
22/03/2022	X	X	—	—	—	—	X	—
23/03/2022	X	X	—	—	NC	X	X	—
24/03/2022	X	X	—	—	—	—	X	—
25/03/2022	X	X	—	NC	NC	—	X	X
SM4BAT 6252 BI S6								
22/03/2022	X	—	—	NC	NC	—	X	X
23/03/2022	X	X	—	NC	NC	—	X	X
24/03/2022	X	X	X	NC	NC	—	X	X
25/03/2022	X	X	X	—	NC	—	X	X
SM4BAT 6259 BI S1								
21/03/2022	X	X	—	—	—	—	X	X
22/03/2022	X	X	—	—	NC	—	X	X
23/03/2022	X	X	—	—	NC	—	X	X
24/03/2022	X	X	X	NC	NC	—	X	X
SM4BAT 6260 BI S7								
21/03/2022	—	X	—	—	—	—	X	X
22/03/2022	X	X	X	—	NC	—	X	X
23/03/2022	—	X	—	—	—	—	X	X
24/03/2022	X	X	X	—	NC	—	X	X
SM4BAT 6266 BI S4								
22/03/2022	X	X	—	—	NC	—	X	—
23/03/2022	X	X	—	—	—	X	X	X
24/03/2022	—	X	—	—	—	—	X	—
25/03/2022	X	X	X	—	NC	—	X	X

Continued over …

Table 2. Species identifications—*continued*.

	A. australis	*C. gouldii*	*C. morio*	*Nyctophilus* sp.	*Ozimops* sp.	*S. balstoni*	*V. baverstocki*	*V. regulus*
SM4BAT 6270 BI S2								
21/03/2022	—	X	—	NC	NC	—	X	X
22/03/2022	—	X	X	NC	NC	X	X	X
23/03/2022	X	X	—	NC	NC	—	X	X
24/03/2022	X	X	—	NC	NC	—	X	X
SM4BAT 6285 BI S3								
22/03/2022	X	X	—	—	NC	—	—	—
23/03/2022	—	X	—	—	—	—	X	X
24/03/2022	X	X	—	—	NC	—	X	X
25/03/2022	—	X	—	—	NC	—	X	X

Definition of confidence level codes

— Not detected.

X Unambiguous identification of the species at the site based on measured call characteristics and comparison with available reference material. Greater confidence in this ID would come only after capture and supported by morphological measurements or a DNA sequence.

NC Needs Confirmation. Either call quality was poor, or the species cannot be distinguished reliably from another that makes similar calls. Alternative identifications are indicated in the *Comments on identifications* section of this report. If this is a species of conservation significance, further survey work might be required to confirm the record.

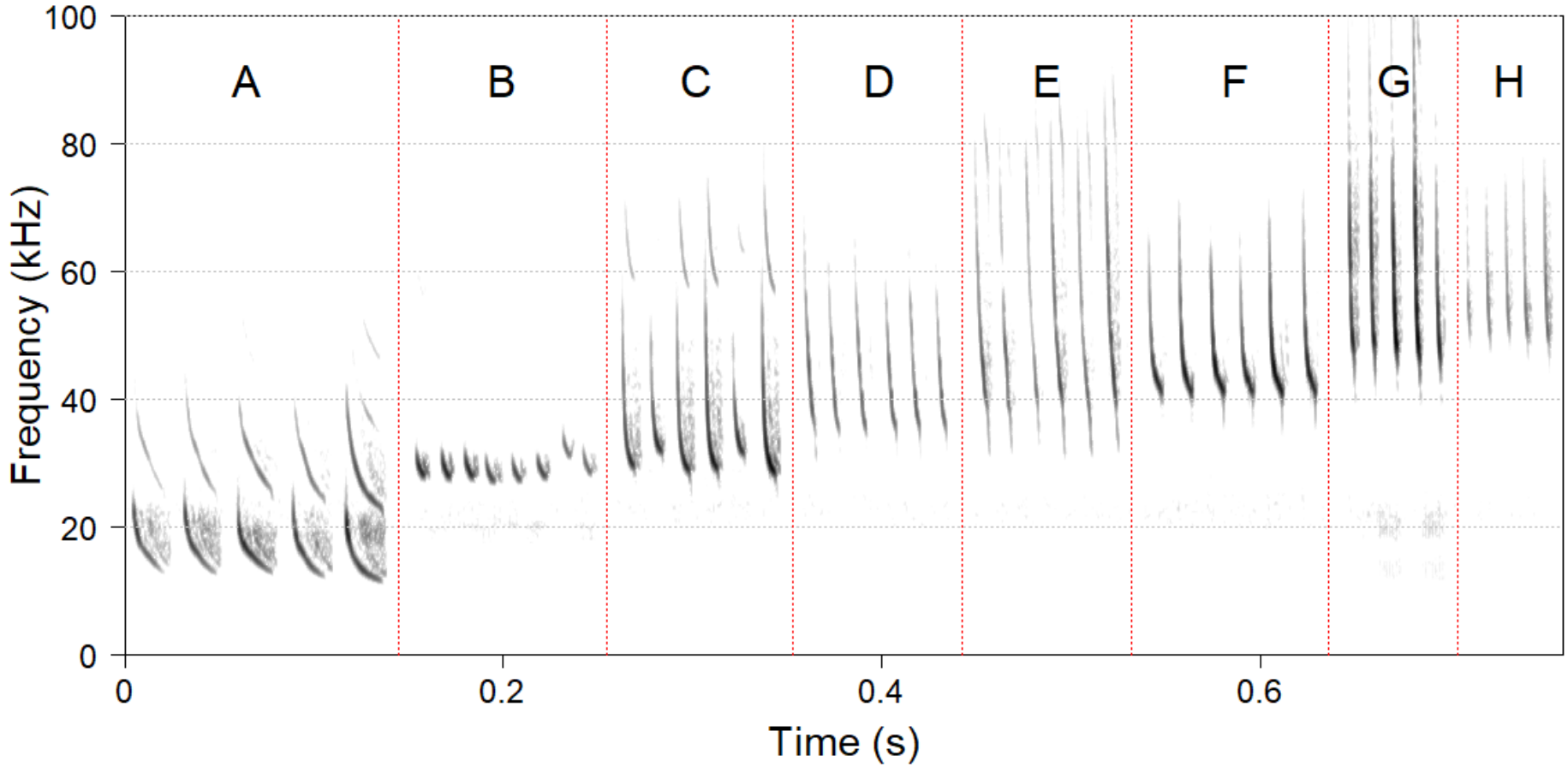

Figure 1. Representative echolocation call sequence portions of the species identified (**A**: *Austronomus australis*; **B**: *Ozimops* sp.; **C**: *Chalinolobus gouldii*; **D**: *Scotorepens balstoni*; **E**: *Nyctophilus* sp.; **F**: *Vespadelus regulus*; **G**: *Vespadelus baverstocki*; **H**: *Chalinolobus morio*; time between pulses has been compressed).

