



13 January 2020

## **Fauna Assessment - Waddington–Wongan Hills Road, Shire of Wongan-Ballidu**

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Our Reference: WHB001

### **1. Introduction**

The Shire of Wongan-Ballidu proposes to upgrade a four kilometre (km) section of the Waddington - Wongan Hills Road, from the intersection with Northam – Pithara Road, located north west of the town of Wongan Hills in the Central Wheatbelt (Survey Area - Figure 1). The Shire proposes to upgrade the road which will involve the trimming of vegetation on the south western verge, and widen the road along the north eastern side by up to 2 m which requires clearing of vegetation. To provide flexibility for the Shire, the area assessed for fauna habitat was up to 10 m on either side of the Waddington – Wongan Hills Road.

This report presents the findings of a fauna assessment undertaken by Western Ecological (WE) for of the Shire of Wongan - Ballidu (The Shire) to inform a clearing permit application for the Department of Water and Environmental Regulation (DWER). The fauna assessment and report was undertaken in conjunction with the accompanying flora and vegetation survey undertaken by Jenny Borger Botanical Consulting.

#### **1.1 Objectives and Scope**

The scope for the fauna assessment was to undertake a field assessment to confirm the environmental values in the Survey Area as identified in the desktop assessment. The scope of work (SoW) to be undertaken was as follows:

- Fauna desktop assessment
- Fauna assessment
- Targeted Black Cockatoo habitat assessment

The results of the above assessment have been consolidated in this report.

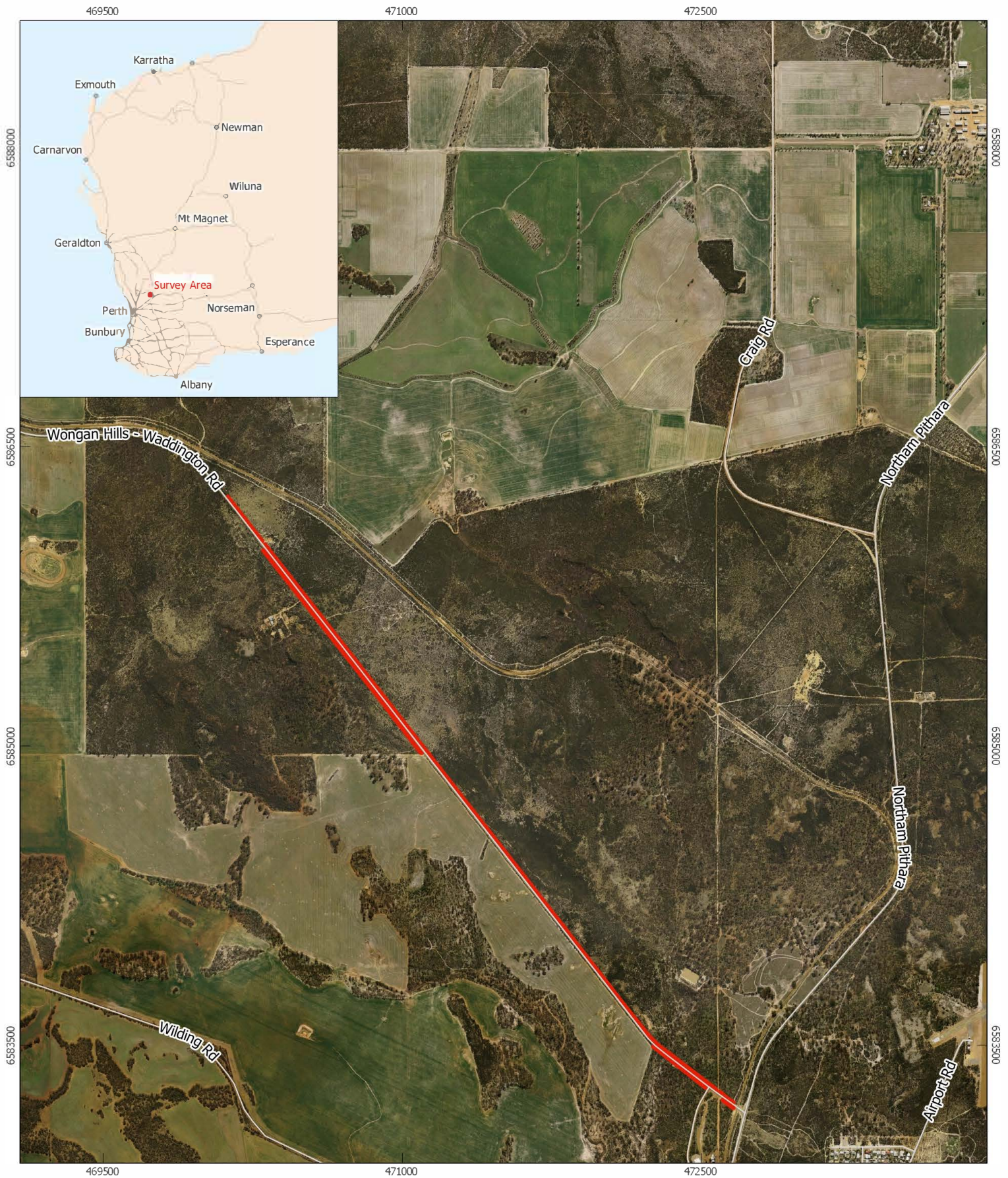
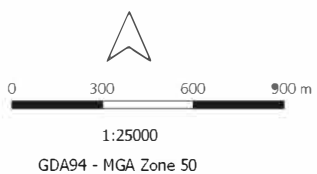


Figure 1: Survey Area Location



Legend

Survey Area



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## 2. Context

### 2.1 Legislative context

Fauna in Western Australia is protected formally and informally by various legislative and non-legislative measures, which are as follows:

- *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) – Australian Government
- *Environmental Protection Act 1986* (EP Act) – State
- *Biodiversity Conservation Act 2016* (BC Act) – State.

Non-legislative measures:

- *WA Department of Biodiversity, Conservation and Attractions (DBCA) Priority lists for flora, ecological communities and fauna.*

A short description of each is given below. Other definitions, including species conservation categories, are provided in Appendix 1.

#### **EPBC Act**

The EPBC Act aims to protect matters of national environmental significance, which are detailed in Appendix 1. Under the EPBC Act, the Commonwealth Department of the Environment and Energy (DoEE) lists protected species and Threatened Ecological Communities (TECs) by criteria set out in the Act. Species are conservation significant if they are listed as Threatened (i.e. Critically Endangered, Endangered and Vulnerable) or Migratory.

Bird species protected as Migratory under the EPBC Act include those listed under international migratory bird agreements relating to the protection of birds, which migrate between Australia and other countries, for which Australia has agreed. This includes the Japan-Australia Migratory Bird Agreement (JAMBA), the China-Australia Migratory Bird Agreement (CAMBA), the Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA) and the Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention).

Some marine fauna or terrestrial fauna that use marine habitats are listed as Marine under the EPBC Act. These species are only considered conservation significant when a proposed development occurs in a Commonwealth marine area (i.e. any Commonwealth Waters or Commonwealth Marine Protected Area). Outside of such areas, the EPBC Act does not consider these species to be matters of national environmental significance, so are not protected under the Act.

#### **EP Act**

Threatened fauna (and significant habitat necessary for the maintenance of indigenous fauna) and Threatened Ecological Communities (TECs) are given special consideration in environmental impact assessments and have special status as Environmentally Sensitive Areas (ESAs) under the EP Act and the Environmental Protection (Clearing of Native Vegetation) Regulations 2004. Exemptions for a clearing permit do not apply in an ESA.

#### **BC Act**

The *Biodiversity Conservation Act 2016* replaced both the *Wildlife Conservation Act* and the *Sandalwood Act* and came into effect on 1 January 2019. The aim of the new Act is to conserve and protect biodiversity and to promote the ecologically sustainable use of biodiversity components in the State, and will bring more activities within the scope of biodiversity laws.

**Criteria for listing** - The Act introduces criteria for range of different listings, and includes listing species as "endangered", "critically endangered" or "vulnerable", which brings WA in line with the EPBC Act 1999.



**Scope of matters protected** - For the first time in WA, the Act provides for not only listing species, but also threatened ecological communities, key threatening processes (such as land degradation), and critical habitats. The Act also establishes recovery plans and other modern features of biodiversity conservation and management.



## 3. Methods

### 3.1 Desktop Assessment

Searches of NatureMap and the EPBC Protected Matters Search Tool (EPBC PMST) were undertaken to identify fauna species of conservation significance potentially occurring in the Survey Area (DBCA 2019; DEE 2019). Searches with a 5 km buffer were centred on the following line coordinates 116° 42' 52" E / 30° 53' 04" S to 116° 41' 10" E / 30° 51' 17" S (Appendix 2). A 5 km buffer was applied due to the relatively low impact of the action.

Collectively, these sources were used to compile a list of species that have been previously recorded in the vicinity of the Survey Area. This list invariably includes some species that do not occur in the Survey Area, as some fauna have a limited or patchy distribution or a high level of habitat specificity for habitats which are not located in the Survey Area e.g. sea birds, wading birds and shorebirds that require coastal shores for habitat. Some fauna may also have become locally extinct or were erroneously identified in previous surveys. This fauna was examined and then excluded from further consideration.

### 3.2 Field Assessment

The field assessment was undertaken on 2 November 2019 by one qualified Zoologist. The field assessment was consistent with standard protocols for the region, relevant EPA Guidance Statements and EPBC Act Survey Guidelines (where relevant and practical) as outlined below:

- EPA Environmental Factor Guideline: Terrestrial Fauna (EPA 2016)
- EPA Technical Guidance: Sampling methods for Terrestrial vertebrate fauna (EPA 2016)
- EPA Technical Guidance: Terrestrial Fauna Surveys (EPA 2016)

Please note that the two EPA Technical Guidance documents (Sampling methods for Terrestrial vertebrate fauna and Terrestrial Fauna Surveys) above from 2016 have not been updated and are respectively the same as the following documents:

- Technical Guidance – Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment (EPA-DEC 2010).
- Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia. Guidance Statement No. 56 (EPA 2004)

#### 3.2.1 Habitat assessment

Habitat assessments were undertaken throughout the fauna assessment. The fauna habitats were assessed for their potential to support species of conservation significance and the quality of habitat they provide to a wider suite of fauna. The habitat assessments were documented systematically for each habitat type on standardised field sheets. The habitat assessments consisted of the following:

- location of the broad habitat type within the Survey Area (GPS co-ordinate) and its relative percentage
- habitat condition was assessed at each assessment site as 'completely degraded' through to 'pristine', based on the scale given in Keighery (1994)
- landscape position
- dominant vegetation and structure (e.g. number of vegetation strata)
- hollow-bearing trees and dead stags (e.g. average size and abundance of hollows)
- description of any rock and rocky outcrops
- logs (e.g. abundance and size)
- substrate (e.g. leaf litter)
- wetlands, creeks, rivers, dams and other water bodies

- description of any observed nests and roosts (if present)
- subterranean roosts (e.g. caves, disused mineshafts and/or adits)
- associated fauna species observed using the habitat
- disturbance (e.g. cattle grazing, fire)
- photo showing a typical example of the broad habitat type.

A total of eight habitat assessments were undertaken in the Survey Area, specifically on the north-eastern side of Waddington – Wongan Hills Road, due to the fact that clearing of up to 2 metres will only occur on this side of the road. The south-westerly side will only be trimmed, where necessary. These are represented in Appendix 3 and Figure 2.

### 3.2.2 Opportunistic fauna observations

Fauna observations were recorded opportunistically during the assessment. The assessment included looking through leaf litter, overturning rocks, and looking under decorticating bark. Other recordings included visual sightings of active fauna such as reptiles and birds, signs of species presence such as burrows and scats of mammals and reptiles, and aural observations of amphibian and bird species.

### 3.3.3 Taxonomy

For species identified in the desktop assessment, where there is doubt to their true taxonomy (through subsequent name changes or taxonomic reviews), an effort was made to determine the current scientific name for each taxon. In some cases, old scientific names were presented where correct nomenclature could not be determined due to name changes. Some taxon names may be followed by 'sp.', meaning that the species name was not given in the data source or the identification is in doubt. Where there are previously recorded taxa such as this that have the potential to be a conservation significant species, they are discussed specifically in the results and discussion sections.

Taxonomy and nomenclature in this report follows the accepted listing of published terrestrial vertebrate species, namely the West Australian (WA) Museum (2019). In addition, the listing for amphibians and reptiles is consistent with Cogger (2014); bird listings are consistent with Christidis & Boles (2008) and mammal listings are consistent with Woinarski *et al.* (2014).

### 3.3.4 Black Cockatoo habitat assessment

The Black Cockatoo habitat assessment was undertaken on 2 November 2019 by one qualified Zoologist with relevant experience as specified by the EPBC Act referral guidelines for three threatened black cockatoo species (DSEWPaC, 2012) and EPBC Act Revised draft referral guidelines for three threatened black cockatoo species (DEE 2017).

Please note that the 2017 guidelines above are draft and currently under review following the public consultation period.

#### Breeding Habitat

Black Cockatoos breed in large hollow-bearing trees, generally in woodlands or forests. The size of the tree can be a useful indication of the hollow-bearing potential of the tree. The assessment considered trees deemed suitable for potential breeding, based on the following criteria:

- Native trees (e.g. Jarrah, Marri, Wandoo etc.)
- Diameter at breast height (DBH)  $\geq$  500 mm (300 mm for Wandoo and Salmon Gum) of trees was estimated
- Hollows > 100 mm diameter at entrance (and considered to be at a suitable height off the ground, deep enough and at the correct angle) - with these observations and estimates occurring from the ground
- Co-ordinates of these trees were taken with a GPS.

#### Foraging Assessment

The Black Cockatoo assessment also involved assessing the habitat for tree and shrub species known to be important dietary items e.g. Marri and Wandoo spp. It included looking for:

- Native trees (e.g. Jarrah, Marri, Sheoak, Banksia etc.)
- Evidence of feeding (chewed cones, seed and nut material)



- Opportunistic observations of Black Cockatoos in the Survey Area (both visual and aural)

#### **Roost Assessment**

The Great Cockey Count data (Birdlife Australia) was examined to determine if any roosts were in or near the Survey Area.

#### **3.3.5 Conservation Significant Arachnid Review**

Following correspondence from DWER, the addition of an assessment addressing invertebrate fauna was requested by The Shire. As such Invertebrate Solutions was engaged to undertake a Conservation Significant Arachnid Review for Wongan Hills, specifically addressing the two Trapdoor spider species raised by DWER, namely the Federally protected Shield-backed trapdoor spider (*Idiosoma nigrum*) and Priority 4 Tree stem trapdoor spider (*Idiosoma castellum*). The results of this assessment can be seen in Addendum 1.



## 4. Results & Discussion

### 4.1 Database Results

Results of the databases searches outlined a total of 149 vertebrate species from 59 families (Appendix 2). These were comprised of five amphibian species from two families, 20 reptile species from six families, 110 bird species from 40 families, and 14 mammal species from 11 families.

A total of 20 conservation significant vertebrate species (including Priority species) from 15 families were identified during the desktop review of the database searches (Appendix 2). These were comprised of one reptile species, 16 bird species from 11 families, and three mammal species from three families.

#### **Waterbirds**

A total of nine wetland bird species were returned in the database searches. These were a combination of waders, waterbirds and migratory marine birds. The Survey Area is approximately 8 km from Lake Ninan, which provides suitable habitat for some of these species. These wetland avifauna such as wading birds, including Plovers and Sandpipers inhabit estuaries, mudflats, saltmarshes, sandflats and beaches, with shallow water edges, where they feed on invertebrates such as worms, molluscs, insects and crustaceans (Garnett *et al.* 2011). Suitable habitat for these species is not present in the Survey Area and therefore, these species have been omitted from any further discussion.

#### **Now regionally extinct**

A number of species in the database searches were also known to be historical records of species now locally extinct, for example the Western Quoll (*Dasyurus geoffroii*), and Banded hare-wallaby (*Lagostrophus fasciatus.fasciatus*). These species have therefore been omitted from any further discussion.

#### **Database errors and anomalies**

Occasionally there are errors and/or anomalies in the database searches that are sourced from the various government departments. For example, the Grey Wagtail (*Motacilla cinerea*), which is a rare visitor and has just two confirmed records (Johnstone & Storr 1998). These species have been omitted from any further discussion.

It is important to note, that the EPBC PMST is not entirely based on point records, but also on broader information, including bioclimatic distribution models, whereas NatureMap is. Consequently, the results of the EPBC PMST are in some cases less accurate, particularly at a local scale (e.g. the Night Parrot [*Pezoporus occidentalis*]). As a result, the EPBC PMST can include species that do not occur in the Survey Area because, for example, there is no habitat available or they are now known to be locally extinct. These species have therefore been omitted from any further discussion.

