

**Reconnaissance Flora/Vegetation  
& Fauna Survey  
Realignment Binneringie Road  
Prepared For  
Shire of Coolgardie**



**October 2018  
Version 1**

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## Glossary

Acronym	Description
ANCA	Australian Nature Conservation Agency.
BA	Birdlife Australia (Formerly RAOU, Birds Australia).
BAM Act	Biosecurity and Agriculture Management Act 2007, WA Government.
BC	Botanica Consulting.
BoM	Bureau of Meteorology.
CAMBA	China Australia Migratory Bird Agreement 1998.
DAFWA	Department of Agriculture and Food (now DPIRD), WA Government.
DBCA	Department of Biodiversity, Conservation and Attractions (formerly DPaW), WA Government.
DEC	Department of Environment and Conservation (now DBCA), WA Government.
DER	Department of Environment Regulation (now DWER), WA Government.
DMIRS	Department of Mines, Industry Regulation and Safety (formerly DMP), WA Government
DMP	Department of Mines and Petroleum (now DMIRS), WA Government.
DotEE	Department of the Environment and Energy (formerly DSEWPaC), Australian Government.
DoW	Department of Water (now DWER), WA Government.
DPaW	Department of Parks and Wildlife (now DBCA), WA Government.
DPIRD	Department of Primary Industries and Regional Development, WA Government
DSEWPaC	Department of Sustainability, Environment, Water, Population and Communities (now DotEE,), Australian Government.
DWER	Department of Water and Environmental Regulation (formerly OEPA, DER and DoW), WA Government
EP Act	<i>Environmental Protection Act 1986</i> , WA Government.
EP Regulations	Environmental Protection (Clearing of Native Vegetation) Regulations 2004, WA Government.
EPA	Environmental Protection Authority, WA Government.
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i> , Australian Government.
ESA	Environmentally Sensitive Area.
Ha	Hectare (10,000 square metres).
IBRA	Interim Biogeographic Regionalisation for Australia.
IUCN	International Union for the Conservation of Nature and Natural Resources – commonly known as the World Conservation Union.
JAMBA	Japan Australia Migratory Bird Agreement 1981.
Km	Kilometre (1,000 metres).
MVG	Major Vegetation Groups.
NVIS	National Vegetation Information System.
OEPA	Office of the Environmental Protection Authority (now DWER), WA Government.
PEC	Priority Ecological Community.
RAOU	Royal Australia Ornithologist Union.
ROKAMBA	Republic of Korea-Australia Migratory Bird Agreement 2007.
SoC	Shire of Coolgardie.
SRE	Short Range Endemic.
SSC	Species Survival Commission, International.
Survey Area	Binneringie Road Realignment.
TEC	Threatened Ecological Community.

Acronym	Description
WA	Western Australia.
WAHERB	Western Australian Herbarium.
WAM	Western Australian Museum, WA Government.
WC Act	<i>Wildlife Conservation Act</i> 1950, WA Government.

## **Executive Summary**

Botanica Consulting (BC) was commissioned by Shire of Coolgardie (SoC) to undertake a reconnaissance flora/vegetation and fauna survey of the Binneringie road realignment (referred to as the 'survey area'). The survey covered an area of 1.8ha and was conducted on the 9<sup>th</sup> September 2018. The survey area is located approximately 5km south-east of Widgiemooltha and 75km south-east of Coolgardie, directly adjacent to the Coolgardie-Esperance Highway.

One vegetation type/ fauna habitat was identified within the survey area, which was represented by a total of 9 Families, 16 Genera and 22 taxa.

No Threatened Flora, Threatened Fauna, Migratory Fauna or Threatened Ecological Communities (TEC) as listed under the Western Australian *Wildlife Conservation (WC) Act 1950*<sup>1</sup> or Commonwealth *Environment Protection and Biodiversity Conservation (EPBC) Act 1999* were identified within the survey area. No Priority Flora, Fauna or Priority Ecological Communities (PEC) as listed by Department of Biodiversity, Conservation and Attractions (DBCA) were recorded within the survey area. No significant flora, fauna or vegetation was identified within the survey area.

Results of the literature review identified 31 mammals (including 9 bat species), 109 birds, 79 reptiles and five frog species as having been previously recorded in the general area, some of which have the potential to occur within the survey area itself subject to the identified habitats being suitable.

A review of the EPBC Act threatened fauna list, DBCA's Threatened Fauna Database and Priority List, unpublished reports and scientific publications identified a small number of specially protected, migratory or priority fauna species as having been previously recorded or as being potentially present in the general vicinity of the survey area. Despite this it is considered unlikely that any fauna species of conservation significance will be significantly impacted on by the proposed development. This conclusion is primarily based on the lack of suitable habitats, the known local extinction of some species, the relatively small size of the impact footprint and the extensive habitat connectivity with adjoining areas. Impacts on fauna and fauna habitat are therefore anticipated to be localised, small/negligible and as a consequence manageable.

The survey area does not contain any world or national heritage places and does not occur within a Bush Forever site. There are no wetlands of international importance (Ramsar Wetlands), national importance (Australian Nature Conservation Agency (ANCA) Wetlands) or conservation category wetlands within the survey area. The survey area is not located within DBCA Managed Land and does not contain any Environmentally Sensitive Areas (ESA) listed under the *Environmental Protection (EP) Act 1986*. Approximately 0.4ha of the far western portion of the survey area is located within a Schedule 1 Area (listed under the EP Act) associated with the Coolgardie-Esperance Highway (road reserve).

Based on the vegetation condition rating scale adapted from Keighery, 1994 and Trudgen, 1988 (ranging from 'pristine' to 'completely degraded'), vegetation was rated as 'very good'. No introduced taxa were identified within the survey area.

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<sup>1</sup> *Biodiversity Conservation Act 2016* received assent on 21 September 2016 with Parts of the Act coming into effect on 3 December 2016. Once fully enacted with enabling subsidiary regulations, it will replace the *Wildlife Conservation Act 1950*.

## **1 Introduction**

### **1.1 Project Description**

BC was commissioned by SoC to undertake a reconnaissance flora/vegetation and fauna survey of the Binneringie road realignment (referred to as the 'survey area'). The survey covered an area of 1.8 ha located approximately 5km south-east of Widgiemooltha and 75km south-east of Coolgardie, directly adjacent to the Coolgardie-Esperance Highway (Figure 1-1). The survey was conducted on 9<sup>th</sup> September 2018.

### **1.2 Objectives**

The flora/ vegetation assessment was conducted in accordance with the requirements of a reconnaissance flora survey as defined in *Technical Guidance - Flora and Vegetation Surveys for Environmental Impact Assessment – December 2016* (EPA, 2016a). The objectives of the assessment were to:

- gather background information on flora and vegetation in the target area (literature review, database and map-based searches);
- identify significant flora, vegetation/ecological communities and assess the potential sensitivity to impact;
- conduct a field survey to verify / ground truth the desktop assessment findings through survey;
- undertake floristic community mapping to a scale appropriate for the bioregion and described according to the National Vegetation Information System (NVIS) structure and floristics;
- undertake vegetation condition mapping;
- assess the project area's plant species diversity, density, composition, structure and weed cover, using NVIS classification system for vegetation description;
- assess Matters of National Environmental Significance (MNES) and indicate whether potential impacts on MNES as protected under the EPBC Act are likely to require referral of the project to the Commonwealth DotEE; and
- determine the State legislative context of environmental aspects required for the assessment.

The fauna assessment was conducted in accordance with the requirements of a reconnaissance terrestrial fauna survey as defined in *Technical Guidance - Terrestrial Fauna Surveys for Environmental Impact Assessment – December 2016* (EPA, 2016b). The objectives of the assessment were to:

- Gather background information on fauna in the survey area (literature review, database and map-based searches);
- Delineate and characterise the faunal assemblages and fauna habitats present in the survey area;
- Document and map locations of any Threatened or Priority listed fauna species located; and
- Assess the regional and local conservation status of fauna species and fauna habitats within the survey area.





Figure 1-1: Regional map of the survey area

Note-survey area not to scale



## **2 Regional Biophysical Environment**

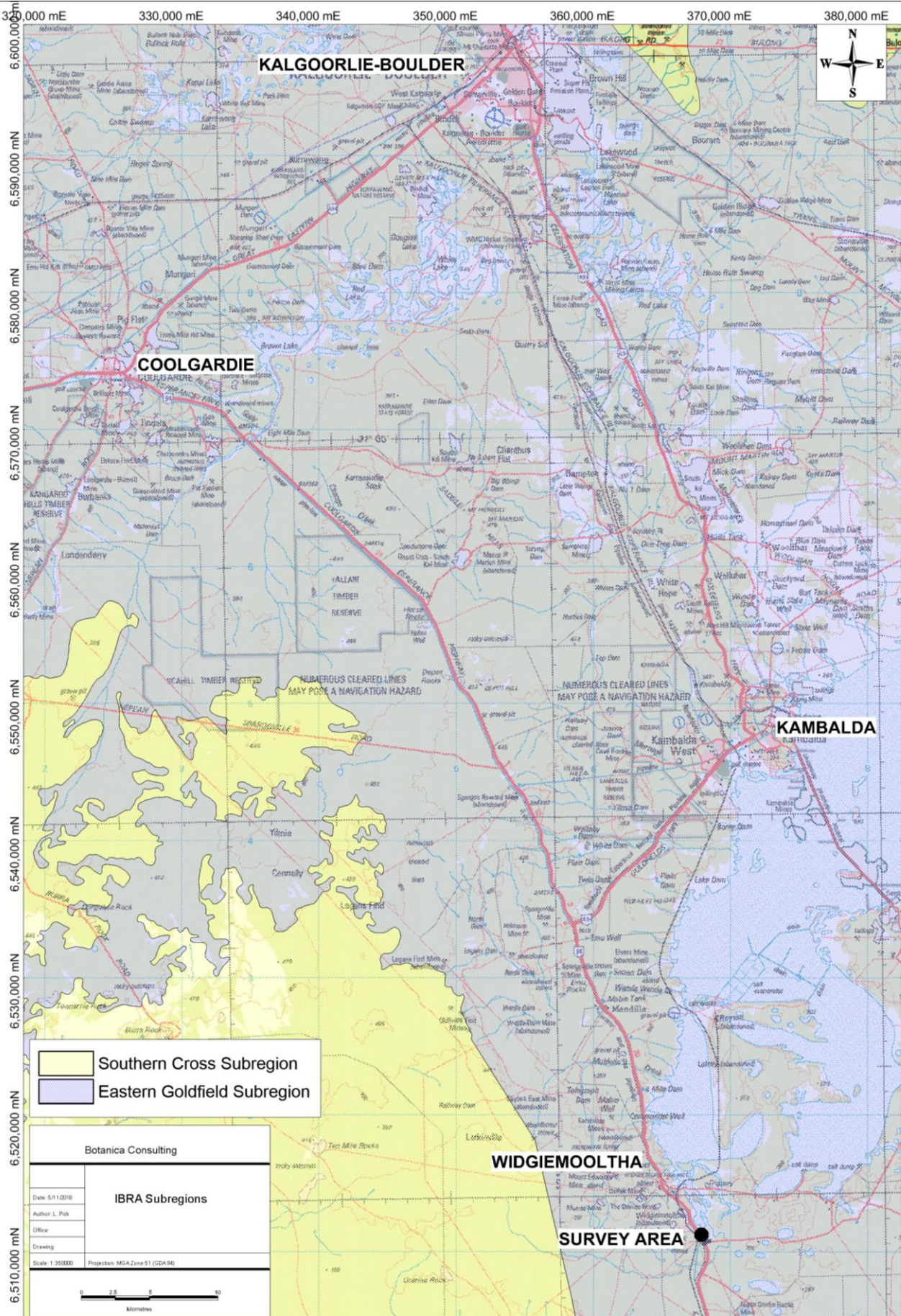
### **2.1 Regional Environment**

The survey area lies within the South-West Interzone of WA in a region known as the Coolgardie Botanical District. Based on the Interim Biogeographic Regionalisation of Australia (IBRA, Version 7 (DotEE, 2012) the survey area is located within the Coolgardie Bioregion of WA. The Coolgardie Bioregion is further divided into three subregions; Mardabilla (COO1), Southern Cross (COO2) and Eastern Goldfields (COO3) subregion with the survey area located within the Eastern Goldfields subregion (Figure 2-1).

The Coolgardie bioregion is within the Yilgarn Craton. Its granite basement includes Archaean Greenstone intrusions in parallel belts. Drainage is occluded. The climate is arid to semi-arid warm Mediterranean with 250-300mm of mainly winter rainfall (McKenzie, May & McKenna, 2002). Diverse woodlands, rich in endemic eucalypts, occur on low greenstone hills, on alluvial soils on the valley floors, around the saline playas of the region's occluded drainage system, and on broad plains of calcareous earths (McKenzie, May & McKenna, 2002).

The Eastern Goldfields subregion comprises gently undulating plains interrupted in the west by low hills and ridges of Archaean greenstones and in the east by a horst of Proterozoic basic granulite. The underlying strata are eroded flat and covered with Tertiary sand and gravel soils, scattered exposures of bedrock, and plains of calcareous earths. (Cowan, 2001).