Appendix H: Invertebrate Identification and SRE Assessments

Alacran Environmental Science

Report No. 2136

[redacted]

Prepared for

Spectrum Ecology

[redacted]

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EXECUTIVE SUMMARY

During 2021 Spectrum Ecology provided several collections of invertebrates from Cowala for taxonomic identification and conservation assessment. In total, the collection contained 52 samples, representing 22 different taxa. Of these taxa *Bothriembryon perobesus* is a Priority 1 (P1) listed species under the Biodiversity Conservation Act and is classified as "Endangered" (C2b) by the IUCN Red List. Of the remaining 21 taxa, 19 belonged to SRE categories and one was widespread. Three species were described with formally names species and 19 were represented by morphospecies or ambiguous (sp.) identifications.

The identity of most of the SRE category taxa was unresolved. Morphospecies were assigned however that is largely within the context of this collection. Broader regional context and species relationships will require a review of these samples and morphospecies using DNA sequencing.

***Alacran* Environmental Science**

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SCOPE

In December (2020), Spectrum Ecology (Spectrum) requested identification and SRE assessment of multiple collections of invertebrate samples from Cowala, Western Australia. Spectrum requested taxonomic identifications and assessment of SRE and other conservation categories for these invertebrate species.

BACKGROUND

SHORT-RANGE ENDEMISM

Short-range endemics (SREs) are organisms with small geographic distributions (Harvey 2002; Ponder *et al.* 2002), nominally less than 10,000 km^2(Harvey 2002). These organisms are typically characterised by one or more of the following features:

- limited dispersal capabilities,
- seasonal activity (cooler or wetter periods),
- slow growth, and
- low levels of fecundity.

Their limited dispersal capabilities result in small populations being isolated from each other by inhospitable geographic features such as rivers, rocky ridges or plains. Prolonged isolation between populations eventually results in speciation, with each population becoming genetically and, or morphologically distinct over time. Two types of short-range endemism have been recognised: Relictual Endemism and Habitat Specialist Endemism (Harvey 2002; Ponder *et al.* 2002).

Relictual SREs result when speciation occurs following the fragmentation of continuous habitat into two or more refugia. In Australia, the primary driver of this over the last 65 million years has been aridification, which acted to isolate formerly widespread species living in mesic forests to small patches of mesic refugia. Relictual SREs include scorpions in the genus *Aops* (Volschenk et al. 2008), pseudoscorpions in the genera *Tyrannochthonius* (Harvey 1991; Edward et al. 2008), *Indohya* (Harvey 1993b; Harvey *et al.* 2007) and *Idioblothrus* (Muchmore 1982; Harvey 1993a; Harvey *et al.* 2008) and millipedes in the genus *Antichiropus* (Car *et al.* 2013; Car *et al.* 2014).

Habitat specialist SREs are species that have adapted to very specific environment types, including those found in arid environments (*e.g.* rocky outcrops, isolated dune systems and salt lakes). These habitats are often relatively young (<10 million years) and therefore are not refugial. Examples of habitat specialist SREs include spiders in the family Selenopidae, pseudoscorpions in the genus *Synsphyronus* (Harvey 2011, 2012), scorpions in the genera *Lychas* and *Urodacus* and tiger beetles in the genus *Pseudotetracha* (Lopez-Lopez et al. 2016)

METHODS

ASSESSMENT OF SHORT-RANGE ENDEMISM

Assessment of short-range endemism can be challenging when data for evaluation are absent or limited. Limitations may include any of the following:

- **Poor survey coverage,** e.g. the fauna of an area has not been sampled extensively enough to enable assessment of species distributions. The absence of a species from survey records may not mean that it is absent from the area.
- **Poor taxonomic resolution,** e.g. a species has not been subject to systematic investigation, and/or the identity is either difficult or impossible to determine. Good taxonomic resolution does not necessarily need to be in the form of published revisions, as it can be facilitated by any of the following:
  - a researcher actively working on the group who can authorise identifications,
  - a publicly accessible reference collection, and/or;
  - assessment of species boundaries using genomic methods such as DNA barcoding (Hebert et al. 2003a; Hebert et al. 2003b).
- **Identification issues**, e.g. surveys sampled life stages of SREs that are impossible to identify based on morphological characters. Examples of relevant taxa include juvenile or female millipedes, mygalomorph spiders and *Urodacus* scorpions.

There are no published systems for assessing the SRE potential for a species. The W.A. Museum previously employed the following system to assess SRE-status of invertebrates:

- **Confirmed SRE:** This category applies when the identity of the taxon is unambiguous and its distribution is less than 10 000 km^2 based on publicly available vouchered records. Supporting data can be either genomic (from DNA sequences) or morphological, ideally both.
- **Potential SRE:** This category applies to situations where there are knowledge gaps for the taxon. The following sub-categories further elucidate this status:
  - **Data Deficiency (DD):** This category covers taxa for which there is insufficient data available to determine SRE status. Factors that fall under this category include:
    - insufficient geographic information (DDG),
    - insufficient taxonomic information (DDT), and/or
    - inappropriate life stages prevent identification to species level.
  - **Habitat Indicators (H):** This category employs habitat characteristics to evaluate SRE status when habitats are known to support SRE taxa. For example, many species sampled from subterranean habitats are known to

be range restricted; a new species discovered from such habitat therefore has greater potential to be range restricted (i.e. a SRE) than widespread.

- **Morphological Evidence (M):** This category uses one or more morphological characters that are characteristic of SRE taxa inhabiting restricted environments, e.g. the specialised morphological features of animals adapted to subterranean habitats, including body markings that are absent or significantly paler than surface dwelling relatives, eyes that are absent or significantly reduced, and/or longer appendages (legs and antennae) than surface relatives.

— **Unpublished Research & Expertise (U):** This category relies on unpublished research or expertise to develop SRE status. **Widespread (not an SRE)**: This category applies when vouchered evidence demonstrates a distribution greater than 10,000 km^2.

TAXONOMY

The taxonomic nomenclature of invertebrates follows the references detailed in Table 2.2. Morphospecies designations follow the parataxonomy of the scientist(s) working on the group; these informal names are written between single quotation marks rather than being italicised as they are not valid under the International Code of Zoological Nomenclature (1999).

In defining morphospecies, Alacran follows the "Phylogenetic Species Concept" (Cracraft 1983):

"A species is the smallest **diagnosable** cluster of individual organisms within which there is a parental pattern of ancestry and descent."

Morphological Identification (Traditional Taxonomy)

For this report, all identifications were carried out by the Dr Erich Volschenk. The references used for species determination are summarised in Table 2.2.

Table 2.1. The following references and collections were used to assist with morphospecies designations.