In addition, many fauna are not distributed evenly across the landscape, are more abundant in some places than others, and consequently more detectable (Currie 2007). Furthermore, some small, common ground-dwelling reptile and mammal species tend to be habitat specific, and many bird species can occur as regular migrants, occasional visitors or vagrants. Therefore, all these species have been excluded from any further discussion.

#### **Conservation Significant Fauna**

With the afore mentioned waterbirds and locally/regionally extinct and database errors species removed, a total of four conservation significant species retrieved from the database searches are considered as either likely, possibly or unlikely to occur in the Survey Area. Of these four conservation significant species, no species were recorded during the assessment, no species are considered Likely to occur in the Survey Area, two species are considered Possible and two species are considered Unlikely to occur (Table 1). All four conservation significant species will be discussed briefly below in section 4.4.

The Likelihood of each species is based on the following criteria:

- Recorded: Recorded during the field survey or site reconnaissance
- Likely: Suitable habitat is present in the Survey Area and the Survey Area is in the species' known distribution



- Possible: Limited or no suitable habitat is present in Survey Area, but is nearby. The species has good dispersal abilities and is known from the general area
- Unlikely: No suitable habitat is present in Survey Area but is nearby, the species has poor dispersal abilities, but is known from the general area; or suitable habitat is present, however the Survey Area is outside of the species' known distribution.

Table 1: Conservation significant fauna potentially occurring in the Survey Area

En = Listed as Endangered under the EBPC Act, Vu = Listed as Vulnerable under the EBPC Act, Mi = Listed as Migratory under the EBPC Act, Ma = Listed as Marine under the EBPC Act, MI = Migratory, OS = Other specially protected species, VU = Vulnerable, EN = Endangered, CD = Conservation Dependent - IUCN Threat categories (BC Act) , P = Listed as Priority by the DBCA.

Taxa		Conservation Status (EPBC Act)	Conservation Status (WA BC Act)	Likelihood
<b>Reptiles</b>				
Western Spiny-tailed Skink	<i>Egernia stokesii badia</i>	En	Vu	Unlikely
<b>Birds</b>				
Malleefowl	<i>Leipoa ocellata</i>	Vu	Vu	Possible
Peregrine Falcon	<i>Falco peregrinus</i>		OS	Unlikely
Carnaby's Black Cockatoo	<i>Calyptorhynchus latirostris</i>	En	En	Possible

## 4.2 Field Assessment Results

### Amphibians

From the database searches, five amphibian species from two families have been recorded in the surrounding area. No amphibian species were recorded during the field assessment. No water was present in the Survey Area and no frogs were heard calling.

### Reptiles

From the database searches, a total of 20 reptile species from six families have been previously recorded in the surrounding area. During the field survey, no reptile species were directly recorded, however a number of Skink or Dragon burrows were recorded. These are likely to be from *Ctenotus* sp, or *Ctenophorus* sp.

### Birds

From the database searches, a total of 110 bird species from 40 families have been previously recorded in the surrounding area (including earlier dismissed species). During the field assessment 17 bird species were recorded:

- Australian Raven (*Corvus coronoides*)
- Australian Ringneck (*Barnardius zonarius*)
- Brown Honeyeater (*Lichmera indistincta*)
- Chestnut-rumped Thornbill (*Acanthiza uropygialis*)
- Galah (*Eolophus roseicapilla*)
- Grey Fantail (*Rhipidura fuliginosa*)
- Grey Shrike-thrush (*Colluricincla harmonica*)
- New Holland Honeyeater (*Phylidonyris novaehollandiae*)
- Red Wattlebird (*Anthochaera carunculata*)
- Singing Honeyeater (*Lichenostomus virescens*)
- Striated Pardalote (*Pardalotus striatus*)
- Tawny-crowned Honeyeater (*Phylidonyris melanops*)
- Variegated Fairy-wren (*Malurus lamberti*)
- Western Rosella (*Platycercus icterotis*)
- White-breasted Robin (*Eopsaltria georgiana*)



- White-cheeked Honeyeater (*Phylidonyris niger*)
- Willie Wagtail (*Rhipidura leucophrys*)

### **Mammals**

From the database searches, a total of 14 mammal species from 11 families have been previously recorded in the surrounding area. During the field survey one mammal species was recorded (indirectly via scats), the Western Grey Kangaroo.

## **4.3 Fauna Habitat**

A total of eight habitat assessments were undertaken in the Survey Area (Appendix 3), which is 5.8 ha in total. These were all undertaken on the north-eastern side of Waddington – Wongan Hills Road, where the clearing will take place. Broad fauna habitat types were then defined and mapped based on the results of the field survey. These can be seen in Figure 2 and are as follows:

### **Sedgeland**

The Survey Area contains a total of 1 ha of Sedgeland. This habitat consists of various species including *Leptosperma*, *Austrostipa* and *Desmocladus*. There are a small number of isolated mallee Eucalypts including *Eucalyptus pyriformis* (Pear-fruited Mallee), which may provide habitat for nectar eating birds such as various Honeyeater species, while the sedge species may provide some cover for small reptile species.

### **Mixed Shrubland**

The Survey Area contains a total of 2.2 ha of Mixed Shrubland. This habitat contains shrubland species including *Grevillia armigera*, *G. paniculate*, *G. petrophiloides* and *Hakea multilineata*. These species are all listed as low priority foraging species for Carnaby's Black Cockatoo (DEC 2011). This habitat also contains various *Banksia* species (none of which are considered to be Carnaby's Black Cockatoo foraging species), well as *Allocasuarina*, over mixed low shrubs and weeds. This Mixed Shrubland habitat does contain some scattered mallee eucalypts including *E. pyriformis*, *E. moderata* and *E. torquata*, which may provide habitat for various bird species. There is limited woody debris and leaf litter present, which likely provides some habitat for small reptiles and possibly small mammals.

### **Melaleuca Shrubland**

The Survey Area contains a total of 1.6 ha of Melaleuca Shrubland. This habitat contains *Melaleuca hamulosa* over *Grevillia* and other low isolated mixed shrubs. Leaf litter is present, which provides habitat for small reptiles and possibly small mammals.

### **Eucalyptus Woodland**

The Survey Area contains a total of 1 ha of Eucalyptus Woodland. This habitat consists of an overstorey of *Eucalyptus loxophleba* (York Gum) and a very small amount of *Eucalyptus salmonophloia* (Salmon Gum), over a midstorey of *Melaleuca*, and an understorey of mixed grasses, sedges and weeds. The Salmon Gum provides a very small amount of foraging habitat for Carnaby's Black Cockatoo, while none of the Salmon Gums or York Gums were large enough to be considered as potential Black Cockatoo breeding habitat. Some areas contain woody debris and leaf litter, which provide habitat, particularly for small reptiles and birds. Other areas, lack midstorey vegetation, woody debris and leaf litter is limited and so provide limited habitat for fauna.

## **4.4 Conservation Significant Fauna**

### **4.3.1 Conservation Significant species recorded**

No conservation significant species were recorded in the Survey Area, during the fauna assessment.

### **4.3.2 Conservation Significant species considered Likely to occur**

No conservation significant species are considered Likely to occur in the Survey Area.

### **4.3.3 Conservation Significant species considered Possible to occur**

A total of two conservation significant species are considered as Possible to occur in the Survey Area - Malleefowl and Carnaby's Black Cockatoo. Due to the fact that a Black Cockatoo habitat assessment forms part of this report, Carnaby's Black Cockatoo will be discussed below in section 4.5.

#### **Malleefowl (*Leipoa ocellata*)**

The Malleefowl is listed as Vulnerable under the EPBC Act and the BC Act. In the past century, the range of the Malleefowl has contracted, particularly in arid areas and at the periphery of its former range (Benshemesh 2007). In Australia, clearing for Agriculture has eliminated and fragmented much of the Malleefowl habitat, resulting in localised extinctions and fragmented populations (Garnett *et al.* 2011). In WA since 1981, the range of the Malleefowl has been estimated to have contracted by between 28 and 30% (Benshemesh 2007; Parsons *et al.* 2008).

Historically, the species was originally common and widespread in semiarid zones, mainly in scrubs of Mallee and other low Eucalypts on sandy and lateritic soils; also Acacia scrubs on heavy red soils, especially north and east of the mulga-eucalypt line. The Malleefowl is now generally rare to uncommon and patchily distributed due to habitat loss.

Habitat in the way of scrubs of mallee and other low Eucalypts on sandy soil is present in the Survey Area, however it is limited (Figure 2). No mounds or tracks were recorded during the assessment and the Survey Area would currently only be considered as foraging habitat. The closest record of the Malleefowl is approximately 2.5 km away and was recorded in 1970.

As a result, the Malleefowl is considered as Possibly occurring in the vicinity of the Survey Area and may utilise the surrounding areas, however, it is not likely to be adversely affected by the limited amount of clearing of mallee and other low Eucalypts in the Survey Area itself.

#### **4.3.4 Conservation Significant species considered Unlikely**

A total of two conservation significant species are considered Unlikely to occur in the Survey Area – the Western Spiny-tailed Skink and Peregrine Falcon.

##### ***Western Spiny-tailed Skink (Egernia stokesii badia)***

The Western Spiny-tailed Skink (*Egernia stokesii badia*) is listed (at subspecies level) as Endangered under the EPBC Act and Vulnerable under the BC Act. The species is distributed along the coast of WA through the arid interior and is found among rocky outcrops, stony hills and mountain ranges, where it shelters in deep crevices or under large boulders (Cogger 2014).

This rocky, hilly and mountainous habitat is not present in the Survey Area and as such the Western Spiny-tailed Skink is considered Unlikely to occur.

##### ***Peregrine Falcon (Falco peregrinus)***

The Peregrine Falcon is listed as OS (Other Specially Protected Species) under the BC Act. The species is an uncommon but a wide-ranging bird across Australia. It occurs mainly along rivers and ranges as well as wooded watercourses and lakes and nests primarily on cliffs, granite outcrops and quarries. The diet of the Peregrine Falcon has been well studied and includes primarily flocking species such as European Starlings (Olsen *et al.* 2008).

No suitable habitat in the way of wooded watercourses are present in the Survey Area and consequently the Peregrine Falcon is considered as Unlikely to occur in the Survey Area.

### **4.5 Black Cockatoo Habitat Assessment**

The Survey Area is within the current known distribution of Carnaby's Black Cockatoo but is outside the range of Baudin's Black Cockatoo and the Forest red-tailed Black Cockatoo (FRTBC). Current known distribution can be seen in the DoEE Black Cockatoo distribution maps (Appendix 4).

During the assessment, no Black Cockatoos were recorded in the Survey Area, or heard calling nearby. No foraging evidence in the way of chewed Eucalyptus nuts, or any other evidence of foraging on known food items were recorded.

### **Carnaby's Black Cockatoo**

Carnaby's Black Cockatoo is endemic to south-west WA, and is distributed from the Murchison River to Esperance and inland to Coorow, Kellerberrin and Lake Cronin (Cale 2003). The species was once common, but the population has declined significantly in the last half century, and is now locally extinct in some areas (Johnstone & Storr 1998; Shah 2006). In the last 45 years (prior to Cale 2003) the species suffered a 50% reduction in its abundance (Cale 2003). More recent information suggests this decline has continued. This reduction is due to the clearing of core breeding habitat in the wheatbelt, the deterioration of nesting hollows, and clearing of food resources on the Swan Coastal Plain (SCP) (Cale 2003). The total population of Carnaby's Black Cockatoo was estimated to be 40,000 in 2008 (Johnstone & Kirkby 2008). Since then, trend analyses of the eight Great Cocky Counts 2010 – 2017 identified strong indications that the population of Carnaby's Black-Cockatoo inhabiting the Perth-Peel Coastal Plain continues to decline (Birdlife 2017).

This species is a postnuptial nomad, tending to move west after breeding. For example; most birds breeding in Badgingarra, Dandaragan, Moora and Bindoon regions tend to move west after breeding into higher rainfall areas especially the near coastal Banksia scrubs e.g. at Wanagarren Nature Reserve, Nilgen Nature Reserve, Yanchep area and Wanneroo area. Then many of these birds move further south onto the southern Swan Coastal Plain including the southern Perth metropolitan area Baldivis, Lake Clifton and Myalup areas (Johnstone & Kirkby 2011).

It is uncommon to common in the subhumid zone and wetter parts of the semiarid zone, scarce and patchily distributed in the drier parts of its range (north of Arrowsmith Lake and east of Marchagee, New Norcia, Toodyay, Tarin Rock and Lake Magenta) and scarce to moderately common in deep south-west (south of Margaret River, Nannup and Bridgetown and east of Albany). Carnaby's Black Cockatoo usually travel in pairs or small flocks, although they are often seen in large flocks (up to 10,000) in non-breeding season (late spring to mid-winter), especially at Banksia scrubs and pine plantations on the Swan Coastal Plain. Because of the large-scale post-war clearing of semiarid sandplains, this species has declined in much of the wheatbelt (Johnstone & Kirkby 2011).

Carnaby's Black Cockatoo feeds on seeds, nuts and flowers of a variety of native and exotic plants. Food plants include a variety of Eucalyptus species, such as Marri (*Corymbia calophylla*), Jarrah (*Eucalyptus marginata*), Swan River Blackbutt (*Eucalyptus patens*), Coastal Blackbutt (*Eucalyptus todtiana*), Caesia (*Eucalyptus caesia*) and Salmon Gum, as well as Pine trees (*Pinus* sp.), Grevillea, Allocasuarina, and Hakea species (Shah 2006). Marri nuts that are damaged extensively, especially on the main body of the nut, are likely to have been chewed by Carnaby's Black Cockatoo. The seeds from a variety of Banksia species and the cones of Pine trees provide the highest energetic yield (Cooper *et al.* 2002). The severed new growth, developing flower heads and chewed seed-pods of Banksia species are also a good indicator of Black Cockatoo feeding. Recent damage to bark is regarded as Black Cockatoo feeding activity along with the stripping of pine needles and cones (Cale 2003).

Approximately 87% (525,732 ha) of potential Carnaby's Black Cockatoo habitat (i.e. areas of vegetation that contain flora species and vegetation types that could support the species' breeding, feeding and night roosting activities) has been cleared in the wheatbelt since European settlement (DPaW 2013). The south-west region is now a severely fragmented landscape and the further loss of foraging habitat, the lack of suitable breeding sites, climate change, alterations in the landscape, changing forest structure with almost every part of the Jarrah-Marri forest logged in the past and with most trees too young to form hollows, and competition with exotic species, exacerbate the future conservation of Carnaby's Black Cockatoo (Johnstone & Kirkby 2011).

Carnaby's Black Cockatoo display strong pair bonds and mate for life. Breeding has been recorded from early July to mid-December, and primarily occurs in the wheatbelt in the semi-arid and subhumid interior (Johnstone & Storr 1998). However, this species is currently expanding its breeding range westward and south into the Jarrah-Marri forests of the Darling Scarp (e.g. Wungong Dam Catchment) and into the Tuart (*Eucalyptus gomphocephala*) forests of the SCP including Yanchep, Baldivis, Lake Clifton and near Bunbury (Johnstone & Kirkby 2011). Carnaby's Black Cockatoo nest in hollows of smooth-barked eucalypts particularly Salmon Gum and Wandoo (*Eucalyptus wandoo*) but nests have also been found in other Eucalypt species including York Gum, Flooded Gum (*Eucalyptus rudis*), the rough-barked Marri and Tuart (Johnstone & Kirkby 2011). Nests are laid on a mat of wood chips at the bottom of a large hollow (mostly top entry hollows) ranging from a few cm's to five m deep (Johnstone & Kirkby 2011). Clutch size is 1–2 eggs, more typically two; only one young is reared (Saunders 1986). Incubation lasts for 29 days and only the female incubates and broods. The nestling is brooded by the female during which time both rely on food from the male. Once brooding is complete, the female then leaves the nest each day at dawn, sometimes returning mid-morning (with the male) to feed the chick (Johnstone & Kirkby 2011). After

approximately three weeks she ceases to brood and the chick is fed by one or both parents in the morning and in the late evening (Johnstone & Kirkby 2011).

### **Potential Breeding Habitat**

With reference to potential breeding habitat, the size of the tree can be a useful indication of its hollow-bearing potential. Trees of suitable DBH are potentially important for maintaining breeding in the long-term, through maintaining the integrity of the habitat and allowing trees to provide future nest hollows. Maintaining the long-term supply of trees of a size to provide suitable nest hollows is particularly important in woodland stands that are known to support Black Cockatoo breeding (DSEWPaC, 2012). This suggests that the tree may develop hollows and have the potential to be used for breeding in the future. To be suitable for Black Cockatoos, the hollow entrances need to be large enough for cockatoos to enter and of adequate depth.