**Figure 2-1: Map of IBRA bioregions in relation to the survey area**

Note-survey area not to scale

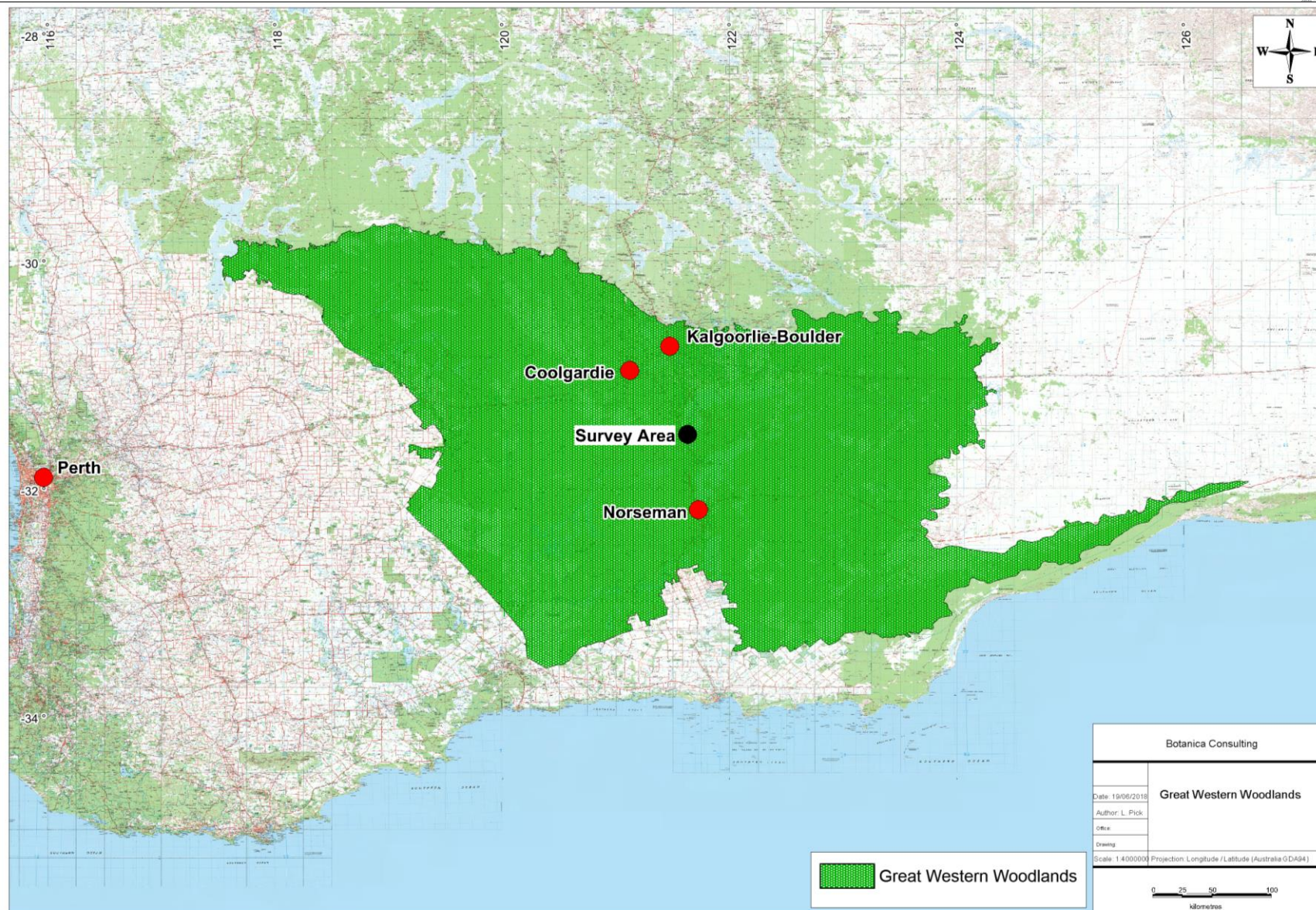


## 2.2 Great Western Woodlands

The survey area lies within the Great Western Woodlands, located approximately 60 km from the northern boundary. The Great Western Woodlands is considered by The Wilderness Society of WA to be of global biological and conservation importance as one of the largest and healthiest temperate woodlands on Earth, containing many endemic taxa. The region covers almost 16 million hectares (160,000 square kilometres), from the southern edge of the Western Australian Wheatbelt to the pastoral lands of the Mulga country in the north, the inland deserts to the northeast, and the treeless Nullarbor Plain to the east (Figure 2-2).

The Great Western Woodlands provides a connection between southwest forests and inland deserts (Gondwana Link) as well as linking the north-west passage to Shark Bay. The majority of the Great Western Woodlands is unallocated crown land (61.1%) with other interests including pastoral leases (20.4%), conservation reserves (15.4%) unallocated crown land, ex pastoral (2%) managed by the Department of Biodiversity, Conservation and Attractions (DBCA) and private land (approximately 1%) (Watson *et. al.*, 2008).

No specific management strategy or formal conservation status applies to the Great Western Woodlands. The Great Western Woodlands currently includes towns, highways, roads, railways, private property, Crown Reserves, agricultural activities and mining tenements.



**Figure 2-2: Location of survey area within the Great Western Woodlands (DBCA, 2011a)**

Note-survey area not to scale

## 2.3 Soils and Landscape Systems

The survey area lies within the Kalgoorlie Province, which consists of undulating plains (with some sandplains, hills and salt lakes) on granitic rocks and greenstone of the Yilgarn Craton. Soils comprise of calcareous loamy earths and red loamy earths with some salt lake soils, red deep sands, yellow sandy earths, shallow loams and loamy duplexes. Vegetation includes Eucalypt woodlands with some Acacia-Casuarina thickets, mulga shrublands, halophytic shrublands and spinifex grasslands. This Province is located within the southern Goldfields between Payne's Find, Menzies, Southern Cross and Balladonia (Tille, 2006).

The Kalgoorlie Province is located on the central eastern portion of the Yilgarn Craton, mostly overlying Archaean rocks of the Southern Cross Domain and the Eastern Goldfields Superterrane. To the north-west is the Murchison Domain. The basement rocks are a mix of granite, gneiss and greenstone. Even-grained porphyritic granitic rocks (intruded by quartz veins and dolerite dykes) are most common across the north as well as in the western half and the north-east. The largest areas of migmatite and gneiss are found in the south-west (Tille, 2006).

The Kalgoorlie Province is further divided into seven soil-landscape zones, with the survey area located within the Kambalda Zone (265). This zone is characterised by flat to undulating plains (with hills, ranges and some salt lakes and stony plains) on greenstone and granitic rocks of the Yilgarn Craton. Soils include calcareous loamy earths and red loamy earths with salt lakes soils and some red-brown hardpan shallow loams and red sandy duplexes. Vegetation includes red mallee blackbutt-salmon gum-gimlet woodlands with mulga and halophytic shrublands (and some spinifex grasslands). This zone is located in the south-eastern Goldfields between Menzies, Norseman and the Fraser Range (Tille, 2006). The Kambalda Zone is further divided into soil landscape systems with the survey area located within the Gumland system described in Table 2-1 below.

**Table 2-1: Soil Landscape Systems within the survey area**

Landscape System Mapping Unit	Description
Gumland System (265Gm)	Extensive pedeplains supporting eucalypt woodlands with halophytic and non-halophytic shrub understoreys.



## 2.4 Vegetation

The vegetation of the Eastern Goldfields subregion consists of Mallees, Acacia thickets and shrub heaths on sandplains. Diverse Eucalyptus woodlands occur around salt lakes, on ranges, and in valleys (Cowan, 2001). The Department of Agriculture and Food Western Australia (DAFWA) GIS file (2011) indicates that the survey area is located within Pre-European Beard vegetation associations Binneringe 9 and 936. The extent of these vegetation associations, as specified in the 2017 Statewide Vegetation Statistics (DBCA, 2017) is provided in Table 2-2 and Figure 2-3.

**Table 2-2: Pre-European Vegetation Associations within the survey area**

Vegetation association	Pre-European extent remaining (%)	% of Current extent within DBCA managed lands	Vegetation Description (Beard, 1990)
Binneringe 9	98.82	2.47	Medium woodland; coral gum ( <i>E. torquata</i> ) & Goldfields blackbutt ( <i>E. lesouefii</i> )
Binneringe 936	98.48	1.04	Medium woodland; salmon gum

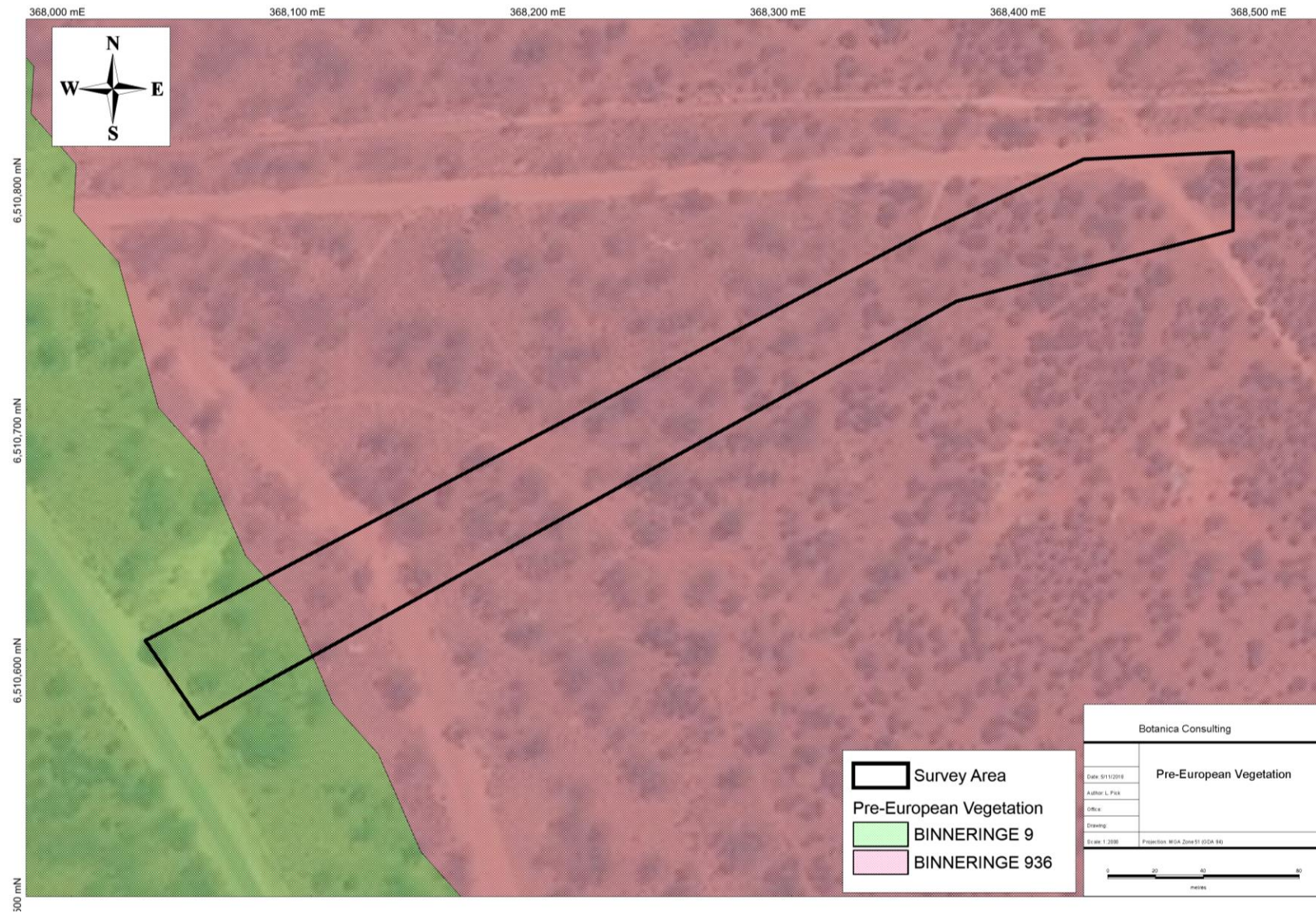


Figure 2-3: Pre-European Vegetation Associations within the survey area



## 2.5 Climate

The climate of the Eastern Goldfields subregion is characterised as an arid to semi-arid climate with annual rainfall of approximately 200-300mm (Beard, 1990; Cowan, 2001). Rainfall data for the Kambalda West weather station (#12117), located approximately 35 km north-east of the survey area, is shown in Figure 2-4 and the average climate data for Coolgardie is shown in Figure 2-5 (BoM, 2018). Rainfall in the months preceding the survey (March-July 2018) was below average, however rainfall received in August was above average.

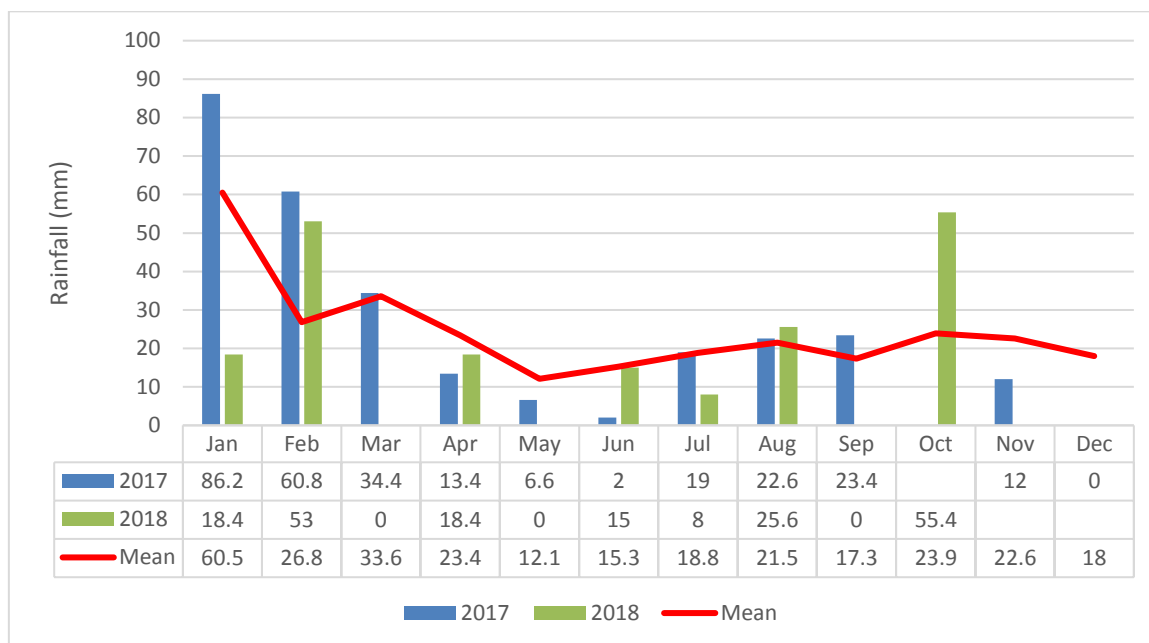


Figure 2-4: Monthly rainfall (Jan 2017 to Oct 2018) for the Kambalda West weather station #12117 (BoM, 2018)