Order	Taxonomic reference	Morphospecies and reference
Pseudoscorpiones	(Harvey 1992; Murienne *et al.* 2008; Harvey 2012, 2013)	W.A. Museum reference collection.
Araneae (Mygalomorphae)	(Castalanelli *et al.* 2014; Rix *et al.* 2017; **Harvey** *et al.* 2018; Rix *et al.* 2018a; Rix *et al.* 2018b; Rix *et al.* 2018c)	WA Museum reference collection
Scorpiones	(Glauert 1925b, a; Acosta 1990; Kovařík 1997; Fet et al. 2000; Volschenk et al. 2000; Volschenk et al. 2008; Volschenk et al. 2010)	Morphospecies designation by Dr Erich S Volschenk, W.A. Museum reference collection.

Chilopoda	(Koch 1983b, a, c, 1984; Koch *et al.* 1984; Koch 1985; Colloff *et al.* 2005; Bonato *et al.* 2014)	W.A. Museum reference collection.
Eupulmonata	(Solem 1985, 1988, 1997; Whisson et al. 2012; Whisson et al. 2014; Stanasic et al. 2017)	W.A. Museum reference collection.
Isopoda	(Judd *et al.* 2003; Judd *et al.* 2013; Javidkar *et al.* 2015; Javidkar *et al.* 2016; Javidkar *et al.* 2017a; Javidkar *et al.* 2017b)	Dr Simon Judd Reference Collection

RESULTS

The collection contained 52 samples, representing 22 different taxa. Of these taxa, one is a Priority 1 listed species, 20 belonged to SRE categories and one was a widespread species. Three species were described with formally names species and 19 were represented by morphospecies or ambiguous (sp.) identifications. A taxonomic summary of the SRE species (with corresponding SRE categories) are summarised in Table 1. The list of representative samples for these taxa are provided in Appendix 1.

Table 2. List of species present in this collection with assigned SRE categories.

CLASS	ORDER	FAMILY	SPECIES/morphospecies	SRE
Arachnida	Opiliones	Triaenonychidae	Nunciella sp.	Potential SRE: DDT
Arachnida	Pseudoscorpiones	Chthoniidae	*Austrochthonius* sp.	Potential SRE: DDT
Arachnida	Pseudoscorpiones	Chthoniidae	*Austrochthonius* 'CO1'	Potential SRE: DDT
Arachnida	Pseudoscorpiones	Chthoniidae	*Austrochthonius* 'CO2'	Potential SRE: DDT
Arachnida	Pseudoscorpiones	Chthoniidae	*Austrochthonius* 'CO3'	Potential SRE: DDT
Arachnida	Pseudoscorpiones	Olpiidae	*Beierolpium* '8/4 CO1'	Potential SRE: DDT
Chilopoda	Geophilomorpha	Geophilidae	**Geophilidae 'CO1'**	Potential SRE: DDT
Chilopoda	Geophilomorpha	Mecistocephalidae	Mecistocephalidae 'CO1'	Potential SRE: DDT
Chilopoda	Lithobiomorpha		Lithobiomorpha sp.	Potential SRE: DDT
Chilopoda	Scolopendromorpha	Cryptopidae	*Cryptops* 'COI'	Potential SRE: DDT
Diplopoda	Polydesmida	Paradoxosomatidae	*Antichiropus* sp.	Potential SRE: DDT
Diplopoda	Spirostreptida	Iulomorphidae	*Podykipus* sp.	Potential SRE: DDT
Gastropoda	Eupulmonata	Bothriembryontidae	*Bothriembryon perobesus*	Priority 1
Gastropoda	Eupulmonata	Punctidae	*Westralaoma expicta*	Widespread
Gastropoda	Eupulmonata	Succineidae	*Austrosuccinea* sp.	Potential SRE: DDT
Malacostraca	Isopoda	Armadillidae	*Pseudodiploexochus* 'CO1'	Potential SRE: DDT
Malacostraca	Isopoda	Armadillidae	Spherillo '2B'	Potential SRE: DDT
Malacostraca	Isopoda	Armadillidae	Spherillo '2D'	Potential SRE: DDT
Malacostraca	Isopoda	Oniscidae	*Hanoniscus monodi*	Potential SRE: DDG
Malacostraca	Isopoda	Philosciidae	*Laevophiloscia* sp.	Potential SRE: DDT
Malacostraca	Isopoda	Philosciidae	Philosciidae sp.	Potential SRE: DDT
Malacostraca	Isopoda	Styloniscidae	*Styloniscus* sp.	Potential SRE: DDT

DISCUSSION

Species identifications and SRE justification for each taxon are discussed below.

ARACHNIDA

Opiliones

Family Triaenonychidae

***Nunciella* sp.**

Nunciella is currently represented by two species in W.A.; however, the genus is currently under revision and at least 22 undescribed species are known. All species of *Nunciella* are SRE's (Sharon Zuiddam, pers. comm.). While the genus is under revision, morphospecies will require assessment by Ms Sharan Zuiddam. species verification may be possible using DNA sequences.

Pseudoscorpiones

Family Chthoniidae

***Austrochthonius* 'CO1', *Austrochthonius* 'CO2' and *Austrochthonius* 'CO3' and *Austrochthonius* sp.**

In Western Australia *Austrochthonius* is represented by four described species; however, none of these are known from the region sampled. Many undescribed species are also known from W.A. The taxonomy of *Austrochthonius* is challenging and relies on both discrete morphological characters and meristic characters.

The present collection appears to contain at least three morphospecies that were diagnosed on the basis of chela morphometrics, trichobothrial patterns and cheliceral morphology. There is potential for these morphospecies to contain more than one species and an assessment of the DNA sequences from targeted specimens is strongly recommended.

Most *Austrochthonius* species appear to be relatively widespread and multiple species are also known to occur in sympatry; however, in the absence of more detailed taxonomic information about the species in this collection, they are potential SREs owing to taxonomic data deficiency.

Family Olpiidae

***Beierolpium* '8/4 CO1'**

A single putative species of *Beierolpium* was identified from this collection. Species groups of *Beierolpium* are generally diagnosable based on trichobothrial patterns and this has led to the W.A. Museum morphospecies notation of "8/4" , "8/2" etc. Assessment of the DNA sequences from specimens within these groups has revealed the presence of numerous undescribed species; therefore, what was thought to represent species is indicative of species complexes and species groups. Unambiguous species identification therefore requires an assessment of their DNA sequences.

Beierolpium '8/4 CO1' is a potential SREs owing to taxonomic data deficiency. A morphologically similar species is known from the Mulgine Hill area, approximately 250 km NE of Cowala survey area and one or more sequences from that species should be included in regional assessment of relationships with *Beierolpium* '8/4 CO1'. This is a potential SRE owing to taxonomic data deficiency.