The literature was consulted in order to determine what size, height, angle and depth the hollow attributes in a tree need to be to make them a potentially suitable nest tree. Past studies have found that on average hollow openings are 25 cm x 27 cm (Saunders *et al.* 1982, Saunders & Dawson 2017) and 30 cm x 34 cm (Johnstone *et al.* 2013). The height of a hollow entrance off the ground is on average 14.49 m (Johnstone *et al.* 2013). Nearly all hollows that are used for nesting by Black Cockatoos are located in the main trunk and have a vertical aspect (Johnstone *et al.* 2013, Saunders & Dawson 2017). Black Cockatoos are large birds with shoulders that are about 100 mm wide, therefore they require hollows with an entrance bigger than this (as shown above they are typically much larger), but the internal dimensions (depth and floor base) need to be much larger in order for it to be suitable to lay eggs in and for adults to be able to move around.

Previous research has found for Carnaby's Black Cockatoo a mean depth of 1.2 m and a floor diameter of 40 cm is required in order for it to be suitable to lay eggs in and for adults to be able to move around (Johnstone *et al.* 2013, Saunders & Dawson 2017).

Two species of Eucalyptus recorded in the Survey Area are listed in the Black Cockatoo guidelines as potential Carnaby's Black Cockatoo breeding habitat species. Salmon Gum and York Gum were recorded in the south-eastern section of the Survey Area (Figure 2). However, no trees with a DBH of > 500 mm for York gum or > 300 mm for Salmon Gum, or of a suitable form, were recorded in the Survey Area. There were also no observable hollows present in any trees, when viewed from the ground. Therefore, no potential breeding habitat is present in the Survey Area.

### **Foraging Habitat**

Carnaby's Black Cockatoo feeds on seeds, nuts and flowers of a variety of native and introduced plants, including Marri, Jarrah, Swan River Blackbutt, Coastal Blackbutt and Salmon Gum, as well as Pine trees (*Pinus* sp.), Grevillea, Allocasuarina, and Hakea species (Shah 2006).

It is important to note that with reference to the Black Cockatoo guidelines, Salmon Gum is not listed as a foraging species, however, the literature was consulted and Carnaby's Black Cockatoo have been recorded feeding on this species (Johnstone & Kirkby 2011). The Salmon Gum trees (as mentioned above) are all under the threshold of 300 mm DBH however they are considered mature (i.e. had fruit or large enough to produce fruit). It is important to note, there was only a very small number of Salmon Gum present in the Survey Area.

A number of the shrub species recorded in the Survey Area are considered to be Carnaby's Black Cockatoo foraging species. *Acacia saligna* (Orange Wattle), *Grevillia armigera* (Prickly Toothbrushes), *G. paniculate* (Kerosene Bush), *G. petrophiloides* (Pink Poker) and *Hakea multilineata* (Grass Leaf Hakea) (Johnstone & Kirkby 2011, DEC 2011). These species were recorded in the areas of Shrubland in the Survey Area (Figure 2).

It is important to note that all of the species recorded in the Survey Area and listed as Carnaby's Black Cockatoo foraging species are considered as low priority foraging species and as such are considered limited in their value to the species (DEC 2011). No foraging evidence in the way of chewed nuts or cones was recorded in the Survey Area.

### **Roosting Habitat**

The 2017 Great Cockey Count (Birdlife 2017) data was examined to determine if any roosts are in or near the Survey Area. The closest record was approximately 45 km south east near Goomalling and approximately 47 km south west near Rica Erickson Nature Reserve.



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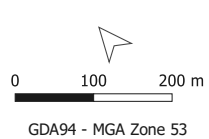
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## Figures





Figure 2: Fauna Habitat Types and Assessment Locations



Legend







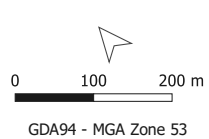
- |   |                    |   |                     |  |                     |
|---|--------------------|---|---------------------|--|---------------------|
|  | Habitat Assessment |  | Eucalyptus Woodland |  | Sedgeland           |
|  | Survey Area        |  | Mixed Shrubland     |  | Melaleuca Shrubland |











Figure 2: Fauna Habitat Types and Assessment Locations



Legend

- |   |                    |   |                     |  |                     |
|---|--------------------|---|---------------------|--|---------------------|
|  | Habitat Assessment |  | Eucalyptus Woodland |  | Sedgeland           |
|  | Survey Area        |  | Mixed Shrubland     |  | Melaleuca Shrubland |



## **Appendix 1: Conservation Categories**

### Categories of Threatened Fauna Species under the EPBC Act

Conservation Code	Description
Ex	Extinct Taxa which at a particular time if, at the time, there is no reasonable doubt that the last member of the species has died.
ExW	Extinct in the Wild Taxa which is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; or 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.
CE	Critically Endangered Taxa which at a particular 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.
En	Endangered Taxa which is not critically endangered and it is facing a very high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria.
Vu	Vulnerable Taxa which is not critically endangered or endangered and is facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria.

Source: Environment Protection and Biodiversity Conservation Act 1999.

### DBCA Fauna Priority Codes

Category	Code	Description
Poorly-known species	Priority 1 (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.
Poorly-known species	Priority 2 (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.
Poorly-known species	Priority 3 (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.

Category	Code	Description
Poorly-known species	Priority 4 (P4)	<p>(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.</p> <p>(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.</p> <p>(c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.</p>

## **Appendix 2: Database Searches**

# NatureMap Species Report

Created By Guest user on 27/11/2019

**Kingdom** Animalia  
**Current Names Only** Yes  
**Core Datasets Only** Yes  
**Method** 'By Line'  
**Points** 116° 41' 10" E,30° 51' 17" S - 116° 42' 52" E,30° 53' 04" S  
**Buffer** 5km  
**Group By** Family

Family	Species	Records
Acanthizidae	10	117
Accipitridae	5	14
Agamidae	3	3
Anatidae	7	25
Araneidae	1	2
Artamidae	2	7
Atherinidae	1	1
Cacatuidae	1	21
Campephagidae	1	12
Charadriidae	1	2
Columbidae	4	26
Corvidae	2	23
Cracticidae	3	29
Cuculidae	1	5
Dasyuridae	2	3
Dicaeidae	1	2
Dicruridae	3	32
Diplodactylidae	1	1
Elapidae	6	16
Falconidae	4	11
Galaxiidae	1	2
Gekkonidae	1	1
Halcyonidae	3	5
Hirundinidae	3	36
Idiopidae	3	9
Limnodynastidae	4	5
Lycosidae	5	16
Macropodidae	1	1
Maluridae	4	27
Megapodiidae	1	2
Meliphagidae	13	132
Meropidae	1	6
Muridae	2	3
Myobatrachidae	1	2
Nemesiidae	1	1
Neosittidae	2	6
Nicodamidae	1	1
Pachycephalidae	3	34
Pardalotidae	2	21
Petroicidae	5	29
Podicipedidae	2	12
Pomatostomidae	1	12
Prodidomidae	2	3
Psittacidae	7	62
Pygopodidae	4	5
Rallidae	1	3
Recurvirostridae	2	9
Salticidae	1	2
Scincidae	4	5
Scolopacidae	1	1
Scutigeridae	1	1
Theridiidae	1	1
Urodacidae	1	2
Vespertilionidae	2	10
Zodariidae	1	1
Zosteropidae	1	15
<b>TOTAL</b>	<b>148</b>	<b>835</b>

Name ID Species Name Naturalised Conservation Code <sup>1</sup>Endemic To Query Area

## Acanthizidae

1.	24260	<i>Acanthiza apicalis</i> (Broad-tailed Thornbill, Inland Thornbill)
2.	24261	<i>Acanthiza chrysorrhoa</i> (Yellow-rumped Thornbill)
3.	24265	<i>Acanthiza uropygialis</i> (Chestnut-rumped Thornbill)
4.	24269	<i>Calamanthus campestris</i> (Rufous Fieldwren)
5.	25530	<i>Gerygone fusca</i> (Western Gerygone)

Name ID	Species Name	Naturalised	Conservation Code	<sup>1</sup> Endemic To Query Area
6.	24277 <i>Hylacola cauta</i> (Shy Groundwren, Shy Heathwren)			
7.	24278 <i>Pyrrholaemus brunneus</i> (Redthroat)			
8.	25534 <i>Sericornis frontalis</i> (White-browed Scrubwren)			
9.	24279 <i>Sericornis frontalis subsp. maculatus</i> (White-browed Scrubwren)			
10.	30948 <i>Smicrornis brevirostris</i> (Weebill)			
<b>Accipitridae</b>				
11.	25535 <i>Accipiter cirrocephalus</i> (Collared Sparrowhawk)			
12.	25536 <i>Accipiter fasciatus</i> (Brown Goshawk)			
13.	24285 <i>Aquila audax</i> (Wedge-tailed Eagle)			
14.	24289 <i>Circus assimilis</i> (Spotted Harrier)			
15.	47965 <i>Hieraaetus morphnoides</i> (Little Eagle)			
<b>Agamidae</b>				
16.	24904 <i>Moloch horridus</i> (Thorny Devil)			
17.	25510 <i>Pogona minor</i> (Dwarf Bearded Dragon)			
18.	24907 <i>Pogona minor subsp. minor</i> (Dwarf Bearded Dragon)			
<b>Anatidae</b>				
19.	24312 <i>Anas gracilis</i> (Grey Teal)			
20.	24316 <i>Anas superciliosa</i> (Pacific Black Duck)			
21.	24318 <i>Aythya australis</i> (Hardhead)			
22.	24321 <i>Chenonetta jubata</i> (Australian Wood Duck, Wood Duck)			
23.	24322 <i>Cygnus atratus</i> (Black Swan)			
24.	24326 <i>Malacorhynchus membranaceus</i> (Pink-eared Duck)			
25.	24331 <i>Tadorna tadornoides</i> (Australian Shelduck, Mountain Duck)			
<b>Araneidae</b>				
26.	<i>Nephila edulis</i>			
<b>Artamidae</b>				
27.	25566 <i>Artamus cinereus</i> (Black-faced Woodswallow)			
28.	24353 <i>Artamus cyanopterus</i> (Dusky Woodswallow)			
<b>Atherinidae</b>				
29.	<i>Atherinosoma wallacei</i>			
<b>Cacatuidae</b>				
30.	<i>Eolophus roseicapillus</i>			
<b>Campephagidae</b>				
31.	25568 <i>Coracina novaehollandiae</i> (Black-faced Cuckoo-shrike)			
<b>Charadriidae</b>				
32.	47937 <i>Eiseyornis melanops</i> (Black-fronted Dotterel)			
<b>Columbidae</b>				
33.	24399 <i>Columba livia</i> (Domestic Pigeon)	Y		
34.	24407 <i>Ocyphaps lophotes</i> (Crested Pigeon)			
35.	24409 <i>Phaps chalcoptera</i> (Common Bronzewing)			
36.	25590 <i>Streptopelia senegalensis</i> (Laughing Turtle-Dove)	Y		
<b>Corvidae</b>				
37.	24416 <i>Corvus bennetti</i> (Little Crow)			
38.	25592 <i>Corvus coronoides</i> (Australian Raven)			
<b>Cracticidae</b>				
39.	24420 <i>Cracticus nigrogularis</i> (Pied Butcherbird)			
40.	25595 <i>Cracticus tibicen</i> (Australian Magpie)			
41.	25596 <i>Cracticus torquatus</i> (Grey Butcherbird)			
<b>Cuculidae</b>				
42.	42307 <i>Cacomantis pallidus</i> (Pallid Cuckoo)			
<b>Dasyuridae</b>				
43.	24108 <i>Sminthopsis crassicaudata</i> (Fat-tailed Dunnart)			
44.	24109 <i>Sminthopsis dolichura</i> (Little long-tailed Dunnart)			
<b>Dicaeidae</b>				
45.	25607 <i>Dicaeum hirundinaceum</i> (Mistletoebird)			
<b>Dicruridae</b>				
46.	24443 <i>Grallina cyanoleuca</i> (Magpie-lark)			
47.	48096 <i>Rhipidura albiscapa</i> (Grey Fantail)			
48.	25614 <i>Rhipidura leucophrys</i> (Willie Wagtail)			
<b>Diplodactylidae</b>				
49.	24940 <i>Diplodactylus pulcher</i>			



Name ID	Species Name	Naturalised	Conservation Code	<sup>1</sup> Endemic To Query Area
<b>Elapidae</b>				
50.	25296 <i>Demansia psammophis</i> subsp. <i>reticulata</i> (Yellow-faced Whipsnake)			
51.	25261 <i>Pseudechis australis</i> (Mulga Snake)			
52.	42416 <i>Pseudonaja mengdeni</i> (Western Brown Snake)			
53.	25263 <i>Pseudonaja modesta</i> (Ringed Brown Snake)			
54.	25266 <i>Simoselaps bertholdi</i> (Jan's Banded Snake)			
55.	25269 <i>Suta fasciata</i> (Rosen's Snake)			
<b>Falconidae</b>				
56.	25621 <i>Falco berigora</i> (Brown Falcon)			
57.	25622 <i>Falco cenchroides</i> (Australian Kestrel, Nankeen Kestrel)			
58.	25623 <i>Falco longipennis</i> (Australian Hobby)			
59.	25624 <i>Falco peregrinus</i> (Peregrine Falcon)		S	
<b>Galaxiidae</b>				
60.	34028 <i>Galaxias occidentalis</i> (Western Minnow)			
<b>Gekkonidae</b>				
61.	24959 <i>Gehyra variegata</i>			
<b>Halcyonidae</b>				
62.	30901 <i>Dacelo novaeguineae</i> (Laughing Kookaburra)	Y		
63.	42351 <i>Todiramphus pyrrhopygius</i> (Red-backed Kingfisher)			
64.	25549 <i>Todiramphus sanctus</i> (Sacred Kingfisher)			
<b>Hirundinidae</b>				
65.	47909 <i>Cheramoeca leucosterna</i> (White-backed Swallow)			
66.	24491 <i>Hirundo neoxena</i> (Welcome Swallow)			
67.	48061 <i>Petrochelidon nigricans</i> (Tree Martin)			
<b>Idiopidae</b>				
68.	33902 <i>Aganippe castellum</i> (Tree-stem Trapdoor Spider)		P4	
69.	<i>Anidiops villosus</i>			
70.	33917 <i>Idiosoma nigrum</i> (Shield-backed Trapdoor Spider)		T	
<b>Limnodynastidae</b>				
71.	25408 <i>Heleioporus albopunctatus</i> (Western Spotted Frog)			
72.	25410 <i>Heleioporus eyrei</i> (Moaning Frog)			
73.	25415 <i>Limnodynastes dorsalis</i> (Western Banjo Frog)			
74.	25425 <i>Neobatrachus kunapalari</i> (Kunapalari Frog)			
<b>Lycosidae</b>				
75.	<i>Dingosa serrata</i>			
76.	<i>Dingosa simsoni</i>			
77.	<i>Hoggicosa forresti</i>			
78.	<i>Lycosa godeffroyi</i>			
79.	<i>Tasmanicosa leuckartii</i>			
<b>Macropodidae</b>				
80.	24128 <i>Lagostrophus fasciatus</i> subsp. <i>fasciatus</i> (Banded hare-wallaby, Mernine)		T	
<b>Maluridae</b>				
81.	25651 <i>Malurus lamberti</i> (Variegated Fairy-wren)			
82.	25652 <i>Malurus leucopterus</i> (White-winged Fairy-wren)			
83.	24549 <i>Malurus leucopterus</i> subsp. <i>leuconotus</i> (White-winged Fairy-wren)			
84.	24551 <i>Malurus pulcherrimus</i> (Blue-breasted Fairy-wren)			
<b>Megapodiidae</b>				
85.	24557 <i>Leipoa ocellata</i> (Malleefowl)		T	
<b>Meliphagidae</b>				
86.	24559 <i>Acanthagenys rufogularis</i> (Spiny-cheeked Honeyeater)			
87.	24561 <i>Anthochaera carunculata</i> (Red Wattlebird)			
88.	24567 <i>Epthianura albifrons</i> (White-fronted Chat)			
89.	42314 <i>Gavicalis virescens</i> (Singing Honeyeater)			
90.	47962 <i>Glyciphila melanops</i> (Tawny-crowned Honeyeater)			
91.	25659 <i>Lichenostomus leucotis</i> (White-eared Honeyeater)			
92.	24576 <i>Lichenostomus leucotis</i> subsp. <i>novaenorciae</i> (White-eared Honeyeater)			
93.	25661 <i>Lichmera indistincta</i> (Brown Honeyeater)			
94.	24582 <i>Lichmera indistincta</i> subsp. <i>indistincta</i> (Brown Honeyeater)			
95.	24583 <i>Manorina flavigula</i> (Yellow-throated Miner)			
96.	25663 <i>Melithreptus brevirostris</i> (Brown-headed Honeyeater)			
97.	24586 <i>Melithreptus brevirostris</i> subsp. <i>leucogenys</i> (Brown-headed Honeyeater)			
98.	42344 <i>Purnella albifrons</i> (White-fronted Honeyeater)			
<b>Meropidae</b>				
99.	24598 <i>Merops ornatus</i> (Rainbow Bee-eater)			