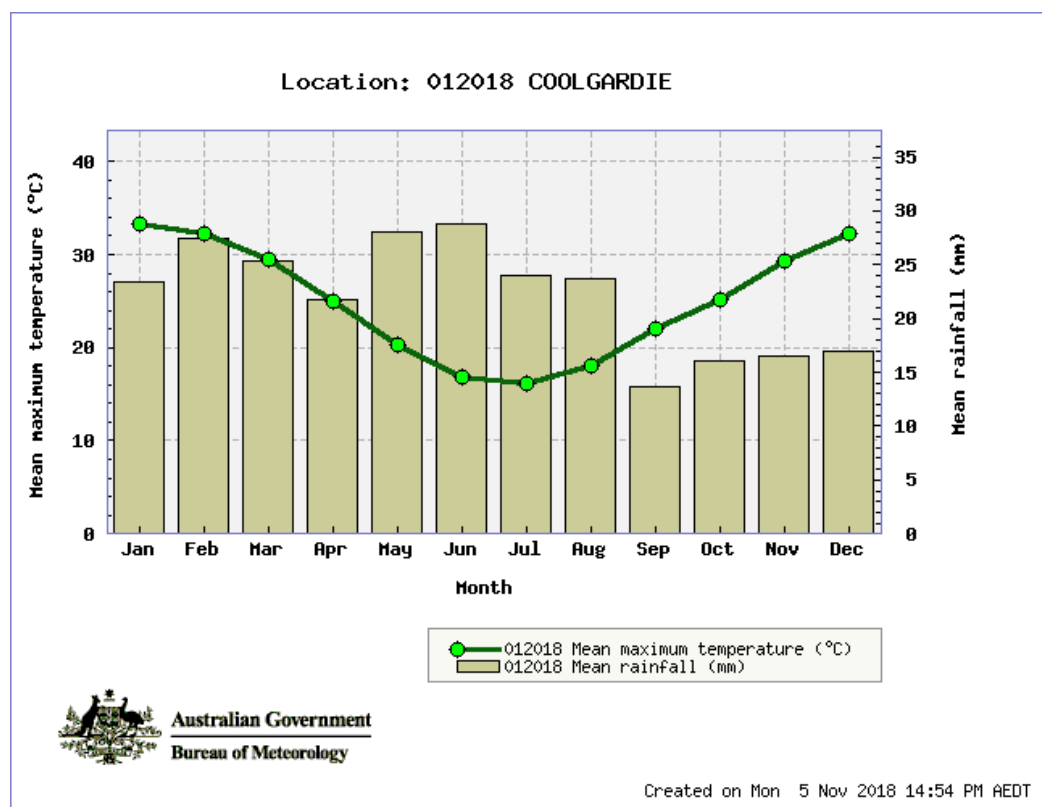


Figure 2-5: Average Climate Data for the Coolgardie weather station #12018 (BoM, 2018)

## 2.6 Hydrology

According to the Geoscience Australia database (2001), there are no drainage lines or inland waters within the survey area. A map showing the regional surface hydrology in the local region is provided in Figure 2-6.

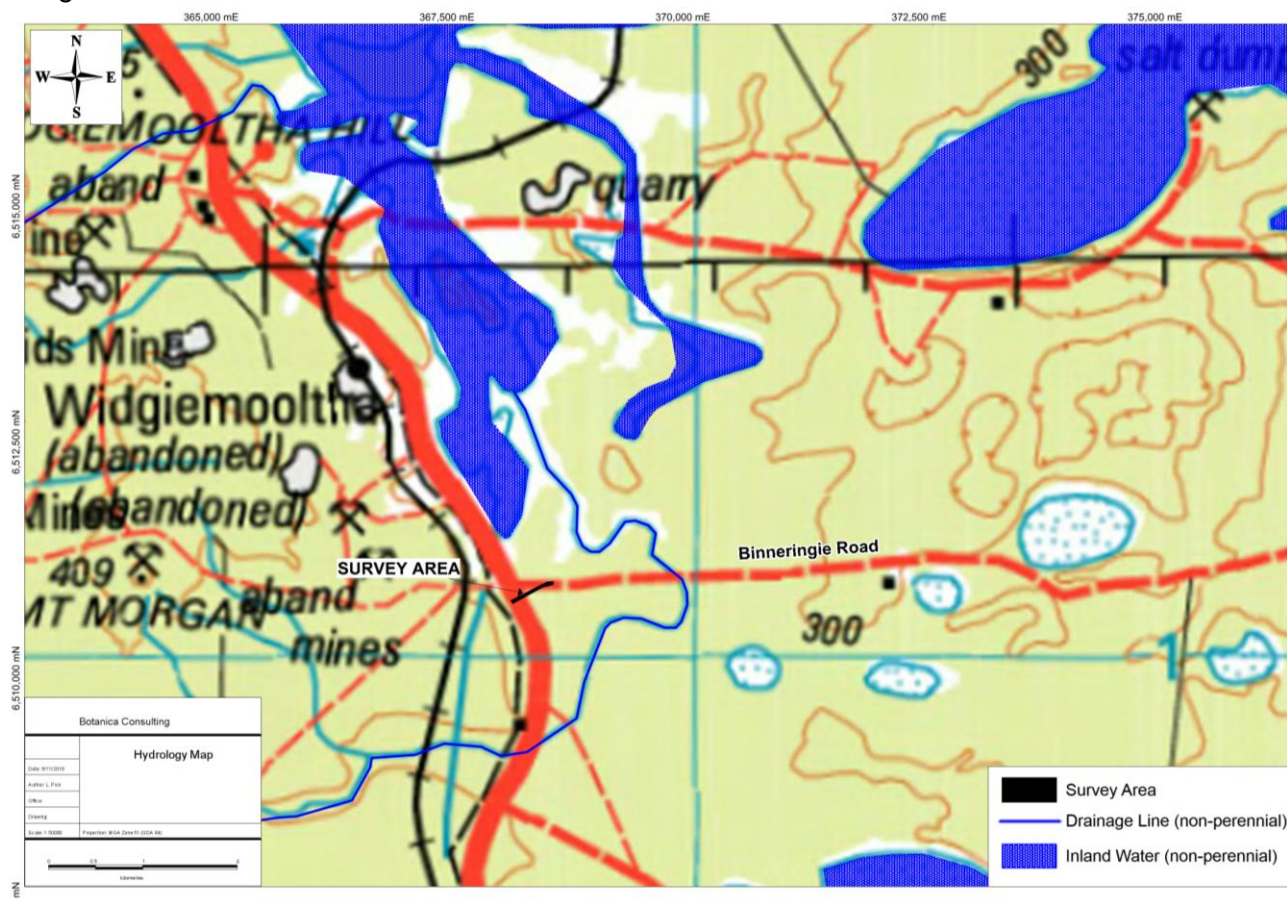


Figure 2-6: Hydrology of the survey area (data obtained from Geoscience Australia, 2001)

## 2.7 Land Use

The dominant land uses of the Eastern Goldfields subregion include Unallocated Crown Land and Crown Reserves, grazing-native pastures-leasehold, freehold, conservation and mining leases (Cowan, 2001). The western portion of the survey area is located within the Coolgardie-Esperance Highway road reserve which is listed as a Schedule 1 Area under the EP Act.

### **3 Survey Methodology**

#### **3.1 Desktop Assessment**

Prior to the field assessment a literature review was undertaken of previous flora and fauna assessments conducted within the local region. Documents reviewed included:

- ATA Environmental (2006a), Vertebrate Fauna Assessment, St. Ives Gold Mine. Unpublished Report commissioned by Jim's Seeds, Weeds and Trees Pty Ltd.
- ATA Environmental (2006b), Fauna Assessment, St. Ives Caves Rock Satellite Pit, Waste Dump and Haul Road. Unpublished Report commissioned by Jim's Seeds, Weeds and Trees Pty Ltd.
- Bamford Consulting Ecologists (2010), Fauna Assessment: impacts of water discharge and general mining activity on vertebrate fauna. Unpublished report for Goldfields - St Ives Gold Mine, Kambalda.
- BC, (2007a), Flora and Vegetation Survey of the Proposed Leviathan Haul Road. Prepared for St Ives Gold Mine.
- BC, (2007b), Flora and Vegetation Survey of the Proposed Tailings Storage Facility. Prepared for St Ives Gold Mine.
- BC, (2008) Flora and Vegetation Survey of the St. Ives Gold Mine AAA Project. Prepared for St Ives Gold Mine.
- BC, (2010), Level 2 Flora survey of Diana, West Idough and Bellerophon Projects. Prepared for St Ives Gold Mine.
- BC, (2011a), Level 1 Flora & Vegetation Survey of Cave Rocks Proposed Pipeline. Prepared for St Ives Gold Mine.
- BC, (2011b), Level 1 Flora & Vegetation Survey of Proposed Workshop area. Prepared for St Ives Gold Mine.
- BC, (2011c), Level 1 Flora & Vegetation Survey Thunderer Project. Prepared for St Ives Gold Mine.
- BC, (2011d), Level 1 Flora survey of proposed 66kv Powerline Extension Athena. Prepared for St Ives Gold Mine.
- BC, (2011e), Level 2 Flora & Vegetation Survey of Cave Rocks. Prepared for St Ives Gold Mine.
- BC, (2012a), Level 1 Flora & Vegetation Survey within the Mining Tenements of St Ives Gold Mine. Prepared for St Ives Gold Mine.
- BC (2017), Flora and Fauna Assessment Widgiemooltha Project. Prepared for Mincor Resources NL.
- Chapman, A., Kealley, I., McMillan, D., McMillan, P. and Rolland, G. (1991), Biological Surveys of Four Goldfields Reserves. Landnote 1/91 Department of Conservation and Land Management.
- E.M. Mattiske and Associates, (1996), Kambalda Nickel Operations Western Mining Corporation Flora and Vegetation Studies. Prepared for Western Mining Corporation.
- Etten, E.V, (2010), Flora & Vegetation of St Ives Gold Mine's Newly Acquired Southern (Heron) Leases South-East of Kambalda, Western Australia. Prepared for St Ives Gold Mine.
- Halpern, Glick, Maunsell (1998), Lake Lefroy Environmental Assessment. Report ES4490C. Unpublished Report to WMC Resources Ltd.
- KLA (2007), St. Ives Gold Mining Company. Northern Tailings Storage Facility (No. 4). Spring Fauna Survey. Unpublished report for St Ives Gold Mining Company.
- KLA (2008), Australian Nickel Mines. Widgiemooltha Project. Fauna Survey. Unpublished report for Botanica Consulting.

- Mattiske Consulting, (2003), Flora and Vegetation Survey St Ives Gold Mine Kambalda. Prepared for St Ives Gold Mine.
- Mattiske Consulting (2007), Flora and Vegetation of the Widgiemooltha Town Site. Prepared for Australian Nickel Mines NL.
- Meissner, R.A & Coppen, R, (2009-2012), Flora and Vegetation of Greenstone Ranges of the Yilgarn Craton: Kangaroo Hills and other Timber Reserves. Science Division Department of Environment and Conservation.
- Ninox Wildlife Consulting (2004), St Ives Gold Delta Island Vertebrate Fauna Assessment. Unpublished Report Commissioned by St Ives Gold Mining Company Pty.
- Western Wildlife (2006), St. Ives Gold Fauna Survey; Spring 2005. Unpublished Report commissioned by Jim's Seeds, Weeds and Trees Pty. Ltd.

Searches of the following databases were undertaken to aid in the compilation of a list of flora and fauna taxa within the survey area:

- DBCA Priority/ Threatened Flora Database Search (DBCA, 2016a)
- DBCA Priority/ Threatened Ecological Communities Database Search (DBCA, 2016b)
- DBCA NatureMap Database (DBCA, 2018);
- DotEE Protected Matters search tool (DotEE, 2018).

The NatureMap and Protected Matters Search were conducted for an area encompassing a 20km radius of the centre coordinates –31.5311S 121.6127E. It should be noted that these lists are based on observations from a broader area than the assessment area (20km radius) and therefore may include taxa not present. The databases also often include very old records that may be incorrect or in some cases the taxa in question have become locally or regionally extinct. Information from these sources should therefore be taken as indicative only and local knowledge and information also needs to be taken into consideration when determining what actual species may be present within the specific area being investigated.

The conservation significance of flora and fauna taxa was assessed using data from the following sources:

- *Environment Protection and Biodiversity and Conservation (EPBC) Act 1999*. Administered by the Australian Government (DotEE);
- *Wildlife Conservation (WC) Act 1950<sup>2</sup>*. Administered by the WA Government (DBCA);
- Red List produced by the Species Survival Commission (SSC) of the World Conservation Union (also known as the IUCN Red List – the acronym derived from its former name of the International Union for Conservation of Nature and Natural Resources). The Red List has no legislative power in Australia but is used as a framework for State and Commonwealth categories and criteria; and
- Priority Flora/ Fauna list. A non-legislative list maintained by DBCA for management purposes (released 16<sup>th</sup> January 2018).

The EPBC Act also requires the compilation of a list of migratory species that are recognised under international treaties including the:

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<sup>2</sup> The *Biodiversity Conservation Act 2016* received assent on 21 September 2016 with Parts of the Act coming into effect on 3 December 2016. Once fully enacted with enabling subsidiary regulations, it will replace the WC Act.



- Japan Australia Migratory Bird Agreement 1981 (JAMBA)<sup>3</sup>;
- China Australia Migratory Bird Agreement 1998 (CAMBA);
- Republic of Korea-Australia Migratory Bird Agreement 2007 (ROKAMBA); and
- Bonn Convention 1979 (The Convention on the Conservation of Migratory Species of Wild Animals).

All migratory bird species listed in the annexes to these bilateral agreements are protected in Australia as Matters of National Environmental Significance (MNES) under the EPBC Act.

Table 3-1 and Table 3-2 below provide the definitions of conservation significant flora and fauna.

**Table 3-1: Definitions of Conservation Significant Flora**

Code	Category
<b>State categories of threatened and priority species</b>	
T	Threatened Flora “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.”
Schedule 1	Critically Endangered – Flora that are considered likely to become extinct or rare, as critically endangered flora
Schedule 2	Endangered – Flora that are considered likely to become extinct or rare, as endangered flora
Schedule 3	Vulnerable – Flora that are considered likely to become extinct or rare, as vulnerable flora
Schedule 4	Extinct-Flora presumed to be extinct
P1	Priority One – Poorly Known Taxa “Taxa which are known from one or a few (generally <5) populations which are under threat, either due to small population size, or being on lands under immediate threat. Such taxa are under consideration for declaration as ‘rare flora’, but are in urgent need of further survey.”
P2	Priority Two – Poorly Known Taxa “Taxa which are known from one or a few (generally <5) populations, at least some of which are not believed to be under immediate threat (i.e. not currently endangered). Such taxa are under consideration for declaration as ‘rare flora’, but urgently need further survey.”
P3	Priority Three – Poorly Known Taxa “Taxa which are known from several populations and the taxa are not believed to be under immediate threat (i.e. not currently endangered), either due to the number of known populations (generally >5), or known populations being large, and either widespread or protected. Such taxa are under consideration for declaration as ‘rare flora’ but needs further survey.”
P4	Priority Four – Rare Taxa “Taxa which are considered to have been adequately surveyed and which, whilst being rare (in Australia), are not currently threatened by any identifiable factors. These taxa require monitoring every 5 – 10 years.”
<b>Commonwealth categories of threatened species</b>	
Extinct	Taxa where there is no reasonable doubt that the last member of the species has died.
Extinct in the wild	Taxa where it 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

<sup>3</sup> Species listed under JAMBA are also specially protected under Schedule 5 of the WC Act.