CHILOPODA

Geophilomorpha

Family Geophilidae

Geophilidae 'CO1'

A single specimen was identified to this family but could not be assigned to genus confidently. Most W.A. representatives of this family were previously placed in the family Chilenophilidae; however, that family is now a synonym of Geophilidae (Bonato *et al.* 2014). Very little is known about the taxonomy of Western Australian Geophilidae. The taxonomy of this family is very heavily dependent on DNA sequence data. The relationship of this specimen to one another species should be verified using DNA sequences. This species is potential SRE owing to taxonomic data deficiency and there is potential for multiple species to be present.

Family Mecistocephalidae

Mecistocephalidae 'CO1'

This morphospecies was represented by a single specimen. Mecistocephalidae is a large family of Geophilomorpha, and many undescribed species have been identified from W.A. using DNA sequences. No widespread species of Mecistocephalidae is known. This is a potential SRE owing to geographical data deficiency.

Lithobiomorpha

Lithobiomorpha sp.

Four samples of this order were present in the collection. No Lithobiomorpha are currently flagged as SRE so no further taxonomic resolution was sought for these samples.

Scolopendromorpha

Family Cryptopidae

***Cryptops* 'CO1'**

A single specimen of *Cryptops* was present in this collection. Cryptopidae is very poorly resolved in Western Australia and there are few records from this region of the state. Most Cryptopidae from arid parts of W.A. appear to be SRE based on DNA sequence assessments; however, coastal species have not been assessed. This species is a potential SRE owing to taxonomic data deficiency.

DIPLOPODA

Polydesmida

Family Paradoxosomatidae

***Antichiropus* sp.**

Seven samples contained representatives of *Antichiropus*. Adult male specimens are required to identify *Antichiropus* specimens, but none were present in this collection. Further complicating matters is the regular occurrence of two or more species in sympatry. Most *Antichiropus* species appear to be SREs (Car *et al.* 2013; Car *et al.* 2014; Car *et al.* 2019). The only way to obtain identifications of these specimens is with the use of DNA sequences. This taxon is a potential SRE owing to taxonomic data deficiency and more than one species may be represented.

Spirostreptida

Family Iulomorphidae

***Podykipus* sp.**

This taxon was represented by four samples. Three species of *Podykipus* are described; however, this genus has never been closely scrutinised using morphology or DNA sequences. Other representatives of this family are SRE in W.A.: *Dinocambala* and *Atelomastix*. The morphologically similar genus *Atelomastix* is represented by numerous species, mostly confined to the south western W.A., and all are SRE (Edward *et al.* 2010). For this reason the current species boundaries within *Podykipus* should be treated cautiously. This taxon is a potential SRE owing to taxonomic data deficiency.

GASTROPODA

Eupulmonata

Family Bothriembryontidae

The taxonomy of *Bothriembryon* is challenging and largely informed by DNA sequence data. Shell morphology alone is often insufficient to obtain identifications so live specimens are required.

Bothriembryon perobesus

A single specimen of this species was present in this collection. Despite being represented by a dead shell, it has a distinctive morphology, being considerably larger and more globose than the other *Bothriembryon* from this region. *Bothriembryon perobesus* is a Priority 1 (P1) listed species under the Biodiversity Conservation Act and an IUCN Red List (IUCN 2012) classification of Endangered (C2b).

Family Punctidae

Westralaoma expicta

Three samples were identified to *Westralaoma* expicta. This is a widespread species found in the southern Murchison and through the WA Goldfields.

Family Succineidae

***Austrosuccinea* sp.**

A single desiccated specimen of an unknown species of *Austrosuccinea* was present in this collection. Very little is known about the taxonomy of these snails, and they are rarely collected alive to enable DNA sequencing. This is a potential SRE owing to taxonomic data deficiency. There is also a small chance that this specimen could yield DNA sequences as tissues are present and may have desiccated fast enough to preserve some extractable DNA.

MALACOSTRACA

Isopoda

Family Armadillidae

***Pseudodiploexochus* 'CO1'**

A single specimen of this species was present. The genus is found all over southern W.A. and is particularly common in the south-west. There are likely to be numerous SRE species. This is a potential SRE owing to taxonomic data deficiency.

***Spherillo* '2B' and *Spherillo* '2D'.**

Spherillo '2' is a morphospecies complex and occurs in the northern jarrah forest region. These are two similar looking morphospecies. There is very limited material, and probably no adult males, but both are significantly different enough to consider them distinct morphospecies. Sequencing should be undertaken if greater resolution between the two species is required. These are potential SREs owing to taxonomic data deficiencies.

Family Oniscidae

Hanoniscus monodi

This species was described from Wooroloo, York and Moora and is among some of the more complete descriptions of Oniscidea in Western Australia. This species appears to be closely associated with creeks and wetlands. Given the information above, the species is potentially widespread, but I have also seen at least three potential new species. The taxonomy is not well-known by modern standards and requires revision and this should be considered a potential SRE owing to taxonomic data deficiency. It would be informative to sequence some material not only for a comparison of these

specimens but for wider systematic interest. Bowley (1935) and subsequent authors have included these species in the family Oniscidea but this is unlikely to be correct.

Family Philosciidae

***Laevophiloscia* sp.**

This is a typical form of *Laevophiloscia* found in drier regions. The taxonomy of this genus in W.A. and the distribution of this species are unknown. This is a potential SRE owing to taxonomic data deficiency; however, the species could be relatively widespread. This species appears to be conspecific with one known from Mulgine Hill, approximately 250 km NE of the Cowala survey area. This should be verified using DNA sequences as it would demonstrate this species to be widespread. This would be unusual for a philosciid isopod species in W.A. since most are thought to be SRE.

Family Styloniscidae

***Styloniscus* sp.**

Styloniscus is a principally wet forest group of species likely to contain many cryptic SRE species. The specimens here should be considered a potential SRE species owing to taxonomic data deficiency. *Styloniscus* is also rarely found on the Swan Coastal Plain. This form of *Styloniscus* has a high potential for SREs (Judd et al. 2003). Species level assessment is likely to require DNA sequencing and there is plenty of available comparable material from the south-west should this be required.

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Appendix 1 (attached file): 2136_Spectrum_Cowala_SRE-Data.xlsx

Alacran Environmental Science

Report No. 2144

[redacted]

Prepared for

Spectrum Ecology

[redacted]

[redacted]*rolpium* '8/4-Na05'

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EXECUTIVE SUMMARY

Spectrum Ecology requested taxonomic identification and SRE assessment of a collection of invertebrates from the Cowalla Area of Western Australia.

The collection contained 168 samples, comprising 34 different taxa belonging to SRE target groups. Of the target groups, 25 were potential SREs and one was a P1 priority listed species.

This collection also contained dead shells of *Bothriembryon perobesus*. This species is a 'Priority 1' listed (DBCA 2018 (September)) and is listed as 'Endangered' under criteria 'C2b' by the IUCN (International Union for the Conservation of Nature and Natural Resources) Red List in 1996 (IUCN 2021).