Name ID	Species Name	Naturalised	Conservation Code	<sup>1</sup> Endemic To Query Area
<b>Muridae</b>				
100.	24223 <i>Mus musculus</i> (House Mouse)	Y		
101.	24230 <i>Pseudomys albocinereus</i> (Ash-grey Mouse)			
<b>Myobatrachidae</b>				
102.	25433 <i>Pseudophryne guentheri</i> (Crawling Toadlet)			
<b>Nemesiidae</b>				
103.	<i>Kwonkan wonganensis</i>			
<b>Neosittidae</b>				
104.	25673 <i>Daphoenositta chrysoptera</i> (Varied Sittella)			
105.	24606 <i>Daphoenositta chrysoptera</i> subsp. <i>pileata</i> (Varied Sittella, Black-capped Sittella)			
<b>Nicodamidae</b>				
106.	<i>Nicodamus mainae</i>			
<b>Pachycephalidae</b>				
107.	25675 <i>Colluricincla harmonica</i> (Grey Shrike-thrush)			
108.	25680 <i>Pachycephala rufiventris</i> (Rufous Whistler)			
109.	24624 <i>Pachycephala rufiventris</i> subsp. <i>rufiventris</i> (Rufous Whistler)			
<b>Pardalotidae</b>				
110.	25682 <i>Pardalotus striatus</i> (Striated Pardalote)			
111.	24630 <i>Pardalotus striatus</i> subsp. <i>westraliensis</i> (Striated Pardalote)			
<b>Petroicidae</b>				
112.	24650 <i>Drymodes brunneopygia</i> (Southern Scrub-robin)			
113.	24651 <i>Eopsaltria australis</i> subsp. <i>griseogularis</i> (Western Yellow Robin)			
114.	24652 <i>Eopsaltria georgiana</i> (White-breasted Robin)			
115.	24654 <i>Microeca fascians</i> subsp. <i>assimilis</i> (Jacky Winter)			
116.	24659 <i>Petroica goodenovii</i> (Red-capped Robin)			
<b>Podicipedidae</b>				
117.	24681 <i>Poliiocephalus poliocephalus</i> (Hoary-headed Grebe)			
118.	25705 <i>Tachybaptus novaehollandiae</i> (Australasian Grebe, Black-throated Grebe)			
<b>Pomatostomidae</b>				
119.	24683 <i>Pomatostomus superciliosus</i> (White-browed Babbler)			
<b>Prodidomidae</b>				
120.	<i>Molycrria vokes</i>			
121.	<i>Myandra bicincta</i>			
<b>Psittacidae</b>				
122.	<i>Barnardius zonarius</i>			
123.	25714 <i>Cacatua pastinator</i> (Western Long-billed Corella)			
124.	25716 <i>Cacatua sanguinea</i> (Little Corella)			
125.	25717 <i>Calyptorhynchus banksii</i> (Red-tailed Black-Cockatoo)			
126.	24734 <i>Calyptorhynchus latirostris</i> (Carnaby's Cockatoo, White-tailed Short-billed Black Cockatoo)			T
127.	24738 <i>Neophema elegans</i> (Elegant Parrot)			
128.	24745 <i>Platycercus icterotis</i> subsp. <i>icterotis</i> (Western Rosella)			
<b>Pygopodidae</b>				
129.	24991 <i>Aprasia repens</i> (Sand-plain Worm-lizard)			
130.	24995 <i>Delma australis</i>			
131.	25005 <i>Lialis burtonis</i>			
132.	25008 <i>Pygopus lepidopodus</i> (Common Scaly Foot)			
<b>Rallidae</b>				
133.	25727 <i>Fulica atra</i> (Eurasian Coot)			
<b>Recurvirostridae</b>				
134.	24774 <i>Cladorhynchus leucocephalus</i> (Banded Stilt)			
135.	25734 <i>Himantopus himantopus</i> (Black-winged Stilt)			
<b>Salticidae</b>				
136.	<i>Sandalodes superbus</i>			
<b>Scincidae</b>				
137.	25074 <i>Ctenotus schomburgkii</i>			
138.	25149 <i>Lerista macropisthopus</i> subsp. <i>macropisthopus</i>			
139.	25184 <i>Menetia greyii</i>			
140.	25192 <i>Morethia obscura</i>			
<b>Scolopacidae</b>				
141.	24806 <i>Tringa glareola</i> (Wood Sandpiper)		IA	

Name ID	Species Name	Naturalised	Conservation Code	<sup>1</sup> Endemic To Query Area
<b>Scutigeridae</b>				
142.	<i>Thereuopoda lesueurii</i>			
<b>Theridiidae</b>				
143.	<i>Latrodectus hasseltii</i>			
<b>Urodacidae</b>				
144.	<i>Urodacus novaehollandiae</i>			
<b>Vespertilionidae</b>				
145.	24186 <i>Chalinolobus gouldii</i> (Gould's Wattled Bat)			
146.	24199 <i>Scotorepens balstoni</i> (Inland Broad-nosed Bat)			
<b>Zodariidae</b>				
147.	<i>Storena formosa</i>			
<b>Zosteropidae</b>				
148.	25765 <i>Zosterops lateralis</i> (Grey-breasted White-eye, Silveryeye)			

**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

<sup>1</sup> For NatureMap's purposes, species flagged as endemic are those whose records are wholly 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.



# 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: 27/11/19 17:03:57

[Summary](#)

[Details](#)

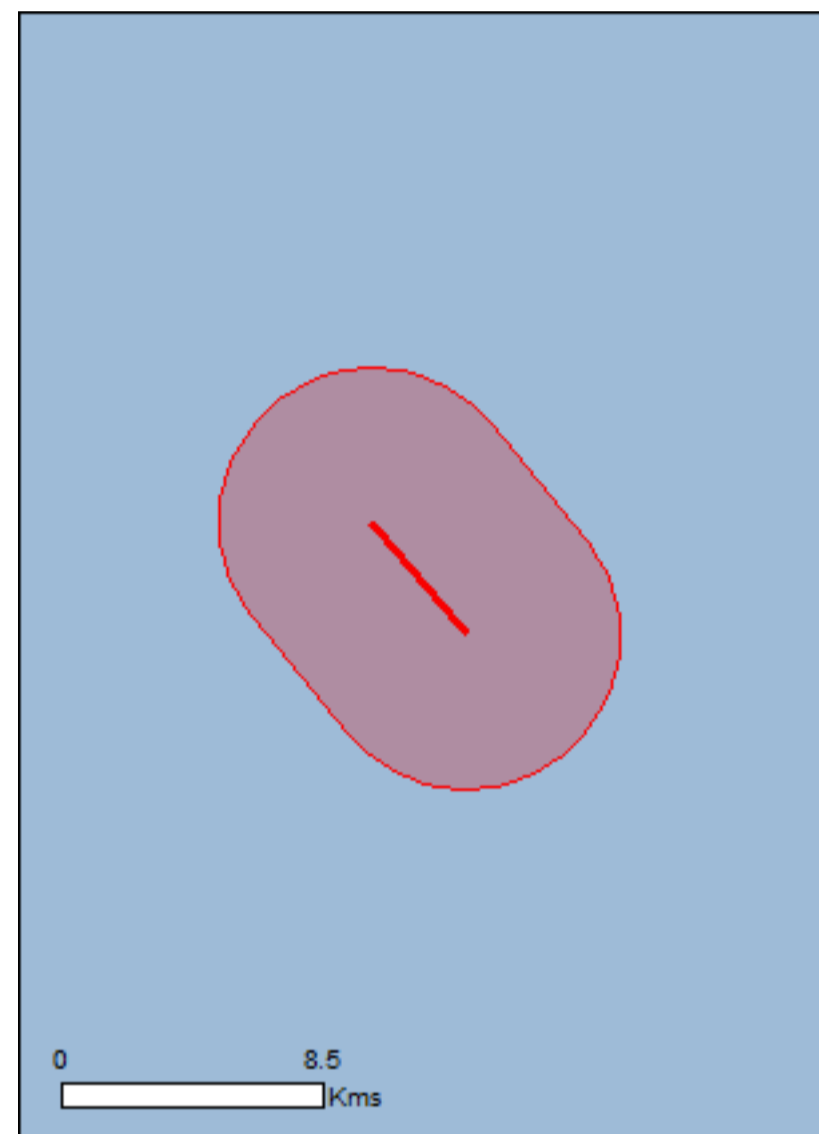
[Matters of NES](#)

[Other Matters Protected by the EPBC Act](#)

[Extra Information](#)

[Caveat](#)

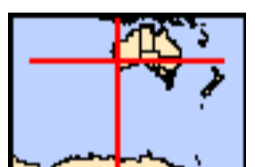
[Acknowledgements](#)



This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2010

[Coordinates](#)

Buffer: 5.0Km



# 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](#).

<a href="#">World Heritage Properties:</a>	None
<a href="#">National Heritage Places:</a>	None
<a href="#">Wetlands of International Importance:</a>	None
<a href="#">Great Barrier Reef Marine Park:</a>	None
<a href="#">Commonwealth Marine Area:</a>	None
<a href="#">Listed Threatened Ecological Communities:</a>	1
<a href="#">Listed Threatened Species:</a>	38
<a href="#">Listed Migratory Species:</a>	6

## 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.

<a href="#">Commonwealth Land:</a>	1
<a href="#">Commonwealth Heritage Places:</a>	None
<a href="#">Listed Marine Species:</a>	12
<a href="#">Whales and Other Cetaceans:</a>	None
<a href="#">Critical Habitats:</a>	None
<a href="#">Commonwealth Reserves Terrestrial:</a>	None
<a href="#">Australian Marine Parks:</a>	None

## Extra Information

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

<a href="#">State and Territory Reserves:</a>	6
<a href="#">Regional Forest Agreements:</a>	None
<a href="#">Invasive Species:</a>	13
<a href="#">Nationally Important Wetlands:</a>	None
<a href="#">Key Ecological Features (Marine)</a>	None

# Details

## Matters of National Environmental Significance

### 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
<a href="#">Eucalypt Woodlands of the Western Australian Wheatbelt</a>	Critically Endangered	Community likely to occur within area

### Listed Threatened Species

[\[ Resource Information \]](#)

Name	Status	Type of Presence
------	--------	------------------

#### Birds

<a href="#">Calidris ferruginea</a> Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
---	-----------------------	--

<a href="#">Calyptorhynchus latirostris</a> Carnaby's Cockatoo, Short-billed Black-Cockatoo [59523]	Endangered	Species or species habitat known to occur within area
--	------------	---

<a href="#">Leipoa ocellata</a> Malleefowl [934]	Vulnerable	Species or species habitat known to occur within area
---	------------	---

<a href="#">Pezoporus occidentalis</a> Night Parrot [59350]	Endangered	Species or species habitat may occur within area
--	------------	--

<a href="#">Rostratula australis</a> Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area
--	------------	--

#### Mammals

<a href="#">Dasyurus geoffroii</a> Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat may occur within area
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<a href="#">Phascogale calura</a> Red-tailed Phascogale, Red-tailed Wambenger, Kenngoor [316]	Vulnerable	Species or species habitat likely to occur within area
--	------------	--

#### Other

<a href="#">Idiosoma nigrum</a> Shield-backed Trapdoor Spider, Black Rugose Trapdoor Spider [66798]	Vulnerable	Species or species habitat known to occur within area
--	------------	---

#### Plants

<a href="#">Acacia ataxiphylla subsp. magna</a> Large-fruited Tammin Wattle [64823]	Endangered	Species or species habitat may occur within area
--	------------	--

<a href="#">Acacia cochlocarpa subsp. velutinos</a> Velvety Spiral Pod Wattle [65112]	Critically Endangered	Species or species habitat may occur within
--	-----------------------	---

Name	Status	Type of Presence area
<a href="#">Acacia pharangites</a> Wongan Gully Wattle [20281]	Endangered	Species or species habitat known to occur within area
<a href="#">Acacia pygmaea</a> Dwarf Rock Wattle [56768]	Endangered	Species or species habitat known to occur within area
<a href="#">Acacia vassalii</a> Vassal's Wattle [6144]	Endangered	Species or species habitat known to occur within area
<a href="#">Caladenia drakeoides</a> Hinged Dragon Orchid [68687]	Endangered	Species or species habitat likely to occur within area
<a href="#">Chorizema humile</a> Prostrate Flame Pea [32573]	Endangered	Species or species habitat may occur within area
<a href="#">Conospermum densiflorum subsp. unicephalatum</a> One-headed Smokebush [64871]	Endangered	Species or species habitat may occur within area
<a href="#">Conostylis wonganensis</a> Wongan Conostylis [10906]	Endangered	Species or species habitat known to occur within area
<a href="#">Dasymalla axillaris</a> Native Foxglove [38829]	Critically Endangered	Species or species habitat likely to occur within area
<a href="#">Daviesia euphorbioides</a> Wongan Cactus [3477]	Endangered	Species or species habitat known to occur within area
<a href="#">Eremophila ternifolia</a> Wongan Eremophila [2293]	Endangered	Species or species habitat known to occur within area
<a href="#">Eremophila viscida</a> Varnish Bush [2394]	Endangered	Species or species habitat may occur within area
<a href="#">Eucalyptus recta</a> Silver Mallet [56430]	Endangered	Species or species habitat likely to occur within area
<a href="#">Frankenia conferta</a> Silky Frankenia [6074]	Endangered	Species or species habitat may occur within area
<a href="#">Gastrolobium glaucum</a> Spike Poison, Wongan Poison [7428]	Endangered	Species or species habitat known to occur within area
<a href="#">Gastrolobium hamulosum</a> Hook-point Poison [9212]	Endangered	Species or species habitat known to occur within area
<a href="#">Grevillea dryandroides subsp. dryandroides</a> Phalanx Grevillea [64646]	Endangered	Species or species habitat may occur within area
<a href="#">Grevillea dryandroides subsp. hirsuta</a> Hairy Phalanx Grevillea [64577]	Endangered	Species or species habitat likely to occur within area
<a href="#">Grevillea pythara</a> Pythara Grevillea [64525]	Endangered	Species or species habitat may occur within area

Name	Status	Type of Presence
<a href="#">Lysiosepalum abollatum</a> Woolly Lysiosepalum [83216]	Critically Endangered	Species or species habitat known to occur within area
<a href="#">Melaleuca sciotostyla</a> Wongan Melaleuca [24324]	Endangered	Species or species habitat known to occur within area
<a href="#">Microcorys eremophiloides</a> Wongan Microcorys [3498]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Philothea wonganensis</a> Wongan Eriostemon [64945]	Endangered	Species or species habitat likely to occur within area
<a href="#">Rhagodia acicularis</a> Wongan Rhagodia [11145]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Roycea pycnophylloides</a> Saltmat [21161]	Endangered	Species or species habitat may occur within area
<a href="#">Stylidium coroniforme subsp. coroniforme</a> Wongan Hills Triggerplant, Wongan Triggerplant [85016]	Endangered	Species or species habitat known to occur within area
<a href="#">Symonanthus bancroftii</a> Bancrofts Symonanthus [12837]	Endangered	Species or species habitat may occur within area
<a href="#">Verticordia staminosa subsp. staminosa</a> Wongan Featherflower [55825]	Endangered	Species or species habitat likely to occur within area
<b>Reptiles</b>		
<a href="#">Egernia stokesii badia</a> Western Spiny-tailed Skink, Baudin Island Spiny-tailed Skink [64483]	Endangered	Species or species habitat may occur within area
<b>Listed Migratory Species</b>		<b>[ Resource Information ]</b>
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
<b>Migratory Marine Birds</b>		
<a href="#">Apus pacificus</a> Fork-tailed Swift [678]		Species or species habitat likely to occur within area
<b>Migratory Terrestrial Species</b>		
<a href="#">Motacilla cinerea</a> Grey Wagtail [642]		Species or species habitat may occur within area
<b>Migratory Wetlands Species</b>		
<a href="#">Actitis hypoleucos</a> Common Sandpiper [59309]		Species or species habitat may occur within area
<a href="#">Calidris acuminata</a> Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
<a href="#">Calidris ferruginea</a> Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
<a href="#">Calidris melanotos</a> Pectoral Sandpiper [858]		Species or species habitat may 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 -

### 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
<b>Birds</b>		
<a href="#">Actitis hypoleucos</a> Common Sandpiper [59309]		Species or species habitat may occur within area
<a href="#">Apus pacificus</a> Fork-tailed Swift [678]		Species or species habitat likely to occur within area
<a href="#">Ardea alba</a> Great Egret, White Egret [59541]		Species or species habitat likely to occur within area
<a href="#">Ardea ibis</a> Cattle Egret [59542]		Species or species habitat may occur within area
<a href="#">Calidris acuminata</a> Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
<a href="#">Calidris ferruginea</a> Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
<a href="#">Calidris melanotos</a> Pectoral Sandpiper [858]		Species or species habitat may occur within area
<a href="#">Chrysococcyx osculans</a> Black-eared Cuckoo [705]		Species or species habitat known to occur within area
<a href="#">Merops ornatus</a> Rainbow Bee-eater [670]		Species or species habitat may occur within area
<a href="#">Motacilla cinerea</a> Grey Wagtail [642]		Species or species habitat may occur within area
<a href="#">Rostratula benghalensis (sensu lato)</a> Painted Snipe [889]	Endangered*	Species or species habitat may occur within area
<a href="#">Thinornis rubricollis</a> Hooded Plover [59510]		Species or species habitat may occur within area

## Extra Information

### State and Territory Reserves [\[ Resource Information \]](#)

Name	State
Elphin	WA
Fowler Gully	WA
Rogers	WA
Unnamed WA16319	WA
Unnamed WA51093	WA
Unnamed WA52103	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 Resources Audit, 2001.