Code	Category
	expected habitat, at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.
Critically endangered	Taxa that are facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria.
Endangered	Taxa which are not critically endangered and is facing a very high risk of extinction in the wild in the near future, as determined in accordance with the prescribed criteria.
Vulnerable	Taxa which are 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.
Conservation dependent	Taxa which are the focus of a specific conservation program the cessation of which would result in the species becoming vulnerable, endangered or critically endangered; or (b) the following subparagraphs are satisfied: (i) the species is a species of fish; (ii) the species is the focus of a plan of management that provides for actions necessary to stop the decline of, and support the recovery of, the species so that its chances of long term survival in nature are maximised; (iii) the plan of management is in force under a law of the Commonwealth or of a State or Territory; (iv) cessation of the plan of management would adversely affect the conservation status of the species.

**Table 3-2: Definitions of Conservation Significant Fauna**

Code	Category
<b>State categories of threatened and priority species</b>	
T	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”.
Schedule 1	Critically Endangered – Threatened species considered to be facing an extremely high risk of extinction in the wild.
Schedule 2	Endangered – Threatened species considered to be facing a very high risk of extinction in the wild.
Schedule 3	Vulnerable – Threatened species considered to be facing a high risk of extinction in the wild.
Schedule 4	Species which have been adequately searched for and there is no reasonable doubt that the last individual has died.
Schedule 5	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.
Schedule 6	Fauna of special conservation need being species dependent on ongoing conservation intervention to prevent it becoming eligible for listing as threatened.
Schedule 7	Fauna otherwise in need of special protection to ensure their conservation.
P1	Priority One – Poorly Known Taxa 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.
P2	Priority Two – Poorly Known Taxa

Code	Category
	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.
P3	<p>Priority Three – Poorly Known Taxa</p> <p>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.</p>
P4	<p>Priority Four – Rare, Near Threatened and other species in need of monitoring</p> <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 do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable.</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>
<b>Commonwealth categories of threatened species</b>	
Extinct	Taxa where there is no reasonable doubt that the last member of the species has died.
Extinct in the wild	Taxa where it 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.
Critically Endangered	Taxa that are facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria.
Endangered	Taxa which are not critically endangered and is facing a very high risk of extinction in the wild in the near future, as determined in accordance with the prescribed criteria.
Vulnerable	Taxa which are 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.
Near Threatened	Taxa which has been evaluated but does not qualify for CR, EN or VU now but is close to qualifying or likely to qualify in the near future.
Least Concern	Taxa which has been evaluated but does not qualify for CR, EN, VU, or NT but is likely to qualify for NT in the near future.
Data Deficient	Taxa for which there is inadequate information to make a direct or indirect assessment of its risk of extinction based on its distribution and/or population status.

A search of the DBCA Priority Ecological Communities (PEC) and Threatened Ecological Communities (TEC) database was also conducted within a 20 km radius of the survey area (DBCA, 2018c). Table 3-3 represents the definitions of Threatened and Priority Ecological Communities.

**Table 3-3: Definition of conservation significant communities**

Category Code	Category
<b>State categories of Threatened Ecological Communities (TEC)</b>	
PTD	<p><b>Presumed Totally Destroyed</b></p> <p>An ecological community will be listed as Presumed Totally Destroyed if there are no recent records of the community being extant and either of the following applies:</p> <p>records within the last 50 years have not been confirmed despite thorough searches or known likely habitats or;</p> <p>all occurrences recorded within the last 50 years have since been destroyed.</p>
CE	<p><b>Critically Endangered</b></p> <p>An ecological community will be listed as Critically Endangered when it has been adequately surveyed and is found to be facing an extremely high risk of total destruction in the immediate future, meeting any one of the following criteria:</p> <p>The estimated geographic range and distribution has been reduced by at least 90% and is either continuing to decline with total destruction imminent, or is unlikely to be substantially rehabilitated in the immediate future due to modification;</p> <p>The current distribution is limited i.e. highly restricted, having very few small or isolated occurrences, or covering a small area;</p> <p>The ecological community is highly modified with potential of being rehabilitated in the immediate future.</p>
E	<p><b>Endangered</b></p> <p>An ecological community will be listed as Endangered when it has been adequately surveyed and is not Critically Endangered but is facing a very high risk of total destruction in the near future. The ecological community must meet any one of the following criteria:</p> <p>The estimated geographic range and distribution has been reduced by at least 70% and is either continuing to decline with total destruction imminent in the short-term future, or is unlikely to be substantially rehabilitated in the short-term future due to modification;</p> <p>The current distribution is limited i.e. highly restricted, having very few small or isolated occurrences, or covering a small area;</p> <p>The ecological community is highly modified with potential of being rehabilitated in the short-term future.</p>
V	<p><b>Vulnerable</b></p> <p>An ecological community will be listed as Vulnerable when it has been adequately surveyed and is not Critically Endangered or Endangered but is facing high risk of total destruction in the medium to long term future. The ecological community must meet any one of the following criteria:</p> <p>The ecological community exists largely as modified occurrences that are likely to be able to be substantially restored or rehabilitated;</p> <p>The ecological community may already be modified and would be vulnerable to threatening process, and restricted in range or distribution;</p> <p>The ecological community may be widespread but has potential to move to a higher threat category due to existing or impending threatening processes.</p>



Category Code	Category
<b>Commonwealth categories of Threatened Ecological Communities (TEC)</b>	
CE	<b>Critically Endangered</b> If, at that time, an ecological community is facing an extremely high risk of extinction in the wild in the immediate future (indicative timeframe being the next 10 years).
E	<b>Endangered</b> If, at that time, an ecological community is not critically endangered but is facing a very high risk of extinction in the wild in the near future (indicative timeframe being the next 20 years).
V	<b>Vulnerable</b> If, at that time, an ecological community is not critically endangered or endangered, but is facing a high risk of extinction in the wild in the medium-term future (indicative timeframe being the next 50 years).
<b>Priority Ecological Communities (PEC)</b>	
P1	<b>Poorly-known ecological communities</b> Ecological communities with apparently few, small occurrences, all or most not actively managed for conservation (e.g. within agricultural or pastoral lands, urban areas, active mineral leases) and for which current threats exist.
P2	<b>Poorly-known ecological communities</b> Communities that are known from few small occurrences, all or most of which are actively managed for conservation (e.g. within national parks, conservation parks, nature reserves, State forest, un-allocated Crown land, water reserves, etc.) and not under imminent threat of destruction or degradation.
P3	<b>Poorly known ecological communities</b> Communities that are known from several to many occurrences, a significant number or area of which are not under threat of habitat destruction or degradation or: Communities known from a few widespread occurrences, which are either large or within significant remaining areas of habitat in which other occurrences may occur, much of it not under imminent threat, or; Communities made up of large, and/or widespread occurrences, that may or not be represented in the reserve system, but are under threat of modification across much of their range from processes such as grazing and inappropriate fire regimes.
P4	<b>Ecological communities that are adequately known, rare but not threatened</b> or meet criteria for near threatened, or that have been recently removed from the threatened list. These communities require regular monitoring.
P5	<b>Conservation Dependent ecological communities</b> Ecological communities that are not threatened but are subject to a specific conservation program, the cessation of which would result in the community becoming threatened within five years.

### 3.2 Field Assessment

Botanica conducted a reconnaissance flora/vegetation and fauna survey covering an area of 1.8 ha. The survey was conducted on 9<sup>th</sup> September 2018, with the area traversed on foot and by 4WD.

#### 3.2.1 Flora Assessment

Prior to the commencement of field work, aerial photography was inspected and obvious differences in the vegetation assemblages were identified. The different vegetation communities identified were then inspected during the field survey to assess their validity. A handheld GPS unit was used to record the coordinates of the boundaries between existing vegetation communities. At each sample point, the following information was recorded:

- GPS location;
- Photograph of vegetation;
- Dominant taxa for each stratum;
- All vascular taxa (including annual taxa);
- Landform classification;
- Vegetation condition rating;
- Collection and documentation of unknown plant specimens; and
- GPS location, photograph and collection of flora of conservation significance if encountered.

Unknown specimens collected during the survey were identified with the aid of samples housed at the BC Herbarium and WAHERB. Vegetation was classified in accordance with the NVIS Vegetation Type classification.

#### 3.2.2 Fauna Assessment

Vegetation and landform units identified during the flora survey have been used to define broad fauna habitat types across the site. This information has been supplemented with observations made during the fauna assessment.

The main aim of the fauna habitat assessment was to determine if it was likely that any species of conservation significance would be utilising the areas that maybe impacted on as a consequence of development at the site. The habitat information obtained was also used to aid in finalising the overall potential fauna list.

As part of the desktop literature review, available information on the habitat requirements of the species of conservation significance listed as possibly occurring in the area was researched. During the field survey, the habitats within the survey area were assessed and specific elements identified, if present, to determine the likelihood of listed threatened species utilising the area and its significance to them.

Opportunistic observations of fauna species were made during all field survey work which involved a series of transects across the survey area during the day.

#### 3.2.3 Personnel involved

Jim Williams - Environmental Consultant/ Director (Diploma of Horticulture)

Lauren Pick - Environmental Consultant (Bachelor of Science-Zoology/Conservation Biology)

### 3.2.4 Scientific licences

**Table 3-4: Scientific Licences of Botanica Staff coordinating the survey**

Licensed staff	Permit Number	Valid
Jim Williams	SL012391 (Licence to flora for scientific purposes)	26/05/2018 to 27/05/2019
Lauren Pick	SL012392 (Licence to flora for scientific purposes)	26/05/2018 to 27/05/2019

### 3.3 Survey limitations and constraints

It is important to note that flora surveys will entail limitations notwithstanding careful planning and design. Potential limitations are listed in Table 3-5.

The conclusions presented in this report are based upon field data and environmental assessments and/or testing carried out over a limited period of time and are therefore merely indicative of the environmental condition of the site at the time of the field assessments. Also, it should be recognised that site conditions can change with time. Information not available at the time of this assessment which may subsequently become available may alter the conclusions presented.

Some species are reported as potentially occurring based on there being suitable habitat (quality and extent) within the survey area or immediately adjacent. The habitat requirements and ecology of many of the species known to occur in the wider area are however often not well understood or documented. It can therefore be difficult to exclude species from the potential list based on a lack of a specific habitats or microhabitats within the survey area. As a consequence of this limitation, the potential species list produced is most likely an overestimation of those species that actually utilise the survey area for some purpose.

In recognition of survey limitations, a precautionary approach has been adopted for this assessment. Any flora and fauna species that would possibly occur within the survey area (or immediately adjacent), as identified through ecological databases, publications, discussions with local experts/residents and the habitat knowledge of the author, has been listed as having the potential to occur.

**Table 3-5: Limitations and constraints associated with the survey**

Variable	Potential Impact on Survey	Details
Access problems	Not a constraint	The survey was conducted via 4WD and on foot. Numerous tracks were located within the survey area, providing ease of access.
Competency/ Experience	Not a constraint	The BC personnel that conducted the survey were regarded as suitably qualified and experienced. <b>Coordinating Botanist/ Zoologist:</b> Jim Williams, & Lauren Pick <b>Data Interpretation:</b> Jim Williams & Lauren Pick
Timing of survey, weather & season	Not a constraint	Fieldwork was completed within the EPA's recommended primary survey time periods (i.e., September – November) for the South-West Interzone.
Area disturbance	Minor constraint	The area has been disturbed from road development and use
Survey Effort/ Extent	Not a constraint	Survey intensity was appropriate for the size/significance of the area with a reconnaissance survey completed to identify

Variable	Potential Impact on Survey	Details
		vegetation types/fauna habitat and areas of Conservation Significance
Availability of contextual information at a regional and local scale	Not a constraint	<p>Threatened flora database searches provided by the DBCA were used to identify any potential locations of Threatened/Priority taxa.</p> <p>BoM, DWER, DPIRD, DBCA and DotEE databases were reviewed to obtain appropriate regional desktop information on the biophysical environment of the local region.</p> <p>BC were able to obtain information about the area from previous flora/ fauna assessments conducted within the region and previous reconnaissance surveys conducted by BC which provided context on the local environment.</p>
Completeness	Minor constraint	<p>In the opinion of BC, the survey area was covered sufficiently in order to identify vegetation assemblages. Few of the plants during the survey were in flower however annual species present. It is estimated that approximately 90% of the flora within the survey area were able to be fully identified.</p> <p>The vegetation types for this study were based on visual descriptions of locations in the field. The distribution of these vegetation communities/ fauna habitats outside the survey area is not known, however vegetation types identified were categorised via comparison to vegetation distributions throughout WA specified in the NVIS Major Vegetation Groups (DotEE, 2017b).</p>

## 4 **Results**

### 4.1 **Desktop Assessment**

#### 4.1.1 **Flora/Vegetation**

According to the results of the NatureMap search (DBCA, 2018a), a total of 295 flora taxa have been recorded within a 20km radius of the survey area. Dominant genera include *Eucalyptus*, *Acacia*, *Eremophila* and *Maireana*. Results of database searches identified five introduced taxa as potentially occurring within a 20km radius of the survey area:

1. *Carrichtera annua* (Ward's Weed)
2. *Lysimachia arvensis* (Pimpernel)
3. *Nicotiana glauca* (Tree Tobacco)
4. *Salvia reflexa* (Mintweed); and
5. *Sonchus oleraceus* (Common Sowthistle).

According to the DPIRD, none of these taxa are listed as a Declared Plant under the BAM Act.

The results of the literature review, combined search of the DBCA's Flora of Conservation Significance databases (DBCA, 2018b), NatureMap search and DotEE protected matters search recorded no Threatened Flora or Priority Flora within the survey area. Two Threatened Flora and seventeen Priority Flora were listed by on the databases as occurring within a 20km radius of the survey area (map of flora locations provided in Appendix 1). These taxa were assessed and ranked for their likelihood of occurrence within the survey area. The rankings and criteria used were:

- **Unlikely:** Area is outside of the currently documented distribution for the species/no suitable habitat (type, quality and extent) was identified as being present during the field/desktop study.
- **Possible:** Area is within the known distribution of the species in question and habitat of at least marginal quality was identified as being present during the field/desktop study, supported in some cases by recent records being documented from within or near the area.
- **Known to Occur:** The species in question was positively identified as being present during the field survey.