The 25 SRE category taxa present in this collection were comprised of the following taxa:

- *Anamidae* sp. (open hole trapdoor spiders) potential SRE,
- *Nunciella* sp. (harvestmen) potential SRE,
- *Austrochthonius* sp. (pseudoscorpion) potential SRE,
- *Beierolpium* '8/4-NA05' (pseudoscorpion) potential SRE,
- *Beierolpium* '8/4-NA06' (pseudoscorpion) potential SRE,
- *Beierolpium* sp. (pseudoscorpion) potential SRE,
- *Urodacus* 'SCO007, bullsbrook' (Australian burrowing scorpions) potential SRE,
- *Urodacus* sp. (Australian burrowing scorpion) potential SRE,
- *Sepedonophilus* sp. (soil centipedes) potential SRE,
- *Mecistocephalus* 'Na01' (soil centipede) potential SRE,
- *Mecistocephalus* 'Na02' (soil centipede) potential SRE,
- *Antichiropus* sp. (flat-backed millipede) potential SRE,
- Iulomorphidae sp. (millipede) potential SRE,
- *Buddelundia* '7' (slater) potential SRE,
- *Spherillo* '2' (slater) potential SRE,
- *Hanoniscus monodi* (slater) potential SRE,
- *Paraplatyarthrus* 'Na01' (slater) potential SRE,
- *Styloniscus* sp. (slater) potential SRE,
- *Laevophiloscia* 'Na01' (slater) potential SRE,
- *Laevophiloscia* 'Na02' (slater) potential SRE,
- Philosciidae 'Na03' (slater) potential SRE,
- Philosciidae sp. (slater) potential SRE,
- *Caenoplana* 'Na01' (flat worm) potential SRE,
- *Caenoplana* 'Na02' (flatworm) potential SRE,
- Lumbriculida sp. (earthworms) potential SRE.

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SCOPE

Spectrum Ecology (Spectrum) requested identification of a collection of invertebrate samples from the Cowalla area in Western Australia.

BACKGROUND

SHORT-RANGE ENDEMISM

Short-range endemics (SREs) are organisms with small geographic distributions (Harvey 2002; Ponder *et al.* 2002), nominally less than 10,000 km^2(Harvey 2002). These organisms are typically characterised by one or more of the following features:

- limited dispersal capabilities,
- seasonal activity (cooler or wetter periods),
- slow growth, and
- low levels of fecundity.

Their limited dispersal capabilities result in small populations being isolated from each other by inhospitable geographic features such as rivers, rocky ridges or plains. Prolonged isolation between populations eventually results in speciation, with each population becoming genetically and, or morphologically distinct over time. Two types of short-range endemism have been recognised: Relictual Endemism and Habitat Specialist Endemism (Harvey 2002; Ponder *et al.* 2002).

Relictual SREs result when speciation occurs following the fragmentation of continuous habitat into two or more refugia. In Australia, the primary driver of this over the last 65 million years has been aridification, which acted to isolate formerly widespread species living in mesic forests to small patches of mesic refugia. Relictual SREs include scorpions in the genus *Aops* (Volschenk et al. 2008), pseudoscorpions in the genera *Tyrannochthonius* (Harvey 1991; Edward et al. 2008), *Indohya* (Harvey 1993b; Harvey *et al.* 2007) and *Idioblothrus* (Muchmore 1982; Harvey 1993a; Harvey *et al.* 2008) and millipedes in the genus *Antichiropus* (Car *et al.* 2013; Car *et al.* 2014).

Habitat specialist SREs are species that have adapted to very specific environment types, including those found in arid environments (*e.g.* rocky outcrops, isolated dune systems and salt lakes). These habitats are often relatively young (<10 million years) and therefore are not refugial. Examples of habitat specialist SREs include spiders in the family Selenopidae, pseudoscorpions in the genus *Synsphyronus* (Harvey 2011, 2012), scorpions in the genera *Lychas* and *Urodacus* and tiger beetles in the genus *Pseudotetracha* (Lopez-Lopez et al. 2016)

METHODS

ASSESSMENT OF SHORT-RANGE ENDEMISM

Assessment of short-range endemism can be challenging when data for evaluation are absent or limited. Limitations may include any of the following:

- **Poor survey coverage,** e.g. the fauna of an area has not been sampled extensively enough to enable assessment of species distributions. The absence of a species from survey records may not mean that it is absent from the area.
- **Poor taxonomic resolution,** e.g. a species has not been subject to systematic investigation, and/or the identity is either difficult or impossible to determine. Good taxonomic resolution does not necessarily need to be in the form of published revisions, as it can be facilitated by any of the following:
  - a researcher actively working on the group who can authorise identifications,
  - a publicly accessible reference collection, and/or;
  - assessment of species boundaries using genomic methods such as DNA barcoding (Hebert et al. 2003a; Hebert et al. 2003b).
- **Identification issues**, e.g. surveys sampled life stages of SREs that are impossible to identify based on morphological characters. Examples of relevant taxa include juvenile or female millipedes, mygalomorph spiders and *Urodacus* scorpions.

There are no published systems for assessing the SRE potential for a species. The W.A. Museum previously employed the following system to assess SRE-status of invertebrates:

- **Confirmed SRE:** This category applies when the identity of the taxon is unambiguous and its distribution is less than 10 000 km^2 based on publicly available vouchered records. Supporting data can be either genomic (from DNA sequences) or morphological, ideally both.
- **Potential SRE:** This category applies to situations where there are knowledge gaps for the taxon. The following sub-categories further elucidate this status:
  - **Data Deficiency (DD):** This category covers taxa for which there is insufficient data available to determine SRE status. Factors that fall under this category include:
    - insufficient geographic information (DDG),
    - insufficient taxonomic information (DDT), and/or
    - inappropriate life stages prevent identification to species level.
  - **Habitat Indicators (H):** This category employs habitat characteristics to evaluate SRE status when habitats are known to support SRE taxa. For example, many species sampled from subterranean habitats are known to be range restricted; a new species discovered from such habitat therefore has greater potential to be range restricted (i.e. a SRE) than widespread.
  - **Morphological Evidence (M):** This category uses one or more morphological characters that are characteristic of SRE taxa inhabiting restricted environments,

e.g. the specialised morphological features of animals adapted to subterranean habitats, including body markings that are absent or significantly paler than surface dwelling relatives, eyes that are absent or significantly reduced, and/or longer appendages (legs and antennae) than surface relatives.

— **Unpublished Research & Expertise (U):** This category relies on unpublished research or expertise to develop SRE status. **Widespread (not an SRE)**: This category applies when vouchered evidence demonstrates a distribution greater than 10,000 km^2.

TAXONOMY

The taxonomic nomenclature of invertebrates follows the references detailed in Table 0.1. Morphospecies designations follow the parataxonomy of the scientist(s) working on the group; these informal names are written between single quotation marks rather than being italicised as they are not valid under the International Code of Zoological Nomenclature (1999).