Name	Status	Type of Presence
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#### Birds

Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		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

#### Mammals

Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Capra hircus Goat [2]		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
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
Carrichtera annua Ward's Weed [9511]		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

Name	Status	Type of Presence
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

# 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

-30.855058 116.686592,-30.88379 116.714058,-30.88379 116.714058

# 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.



## **Appendix 3: Fauna Habitat Assessments**

### FAUNA HABITAT ASSESSMENT SHEET

(South West)

Location: Wongan Hills		Site Number: HA 1			
Project Number: WHB001		Aspect	N	NE	NW
Date: 2/11/19	Easting: 470025		S	SE	SW
Quadrat Size: 10 x 20	Northing: 6586373		E	W	N/A



<b>Soil Texture</b>	sand	sandy-loam	loam	cracking clay	clay
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#### VEGETATION

Vegetation	Hummock Grassland		Average Height (M)	Cover				
	Other:			Scattered Plants	Sparse	Moderate	Thick	
	Mixed Shrubland	Stratum						
Riverine Woodland	Overstorey	<i>Allocasuarina</i>	2	0 <5%	1 <20%	2 20-60%	3 60-100%	
Other Grassland	Midstorey	<i>Acacia, Hakea, Grevillea</i>	1.5	0 <5%	1 <20%	2 20-60%	3 60-100%	
Euc Woodland	Ground Cover	<i>Mixed grasses, herbs</i>	<0.5	0 <5%	1 <20%	2 20-60%	3 60-100%	

#### CONDITION

#### LAST FIRE

5 Pristine	4 Excellent	3 Very Good	2 Good	1 Degraded	0 Completely Degraded		0 <1 year	1 1-3 Yr	2 4-5 Yr	3 >5 Yr
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Notes

Notes

#### (general)

#### DISTURBANCE

#### (cattle)

	0 heavy	1 medium	2 mild	3 none		0 heavy	1 medium	2 mild	3 none	
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Notes

Notes

#### GROUND COVER

<b>Bare Ground</b>	0 <5%	1 <20%	2 20-60%	3 60-100%	<b>Hummock Grass</b>	0 <5%	1 <20%	2 20-60%	3 60-100%	
<b>Rock</b>	0 <5%	1 <20%	2 20-60%	3 60-100%	<b>Other Grass</b>	0 <5%	1 <20%	2 20-60%	3 60-100% *	
<b>Leaf Litter</b>	0 <5%	1 <20%	2 20-60%	3 60-100%	<b>Herbs</b>	0 <5%	1 <20%	2 20-60%	3 60-100%	
<b>Logs &gt;10cm</b>	0 <5%	1 <20%	2 20-60%	3 60-100%						

MICROHABITATS									
<b>Burrowing Suitability</b>	0 Rock	1 Stony	<b>2 Sandy Loam</b>	3 Sand	<b>Peeling Bark</b>	0 none	1 rare	2 moderate	3 common
<b>Pebbles Stones</b>	0 none	<b>1</b> 0-30%	2 30-70%	3 70-100%	<b>Large Hollows</b>	0 none	1 rare	2 moderate	3 common
<b>Exfoliating Slabs</b>	0 none	1 0-30%	2 30-70%	3 70-100%	<b>Small Hollows</b>	0 none	1 rare	2 moderate	3 common
<b>Rock Crevices</b>	0 none	1 0-30%	2 30-70%	3 70-100%	<b>Water Presence</b>	0 none	1 rare	2 moderate	3 common
<b>Boulders</b>	0 none	1 0-30%	2 30-70%	3 70-100%	<b>Distance to Water</b>	0 >5km	<b>1</b> 2-5km	2 500m - 2km	3 <500m
<b>Suitability for Bats</b>	YES		NO		<b>Termite Mounds</b>	0 none	<b>1</b> rare	2 moderate	3 common
<b>Caves</b>	<b>Absent</b>	Present			<b>Woody Debris</b>	0 none	1 rare	<b>2</b> moderate	3 common
BLACK COCKATOOS									
<b>Foraging Habitat</b>					<b>Breeding Habitat</b>				
<b>Species:</b>			<b>% cover</b>		<b>Species:</b>		<b>Hollows:</b>		
Grevillea			10		N/A		Small (<120mm)		
Hakea			10				0		
							Large (>120mm)		
							0		
FAUNA RECORDED									
<b>Birds</b>				<b>Mammals</b>			<b>Reptiles</b>		
Australian Raven							Skink burrows		
Brown Honeyeater									
Singing Honeyeater									
Red Wattlebird									
White-breasted Robin									



**FAUNA HABITAT ASSESSMENT SHEET**

(South West)

Location: Wongan Hills Site Number: HA 2

Project Number: WHB001 Aspect

Date: 2/11/19 Easting: 470102 N NE NW

Quadrat Size: 10 x 20 Northing: 6586273 S SE SW

E W N/A



Soil Texture	sand	sandy-loam	loam	cracking clay	clay
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**VEGETATION**

Vegetation	Other:		Average Height (M)	Cover				
	Hummock Grassland	Stratum		Scattered Plants	Sparse	Moderate	Thick	
Riverine Woodland	Overstorey	<i>E.pyriformis</i>	3	0 <5%	1 <20%	2 20-60%	3 60-100%	
Other Grassland	Midstorey	<i>Allocasuarina, Acacia</i>	1.5	0 <5%	1 <20%	2 20-60%	3 60-100%	
Euc Woodland	Ground Cover	<i>Mixed sedges, grasses, herbs</i>	<0.5	0 <5%	1 <20%	2 20-60%	3 60-100%	

**CONDITION**

**LAST FIRE**

5 Pristine	4 Excellent	3 Very Good	2 Good	1 Degraded	0 Completely Degraded	0 <1 year	1 1-3 Yr	2 5 Yr	4 3 >5 Yr
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Notes

Notes

(general)

**DISTURBANCE**

(cattle)

0 heavy	1 medium	2 mild	3 none	0 heavy	1 medium	2 mild	3 none
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Notes

Notes

**GROUND COVER**

Bare Ground	0 <5%	1 <20%	2 20-60%	3 60-100%	Hummock Grass	0 <5%	1 <20%	2 20-60%	3 60-100%
Rock	0 <5%	1 <20%	2 20-60%	3 60-100%	Other Grass	0 <5%	1 <20%	2 20-60%	3 60-100% *

Leaf Litter	0 <5%	1 <20%	2 20-60%	3 60-100%	Herbs	0 <5%	1 <20%	2 20-60%	3 60-100%	
Logs >10cm	0 <5%	1 <20%	2 20-60%	3 60-100%						

**MICROHABITATS**

Burrowing Suitability	0 Rock	1 Stony	2 Sandy Loam	3 Sand	Peeling Bark	0 none	1 rare	2 moderate	3 common
Pebbles Stones	0 none	1 0-30%	2 30-70%	3 70-100%	Large Hollows	0 none	1 rare	2 moderate	3 common
Exfoliating Slabs	0 none	1 0-30%	2 30-70%	3 70-100%	Small Hollows	0 none	1 rare	2 moderate	3 common
Rock Crevices	0 none	1 0-30%	2 30-70%	3 70-100%	Water Prescense	0 none	1 rare	2 moderate	3 common
Boulders	0 none	1 0-30%	2 30-70%	3 70-100%	Distance to Water	0 >5km	1 2-5km	2 500m - 2km	3 <500m
Suitability for Bats	YES		NO		Termite Mounds	0 none	1 rare	2 moderate	3 common
Caves	Absent	Present			Woody Debris	0 none	1 rare	2 moderate	3 common

**BLACK COCKATOOS**

Foraging Habitat		Breeding Habitat	
Species:	% cover	Species:	Hollows:
		N/A	Small (<120mm)
			0
			Large (>120mm)
			0

**FAUNA RECORDED**

Birds	Mammals	Reptiles
Singing Honeyeater		
Tawny-crowned Honeyeater		

**FAUNA HABITAT ASSESSMENT SHEET**

(South West)

Location: Wongan Hills Site Number: HA 3

Project Number: WHB001 Aspect

Date: 2/11/19 Easting: 470384

Quadrat Size: 10 x 20 Northing: 6585912

N	NE	NW
S	SE	SW
E	W	N/A



Soil Texture	sand	sandy-loam	loam	cracking clay	clay
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**VEGETATION**

Vegetation	Other:		Average Height (M)	Cover				
	Stratum			Scattered Plants	Sparse	Moderate	Thick	
	Hummock Grassland							
Acacia Shrubland								
Riverine Woodland	Overstorey	<i>E.leptopoda arctata</i>	3	0 <5%	1 <20%	2 20-60%	3 60-100%	
Other Grassland	Midstorey	<i>Melaleuca</i>	1.5	0 <5%	1 <20%	2 20-60%	3 60-100%	
Euc Woodland	Ground Cover	<i>Mixed grasses, hibbertia</i>	<0.5	0 <5%	1 <20%	2 20-60%	3 60-100%	

**CONDITION**

**LAST FIRE**

5 Pristine	4 Excellent	3 Very Good	2 Good	1 Degraded	0 Completely Degraded	0 <1 year	1 1-3 Yr	2 5 Yr	4 3 >5 Yr
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Notes

Notes

(general)

**DISTURBANCE**

(cattle)

0 heavy	1 medium	2 mild	3 none	0 heavy	1 medium	2 mild	3 none
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Notes

Notes

**GROUND COVER**

Bare Ground	0 <5%	1 <20%	2 20-60%	3 60-100%	Hummock Grass	0 <5%	1 <20%	2 20-60%	3 60-100%
Rock	0 <5%	1 <20%	2 20-60%	3 60-100%	Other Grass	0 <5%	1 <20%	2 20-60%	3 60-100% *

Leaf Litter	0 <5%	1 <20%	2 20-60%	3 60-100%	Herbs	0 <5%	1 <20%	2 20-60%	3 60-100%	
Logs >10cm	0 <5%	1 <20%	2 20-60%	3 60-100%						

#### MICROHABITATS

Burrowing Suitability	0 Rock	1 Stony	2 Sandy Loam	3 Sand	Peeling Bark	0 none	1 rare	2 moderate	3 common
Pebbles Stones	0 none	1 0-30%	2 30-70%	3 70-100%	Large Hollows	0 none	1 rare	2 moderate	3 common
Exfoliating Slabs	0 none	1 0-30%	2 30-70%	3 70-100%	Small Hollows	0 none	1 rare	2 moderate	3 common
Rock Crevices	0 none	1 0-30%	2 30-70%	3 70-100%	Water Prescence	0 none	1 rare	2 moderate	3 common
Boulders	0 none	1 0-30%	2 30-70%	3 70-100%	Distance to Water	0 >5km	1 2-5km	2 500m - 2km	3 <500m
Suitability for Bats	YES		NO		Termite Mounds	0 none	1 rare	2 moderate	3 common
Caves	Absent	Present			Woody Debris	0 none	1 rare	2 moderate	3 common

#### BLACK COCKATOOS

Foraging Habitat		Breeding Habitat	
Species:	% cover	Species:	Hollows:
		N/A	Small (<120mm)
			0
			Large (>120mm)
			0

#### FAUNA RECORDED

Birds	Mammals	Reptiles
Singing Honeyeater		
Brown Honeyeater		
Grey Shrike-thrush		
Variiegated Fairy-wren		

**FAUNA HABITAT ASSESSMENT SHEET**

(South West)

Location: Wongan Hills Site Number: HA 4

Project Number: WHB001 Aspect

Date: 2/11/19 Easting: 471230 N NE NW

Quadrat Size: 10 x 20 Northing: 6584835 S SE SW

E W N/A



<b>Soil Texture</b>	<b>sand</b>	sandy-loam	loam	cracking clay	clay
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**VEGETATION**

Vegetation	Hummock Grassland	Other:	Average Height (M)	Cover				
	Acacia Shrubland	Stratum		Scattered Plants	Sparse	Moderate	Thick	
Riverine Woodland	Overstorey	<i>E.leptopoda arctata</i>	3	0 <5%	1 <20%	2 20-60%	3 60-100%	
Other Grassland	Midstorey	<i>Melaleuca, Hakea, Grevillea</i>	1.5	0 <5%	1 <20%	2 20-60%	3 60-100%	
Euc Woodland	Ground Cover	<i>Mixed grasses, hibbertia</i>	<0.5	0 <5%	1 <20%	2 20-60%	3 60-100%	

**CONDITION**

**LAST FIRE**

5 Pristine	4 <b>Excellent</b>	3 Very Good	2 Good	1 Degraded	0 Completely Degraded	0 <1 year	1 1-3 Yr	2 5 Yr	4 3 >5 Yr
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Notes

Notes

(general)

**DISTURBANCE**

(cattle)

0 heavy	1 medium	2 mild	3 <b>none</b>	0 heavy	1 medium	2 mild	3 <b>none</b>
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Notes

Notes

**GROUND COVER**

Bare Ground	0 <5%	1 <20%	2 20-60%	3 60-100%	Hummock Grass	0 <5%	1 <20%	2 20-60%	3 60-100%
Rock	0 <5%	1 <20%	2 20-60%	3 60-100%	Other Grass	0 <5%	1 <20%	2 20-60%	3 60-100% *

Leaf Litter	0 <5%	1 <20%	2 20-60%	3 60-100%	Herbs	0 <5%	1 <20%	2 20-60%	3 60-100%	
Logs >10cm	0 <5%	1 <20%	2 20-60%	3 60-100%						

**MICROHABITATS**

Burrowing Suitability	0 Rock	1 Stony	2 Sandy Loam	3 Sand	Peeling Bark	0 none	1 rare	2 moderate	3 common
Pebbles Stones	0 none	1 0-30%	2 30-70%	3 70-100%	Large Hollows	0 none	1 rare	2 moderate	3 common
Exfoliating Slabs	0 none	1 0-30%	2 30-70%	3 70-100%	Small Hollows	0 none	1 rare	2 moderate	3 common
Rock Crevices	0 none	1 0-30%	2 30-70%	3 70-100%	Water Prescense	0 none	1 rare	2 moderate	3 common
Boulders	0 none	1 0-30%	2 30-70%	3 70-100%	Distance to Water	0 >5km	1 2-5km	2 500m - 2km	3 <500m
Suitability for Bats	YES		NO		Termite Mounds	0 none	1 rare	2 moderate	3 common
Caves	Absent	Present			Woody Debris	0 none	1 rare	2 moderate	3 common

**BLACK COCKATOOS**

Foraging Habitat			Breeding Habitat		
Species:	% cover		Species:	Hollows:	
			N/A	Small (<120mm)	
				0	
				Large (>120mm)	
				0	

**FAUNA RECORDED**

Birds	Mammals	Reptiles
Singing Honeyeater	Western Grey Kangaroo scats	
Brown Honeyeater		

**FAUNA HABITAT ASSESSMENT SHEET**

(South West)

Location: Wongan Hills Site Number: HA 5

Project Number: WHB001	<b>Aspect</b>	N	NE	NW
Date: 2/11/19		S	SE	SW
Quadrat Size: 10 x 20		E	W	N/A
Easting: 472094		Northing: 6583737		



<b>Soil Texture</b>	sand	sandy-loam	loam	cracking clay	clay
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**VEGETATION**