A total of nine Priority Flora taxa were ranked as 'possible' to occur within the survey area (Table 4-1) below. All remaining flora were ranked 'unlikely' to occur within the survey area.

**Table 4-1: Likelihood of occurrence for Threatened and Priority Flora within the survey area**

Taxon	EPBC Act	WC Act	DBCA Priority	Description (WAHERB, 2018)	Likelihood of Occurrence
<i>Allocasuarina eriochlamys</i> subsp. <i>grossa</i>			P3	Dioecious or monoecious shrub, 1-3 m high, bracteoles prominently exceeding cone. Stony loam, laterite clay. Granite outcrops.	Unlikely
<i>Austrostipa blackii</i>			P3	Tufted perennial, grass-like or herb, 1 m high. Fl. Sep to Nov.	Possible
<i>Austrostipa</i> sp. Carlingup Road (S. Kern & R. Jasper LCH 18459)			P1	No description available	Possible
<i>Calandrinia</i> sp. Widgiemooltha (F. Obbens & E. Reid FO 9/05)			P1	No description available	Possible
<i>Diocirea acutifolia</i>			P3	Low, dense, rounded shrub, 0.3-0.8 m high. Fl. white, Nov to Dec. Clay loam, gravelly loam. Undulating flats.	Possible
<i>Eremophila annosocaulis</i>			P3	No description available	Possible
<i>Eremophila perglandulosa</i>			P1	Low, spreading, viscid shrub, ca 0.25 m high. Fl. blue-purple, Jan.	Possible
<i>Gastrolobium graniticum</i>	T (EN)	T (EN)		Erect, open shrub, to 2.5 m high. Fl. yellow&orange&red, Aug to Sep. Sand, sandy loam, granite. Margins of rock outcrops, along drainage lines.	Unlikely
<i>Grevillea phillipsiana</i>			P1	Prickly shrub, 0.8-1.5 m high. Fl. red/red & orange, Jul to Sep. Red sand, stony loam. Granite hills.	Unlikely
<i>Phebalium clavatum</i>			P2	Upright shrub, 0.5-1.5 m high. Fl. white, Aug to Sep. Sandy soils. Sandplains.	Unlikely
<i>Philotheca apiculata</i>			P1	Erect shrub, 0.5-1.5 m high. Fl. white-pink, Aug to Nov. Stony clay loam. Rocky outcrops, hillsides.	Unlikely
<i>Pityrodia scabra</i> subsp. <i>dendrotricha</i>			P3	No description available	Possible
<i>Prostanthera splendens</i>			P1	Erect, openly branched shrub, 0.2-1 m high. Fl. blue-purple, Aug to Oct. Stony loam, shallow soils with ironstone pebbles. Breakaways	Unlikely
<i>Ptilotus rigidus</i>			P1	No description available	Possible
<i>Stylidium choreanthum</i>			P3	Creeping perennial, herb, 0.01-0.03 m high, to 0.3 m wide. Fl. pink/white, Sep to Nov. White/yellow or red sand. Plains	Unlikely
<i>Tecticornia flabelliformis</i>	T (VU)		P1	Erect shrub, to 0.2 m high. Clay. Saline flats.	Unlikely
<i>Tecticornia mellarium</i>			P1	No description available	Possible
<i>Trachymene pyrophila</i>			P2	Annual, herb, 0.1-0.5 m high, indumentum of patent glandular hairs. Fl. white, Nov to Dec or Jan to Mar. Yellow or orange sand. Sandplains; germinating after fire or other disturbances such as mining.	Unlikely

#### 4.1.2 Fauna

According to the results of the NatureMap search (DBCA, 2018a), a total of 100 vertebrate fauna taxa have been recorded within a 20km radius of the survey area including two amphibians, 43 bird species, 7 mammals and 33 reptiles. A total of 15 invertebrate species have also been recorded within a 20km radius of the survey area.

Combined results of database searches (DBCA 2018a and DotEE 2018) identified twelve introduced taxa as potentially occurring within the survey area, these being:

1. *Camelus dromedaries* (Camel)
2. *Canis lupus familiaris* (Dog)
3. *Capra hircus* (Goat)
4. *Columba livia* (Domestic Pigeon)
5. *Equus asinus* (Donkey)
6. *Equus caballus* (Horse)
7. *Felis catus* (Cat)
8. *Mus musculus* (House Mouse)
9. *Oryctolagus cuniculus* (Rabbit)
10. *Streptopelia chinensis* (Spotted Turtle-Dove)
11. *Streptopelia senegalensis* (Laughing Dove)
12. *Vulpes vulpes* (Red Fox)

Fauna of conservation significance identified during the literature review as previously being recorded in the general area were assessed and ranked for their likelihood of occurrence within the survey area itself (Table 4-2). The rankings and criteria used were:

- **Would Not Occur:** There is no suitable habitat for the species in the survey area and/or there is no documented record of the species in the general area since records have been kept and/or the species is generally accepted as being locally/regionally extinct (supported by a lack of recent records).
  - **Locally Extinct:** Populations no longer occur within a small part of the species natural range, in this case within 10 or 20 km of the survey area. Populations do however persist outside of this area.
  - **Regionally Extinct:** Populations no longer occur in a large part of the species natural range, in this case within the southern and south-western goldfields region. Populations do however persist outside of this area.
- **Unlikely to Occur:** The survey area is outside of the currently documented distribution for the species in question, or no suitable habitat (type, quality and extent) was identified as being present during the field assessment. Individuals of some species may occur occasionally as vagrants/transients especially if suitable habitat is located nearby but the site itself would not support a population or part population of the species
- **Possibly Occurs:** Survey area is within the known distribution of the species in question and habitat of at least marginal quality was identified as likely to be present during the field survey and literature review, supported in some cases by recent records being documented in literature from within or near the survey area. In some cases, while a species may be classified as possibly being present at times, habitat may be marginal

(e.g. poor quality, fragmented, limited in extent) and therefore the frequency of occurrence and/or population levels may be low.

- **Known to Occur:** The species in question has been positively identified as being present (for sedentary species) or as using the survey area as habitat for some other purpose (for non-sedentary/mobile species) during field surveys within or near the survey area. This information may have been obtained by direct observation of individuals or by way of secondary evidence (e.g. tracks, foraging debris, scats). In some cases, while a species may be classified as known to occur, habitat may be marginal (e.g. poor quality, fragmented, limited in extent) and therefore the frequency of occurrence and/or population levels may be low.



**Table 4-2: Likelihood of Occurrence – Fauna Species of Conservation Significance**

Taxon	Conservation Status			Habitat Description	Likelihood of Occurrence
	EPBC Act	WC Act	DBCA Priority		
Various Migratory Shorebirds	Various			Generally, occur around inland waters, both salt and fresh waters (DotEE 2018)	Would not occur. No Suitable Habitat.
Fork-tailed Swift <i>Apus pacificus</i>	Mig	S5	-	Low to very high airspace over varied habitat from rainforest to semi desert.	Unlikely to occur. Very occasional transients only.
Grey Wagtail <i>Motacilla cinerea</i>	Mig	S5	-	Running water in disused quarries, sandy, rocky streams in escarpments and rainforest, sewerage ponds, ploughed fields and airfields (Morecombe 2004)	Would not occur. No Suitable Habitat.
Malleefowl <i>Leipoa ocellata</i>	VU	S3	-	Scrublands and woodlands dominated by mallee and wattle species (DotEE 2018)	Unlikely to occur. Habitat appears marginal/unsuitable. No recent nearby records and no evidence seen during field survey. Occasional transients only. Would not breed within the survey area.
Night Parrot <i>Pezoporus occidentalis</i>	EN	S1	-	Found in arid and semi arid zones of Australia (DotEE 2018)	Would not occur. No Suitable Habitat. Never Recorded in this area of Goldfields.
Peregrine Falcon <i>Falco peregrinus</i>	-	S7	-	Diverse from rainforest to arid shrublands, from coastal heath to alpine (Morcombe 2004).	Possibly occurs but only rarely.
Chuditch <i>Dasyurus geoffroii</i>	VU	S3	-	Occurring in a variety of habitats including deserts, woodlands and shrublands (DotEE 2018)	Would not occur. No recent records nearby and very likely to be locally extinct.
Central Long-eared Bat <i>Nyctophilus major tor</i>	-	-	P4	Heavy eucalypt woodlands and tall woodlands with a tall shrub understorey. Less common in open woodlands. Roosts in tree cavities, in foliage and under loose bark (Churchill 2008)	Possibly occurs though lack of records suggests it is uncommon.

It should be noted that while habitats onsite for one or more of the species listed above are considered possibly suitable, some or all may be marginal in extent/quality and therefore the fauna species considered as possibly occurring may in fact only visit the area for short periods as infrequent vagrants.

A number of other species of conservation significance, while possibly present in the general area and/or the Goldfields region are not listed as potential species due to the survey area being outside of their currently recognised range, a lack of suitable habitat or known/very likely local or regional extinction (and no subsequent recruitment from adjoining areas).

## 4.2 Field Assessment

### 4.2.1 Vegetation Types

One broad vegetation type was identified within the survey area (Table 4-3) which was represented by a total of 9 Families, 16 Genera and 22 taxa as listed in Appendix 2. A map showing the vegetation type present in the survey area is provided in Figure 4-1.

**Table 4-3: Summary of vegetation types within the survey area**

Landform	Major Vegetation Group	Vegetation Code	Vegetation Type	Area (ha)	Area (%)
Clay-Loam Plain	Eucalypt Woodlands (MVG 5)	CLP-EW1	Low woodland of <i>Eucalyptus salubris</i> over tall open shrubland of <i>Melaleuca sheathiana</i> and low shrubland of <i>Atriplex vesicaria</i> / <i>Cratystylis conocephala</i> in clay-loam plain	1.8	100
Total				1.8	100

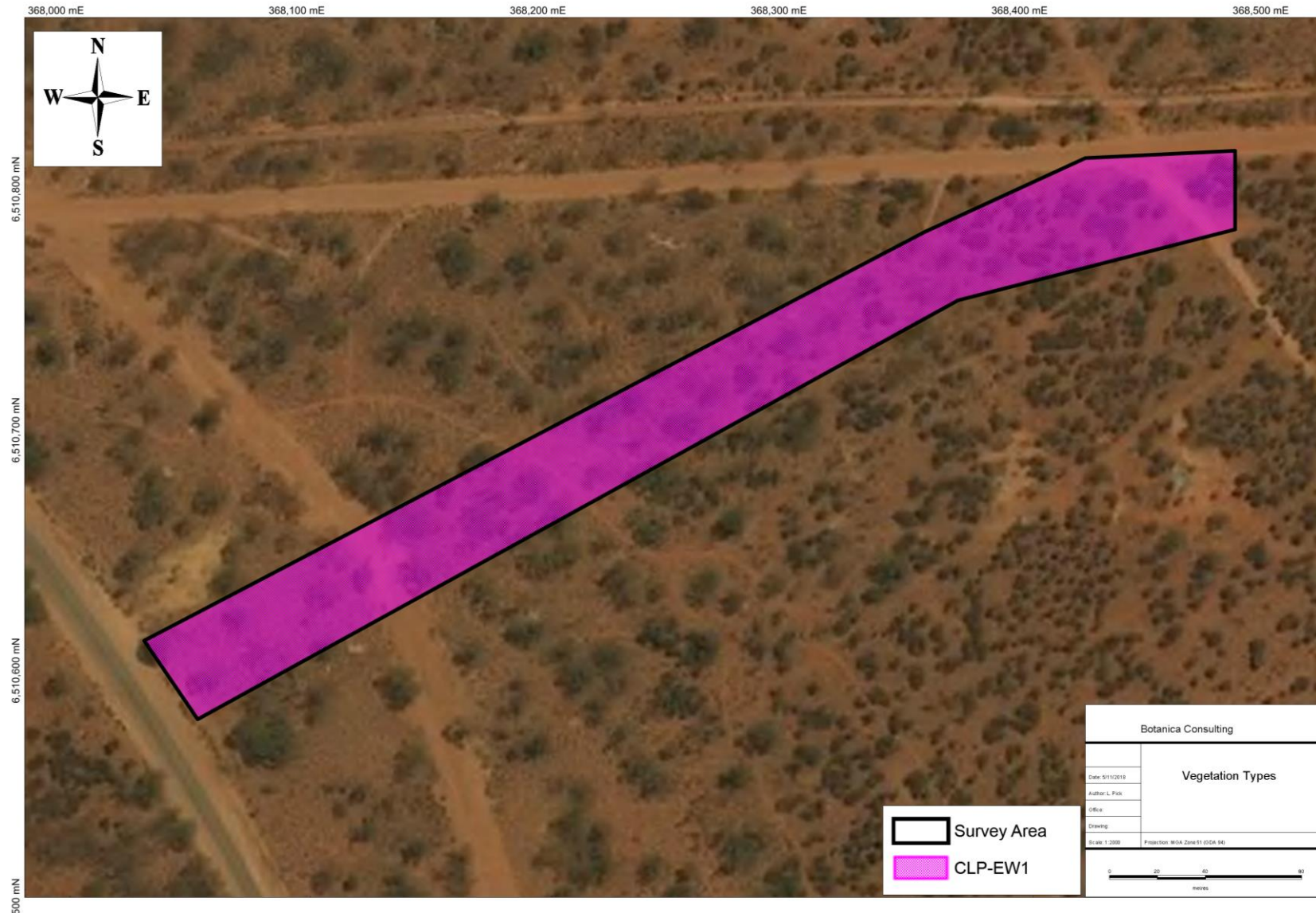


Figure 4-1: Vegetation types within the survey area



## **Clay-Loam Plain: Eucalypt Woodlands**

### **4.2.1.1 Low woodland of *Eucalyptus salubris* over tall open shrubland of *Melaleuca sheathiana* and low shrubland of *Atriplex vesicaria*/ *Cratystylis conocephala* in clay-loam plain (CLP-EW1)**

The total flora recorded within this vegetation type was represented by a total of 9 Families, 16 Genera and 22 Taxa (Plate 4-1). Dominant taxa are shown in Table 4-4. According to the NVIS, this vegetation type is best represented by the MVG 5 -Eucalyptus Woodland (DotEE, 2017b).