In defining morphospecies, Alacran follows the "Phylogenetic Species Concept" (Cracraft 1983):

> "A species is the smallest **diagnosable** cluster of individual organisms within which there is a parental pattern of ancestry and descent."

Morphological Identification (Traditional Taxonomy)

For this report, all Isopods were identified by Dr Simon Judd and all remaining taxa were identified by Dr Erich Volschenk. The references used for species determination are summarised in Table 0.1.

Table 0.1. The following references and collections were used to assist with morphospecies designations.

Order	Taxonomic reference	Morphospecies and reference
Araneae	(Raven et al. 2002; Framenau et al. 2013; Harms et al. 2013; Miglio et al. 2014; World Spider Catalog 2014; Framenau et al. 2017a; Framenau et al. 2017b; Rix et al. 2017; Harvey et al. 2018; Huey et al. 2019)	W.A. Museum reference collection.
Opiliones	(Derkarabetian et al. 2021)	W.A. Museum reference collection.
Pseudoscorpiones	(Harvey 1992; Murienne *et al.* 2008; Harvey 2012, 2013)	W.A. Museum reference collection.
Scorpiones	(Glauert 1925b, a; Acosta 1990; Kovařík 1997; Fet et al. 2000; Volschenk et al. 2000; Volschenk et al. 2008; Volschenk et al. 2010)	Morphospecies designation by Dr Erich S Volschenk, W.A. Museum reference collection.
Chilopoda	(Koch 1983b, a, c, 1984; Koch *et al.* 1984; Koch 1985; Colloff *et al.* 2005)	W.A. Museum reference collection.
Diplopoda	(Framenau *et al.* 2008; Edward *et al.* 2010; Car *et al.* 2013; Car *et al.* 2014)	W.A. Museum reference collection.

Order	Taxonomic reference	Morphospecies and reference
Eupulmonata	(Solem 1985, 1988, 1997; Whisson *et al.* 2012; Whisson *et al.* 2014; Stanisic *et al.* 2017)	W.A. Museum reference collection.
Tricladida	(Cannon 1986; Winsor 2003; Sluys *et al.* 2009)	Alacran and Genbank DNA sequences

RESULTS

The collection contained 168 samples, comprising 34 different taxa belonged to SRE target groups. Of the target groups, 25 taxa were potential SRE and one species was a priority 1 (P1) listed species.

A single species of *Beierolpium* was identified and three species of Philosciidae were present. The species in this collection could not be confirmed against the target morphospecies based on morphology alone. Both of these groups (Olpiidae and Philosciidae) are taxonomically challenging and require species level identification to be verified with DNA sequences.

A taxonomic summary of the SRE species (with corresponding SRE categories) are summarised in Table 2. The list of representative samples for these taxa are provided in Appendix 1.

Table 2. List of species present in this collection with assigned SRE categories.

Order	Family	Species	SRE category
Araneae	Anamidae	Anamidae sp.	Potential SRE: DDT
Opiliones	Triaenonychidae	*Nunciella* sp.	Potential SRE: DDT
Pseudoscorpiones	Chthoniidae	*Austrochthonius* 'PSE188, similis'	Widespread
Pseudoscorpiones	Chthoniidae	*Austrochthonius* 'PSE191, grandis'	Widespread
Pseudoscorpiones	Chthoniidae	*Austrochthonius* sp.	Potential SRE: DDG
Pseudoscorpiones	Olpiidae	*Beierolpium* '8/4-Na05'	Potential SRE: DDG
Pseudoscorpiones	Olpiidae	*Beierolpium* '8/4 Na06'	Potential SRE: DDT
Pseudoscorpiones	Olpiidae	*Beierolpium* sp.	Potential SRE: DDT
Scorpiones	Buthidae	*Lychas* 'splendens'	Widespread
Scorpiones	Urodacidae	*Urodacus novaehollandiae*	Widespread
Scorpiones	Urodacidae	*Urodacus* 'SCO007, bullsbrook'	Potential SRE: DDG
Scorpiones	Urodacidae	*Urodacus* sp.	Potential SRE: DDT
Geophilomorpha	Geophilidae	*Sepedonophilus* sp.	Potential SRE: DDT
Geophilomorpha	Mecistocephalidae	*Mecistocephalus* 'Na01'	Potential SRE: DDG
Geophilomorpha	Mecistocephalidae	*Mecistocephalus* 'Na02'	Potential SRE: DDG
Lithobiomorpha	Henicopidae	*Lamyctes africanus*	Widespread
Scolopendromorpha	Scolopendridae	Scolopendridae sp.	Widespread
Polydesmida	Paradoxosomatidae	*Antichiropus whistleri*	Widespread
Polydesmida	Paradoxosomatidae	*Antichiropus* sp.	Potential SRE: DDT
Spirostreptida	Iulomorphidae	Iulomorphidae sp.	Potential SRE: DDT
Isopoda	Armadillidae	*Buddelundia* '7'	Potential SRE: DDT
Isopoda	Armadillidae	*Spherillo* '2'	Potential SRE: DDT
Isopoda	Oniscidae	*Hanoniscus monodi*	Potential SRE: DDT
Isopoda	Paraplatyarthridae	*Paraplatyarthrus* 'Na01'	Potential SRE: DDT
Isopoda	Philosciidae	*Laevophiloscia* 'Na01'	Potential SRE: DDG
Isopoda	Philosciidae	*Laevophiloscia* 'Na02'	Potential SRE: DDG

Order	Family	Species	SRE category
Isopoda	Philosciidae	*Laevophiloscia* sp.	Potential SRE: DDT
Isopoda	Philosciidae	Philosciidae 'Na03'	Potential SRE: DDT
Isopoda	Styloniscidae	*Styloniscus* sp.	Potential SRE: DDT
Stylommatophora	Bothriembryontidae	*Bothriembryon perobesus*	Priority 1
Stylommatophora	Punctidae	*Westralaoma* sp.	Widespread
Tricladida	Geoplanidae	*Caenoplana* 'Na01'	Potential SRE: DDT
Tricladida	Geoplanidae	*Caenoplana* 'Na02'	Potential SRE: DDG
Lumbriculida		Lumbriculida sp.	Potential SRE: DDT

DISCUSSION

Species identifications and SRE justification for each taxon are discussed below.

ARACHNIDA

Araneae (spiders)

Family Anamidae

***Anamidae* sp.**

Two samples of this taxon were present in this collection, neither of which contained adult males. Species (and genus) identification of Anamidae requires morphological assessment of adult males and the family contains many potential SRES in the genera *Aname*, *Kwonkan*, *Proshermacha*, *Swolnpes* and *Hesperonatalius*. This taxon is therefore a potential SRE owing to taxonomic data deficiency. Greater taxonomic resolution may be obtainable using DNA sequences.