<b>Vegetation</b>	Hummock Grassland	Other: Shrubland	<b>Average Height (M)</b>	<b>Cover</b>				
	Acacia Shrubland	Stratum		Scattered Plants	Sparse	Moderate	Thick	
Riverine Woodland	Overstorey	<i>E.leptopoda arctata</i> , <i>Eucalyptus moderata</i>	2	0 <5%	1 <20%	2 20-60%	3 60-100%	
Other Grassland	Midstorey	<i>Melaleuca</i> , <i>Hakea</i> , <i>Grevillea</i>	1.5	0 <5%	1 <20%	2 20-60%	3 60-100%	
Euc Woodland	Ground Cover	Mixed herb, sedges	<0.5	0 <5%	1 <20%	2 20-60%	3 60-100%	

**CONDITION**

**LAST FIRE**

5 Pristine	4 Excellent	3 Very Good	2 Good	1 Degraded	0 Completely Degraded	0 <1 year	1 1-3 Yr	2 5 Yr	4 >5 Yr
<b>Notes</b>					<b>Notes</b>				

(general)

**DISTURBANCE**

(cattle)

	0 heavy	1 medium	2 mild	3 none		0 heavy	1 medium	2 mild	3 none
<b>Notes</b>					<b>Notes</b>				

**GROUND COVER**

<b>Bare Ground</b>	0 <5%	1 <20%	2 20-60%	3 60-100%	<b>Hummock Grass</b>	0 <5%	1 <20%	2 20-60%	3 60-100%
<b>Rock</b>	0 <5%	1 <20%	2 20-60%	3 60-100%	<b>Other Grass</b>	0 <5%	1 <20%	2 20-60%	3 60-100% *
<b>Leaf Litter</b>	0 <5%	1 <20%	2 20-60%	3 60-100%	<b>Herbs</b>	0 <5%	1 <20%	2 20-60%	3 60-100%

Logs >10cm	0 <5%	1 <20%	2 20-60%	3 60-100%					
MICROHABITATS									
Burrowing Suitability	0 Rock	1 Stony	2 Sandy Loam	3 Sand	Peeling Bark	0 none	1 rare	2 moderate	3 common
Pebbles Stones	0 none	1 0-30%	2 30-70%	3 70-100%	Large Hollows	0 none	1 rare	2 moderate	3 common
Exfoliating Slabs	0 none	1 0-30%	2 30-70%	3 70-100%	Small Hollows	0 none	1 rare	2 moderate	3 common
Rock Crevices	0 none	1 0-30%	2 30-70%	3 70-100%	Water Prescense	0 none	1 rare	2 moderate	3 common
Boulders	0 none	1 0-30%	2 30-70%	3 70-100%	Distance to Water	0 >5km	1 2-5km	2 500m - 2km	3 <500m
Suitability for Bats	YES		NO		Termite Mounds	0 none	1 rare	2 moderate	3 common
Caves	Absent	Present			Woody Debris	0 none	1 rare	2 moderate	3 common
BLACK COCKATOOS									
Foraging Habitat					Breeding Habitat				
Species:			% cover		Species:		Hollows:		
					N/A		Small (<120mm)		
							0		
							Large (>120mm)		
							0		
FAUNA RECORDED									
Birds			Mammals				Reptiles		
Singing Honeyeater			Western Grey Kangaroo scats						
Grey Shrike-thrush									
Australian Raven									
Red Wattlebird									



**FAUNA HABITAT ASSESSMENT SHEET**

(South West)

Location: Wongan Hills Site Number: HA 6

Project Number: WHB001 Aspect

Date: 2/11/19 Easting: 472420 N NE NW

Quadrat Size: 10 x 20 Northing: 6583414 S SE SW

E W N/A



Soil Texture	sand	sandy-loam	loam	cracking clay	clay
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**VEGETATION**

Vegetation	Other: Shrubland		Average Height (M)	Cover				
	Hummock Grassland	Stratum		Scattered Plants	Sparse	Moderate	Thick	
Riverine Woodland	Overstorey	<i>E. loxophleba</i> , <i>E. salmonophloia</i>	10	0 <5%	1 <20%	2 20-60%	3 60-100%	
Other Grassland	Midstorey	<i>Acacia</i> , <i>Melaleuca</i>	1.5	0 <5%	1 <20%	2 20-60%	3 60-100%	
Euc Woodland	Ground Cover	Mixed shrubs, sedges, weeds	<0.5	0 <5%	1 <20%	2 20-60%	3 60-100%	

**CONDITION**

**LAST FIRE**

5 Pristine	4 Excellent	3 Very Good	2 Good	1 Degraded	0 Completely Degraded	0 <1 year	1 1-3 Yr	2 5 Yr	4 3	3 >5 Yr
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Notes

Notes

(general)

**DISTURBANCE**

(cattle)

0 heavy	1 medium	2 mild	3 none	0 heavy	1 medium	2 mild	3 none
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Notes

Notes

GROUND COVER										
Bare Ground	0 <5%	1 <20%	2 20-60%	3 60-100%	Hummock Grass	0 <5%	1 <20%	2 20-60%	3 60-100%	
Rock	0 <5%	1 <20%	2 20-60%	3 60-100%	Other Grass	0 <5%	1 <20%	2 20-60%	3 60-100% *	
Leaf Litter	0 <5%	1 <20%	2 20-60%	3 60-100%	Herbs	0 <5%	1 <20%	2 20-60%	3 60-100%	
Logs >10cm	0 <5%	1 <20%	2 20-60%	3 60-100%						
MICROHABITATS										
Burrowing Suitability	0 Rock	1 Stony	2 Sandy Loam	3 Sand	Peeling Bark	0 none	1 rare	2 moderate	3 common	
Pebbles Stones	0 none	1 0-30%	2 30-70%	3 70-100%	Large Hollows	0 none	1 rare	2 moderate	3 common	
Exfoliating Slabs	0 none	1 0-30%	2 30-70%	3 70-100%	Small Hollows	0 none	1 rare	2 moderate	3 common	
Rock Crevices	0 none	1 0-30%	2 30-70%	3 70-100%	Water Presence	0 none	1 rare	2 moderate	3 common	
Boulders	0 none	1 0-30%	2 30-70%	3 70-100%	Distance to Water	0 >5km	1 2-5km	2 500m - 2km	3 <500m	
Suitability for Bats	YES		NO		Termite Mounds	0 none	1 rare	2 moderate	3 common	
Caves	Absent	Present			Woody Debris	0 none	1 rare	2 moderate	3 common	
BLACK COCKATOOS										
Foraging Habitat					Breeding Habitat					
Species:				% cover		Species:			Hollows:	
Salmon Gum				<1		N/A			Small (<120mm)	
									0	
									Large (>120mm)	
									0	
FAUNA RECORDED										
Birds				Mammals				Reptiles		
Chestnut-rumped Thornbill										
Western Rosella										
Australian Raven										
Galah										

**FAUNA HABITAT ASSESSMENT SHEET**

(South West)

Location: Wongan Hills Site Number: HA 7

Project Number: WHB001		<b>Aspect</b>	N	NE	NW
Date: 2/11/19	Easting: 472588		S	SE	SW
Quadrat Size: 10 x 20	Northing: 6583276		E	W	N/A



<b>Soil Texture</b>	sand	sandy-loam	loam	cracking clay	clay
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**VEGETATION**

Vegetation	Hummock Grassland		Average Height (M)	Cover				
	Other: Shrubland			Scattered Plants	Sparse	Moderate	Thick	
	Acacia Shrubland							
	Stratum							
	Riverine Woodland	Overstorey	<i>E. loxophleba</i>	10	0 <5%	1 <20%	2 20-60%	3 60-100%
	Other Grassland	Midstorey	<i>Melaleuca</i>	2	0 <5%	1 <20%	2 20-60%	3 60-100%
	Euc Woodland	Ground Cover	<i>Weeds, grasses, sedges</i>	<0.5	0 <5%	1 <20%	2 20-60%	3 60-100%

**CONDITION**

**LAST FIRE**

5 Pristine	4 Excellent	3 Very Good	2 <b>Good</b>	1 Degraded	0 Completely Degraded		0 <1 year	1 1-3 Yr	2 5 Yr	4 3 >5 Yr
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Notes

Notes

(general)

**DISTURBANCE**

(cattle)

	0 heavy	1 medium	2 mild	3 none		0 heavy	1 medium	2 mild	3 none	
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Notes

Notes

Weeds

**GROUND COVER**

<b>Bare Ground</b>	0 <5%	1 <20%	2 20-60%	3 60-100%	<b>Hummock Grass</b>	0 <5%	1 <20%	2 20-60%	3 60-100%	
<b>Rock</b>	0 <5%	1 <20%	2 20-60%	3 60-100%	<b>Other Grass</b>	0 <5%	1 <20%	2 20-60%	3 60-100% *	
<b>Leaf Litter</b>	0 <5%	1 <20%	2 20-60%	3 60-100%	<b>Herbs</b>	0 <5%	1 <20%	2 20-60%	3 60-100%	

Logs >10cm	0 <5%	1 <20%	2 20-60%	3 60-100%						
MICROHABITATS										
Burrowing Suitability	0 Rock	1 Stony	2 Sandy Loam	3 Sand	Peeling Bark	0 none	1 rare	2 moderate	3 common	
Pebbles Stones	0 none	1 0-30%	2 30-70%	3 70-100%	Large Hollows	0 none	1 rare	2 moderate	3 common	
Exfoliating Slabs	0 none	1 0-30%	2 30-70%	3 70-100%	Small Hollows	0 none	1 rare	2 moderate	3 common	
Rock Crevices	0 none	1 0-30%	2 30-70%	3 70-100%	Water Prescense	0 none	1 rare	2 moderate	3 common	
Boulders	0 none	1 0-30%	2 30-70%	3 70-100%	Distance to Water	0 >5km	1 2-5km	2 500m - 2km	3 <500m	
Suitability for Bats	YES		NO		Termite Mounds	0 none	1 rare	2 moderate	3 common	
Caves	Absent	Present			Woody Debris	0 none	1 rare	2 moderate	3 common	
BLACK COCKATOOS										
Foraging Habitat					Breeding Habitat					
Species:			% cover		Species:			Hollows:		
					N/A			Small (<120mm)		
								0		
								Large (>120mm)		
								0		
FAUNA RECORDED										
Birds			Mammals				Reptiles			
Chestnut-rumped Thornbill			Western Grey Kangaroo scats							
Western Rosella										
Australian Raven										

**FAUNA HABITAT ASSESSMENT SHEET**

(South West)

Location: Wongan Hills Site Number: HA 8

Project Number: WHB001		<b>Aspect</b>	N	NE	NW
Date: 2/11/19	Easting: 471602		S	SE	SW
Quadrat Size: 10 x 20	Northing: 6584356		E	W	N/A



<b>Soil Texture</b>	<b>sand</b>	sandy-loam	loam	cracking clay	clay
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**VEGETATION**

Vegetation	Hummock Grassland	Other:	Average Height (M)	Cover				
	Acacia Shrubland	Stratum		Scattered Plants	Sparse	Moderate	Thick	
Riverine Woodland	Overstorey	<i>E.leptopoda arctata</i>	3	0 <5%	1 <20%	2 20-60%	3 60-100%	
Other Grassland	Midstorey	<i>Melaleuca, Hakea, Grevillea</i>	1.5	0 <5%	1 <20%	2 20-60%	3 60-100%	
Euc Woodland	Ground Cover	<i>Mixed grasses, hibbertia</i>	<0.5	0 <5%	1 <20%	2 20-60%	3 60-100%	

**CONDITION**

**LAST FIRE**

5 Pristine	4 <b>Excellent</b>	3 Very Good	2 Good	1 Degraded	0 Completely Degraded	0 <1 year	1 1-3 Yr	2 5 Yr	4 3 >5 Yr
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Notes

Notes

(general)

**DISTURBANCE**

(cattle)

0 heavy	1 medium	2 mild	3 <b>none</b>	0 heavy	1 medium	2 mild	3 <b>none</b>
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Notes

Notes

**GROUND COVER**

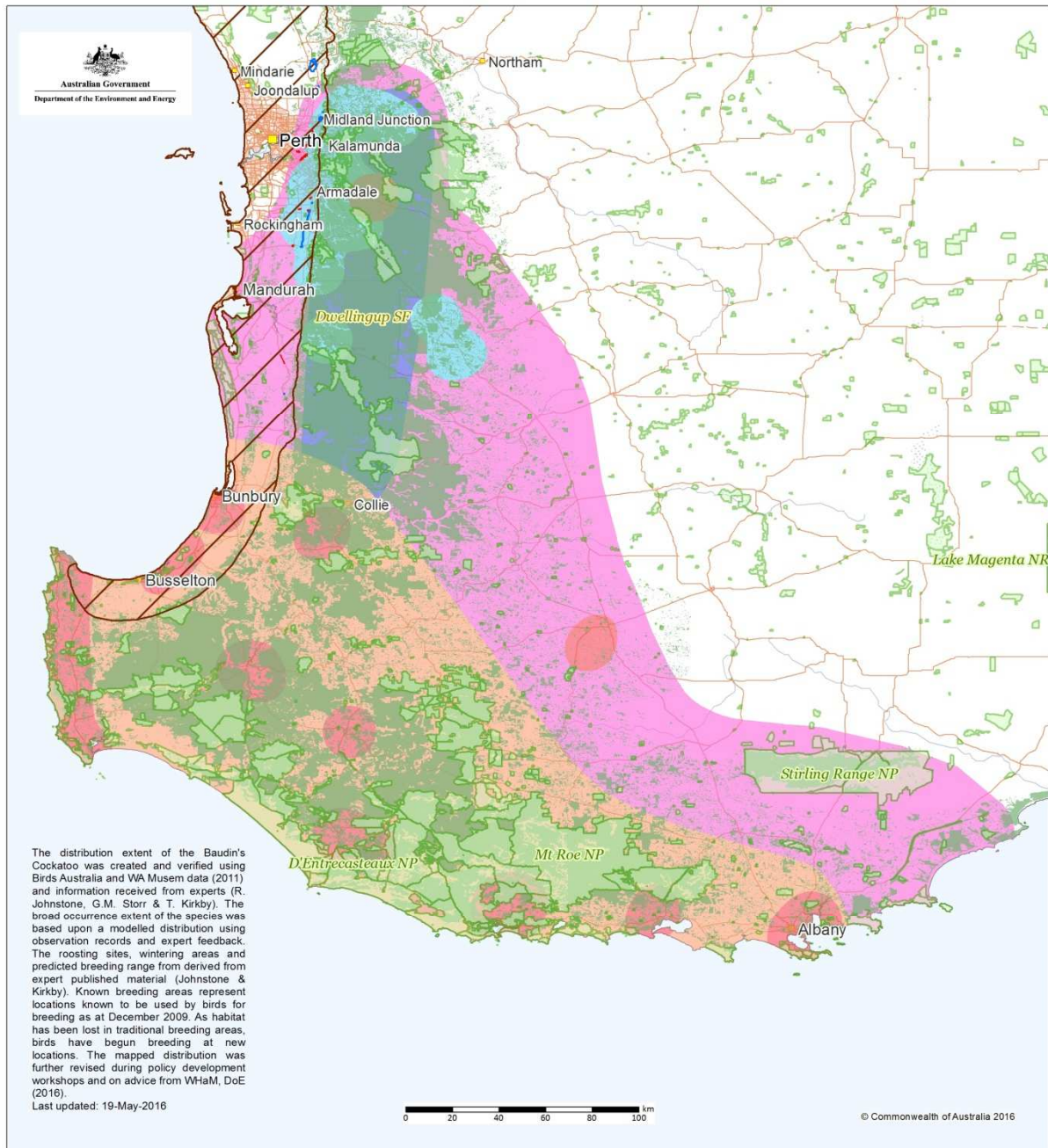
<b>Bare Ground</b>	0 <5%	1 <20%	2 20-60%	3 60-100%	<b>Hummock Grass</b>	0 <5%	1 <20%	2 20-60%	3 60-100%
<b>Rock</b>	0 <5%	1 <20%	2 20-60%	3 60-100%	<b>Other Grass</b>	0 <5%	1 <20%	2 20-60%	3 60-100% *
<b>Leaf Litter</b>	0 <5%	1 <20%	2 20-60%	3 60-100%	<b>Herbs</b>	0 <5%	1 <20%	2 20-60%	3 60-100%