**Table 4-4: Low woodland of *Eucalyptus salubris* over tall open shrubland of *Melaleuca sheathiana* and low shrubland of *Atriplex vesicaria*/ *Cratystylis conocephala* in clay-loam plain**

Life Form/Height Class	Canopy Cover	Dominant taxa present
Tree >10m	10-30%	<i>Eucalyptus salubris</i>
Shrub >2m	10-30%	<i>Melaleuca sheathiana</i>
Shrub <1m	10-30%	<i>Atriplex vesicaria</i> <i>Cratystylis conocephala</i>



**Plate 4-1: Low woodland of *Eucalyptus salubris* over tall open shrubland of *Melaleuca sheathiana* and low shrubland of *Atriplex vesicaria*/ *Cratystylis conocephala* in clay-loam plain**

#### 4.2.2 Vegetation Condition

Based on the vegetation condition rating scale adapted from Keighery, 1994 and Trudgen, 1988 (Appendix 3), the vegetation was 'very good'. 'Very Good' condition depicts that vegetation structure has been altered by obvious signs of disturbance, caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing.


#### 4.2.3 Introduced Plant Species

No introduced taxa were identified during the field assessment.

#### 4.2.4 Fauna Habitat

The broad scale terrestrial fauna habitat within the survey presented below are based on vegetation and associated landforms identified during the flora and vegetation survey. The extent of the identified fauna habitats and a summary description is provided in Table 4-5 below.

**Table 4-5: Main Terrestrial Fauna Habitats within the Survey Area**

Code	Fauna Habitat Description	Example Image
CLP- EW1/EW2	<u>Clay Loam Plain</u> Eucalypt Woodland Total Area = 1.8 ha (100%)	

Based on the habitats present within the survey area, a list of expected vertebrate fauna species likely to occur in the survey area was compiled from information obtained during the literature review and is presented in Appendix 4. The results of some previous fauna surveys carried out in the general area are also summarised in this species listing as are the DBCA NatureMap database search results.

Not all species listed in existing databases and publications as potentially occurring within the region (i.e. EPBC Act's Threatened Fauna and Migratory species lists, DBCA's NatureMap database and various publications) are considered likely to be present within the survey area. The list of potential fauna takes into consideration that firstly the species in question is not known to be locally/regionally extinct and secondly that suitable habitat for each species, as identified during the habitat assessment, is present within the survey area, though compiling an accurate list has limitations (see Section 3.3).



Despite the omission of some species it should be noted that the list provided is still very likely an over estimation of the fauna species utilising the survey area (either on a regular or infrequent basis) as a result of the precautionary approach adopted for the assessment. At any one time, only a subset of the listed potential species is likely to be present within the bounds of the survey area.

Table 4-6 summarises the numbers of potential species based on vertebrate class considered likely to be present in the general vicinity of the survey area based on the complete list held Appendix 4.

**Table 4-6: Summary of Potential Vertebrate Fauna Species**

Group	Total number of potential species	Potential number of specially protected species	Potential number of migratory species	Potential number of priority species
Amphibians	5	0	0	0
Reptiles	79	0	0	0
Birds	109	2	1	0
Non-Volant Mammals	22 <sup>7</sup>	0	0	0
Volant Mammals (Bats)	9	0	0	0
<b>Total</b>	<b>224<sup>7</sup></b>	<b>2</b>	<b>1</b>	<b>0</b>

Superscript = number of introduced species included in the total. Note: Where a species state and federal conservation status is different, the highest category is used.

#### 4.2.5 Significant Flora

According to the EPA *Environmental Factor Guideline for Flora and Vegetation* (EPA, 2016b) significant flora includes:

- flora being identified as threatened or priority species
- locally endemic flora or flora associated with a restricted habitat type (e.g. surface water or groundwater dependent ecosystems)
- new species or anomalous features that indicate a potential new species
- flora representative of the range of a species (particularly, at the extremes of range, recently discovered range extensions, or isolated outliers of the main range)
- unusual species, including restricted subspecies, varieties or naturally occurring hybrids
- flora with relictual status, being representative of taxonomic groups that no longer occur widely in the broader landscape.

No significant flora were identified within the survey area. A map showing regional Threatened and Priority Flora known records in relation to the survey area is provided in Appendix 1.

#### 4.2.6 Significant Fauna

According to the EPA *Environmental Factor Guideline for Terrestrial Fauna* (EPA, 2016d) significant fauna includes:

- Fauna being identified as a threatened or priority species
- Fauna species with restricted distribution
- Fauna subject to a high degree of historical impact from threatening processes
- Fauna providing an important function required to maintain the ecological integrity of a significant ecosystem.

No significant fauna were confirmed as occurring within the survey area.

#### 4.2.7 Significant Vegetation

According to the EPA *Environmental Factor Guideline for Flora and Vegetation* (EPA, 2016b) significant vegetation includes:

- vegetation being identified as threatened or priority ecological communities
- vegetation with restricted distribution
- vegetation subject to a high degree of historical impact from threatening processes
- vegetation which provides a role as a refuge
- vegetation providing an important function required to maintain ecological integrity of a significant ecosystem.

No significant vegetation was identified within the survey area.

#### 4.3 Matters of National Environmental Significance

None of the following matters of national environmental significance as defined by the Commonwealth EPBC Act were identified within the survey area:

- world heritage properties
- national heritage places
- wetlands of international importance (often called 'Ramsar' wetlands after the international treaty under which such wetlands are listed)
- nationally threatened species and ecological communities
- Commonwealth marine areas
- the Great Barrier Reef Marine Park
- nuclear actions (including uranium mining) a water resource, in relation to coal seam gas development and large coal mining development.

#### 4.4 Matters of State Environmental Significance

There are no wetlands of national importance (ANCA Wetlands) or conservation category wetlands within the survey area. The survey area does not contain any TEC as listed under the WC Act or EP Act. No Threatened Flora taxon listed under the WC Act were recorded within the survey area. The survey area is not located within DBCCA managed land and does not contain any ESA as listed under the EP Act. Approximately 0.4ha of the western portion of the survey area is located within a Schedule 1 Area listed under the EP Act (associated with the Coolgardie-Esperance Highway road reserve).

A map showing areas of conservation significance in relation to the survey area is provided in Appendix 1.



#### 4.5 Native Vegetation Clearing Principles

Based on the outcomes from the survey undertaken, as presented in this report, Botanica provides the following comments regarding the native vegetation clearing principles listed under Schedule 5 of the EP Act (Table 4-7).

**Table 4-7: Assessment of development within the survey area against native vegetation clearing principles**

Letter	Principle	Assessment	Outcome
(a)	Native vegetation should not be cleared if it comprises a high level of biological diversity.	Vegetation identified within the survey area is not considered to be of high biological diversity and is well represented outside of the proposed impact area.	Development within the survey area is unlikely to be at variance to this principle
(b)	Native vegetation should not be cleared if it comprises the whole or part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to WA.	No significant fauna habitat identified within the project area. Fauna habitats are well represented outside of the project area. No significant fauna were observed within the survey area.	Development within the survey area is unlikely to be at variance to this principle
(c)	Native vegetation should not be cleared if it includes or is necessary for the continued existence of rare flora.	No Threatened Flora taxa, pursuant to the WC Act and the EPBC Act were identified within the survey area.	Development within the survey area is unlikely to be at variance to this principle
(d)	Native vegetation should not be cleared if it comprises the whole or part of or is necessary for the maintenance of a threatened ecological community (TEC).	No TEC listed under the EPBC Act or by the WC Act occur within the survey area.	Development within the survey area is unlikely to be at variance to this principle
(e)	Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared.	According to DAFWA (2011), the survey area occurs in pre-European Beard vegetation associations Binneringe 9 and 936, both of which retains approximately >98% of the original vegetation extent.	Development within the survey area is unlikely to be at variance to this principle
(f)	Native vegetation should not be cleared if it is growing, in, or in association with, an environment associated with a watercourse or wetland.	According to the Geoscience Australia database (2001), there are no drainage lines or inland waters within the survey area. No riparian vegetation was identified within the survey area.	Development within the survey area is unlikely to be at variance to this principle
(g)	Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.	According to DAFWA (2011), the survey area occurs in pre-European Beard vegetation associations Binneringe 9 and 936, both of which retains approximately >98% of the original vegetation extent. Clearing within these vegetation associations is not likely to lead to land degradation issues such as salinity, water logging or acidic soils.	Development within the survey area is unlikely to be at variance to this principle
(h)	Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any	The survey area is located within or in close proximity to any conservation areas.	Development within the survey area is unlikely to be at variance to this principle

Letter	Principle	Assessment	Outcome
	adjacent or nearby conservation area.		
(i)	Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water.	According to the Geoscience Australia database (2001), there are no drainage lines or inland waters within the survey area. No riparian vegetation was identified within the survey area. The survey area is located in an arid to semi-arid environment with most rainfall lost by evaporation or surface runoff. Only a small portion infiltrates the soil and recharges the groundwater.	Development within the survey area is unlikely to be at variance to this principle
(j)	Native vegetation should not be cleared if clearing the vegetation is likely to cause, or exacerbate, the incidence of flooding	Rainfall is unreliable and highly variable with an average rainfall of 200-300mm and an evaporation rate of 2400 mm. The region is not prone to flooding and does not contain riparian vegetation.	Development within the survey area is unlikely to be at variance to this principle

## 5 **Summary**

One vegetation type/ fauna habitat was identified within the survey area., which was represented by a total of 9 Families, 16 Genera and 22 taxa.

Results of the literature review identified 31 mammals (including 9 bat species), 109 birds, 79 reptiles and five frog species as having been previously recorded in the general area, some of which have the potential to occur within the survey area.

No Threatened Flora, Threatened Fauna, Migratory Fauna or TEC as listed under the WC Act or Commonwealth EPBC Act 1999 were identified within the survey area. No Priority Fauna, Flora or PEC were recorded within the survey area. No significant flora, vegetation or fauna were identified within the survey area.

A review of the EPBC Act threatened fauna list, DBCA's Threatened Fauna Database and Priority List, unpublished reports and scientific publications identified a small number of specially protected, migratory or priority fauna species as having been previously recorded or as being potentially present in the general vicinity of the survey area. Despite this it is considered unlikely that any fauna species of conservation significance will be significantly impacted on by the proposed development. This conclusion is primarily based on the lack of suitable habitats, the known local extinction of some species and the extensive habitat connectivity with adjoining areas. Impacts on fauna and fauna habitat are therefore anticipated to be localised, small/negligible and as a consequence manageable.

The survey area does not contain any world or national heritage places and does not occur within a Bush Forever site. There are no wetlands of international importance (Ramsar Wetlands), national importance (ANCA Wetlands) or conservation category wetlands within the survey area. The survey area is not located within DBCA Managed Land and does not contain any ESA listed under the EP Act. Approximately 0.4ha of the far western portion of the survey area is located within a Schedule 1 Area (listed under the EP Act) associated with the Coolgardie-Esperance Highway (road reserve).

## 6 **Bibliography**

ATA Environmental (2006a), Vertebrate Fauna Assessment, St. Ives Gold Mine. Unpublished Report commissioned by Jim's Seeds, Weeds and Trees Pty Ltd.

ATA Environmental (2006b), Fauna Assessment, St. Ives Caves Rock Satellite Pit, Waste Dump and Haul Road. Unpublished Report commissioned by Jim's Seeds, Weeds and Trees Pty Ltd.

Bamford Consulting Ecologists (2010), Fauna Assessment: impacts of water discharge and general mining activity on vertebrate fauna. Unpublished report for Goldfields - St Ives Gold Mine, Kambalda.

BC, (2007a), Flora and Vegetation Survey of the Proposed Leviathan Haul Road. Prepared for St Ives Gold Mine.

BC, (2007b), Flora and Vegetation Survey of the Proposed Tailings Storage Facility. Prepared for St Ives Gold Mine.

BC, (2008) Flora and Vegetation Survey of the St. Ives Gold Mine AAA Project. Prepared for St Ives Gold Mine.

BC, (2010), Level 2 Flora survey of Diana, West Idough and Bellerophon Projects. Prepared for St Ives Gold Mine.

BC, (2011a), Level 1 Flora & Vegetation Survey of Cave Rocks Proposed Pipeline. Prepared for St Ives Gold Mine.

BC, (2011b), Level 1 Flora & Vegetation Survey of Proposed Workshop area. Prepared for St Ives Gold Mine.

BC, (2011c), Level 1 Flora & Vegetation Survey Thunderer Project. Prepared for St Ives Gold Mine.

BC, (2011d), Level 1 Flora survey of proposed 66kv Powerline Extension Athena. Prepared for St Ives Gold Mine.

BC, (2011e), Level 2 Flora & Vegetation Survey of Cave Rocks. Prepared for St Ives Gold Mine.

BC, (2012a), Level 1 Flora & Vegetation Survey within the Mining Tenements of St Ives Gold Mine. Prepared for St Ives Gold Mine.

BC (2017), Flora and Fauna Assessment Widgiemooltha Project. Prepared for Mincor Resources NL.

Beard, J.S., (1990), *Plant Life of Western Australia*, Kangaroo Press Pty Ltd, NSW.

BoM, (2018), Kambalda West and Coolgardie weather station Climate Data, Bureau of Meteorology.

Available: <http://www.bom.gov.au/climate>

Accessed: 5<sup>th</sup> November 2018

Chapman, A., Kealley, I., McMillan, D., McMillan, P. and Rolland, G. (1991), Biological Surveys of Four Goldfields Reserves. Landnote 1/91 Department of Conservation and Land Management.

Cowan, (2001), *A Biodiversity Audit of Western Australia's 53 Biogeographical Region in 2001- Coolgardie Region (COO3-Eastern Goldfields)*, Department of Conservation and Land Management.

DAFWA (2011), *Pre-European Vegetation - Western Australia (NVIS Compliant Version GIS file)*, Department of Agriculture and Food Western Australia

DAFWA (2014), *Soil Landscape System of Western Australia*, Department of Agriculture and Food Western Australia

DBCA (2016a), *Threatened Flora Database search results*, Department of Biodiversity, Conservation and Attractions. Results obtained March 2016.

DBCA (2016b), *Threatened Flora Database search results*, Department of Biodiversity, Conservation and Attractions. Results obtained March 2016.

DBCA (2017). *2017 Statewide Vegetation Statistics*. Department of Biodiversity, Conservation and Attractions

DBCA (2018a), *Nature Map Database search*, Department of Biodiversity, Conservation and Attractions

Available: <https://naturemap.dpaw.wa.gov.au/>

Accessed: 1<sup>st</sup> September 2018

DotEE, (2012), *Interim Biogeographic Regionalisation for Australia (IBRA), Version 7*, Department of the Environment and Energy.