Opiliones (harvestmen)

Family Triaenonychidae

***Nunciella* sp.**

A single representative of this taxon was present in this collection. The taxonomy of this family is complicated in WA and most species currently described are likely to contain multiple species. In the absence of a workable morphology-based taxonomy, species delimitation is heavily dependent on DNA sequencing. This is a potential SRE owing to taxonomic data deficiency.

Pseudoscorpiones (pseudoscorpions)

Family Chthoniidae

***Austrochthonius* spp.**

Two morphospecies of Austrochthonius were identified from this collection:

- *Austrochthonius* 'PSE188, similis', three samples.
- *Austrochthonius* 'PSE191, grandis', one sample.

- *Austrochthonius* sp., 14 samples

The taxonomy of this group is unresolved and numerous undescribed morphospecies are known. Both morphospecies in this collection are widespread. The 14 samples of *Austrochthonius* sp. were all juveniles and species identity were not possible.

Family Olpiidae

Species level assessment of nearly all olpiids is heavily dependent on DNA barcoding and while morphospecies are cautiously identified here, all should be verified using DNA sequence data.

***Beierolpium* '8/4-Na05' and *Beierolpium* '8/4-Na06'**

Beierolpium '8/4-Na05' was represented by five samples and *Beierolpium* '8/4-Na06' was represented by a single sample.

The taxonomy of *Beierolpium* is complicated by many undescribed species and currently, most can only be diagnosed confidently using DNA sequence data. The morphospecies recognised in the specimens in this collection was done tentatively and they should be confirmed using DNA sequence data.

Beierolpium contains many potential SRE morphospecies and these two morphospecies are potential SRE owing to geographical data deficiency.

***Beierolpium* sp.**

This taxon was represented by four samples, all of which were juveniles. Species level identity was not possible using morphology; however, greater taxonomic resolution may be achieved following assessment of the DNA of these specimens. *Beierolpium* contains many potential SRE morphospecies and in the absence of species level identity, this is a potential SRE owing to taxonomic data deficiency.

Scorpiones (scorpions)

Family Buthidae (narrow handed scorpions)

***Lychas* 'splendens'**

This species was represented by a single sample. This is a widespread species that is distributed throughout the wheatbelt.

Family Urodacidae (Australian burrowing scorpions)

***Urodacus* 'SCO007, bullsbrook'**

This morphospecies was represented by six samples. This morphospecies is known from two populations, one from the vicinity of Lancelin and the other from Bullsbrook. In both cases they are associated with Banksia woodland. While these two populations are separated by nearly 100km, no other populations are known, therefore this morphospecies is a potential SRE owing to geographical data deficiency.

Urodacus novaehollandiae

This species was represented by six samples. *Urodacus novaehollandiae* is widespread throughout SW WA and is common in the Swan Coastal Plain, Jarrah Forrest and South coast bioregions. The specimens sampled in this collection represent the most northerly records for *Urodacus novaehollandiae*.

***Urodacus* sp.**

This taxon was represented by five samples. These may represent juveniles of *Urodacus* 'SCO007, bullsbrook', or they may be representatives of the *Urodacus* 'armatus spp. group', a diverse and poorly resolved group of *Urodacus* that are usually associated with sandy soils. Adult males are required for morphological identification to species level. In the absence of adult males, this is a potential SRE owing to taxonomic data deficiency. The identity of this species could be resolved further with an assessment of its DNA sequences. More than one species may be included in this taxon as well.

CHILOPODA

Geophilomorpha (soil centipedes)

Species level assessment of all soil centipedes is heavily dependent on DNA barcoding and while some morphospecies are cautiously identified here, all should be verified using DNA sequence data.

Family Geophilidae

***Sepedonophilus* sp.**

This taxon was represented by five samples. The taxonomy of this group is very poorly known and numerous undescribed morphospecies are known. Species level identity for W.A. representatives of this family can only be achieved with the aid of DNA sequences. Most W.A. *Sepedonophilus* morphospecies appear to be SREs.

Family Mecistocephalidae

***Mecistocephalus* 'Na01' and *Mecistocephalus* 'Na02'**

Two morphospecies were 'loosely' identified from this collection. The taxonomy of this group is very poorly known and numerous undescribed morphospecies are known. Species level identity for W.A. representatives of this family can only be achieved with the aid of DNA sequences. Most W.A. *Mecistocephalus* morphospecies appear to be SREs. Both of these morphospecies are potential SRE owing to geographical data deficiency.

Lithobiomorpha (stone centipedes)

Family Henicopidae

Lamyctes africanus

This species was represented by a single sample. This species is widespread.

Scolopendromorpha (centipedes)

Scolopendromorpha is represented by two families, Scolopendridae and Cryptopidae. Species of Scolopendridae are largely widespread; however, Cryptopidae contains numerous potential SREs.

Family Scolopendridae

Scolopendridae sp.

Three samples of this taxon were present. They were not identified to species as they were all larger specimens and therefore represent widespread species.

DIPLOPODA

Polydesmida (flat-back millipedes)

Family Paradoxosomatidae

Antichiropus whistleri

One male specimen of *Antichiropus whistleri* was identified from this collection. This is a widespread species (Car *et al.* 2013).

***Antichiropus* sp.**

Antichiropus sp. was represented by 13 samples. This unresolved taxon was represented by female and juvenile specimens; therefore, species level identification was not possible. Multiple species of *Antichiropus* can occur sympatricaly so it could not be assumed that they would all be *Antichiropus whistleri*. Female and juvenile *Antichiropus* specimens can only be determined by assessing their DNA sequences. These taxa are Potential SREs owing to taxonomic data deficiency.

Spirostreptida

Family Iulomorphidae

***Iulomorphidae* sp.**

A single poorly preserved specimen of this taxon was present. This is likely to be a species of *Podykipus*; however, live collected specimens are needed in order to confirm genus and species level identity. The taxonomy of *Podykipus* is poorly known and it is suspected to contain undescribed SRE species as its related genus *Atelomastix* does (Edward *et al.* 2010)

MALACOSTRACA

Isopoda (slaters)

All of the Isopod identifications for this report were undertaken by Dr Simon Judd. The descriptions provided below are based on his advice.

Family Armadillidae

***Buddelundia* '7'**

This morphospecies is known from the Perth area of the northern part of the Swan Coastal Plain and the area of this study. This morphospecies may be conspecific with *Buddelundia subinermis* Budde-Lund 1912 described form the Geraldton area, but further work is needed to confirm this. This is a potential SRE owing to geographical data deficiency.

Spherillo '2'

This taxon is a species complex and occurs in the northern Jarrah Forest and northern Swan Coastal Plain regions. These would not determine these as *Spherillo* now; however, the name is used to preserve relationships with samples elsewhere (W.A. Museum) with this name. These specimens were typical of those found on the northern Swan Coastal Plain and matched AES 211157 from Alacran Project 2136 determined as *Spherillo* '2B'. Sequencing should be undertaken if greater resolution is required. This taxon is a potential SRE owing to taxonomic data deficiency.