Logs >10cm	0 <5%	1 <20%	2 20-60%	3 60-100%					
MICROHABITATS									
Burrowing Suitability	0 Rock	1 Stony	2 Sandy Loam	3 Sand	Peeling Bark	0 none	1 rare	2 moderate	3 common
Pebbles Stones	0 none	1 0-30%	2 30-70%	3 70-100%	Large Hollows	0 none	1 rare	2 moderate	3 common
Exfoliating Slabs	0 none	1 0-30%	2 30-70%	3 70-100%	Small Hollows	0 none	1 rare	2 moderate	3 common
Rock Crevices	0 none	1 0-30%	2 30-70%	3 70-100%	Water Prescence	0 none	1 rare	2 moderate	3 common
Boulders	0 none	1 0-30%	2 30-70%	3 70-100%	Distance to Water	0 >5km	1 2-5km	2 500m - 2km	3 <500m
Suitability for Bats	YES		NO		Termite Mounds	0 none	1 rare	2 moderate	3 common
Caves	Absent	Present			Woody Debris	0 none	1 rare	2 moderate	3 common
BLACK COCKATOOS									
Foraging Habitat					Breeding Habitat				
Species:			% cover		Species:		Hollows:		
					N/A		Small (<120mm)		
							0		
							Large (>120mm)		
							0		
FAUNA RECORDED									
Birds			Mammals				Reptiles		
Singing Honeyeater			Western Grey Kangaroo scats						
Grey Shrike-thrush									

## **Appendix 4: DoEE Black Cockatoo Distribution Maps**

## Appendix 3 – Distribution maps for the three black cockatoos

Map 2: Modelled distribution for Baudin's Cockatoo (*Calyptorhynchus baudinii*)



INDICATIVE MAP ONLY: For the latest departmental information, please refer to the Protected Matters Search Tool and the Species Profiles & Threats Database at

Produced by:  
Environmental Resources Information Network 2016

Contextual data source:  
National Vegetation Information System (NVIS 4.2) 2016  
Interim Biogeographic Regionalisation for Australia (IBRA) version 7 2012  
Collaborative Australian Protected Area Database (CAPAD) 2014  
Geoscience Australia GEODATA TOPO 250K Topographic Data Series 3 2006

Projection: Geographic  
Datum: GDA94

### Ecological Communities

- Corymbia calophylla - Xanthorrhoea preissii woodlands and shrublands of the Swan Coastal Plain
- Corymbia calophylla - Kingia australis woodlands on heavy soils of the Swan Coastal Plain
- Banksia Woodlands of the Swan Coastal Plain
- Conservation Areas
- Jarrah, Karri and Mann (NVIS 4.2)

### Species

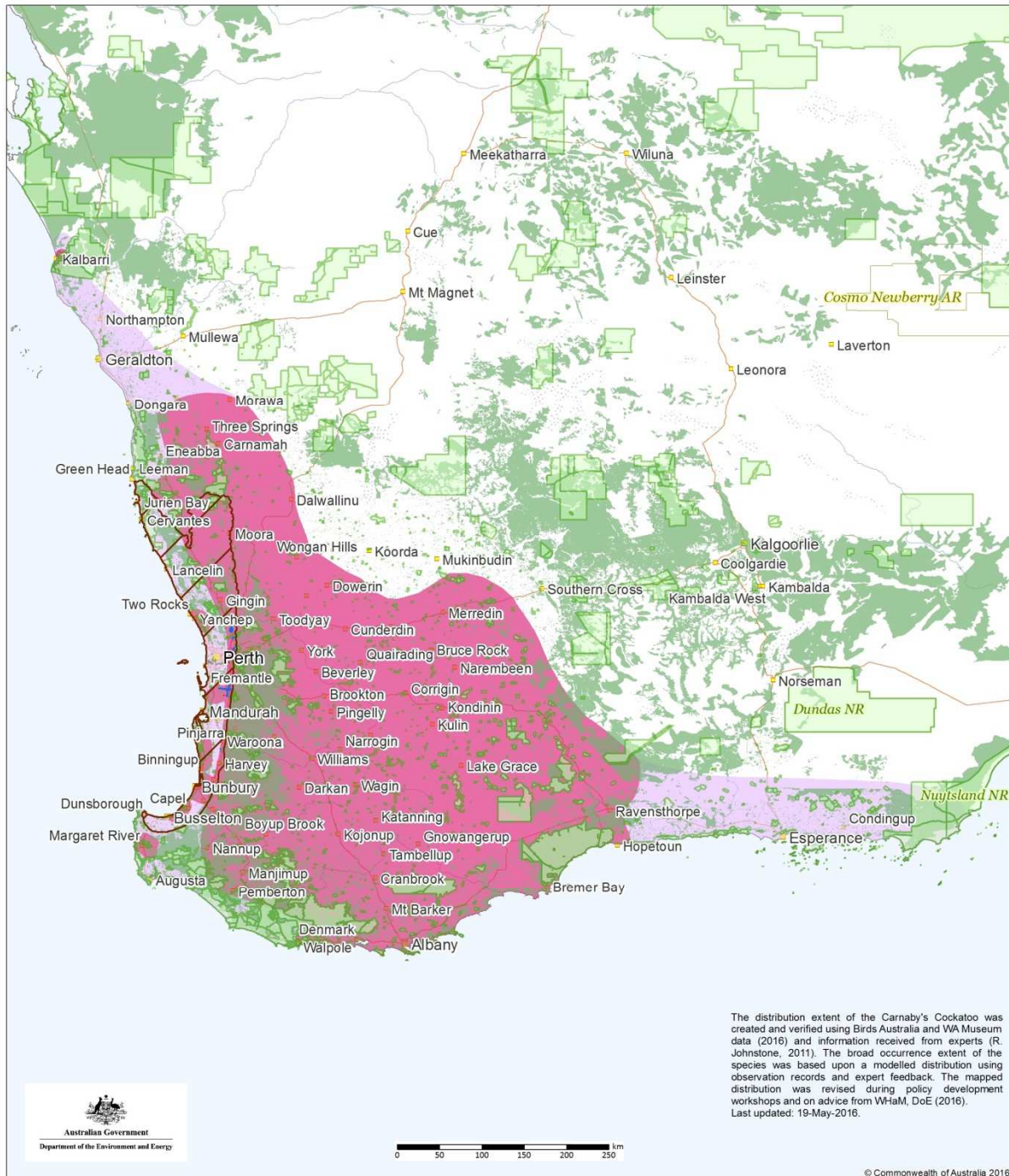
- Known Breeding Areas
- Predicted Breeding Range
- Known Foraging Areas
- Main Wintering Area
- Species Likely to Occur

### Cities & Towns

- Cities & Towns
- Roads (sealed)
- Roads (unsealed)
- State Border
- Major Rivers
- Lakes/Reservoirs
- Non-perennial Lakes



Map 3: Modelled distribution for Carnaby's Cockatoo (*Calyptorhynchus latirostris*)



INDICATIVE MAP ONLY: For the latest departmental information, please refer to the Protected Matters Search Tool and the Species Profiles & Threats Database at <http://www.environment.gov.au/biodiversity/threatened/index.html>

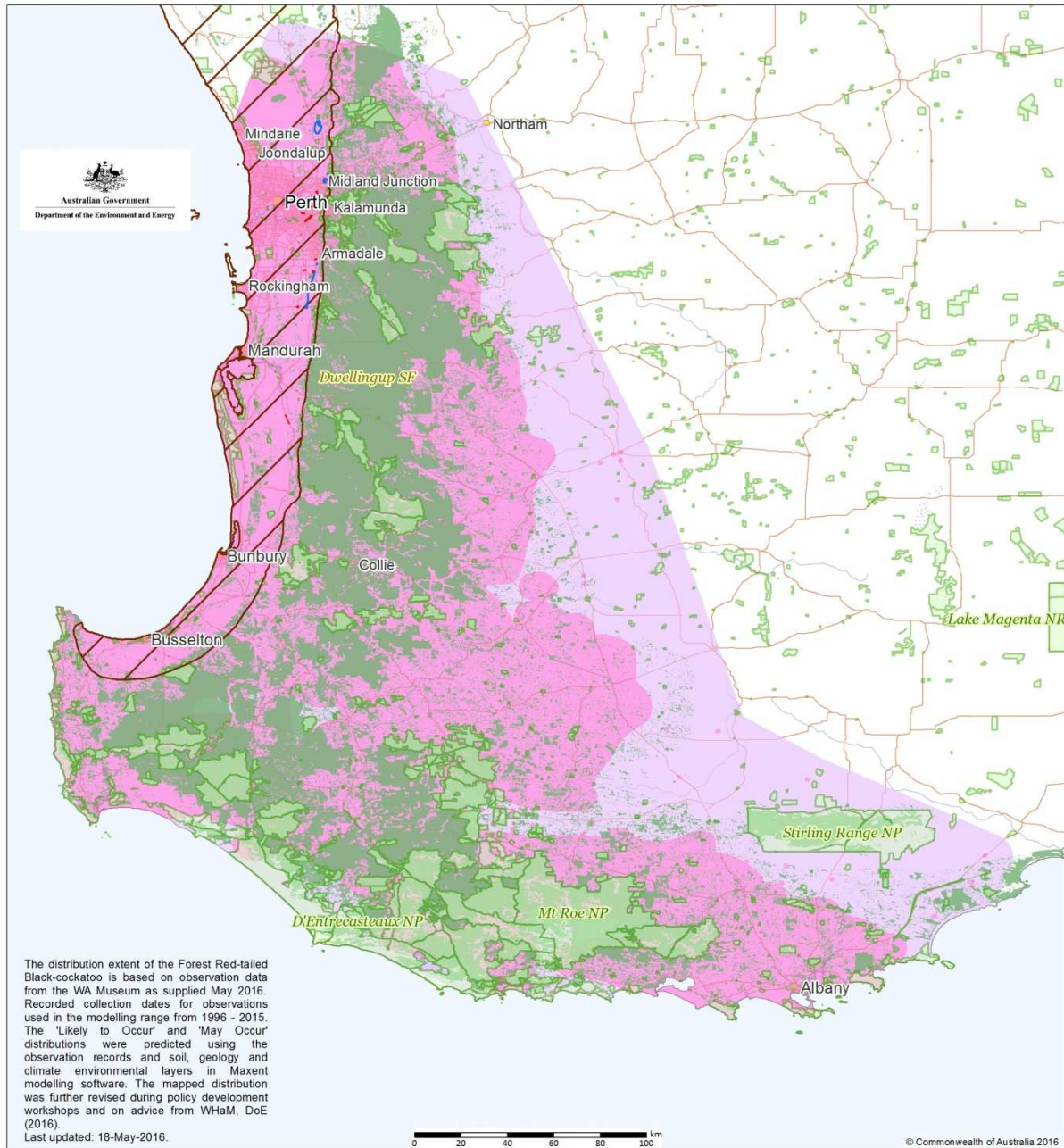
Produced by:  
Environmental Resources Information Network 2016

Contextual data source:  
National Vegetation Information System (NVIS 4.2) 2016  
Interim Biogeographic Regionalisation for Australia (IBRA) version 7 2012  
Collaborative Australian Protected Area Database (CAPAD) 2014  
Geoscience Australia GEODATA TOPO 250K Topographic Data Series 3 2006

Projection: Geographic  
Datum: GDA94

- Conservation Areas
  - Jerrah, Kam, Marn, Salmon Gum, Wandoo, Banksia, Grevillea, Dryandra and Hakea (NVIS 4.2)
- Species
  - Breeding Range
  - Non-breeding Range
- Ecological Communities
  - Corymbia calophylla - Xanthorrhoea preissii woodlands and shrublands of the Swan Coastal Plain
  - Corymbia calophylla - Kingia australis woodlands on heavy soils of the Swan Coastal Plain
  - Banksia Woodlands of the Swan Coastal Plain
- Cities & Towns
- Roads (sealed)
- Roads (unsealed)
- State Border
- Major Rivers
- Lakes/Reservoirs
- Non-perennial Lakes

Map 4: Modelled distribution for Forest Red-tailed Black-Cockatoo (*Calyptorhynchus banksii naso*)



INDICATIVE MAP ONLY: For the latest departmental information, please refer to the Protected Matters Search Tool and the Species Profiles & Threats Database at <http://www.environment.gov.au/biodiversity/threatened/index.html>

Produced by:  
Environmental Resources Information Network 2016

Contextual data source:  
National Vegetation Information System (NVIS 4.2) 2016  
Interim Biogeographic Regionalisation for Australia (IBRA) version 7 2012  
Collaborative Australian Protected Area Database (CAPAD) 2014  
Geoscience Australia GEODATA TOPO 250K Topographic Data Series 3 2006

Projection: Geographic  
Datum: GDA94

Conservation Areas  
Jarrah, Karri and Marri (NVIS 4.2)

Species  
Likely to Occur  
May Occur

Ecological Communities

Corymbia calophylla - Xanthorrhoea preissii woodlands and shrublands of the Swan Coastal Plain  
Corymbia calophylla - Kingia australis woodlands on heavy soils of the Swan Coastal Plain  
Banksia Woodlands of the Swan Coastal Plain

Cities & Towns  
Roads (sealed)  
Roads (unsealed)  
State Border  
Major Rivers  
Lakes/Reservoirs  
Non-perennial Lakes



## ***Addendum 1: Conservation Significant Arachnid Review for Wongan Hills***

13<sup>th</sup> January 2020  
Dr Tim Moulds  
Director Invertebrate Solutions Pty Ltd  
PO Box 14  
Victoria Park, WA 6979  
Reference: 2019ISJ15-F01-20200113

### **Conservation Significant Arachnid Review for Wongan Hills.**

Attention      Laura Stevens  
Principal Zoologist  
Western Ecological Pty Ltd

Dear Laura

In response to your request on 20<sup>th</sup> December 2019 to provide a desktop assessment of conservation significant arachnids in the Wongan Hills region of the Western Australian Wheatbelt Invertebrate Solutions makes the following response in the form of a technical memorandum.

## **Introduction**

The shire of Wongan- Ballidu is proposing to widen a 4 km section of Waddington-Wongan Hills Road west from the intersection with Northam – Pithara Road. The widening works include clearing of 1 -2 m of vegetation on the north eastern verge and vegetation trimming by hand on the south western verge. The shire was notified by the Department of Water and Environment Regulation that there were conservation significant mygalomorph spiders potentially present in the local area including the Federally protected species The Shield-backed trapdoor spider (*Idiosoma nigrum*) and The tree stem trapdoor spider (*Idiosoma castellum*) that is Priority 4 (DWER 2019).

## Likelihood of Conservation Significant Arachnid Occurrence

The likelihood of Conservation Significant arachnid species occurring in the Project area was assessed using a combination of regional and local botanical and landform information and database searches including:

- Analysis of published and unpublished reports concerning SRE and conservation significant invertebrates from the region.
- Botanical and vegetation mapping and other information available for the Study Area.
- Results of a Protected Matters Search from the Federal Government’s Department of the Environment and Energy (DEE) website.
- Records of fauna held by the Western Australian Museum.

Based on the analysis of all available information the Study Area was assigned a level of likelihood to support SRE invertebrates of either ‘Very Low’, ‘Low’, ‘Moderate’, ‘High’, or ‘Definite’ (Table 1).

**Table 1 Conservation Significant Arachnid species likelihood of occurrence definitions**

SRE Species Likelihood of occurrence	Definition
<b>Definite</b>	The species is confirmed to occur within the Project area
<b>High</b>	Habitat for the species is known to occur within the Project area and known records of the species are within 20 km
<b>Moderate</b>	Habitat for the species is known to occur within the Project area and known records of the species are within 50 km
<b>Low</b>	The species has been recorded from within 50 km, however, no habitat is present for the species within the Project area
<b>Very low</b>	No habitat exists for the species within the Project area and no records of the species are within 50 km or the distribution of the species is known well enough to exclude its presence within the Project area.

470000

475000

6685000

6685000

6680000

6680000

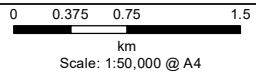
470000

475000



### Legend

- Project Boundary
- Idiopidae: *Idiosoma nigrum* Location
- Wongan Hills - Waddington Rd
- Road
- Railway
- Watercourse



- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS

### LOCALITY MAP



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PROJECT ID		DATE	
North Kiaka Quartzite Mine		13/01/2020	
HORIZONTAL DATUM AND PROJECTION			
GDA 1994 MGA Zone 50			
CREATED	CHECKED	APPROVED	REVISION
ENVIRONMAPS	TM	TM	0

**Conservation Significant Arachnid Assessment for the Waddington- Wongan Hills Road, Shire of Wongan-Ballidu**

**Figure 1**  
 The Project Area in the Local Wongan Hills Region Including Local Distribution Records of Conservation Significant Arachnids

- LOCALITY MAP SOURCED FROM LANDGATE 2006 - WORLD IMAGERY OPEN SOURCE

## Conservation Significant Arachnids

A list of conservation significant spiders for the Project Area was compiled from the DBCA Specially Protected Fauna Notice 2019 (DBCA 2019) and the DoEE’s Protected Matters Search Tool (PMST). SRE species that are listed under the BC Act and/or the EPBC Act and are likely to occur or have known habitat within the Desktop Study Area are shown in Table 2 along with their conservation code. The PMST results listed the mygalomorph trapdoor spider *Idiosoma nigrum* as having potential habitat within the area based upon bioclimatic modelling. A full description of the BC and DBCA conservation codes are shown in Appendix 1. The full list of species obtained from the PMST search is shown in the vertebrate fauna report (Western Ecological 2020).