DotEE (2015b), *National Vegetation Information System (NVIS) Version 7*, Department of the Environment and Energy

DotEE (2018a), *Protected Matters Search Tool, Environment Protection and Biodiversity Conservation Act 1999*, Department of the Environment and Energy

Available: <http://www.environment.gov.au/epbc/protected-matters-search-tool>

Accessed: 1<sup>st</sup> September 2018

DotEE (2018b) *Species Profiles and Threats Database*, Department of Environment and Energy

Available: <http://www.environment.gov.au/sprat>

Accessed: 12<sup>th</sup> October 2018

DPIRD (2018), *Declared Organism-database search*, Department of Primary Industries and Regional Development, Western Australia

Available: <https://www.agric.wa.gov.au/bam/western-australian-organism-list-waol>

Accessed: 22<sup>nd</sup> October 2018

E.M. Mattiske and Associates, (1996), *Kambalda Nickel Operations Western Mining Corporation Flora and Vegetation Studies*. Prepared for Western Mining Corporation.

EPA, (2016a), *Technical Guidance - Flora and Vegetation Surveys for Environmental Impact Assessment – December 2016*. Environmental Protection Authority

EPA, (2016b), *Technical Guidance - Terrestrial Fauna Surveys for Environmental Impact Assessment – December 2016*. Environmental Protection Authority

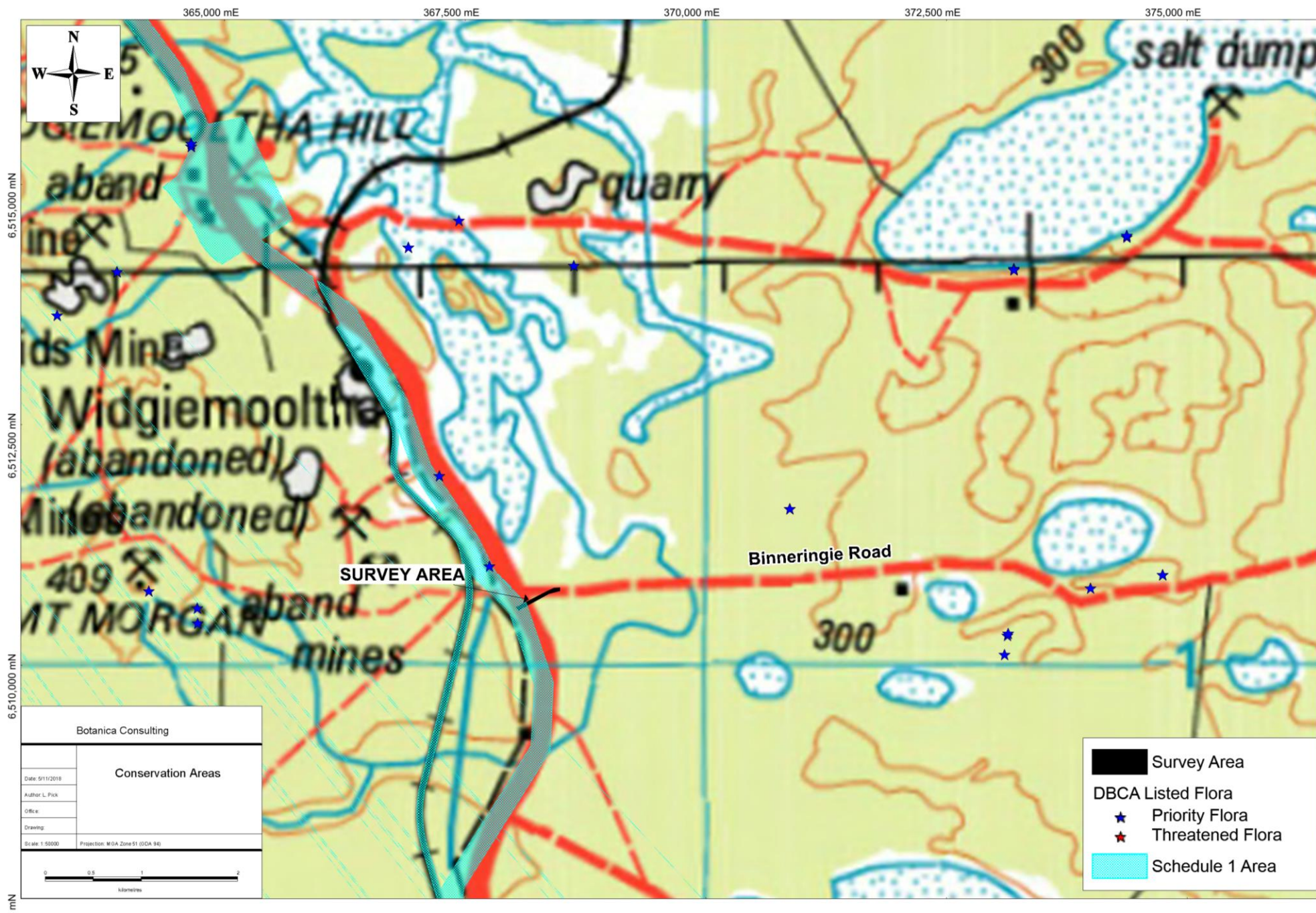
Etten, E.V, (2010), *Flora & Vegetation of St Ives Gold Mine's Newly Acquired Southern (Heron) Leases South-East of Kambalda, Western Australia*. Prepared for St Ives Gold Mine.

Government of Western Australia (2018), *Wildlife Conservation Act 1950*. Wildlife Conservation (Rare Flora and Fauna) Notice 2017. Government Gazette, WA. 16 January 2018.

- Halpern Glick Maunsell, (1997), *Barwidgee Pastoral Lease Mulgara Dasycercus cristicauda Survey*. Unpublished report prepared for Great Central Mines, November 1997.
- Halpern, Glick, Maunsell (1998), Lake Lefroy Environmental Assessment. Report ES4490C. Unpublished Report to WMC Resources Ltd.
- Hart, R.P. and Kitchener, D.J., (1986), *First Record of Sminthopsis psammophila (Marsupialia: Dasyuridae) from Western Australia*. Records of the Western Australian Museum 13(1): 139-144.
- How, R.A. et al. (1988), The biological survey of the eastern goldfields of Western Australia. Part 4. Lake Johnston-Hyden Study Area. Records of the WAM, supplement No. 30.
- KLA (2007), St. Ives Gold Mining Company. Northern Tailings Storage Facility (No. 4). Spring Fauna Survey. Unpublished report for St Ives Gold Mining Company.
- KLA (2008), Australian Nickel Mines. Widgiemooltha Project. Fauna Survey. Unpublished report for Botanica Consulting.
- Mattiske Consulting, (2003), Flora and Vegetation Survey St Ives Gold Mine Kambalda. Prepared for St Ives Gold Mine.
- Mattiske Consulting (2007), Flora and Vegetation of the Widgiemooltha Town Site. Prepared for Australian Nickel Mines NL.
- McKenzie, N.L May, J.E & McKenna, S (2002), *Bioregional summary of the 2002 Biodiversity Audit for Western Australia*. Department of Conservation and Land Management.
- Meissner, R.A & Coppen, R, (2009-2012), Flora and Vegetation of Greenstone Ranges of the Yilgarn Craton: Kangaroo Hills and other Timber Reserves. Science Division Department of Environment and Conservation.
- Natural Heritage Trust (2007). National manual for the malleefowl monitoring system. Standards, protocols and monitoring procedures.
- Ninox Wildlife Consulting (2004), St Ives Gold Delta Island Vertebrate Fauna Assessment. Unpublished Report Commissioned by St Ives Gold Mining Company Pty.
- NHT, Natural Heritage Trust (2007), *National manual for the malleefowl monitoring system*. Standards, protocols and monitoring procedures.
- Orell, P. And Morris, K. (1994), *Chuditch Recovery Plan 1992-2001*, Department of Conservation and Land Management, Como.
- Shepherd, D. P., Beeston, G. R. and Hopkins, A. J. M. (2002) *Native Vegetation in Western Australia. Extent, Type and Status*, Department of Agriculture, Western Australia
- Tille, P. (2006), *Soil Landscapes of Western Australia's Rangelands and Arid Interior*, Department of Agriculture and Food Western Australia
- WAHERB, (2018), *Florabase – Information on the Western Australian Flora*, Department of Biodiversity, Conservation and Attractions.  
Available: <https://florabase.dpaw.wa.gov.au/>  
Accessed 5<sup>th</sup> November 2018
- Western Wildlife (2006), St. Ives Gold Fauna Survey; Spring 2005. Unpublished Report commissioned by Jim's Seeds, Weeds and Trees Pty. Ltd.



# Appendix 1: Regional map of conservation areas





## Appendix 2: Species List

Family	Genus	Taxon	CLP-EW1
Asteraceae	<i>Cratystylis</i>	<i>conocephala</i>	*
Asteraceae	<i>Olearia</i>	<i>mulleri</i>	*
Chenopodiaceae	<i>Atriplex</i>	<i>stipitata</i>	*
Chenopodiaceae	<i>Atriplex</i>	<i>vesicaria</i>	*
Chenopodiaceae	<i>Maireana</i>	<i>georgei</i>	*
Chenopodiaceae	<i>Maireana</i>	<i>sedifolia</i>	*
Chenopodiaceae	<i>Maireana</i>	<i>trichoptera</i>	*
Chenopodiaceae	<i>Maireana</i>	<i>triptera</i>	*
Chenopodiaceae	<i>Sclerolaena</i>	<i>diacantha</i>	*
Chenopodiaceae	<i>Tecticornia</i>	<i>disarticulata</i>	*
Fabaceae	<i>Acacia</i>	<i>colletoides</i>	*
Frankeniaceae	<i>Frankenia</i>	<i>setosa</i>	*
Goodeniaceae	<i>Scaevola</i>	<i>spinescens</i>	*
Myrtaceae	<i>Eucalyptus</i>	<i>celestrioides</i>	*
Myrtaceae	<i>Eucalyptus</i>	<i>lesouefii</i>	*
Myrtaceae	<i>Eucalyptus</i>	<i>salubris</i>	*
Myrtaceae	<i>Melaleuca</i>	<i>sheathiana</i>	*
Santalaceae	<i>Exocarpos</i>	<i>aphylus</i>	*
Santalaceae	<i>Santalum</i>	<i>spicatum</i>	*
Scrophulariaceae	<i>Eremophila</i>	<i>scoparia</i>	*
Solanaceae	<i>Lycium</i>	<i>australis</i>	*
Solanaceae	<i>Solanum</i>	<i>nummularium</i>	*

### Appendix 3: Vegetation Condition Rating

Vegetation Condition Rating	South West and Interzone Botanical Provinces	Eremaean and Northern Botanical Provinces
Pristine	Pristine or nearly so, no obvious signs of disturbance or damage caused by human activities since European settlement.	
Excellent	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species. Damage to trees caused by fire, the presence of non-aggressive weeds and occasional vehicle tracks.	Pristine or nearly so, no obvious signs of damage caused by human activities since European settlement.
Very Good	Vegetation structure altered, obvious signs of disturbance. Disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing.	Some relatively slight signs of damage caused by human activities since European settlement. For example, some signs of damage to tree trunks caused by repeated fire, the presence of some relatively non-aggressive weeds, or occasional vehicle tracks.
Good	Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate it. Disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing.	More obvious signs of damage caused by human activity since European settlement, including some obvious impact on the vegetation structure such as that caused by low levels of grazing or slightly aggressive weeds.
Poor		Still retains basic vegetation structure or ability to regenerate it after very obvious impacts of human activities since European settlement, such as grazing, partial clearing, frequent fires or aggressive weeds.
Degraded	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. Disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds at high density, partial clearing, dieback and grazing.	Severely impacted by grazing, very frequent fires, clearing or a combination of these activities. Scope for some regeneration but not to a state approaching good condition without intensive management. Usually with a number of weed species present including very aggressive species.
Completely Degraded	The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These areas are often described as 'parkland cleared' with the flora comprising weed or crop species with isolated native trees and shrubs.	Areas that are completely or almost completely without native species in the structure of their vegetation; i.e. areas that are cleared or 'parkland cleared' with their flora comprising weed or crop species with isolated native trees or shrubs.

#### Appendix 4: Potential Fauna Species List

# Fauna Potentially in Region of Survey Area

## Binneringie Road Realignment

Approximate centroid - 31.53111°S and 121.61278°E

Compiled by Greg Harewood - November 2018

Recorded (Sighted/Heard/Signs) = X

A = Botanica (2016). Biological Assessment Spargoville Material Pit Extension. Unpublished report for MRWA.

B = Chapman et al (1991). Biological Surveys of Four Goldfields Reserves. Landnote 1/91 Department of Conservation and Land Management.

C = McKenzie, N.L. and Hall, N.J. (1992). The Biological Survey of the Eastern Goldfields of WA - Pt 8: Kurnalpi – Kalgoorlie study area. Records of the WAM, Supplement 41: 1 – 125.

D = Ninox Wildlife Consulting (2004). St Ives Gold Delta Island Vertebrate Fauna Assessment. Unpublished Report Commissioned by St Ives Gold Mining Company Pty Ltd.

E = Western Wildlife (2006). St. Ives Gold Fauna Survey; Spring 2005. Unpublished Report commissioned by Jim's Seeds, Weeds and Trees Pty. Ltd.

F = ATA Environmental (June 2006). Vertebrate Fauna Assessment, St. Ives Gold Mine. Unpublished Report commissioned by Jim's Seeds, Weeds and Trees Pty Ltd.

G = Halpern, Glick, Maunsell (1998). Lake Lefroy Environmental Assessment. Report ES4490C. Unpublished Report to WMC Resources Ltd.

H = KLA (2007). St. Ives Gold Mining Company. Northern Tailings Storage Facility (No. 4). Spring Fauna Survey. Unpublished report for St Ives Gold Mining Company.

I = Bamford Consulting Ecologists (2010). St. Ives Gold Mine Kambalda. Fauna Assessment. Unpublished report for St Ives Gold Mining Company.

J = DBCA (2018). NatureMap Database search. "By Circle"121° 36' 46" E, 31° 31' 52" S (plus 20km buffer). 5 November 2018.