Family Oniscidae

Hanoniscus monodi

This species was represented by three samples. The species was described from Wooroloo, York and Moora and is among some of the more complete descriptions of Oniscidea in Western Australia. I have collected it at Chittering Lake and Hill River. I also have records of it from the Geraldton area, but these were determined in 2009 and need to be compared with this material. The species is likely associated with creeks and wetlands; therefore, its distribution is not reflected by its area of occupancy. The taxonomy is not well-known by modern standards and requires revision. This should be considered a potential SRE owing to taxonomic data deficiency.

Family Paraplatyarthridae

***Paraplatyarthrus* 'Na01'**

A single male specimen of this taxon was resent in this collection. This type of *Paraplatyarthrus* is found all over south-western Australia. They are small and cryptic species and have a high potential for SREs. The distribution of this morphospecies is unknown. Greater taxonomic resolution may be obtained following an assessment of its DNA sequences. It is a potential SRE owing to taxonomic data deficiency.

Family Philosciidae

***Laevophiloscia* 'Na01' and *Laevophiloscia* 'Na02'**

Laevophiloscia 'Na01' was represented by 13 samples and *Laevophiloscia* 'Na02' was represented by four samples. Both of these morphospecies represent 'typical' forms of *Laevophiloscia* and the most common type of Philosciidae in the south-west. The taxonomy of this group is very poorly known. They must be sequenced for greater resolution. Two morphospecies were tentatively identified from this collection. Both of these

morphospecies are potential SRE owing to taxonomic data deficiencies. Sequencing is the most cost effective and practical method to confirm a wider distribution should it be necessary.

***Laevophiloscia* sp.**

This taxon was represented by three samples representing damaged or juvenile specimens that could not be identified to species. In the absence of species level identification, this taxon is a potential SRE owing to taxonomic data deficiency.

Philosciidae 'Na03'

This morphospecies was represented by 11 samples from this collection. The genus is unknown, but it is markedly different to *Laevophiloscia* and has highly distinctive dorsal setae. This is a potential SRE owing to geographical and taxonomic data deficiency. It is also possible that more than one species is represented by this morphospecies. Further taxonomic resolution will require assessment of their DNA sequences.

Family Styloniscidae

***Styloniscus* sp.**

This taxon was represented by represented by a single sample. *Styloniscus* is a principally wet forest group of species likely to contain many cryptic SRE species. This form of *Styloniscus* (also referred to as *Styloniscus* '7') has a high potential for SREs (Judd & Horwitz, 2003). There is plenty of available comparable material from the south-west should sequencing be required. This is most likely the same species collected in Alacran Project 2129. The specimens here should be considered Potential SREs owing to taxonomic data deficiency. Representatives of *Styloniscus* are rarely found on the Swan Coastal Plain.

GASTROPODA

Stylommatophora (terrestrial snails and slugs)

Family Bothriembryontidae

Bothriembryon perobesus

This species was tentatively identified and was represented by five samples, all dead shells. The taxonomy of *Bothriembryon* is complicated and unpublished assessment of their DNA sequences by W.A. Museum has identified a large undescribed fauna. The specimens in this collection were significantly larger than specimens I've seen previously. There is potential that this species is a complex of very similar species but this needs to be investigated using DNA sequences.

Bothriembryon perobesus is a 'Priority 1' listed species (DBCA 2018 (September)) and is listed as 'Endangered' under criteria 'C2b' by the IUCN (International Union for the Conservation of Nature and Natural Resources) Red List in 1996 (IUCN 2021). Stanisic *et al.* (2017) considered this species to be 'Probably extinct'.

Family Punctidae

***Westralaoma* sp.**

This taxon was represented by two samples. All species of *Westralaoma* are widespread (Stanisic *et al.* 2017).

RHABDITOPHORA

Tricladida (flat worms)

Family Geoplanidae

The W.A. fauna of Geoplanidae is very poorly known taxonomically. They possess biological characteristics that are likely to make them SREs: low vagility, and soft, wet bodies (Harvey 2002); however, they have never been assessed for SRE potential previously.

***Caenoplana* 'Na01'**

This taxon was represented by five samples. This morphospecies was distinguished by the absence of distinctive morphological features so it may represent multiple species. This taxon is a potential SRE owing to taxonomic and geographical data deficiency.

***Caenoplana* 'Na02'**

This morphospecies was represented by a single specimen. This morphospecies has a distinctive morphology (colour pattern) that differs from *Caenoplana* 'Na01'. This is a potential SRE owing to geographical data deficiency.

LUMBRICULIDA (EARTHWORMS)

Lumbriculida sp.

This taxon was represented by six samples. Owing to the complexity of assessing species in this order, these samples were not identified beyond the rank of Order. Native earthworms are regarded and having potential to be SREs.

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Appendix 1 (Attachment) 2144-Spectrum-Cowalla-SRE.xlsx

Appendix I: Species Excluded from Assessment

Species	Conservation Status			Database Record
	EPBC Act	BC Act	DBCA	
Brown Skua (Stercorarius antarcticus)			P4	PMST
Wandering Albatross (Diomedea exulans)	VU & MI	VU		PMST
Amsterdam Albatross (Diomedea amsterdamensis)		EN		PMST
Northern Royal Albatross (Diomedea sanfordi)	EN & MI	VU		PMST
Southern Royal Albatross (Diomedea epomophora)				ALA
Sooty Albatross (Phoebetria fusca)	VU & MI	EN		PMST
Black-browed Albatross (Thalassarche melanophris)	VU & MI	EN		PMST, ALA
Campbell Island Albatross (Thalassarche melanophris impavida)	VU & MI	VU		PMST
Shy Albatross (Thalassarche cauta)	VU & MI	VU		PMST
White-capped Albatross (Thalassarche cauta steadi)	VU & MI	VU		PMST
Indian Yellow-nosed Albatross (Thalassarche carteri)	VU & MI	EN		PMST
Atlantic Yellow-nosed Albatross (Thalassarche chlororhynchos)				ALA
Southern Giant Petrel (Macronectes giganteus)	EN & MI	MI		NatureMap, PMST
Northern Giant Petrel (Macronectes halli)	VU & MI	MI		PMST
Blue Petrel (Halobaena caerulea)				NatureMap, PMST
Fairy Prion (Pachyptila turtur)				PMST
Soft-plumaged Petrel (Pterodroma mollis)	VU			PMST
Wedge-tailed Shearwater (Ardenna pacifica)	MI	MI		NatureMap, PMST
Flesh-footed Shearwater (Ardenna carneipes)	MI	VU		NatureMap, PMST
Little Shearwater (Puffinus assimilis)				PMST
Common Noddy (Brown Noddy) (Anous stolidus)	MI	MI		NatureMap, PMST
Australian Lesser Noddy (Anous tenuirostris melanops)	VU	EN		PMST