**Table 2 Conservation significant spiders potentially within the Project Area.**

Higher Classification	Genus and Species	DBCA/ BC Status	EPBC status
Arachnida: Mygalomorphae: Idiopidae	<i>Idiosoma castellum</i> (formerly <i>Aganippe castellum</i> )	P4	-
	<i>Idiosoma nigrum</i>	Endangered	Vulnerable

### Mygalomorphae: Idiopidae

#### *Idiosoma castellum* – Priority 4

The tree stem trapdoor spider *Idiosoma castellum* was originally described as *Aganippe castellum* (Main 1986), however, following extensive genetic and morphological revision of the Idiopidae the genus has recently been synonymised and placed within the genus *Idiosoma* (Rix et al. 2017) as the sister clade to the remainder of the genus. *Idiosoma castellum* builds distinctive palisade of twigs beside tree trunks and is commonly known as the ‘Tree-stem trapdoor spider’ and is found only in the Western Australian Wheatbelt where it was first described from the town of Minnivale.

Whilst the WAM holds no records of *Idiosoma castellum* from within the Project area, Wongan Hills or nearby nature reserves DBCA has records of this specie’s within 200 m of the Project area (DWER 2019). This species is therefore considered a High Likelihood of occurrence within the Project area. It should be noted, however, that the Project area is a narrow strip of somewhat degraded vegetation, and as this species is not highly mobile and tends to occur within metres of other female *I. castellum* burrows it is considered unlikely to actually occur within the Project area. The Project is not anticipated to have any significant impact, either directly or indirectly on the population of *Idiosoma castellum* especially when considering the very small extent of the proposed clearing (<1 Ha) and the degraded nature of the vegetation that is present in the vicinity of the Project area.

#### *Idiosoma nigrum* – Endangered (DBCA) / Vulnerable (EPBC Act)

*Idiosoma nigrum* commonly known as the ‘Shield-backed trapdoor spider’ is the only spider in Australia currently provided protection at a Federal level under the EPBC Act which considers the species as Vulnerable. The species was once considered wide ranging throughout much of the Western Australian Wheatbelt and into the arid zone prior to a revision by Rix et al. (2018) that split *I. nigrum* into 15 species and restricts true *I. nigrum* to a small portion of the northern Wheatbelt including Wongan Hills from where it was first described (Main

1952). The species is now known to occur roughly within a polygon bounded by Bolgart, New Norcia, Walebing, and Bindi Bindi along its western margin, east to Koorda along its northern margin, south to Durokoppin and Kellerberrin along its eastern margin, and from Kellerberrin to Bolgart along its southern margin (Rix et al. 2018, Plate 1).

The species occurs in remnant bushland patches near Wongan Hills including within vegetation contiguous with the Project area, with the nearest published record of the species (Rix et al 2018) being some 250 m to the north east of the Project area (Figure 1). There are additional records of *I. nigrum* held by DBCA that are known to occur within 160 m of the Project area (DWER 2019), which would give the species a High Likelihood of occurrence within the Project area (Table 1). The Project area is, however, a narrow strip of somewhat degraded vegetation and it is considered unlikely to contain extant specimens of *I. nigrum*, due to their poor dispersal and occurrence in clustered maternal family groups in the landscape (Rix et al 2018). The Project is not anticipated to have any significant impact, either directly or indirectly on the population of *I. nigrum* that is present to the north of the Project area especially when considering the very small extent of the proposed clearing (<1 Ha) and the degraded nature of the vegetation.

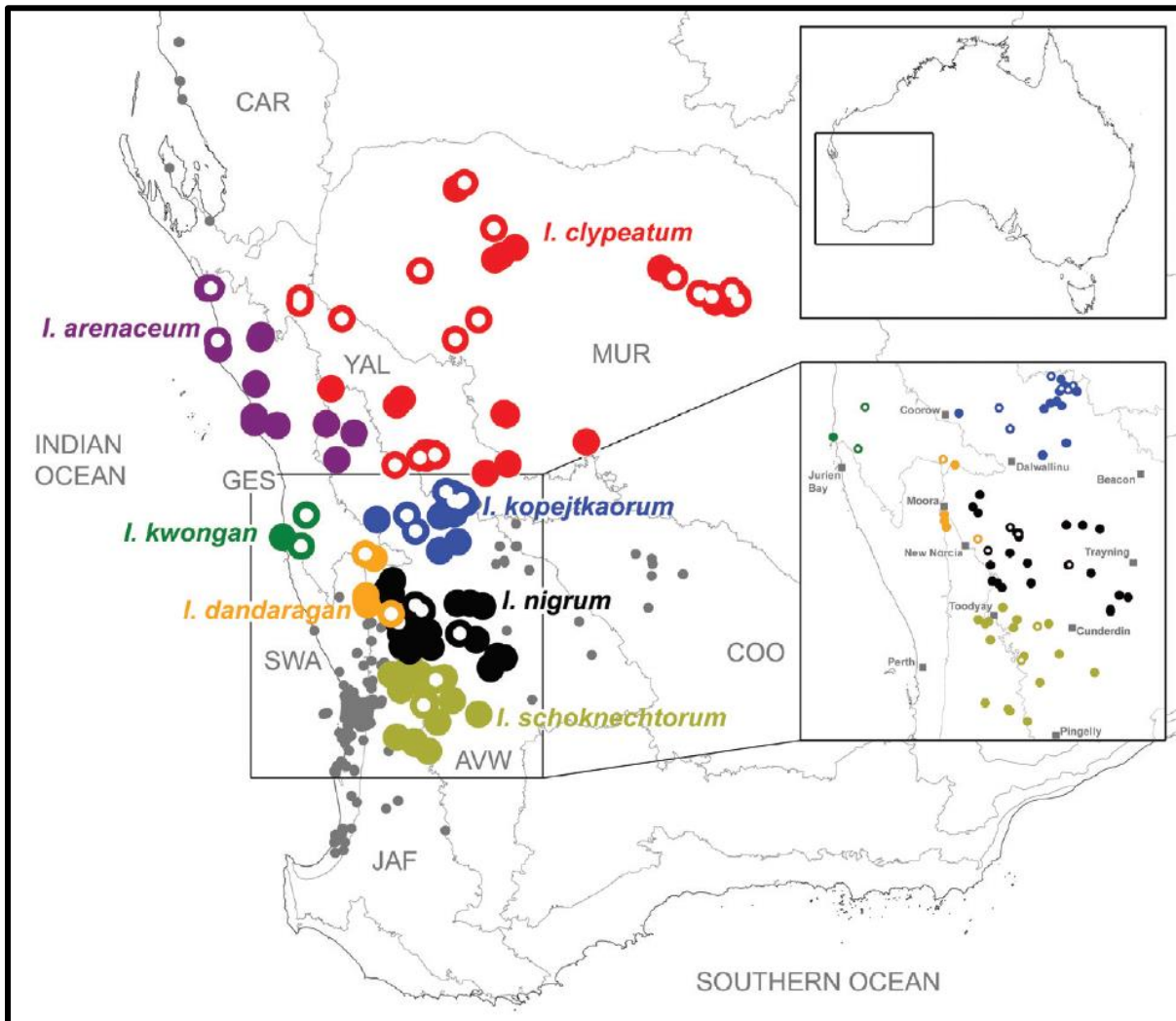


Plate 1 Regional distribution of *Idiosoma nigrum* in the northern Wheatbelt (After Rix et al. 2018 Figure 374).



## Conclusions and Recommendations

Two conservation significant spiders, *Idiosoma castellum* (formerly *Aganippe castellum*) and *Idiosoma nigrum* were assessed for their potential to occur within the Project area. These species are both found to have a High likelihood of occurrence within the Project area due to unpublished records of these species held by DBCA that occur within 160 m (*I. nigrum*) and 200 m (*I. castellum*). Additional published records of *Idiosoma nigrum* are known to occur within the Nature Reserve immediately to the north of the Project area. Despite the close proximity of both these conservation listed spiders, no significant impacts, either direct or indirect, are anticipated when the extremely small size of the proposed clearing (<1 Ha) and the generally degraded nature of the roadside vegetation to be cleared is taken into account.

Sincerely



Dr Tim Moulds

Director and Principal Ecologist

***Invertebrate Solutions Pty Ltd***

0429792834

[tim@invertebratesolutions.com](mailto:tim@invertebratesolutions.com)

## Limitations and Exclusions

This study was limited to the extent of information made available to Invertebrate Solutions at the time of undertaking the work. Information not made available to this study, or which subsequently becomes available may alter the conclusions made herein.

The opinions, conclusions and any recommendations in this report are based on information available, including published species distribution records and reviewed at the date of preparation of the report. Invertebrate Solutions has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared. The opinions, conclusions and any recommendations in this report are based on assumptions made by Invertebrate Solutions described in this report (this section and throughout this report). Invertebrate Solutions disclaims liability arising from any of the assumptions being incorrect.

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# Appendix 1

## DBCA Conservation Codes



# CONSERVATION CODES

## For Western Australian Flora and Fauna

Specially protected fauna or flora are species\* which have been adequately searched for and are deemed to be, in the wild, either rare, at risk of extinction, or otherwise in need of special protection, and have been gazetted as such.

Categories of specially protected fauna and flora are:

### **T Threatened species**

Published as Specially Protected under the *Wildlife Conservation Act 1950*, and listed under Schedules 1 to 4 of the Wildlife Conservation (Specially Protected Fauna) Notice for Threatened Fauna and Wildlife Conservation (Rare Flora) Notice for Threatened Flora (which may also be referred to as Declared Rare Flora).

**Threatened fauna** is that subset of 'Specially Protected Fauna' declared to be 'likely to become extinct' pursuant to section 14(4) of the Wildlife Conservation Act.

**Threatened flora** is flora that has been declared to be 'likely to become extinct or is rare, or otherwise in need of special protection', pursuant to section 23F(2) of the Wildlife Conservation Act.

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.

### **CR Critically endangered species**

Threatened species considered to be facing an extremely high risk of extinction in the wild. Published as Specially Protected under the *Wildlife Conservation Act 1950*, in Schedule 1 of the Wildlife Conservation (Specially Protected Fauna) Notice for Threatened Fauna and Wildlife Conservation (Rare Flora) Notice for Threatened Flora.

### **EN Endangered species**

Threatened species considered to be facing a very high risk of extinction in the wild. Published as Specially Protected under the *Wildlife Conservation Act 1950*, in Schedule 2 of the Wildlife Conservation (Specially Protected Fauna) Notice for Threatened Fauna and Wildlife Conservation (Rare Flora) Notice for Threatened Flora.

### **VU Vulnerable species**

Threatened species considered to be facing a high risk of extinction in the wild. Published as Specially Protected under the *Wildlife Conservation Act 1950*, in Schedule 3 of the Wildlife Conservation (Specially Protected Fauna) Notice for Threatened Fauna and Wildlife Conservation (Rare Flora) Notice for Threatened Flora.

### **EX Presumed extinct species**

Species which have been adequately searched for and there is no reasonable doubt that the last individual has died. Published as Specially Protected under the *Wildlife Conservation Act 1950*, in Schedule 4 of the Wildlife Conservation (Specially Protected Fauna) Notice for Presumed Extinct Fauna and Wildlife Conservation (Rare Flora) Notice for Presumed Extinct Flora.

### **IA Migratory birds protected under an international agreement**

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 the Bonn Convention, relating to the protection of migratory birds. Published as Specially Protected under the *Wildlife Conservation Act 1950*, in Schedule 5 of the Wildlife Conservation (Specially Protected Fauna) Notice.

## **CD Conservation dependent fauna**

Fauna of special conservation need being species dependent on ongoing conservation intervention to prevent it becoming eligible for listing as threatened. Published as Specially Protected under the *Wildlife Conservation Act 1950*, in Schedule 6 of the Wildlife Conservation (Specially Protected Fauna) Notice.

## **OS Other specially protected fauna**

Fauna otherwise in need of special protection to ensure their conservation. Published as Specially Protected under the *Wildlife Conservation Act 1950*, in Schedule 7 of the Wildlife Conservation (Specially Protected Fauna) Notice.

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## **P Priority species**

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 flora or fauna.

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.

### **1 Priority 1: Poorly-known species**

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.

### **2 Priority 2: Poorly-known species**

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.

### **3 Priority 3: Poorly-known species**

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.

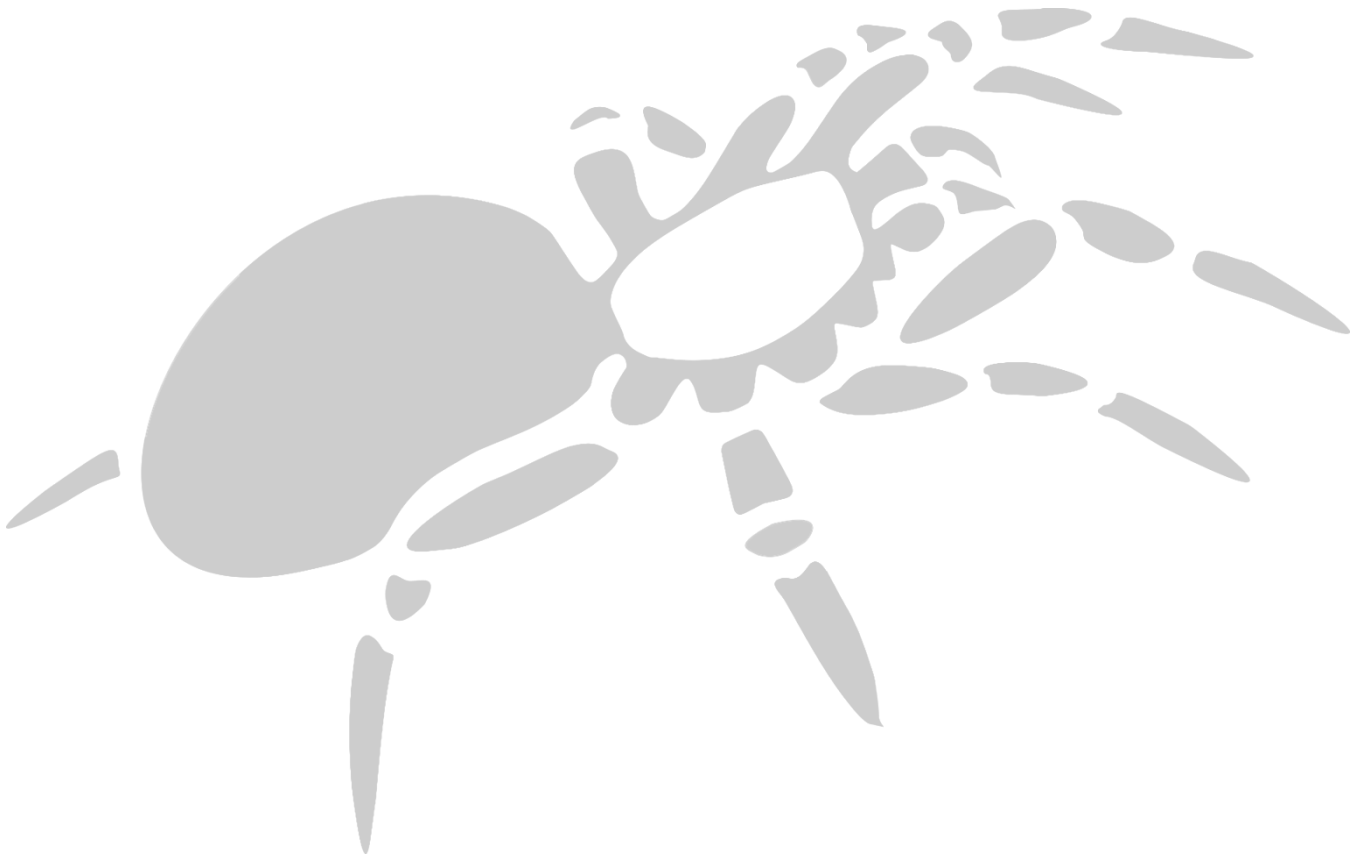
### **4 Priority 4: Rare, Near Threatened and other species in need of monitoring**

(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.

\*Species includes all taxa (plural of taxon - a classificatory group of any taxonomic rank, e.g. a family, genus, species or any infraspecific category i.e. subspecies or variety, or a distinct population).



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