Class Family Species	Common Name	Conservation Status	A	B	C	D	E	F	G	H	I	J
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## Amphibia

### Myobatrachidae

Ground or Burrowing Frogs

<i>Neobatrachus kunapalari</i>	Kunapalari Frog	LC				X			X		X	X
<i>Neobatrachus pelobatoides</i>	Humming Frog	LC				X			X			
<i>Neobatrachus sutor</i>	Shoemaker Frog	LC			X	X			X			
<i>Neobatrachus wilsmorei</i>	Plonking Frog	LC			X							
<i>Pseudophryne occidentalis</i>	Western Toadlet	LC		X	X	X	X	X	X		X	X

Class Family Species	Common Name	Conservation Status	A	B	C	D	E	F	G	H	I	J
<b>Reptilia</b>												
<b>Carphodactylidae</b> Knob-tailed Geckos												
<i>Nephurus laevis</i>	Smooth Knob-tail					X	X	X	X		X	X
<b>Diplodactylidae</b> Geckoes												
<i>Crenadactylus ocellatus</i>	Clawless Gecko					X	X	X				X
<i>Diplodactylus conspicillatus</i>	Fat-tailed Gecko											
<i>Diplodactylus granariensis rex</i>	Western Stone Gecko			X	X	X	X	X				
<i>Diplodactylus pulcher</i>	Western Saddled Ground Gecko			X	X	X	X	X				X
<i>Lucasium maini</i>	Mains Ground Gecko			X	X	X	X	X	X	X		X
<i>Oedura reticulata</i>	Reticulated Velvet Gecko				X	X	X	X				
<i>Rhynchoedura ornata</i>	Beaked Gecko				X							
<i>Strophurus assimilis</i>	Goldfields Spiny-tailed Gecko			X			X	X		X	X	X
<i>Strophurus elderi</i>	Jewelled Gecko				X		X	X			X	X
<i>Strophurus strophurus</i>	Ring-tailed Gecko											

Class Family Species	Common Name	Conservation Status	A	B	C	D	E	F	G	H	I	J
<b>Gekkonidae</b> Geckoes												
<i>Christinus marmoratus</i>	Marbled Gecko						X					X
<i>Gehyra purpurascens</i>	Purple Arid Dtella					X				X	X	X
<i>Gehyra variegata</i>	Variegated Dtella			X	X	X	X	X	X	X	X	X
<i>Heteronotia binoei</i>	Bynoe's Gecko			X	X	X	X	X	X	X	X	X
<i>Nephhrurus milii</i>	Barking Gecko			X	X	X	X	X			X	
<b>Pygopodidae</b> Legless Lizards												
<i>Delma australis</i>	Marble-faced Delma				X		X	X			X	X
<i>Delma butleri</i>	Unbanded Delma					X	X	X	X			X
<i>Delma fraseri</i>	Fraser's Legless Lizard					X	X	X				X
<i>Lialis burtonis</i>	Burton's Legless Lizard				X	X	X	X			X	X
<i>Pygopus lepidopodus</i>	Common Scaly Foot					X	X	X				X
<i>Pygopus nigriceps</i>	Hooded Scaly Foot											



Class Family Species	Common Name	Conservation Status	A	B	C	D	E	F	G	H	I	J
<b>Agamidae</b> Dragon Lizards												
<i>Caimanops amphiboluroides</i>	Mulga Dragon				X							
<i>Ctenophorus cristatus</i>	Bicycle Dragon			X	X	X	X	X		X	X	X
<i>Ctenophorus fordi</i>	Mallee Sand Dragon			X	X	X	X	X	X		X	X
<i>Ctenophorus isolepis</i>	Crested Dragon								X			
<i>Ctenophorus maculatus</i>	Spotted Military Dragon											
<i>Ctenophorus nuchalis</i>	Central Netted Dragon											
<i>Ctenophorus ornatus</i>	Ornate Crevice Dragon			X						X		X
<i>Ctenophorus reticulatus</i>	Western Netted Dragon				X	X						X
<i>Ctenophorus salinarum</i>	Salt Pan Dragon					X	X	X	X	X	X	X
<i>Ctenophorus scutulatus</i>	Lozenge-marked Bicycle Dragon			X	X		X	X			X	X
<i>Moloch horridus</i>	Thorny Devil			X	X	X		X			X	X
<i>Pogona minor</i>	Western Bearded Dragon			X	X	X	X	X	X	X	X	X
<i>Tympanocryptis cephalus</i>	Pebble Dragon					X		X				X

Class Family <i>Species</i>	Common Name	Conservation Status	A	B	C	D	E	F	G	H	I	J
Varanidae Monitor's or Goanna's												
<i>Varanus caudolineatus</i>	Stripe-tailed Pygmy Monitor				X							
<i>Varanus gouldii</i>	Bungarra or Sand Monitor			X	X	X	X	X	X	X	X	X
<i>Varanus tristis</i>	Racehorse Monitor			X				X				X

Class Family Species	Common Name	Conservation Status	A	B	C	D	E	F	G	H	I	J
<b>Scincidae</b> Skinks												
<i>Cryptoblepharus buchananii</i>	Buchanan's Snake-eyed Skink			X	X	X	X	X	X			X
<i>Ctenotus atlas</i>	Southern Malle Ctenotus				X	X	X	X	X	X	X	X
<i>Ctenotus impar</i>	Odd-striped Ctenotus											
<i>Ctenotus leonhardii</i>	Leonhardi's Skink				X	X					X	X
<i>Ctenotus pantherinus ocellifer</i>	Leopard Skink			X								
<i>Ctenotus schomburgkii</i>	Barred Wedge-snout Ctenotus				X	X	X	X	X		X	X
<i>Ctenotus severus</i>	Stern Rock Ctenotus									X		
<i>Ctenotus uber</i>	Spotted Ctenotus				X		X	X				X
<i>Cyclodomorphus melanops elongatus</i>	Eastern Slender Blue-tongue			X	X		X	X				
<i>Egernia depressa</i>	Pygmy Spiny-tailed Skink							X				X
<i>Egernia formosa</i>	Goldfields Crevice Skink				X	X	X	X				X
<i>Egernia inornata</i>	Desert Skink			X	X		X	X		X	X	
<i>Egernia multiscutata</i>	Bull Skink					X						
<i>Egernia richardi</i>	Woodland Crevice Skink											

Class Family Species	Common Name	Conservation Status	A	B	C	D	E	F	G	H	I	J
<i>Eremiascincus richardsonii</i>	Broad-banded Sand Swimmer						X	X				X
<i>Hemiergis initialis initialis</i>	Sth Five-toed Mulch Skink					X	X	X				
<i>Hemiergis peronii peronii</i>	Four-toed Earless Skink											
<i>Lerista distinguenda</i>	SW Four-toed Lerista						X	X			X	X
<i>Lerista kingi</i>												X
<i>Lerista muelleri</i>	Common Mulch Skink			X	X	X	X	X	X			
<i>Lerista picturata</i>	Goldfields Robust Lerista				X	X	X	X				X
<i>Lerista taeniata</i>												X
<i>Menetia greyii</i>	Dwarf Skink			X	X	X	X	X	X	X	X	X
<i>Morethia adelaidensis</i>	Saltbush Flecked Morethia				X		X	X	X			
<i>Morethia butleri</i>	Woodland Dark-flecked Morethia				X	X	X	X				X
<i>Morethia obscura</i>	Shrubland Pale-flecked Morethia			X			X	X			X	X
<i>Tiliqua occipitalis</i>	Western Bluetongue			X		X						
<i>Tiliqua rugosa</i>	Bobtail			X	X	X	X	X	X	X		



Class	Common	Conservation										
Family	Name	Status	A	B	C	D	E	F	G	H	I	J
Species												
<b>Typhlopidae</b>												
Blind Snakes												
<i>Ramphotyphlops australis</i>	Southern Blind Snake					X	X	X			X	
<i>Ramphotyphlops bicolor</i>	Dark-spined Blind Snake										X	
<i>Ramphotyphlops bituberculatus</i>	Prong-snouted Blind Snake					X						
<b>Boidae</b>												
Pythons, Boas												
<i>Morelia spilota</i>	Carpet Python			X			X					X

Class Family Species	Common Name	Conservation Status	A	B	C	D	E	F	G	H	I	J
<b>Elapidae</b> Elapid Snakes												
<i>Brachyurophis fasciolata</i>	Narrow-banded Shovel-nosed Snake					X	X	X			X	
<i>Demansia psammophis</i>	Yellow-faced Whipsnake					X	X	X				X
<i>Parasuta gouldii</i>	Gould's Hooded Snake				X	X	X	X				X
<i>Parasuta monachus</i>	Monk Snake				X	X	X	X				X
<i>Pseudechis australis</i>	Mulga Snake			X			X	X		X		X
<i>Pseudonaja modesta</i>	Ringed Brown Snake				X		X	X				X
<i>Pseudonaja nuchalis</i>	Gwardar				X	X					X	X
<i>Simoselaps bertholdi</i>	Jan's Banded Snake			X	X	X	X	X				X
<i>Suta fasciata</i>	Rosen's Snake											X
<b>Aves</b>												
<b>Casuariidae</b> Emus, Cassowaries												
<i>Dromaius novaehollandiae</i>	Emu	LC		X	X	X	X	X	X	X	X	X
<b>Megapodiidae</b> Moundbuilders												
<i>Leipoa ocellata</i>	Malleefowl	S3 VU VU A2bce+3ce	X		X						X	X

Class Family Species	Common Name	Conservation Status	A	B	C	D	E	F	G	H	I	J
<b>Accipitridae</b> Kites, Goshawks, Eagles, Harriers												
<i>Accipiter cirrocephalus</i>	Collared Sparrowhawk	LC		X		X		X				X
<i>Accipiter fasciatus</i>	Brown Goshawk	LC		X	X	X	X	X		X	X	X
<i>Aquila audax</i>	Wedge-tailed Eagle	LC		X	X	X	X			X	X	X
<i>Aquila morphnoides</i>	Little Eagle	LC		X		X						X
<i>Circus assimilis</i>	Spotted Harrier	LC			X							
<i>Haliastur sphenurus</i>	Whistling Kite	LC			X	X	X					
<i>Hamirostra isura</i>	Square-tailed Kite	LC		X			X					
<i>Hamirostra melanosternon</i>	Black-breasted Buzzard	LC					X					
<b>Falconidae</b> Falcons												
<i>Falco berigora</i>	Brown Falcon	LC		X	X	X	X				X	X
<i>Falco cenchroides</i>	Australian Kestrel	LC		X	X	X	X					X
<i>Falco longipennis</i>	Australian Hobby	LC										X
<i>Falco peregrinus</i>	Peregrine Falcon	S7 LC				X			X			X

Class	Common	Conservation										
Family	Name	Status	A	B	C	D	E	F	G	H	I	J
Species												
<b>Otididae</b>												
Bustards												
<i>Ardeotis australis</i>	Australian Bustard											
<b>Charadriidae</b>												
Lapwings, Plovers, Dotterels												
<i>Vanellus tricolor</i>	Banded Lapwing	LC		X								
<b>Columbidae</b>												
Pigeons, Doves												
<i>Ocyphaps lophotes</i>	Crested Pigeon	LC		X	X	X	X	X			X	X
<i>Phaps chalcoptera</i>	Common Bronzewing	LC		X	X	X	X	X		X	X	X

Class Family Species	Common Name	Conservation Status	A	B	C	D	E	F	G	H	I	J
<b>Psittacidae</b> Parrots												
<i>Cacatua roseicapilla</i>	Galah	LC		X	X		X					
<i>Glossopsitta porphyrocephala</i>	Purple-crowned Lorikeet	LC		X	X	X	X	X	X		X	X
<i>Melopsittacus undulatus</i>	Budgerigar	LC			X						X	X
<i>Neophema splendida</i>	Scarlet-chested Parrot	LC									X	
<i>Nymphicus hollandicus</i>	Cockatiel	LC			X							
<i>Platycercus varius</i>	Mulga Parrot	LC		X	X						X	X
<i>Platycercus zonarius</i>	Australian Ringneck	LC		X	X	X	X	X	X	X	X	X
<i>Polytelis anthopeplus</i>	Regent Parrot	LC		X		X	X	X		X	X	
<b>Cuculidae</b> Parasitic Cuckoos												
<i>Chrysococcyx basalis</i>	Horsfield's Bronze Cuckoo	LC			X	X					X	X
<i>Chrysococcyx osculans</i>	Black-eared Cuckoo	LC			X	X						
<i>Cuculus pallidus</i>	Pallid Cuckoo	LC			X	X			X			
<b>Strigidae</b> Hawk Owls												
<i>Ninox novaeseelandiae</i>	Boobook Owl	LC		X	X		X					X



Class	Common	Conservation										
Family	Name	Status	A	B	C	D	E	F	G	H	I	J
Species												
<b>Tytonidae</b>												
Barn Owls												
<i>Tyto alba</i>	Barn Owl	LC								X		
<b>Podargidae</b>												
Frogmouths												
<i>Podargus strigoides</i>	Tawny Frogmouth	LC		X	X	X	X					
<b>Caprimulgidae</b>												
Nightjars												
<i>Eurostopodus argus</i>	Spotted Nightjar	LC		X								
<b>Aegothelidae</b>												
Owlet-nightjars												
<i>Aegotheles cristatus</i>	Australian Owlet-nightjar	LC		X	X	X			X		X	X
<b>Halcyonidae</b>												
Tree Kingfishers												
<i>Todiramphus pyrrhopygia</i>	Red-backed Kingfisher	LC			X	X	X	X				
<i>Todiramphus sanctus</i>	Sacred Kingfisher	LC		X		X						X
<b>Meropidae</b>												
Bee-eaters												
<i>Merops ornatus</i>	Rainbow Bee-eater	JA LC		X	X	X	X	X		X	X	X

Class	Common	Conservation										
Family	Name	Status	A	B	C	D	E	F	G	H	I	J
Species												
<b>Climacteridae</b>												
Treecreepers												
<i>Climacteris affinis</i>	White-browed Treecreeper	LC			X							
<i>Climacteris rufa</i>	Rufous Treecreeper	LC		X	X	X	X	X	X	X	X	X
<b>Maluridae</b>												
Fairy Wrens, GrassWrens												
<i>Malurus leucopterus</i>	White-winged Fairy-wren	LC			X	X	X	X			X	X
<i>Malurus pulcherrimus</i>	Blue-breasted Fairy-wren	LC				X	X	X				X
<i>Malurus splendens</i>	Splendid Fairy-wren	LC		X								X

Class Family Species	Common Name	Conservation Status	A	B	C	D	E	F	G	H	I	J
<b>Acanthizidae</b> Thornbills, Geryones, Fieldwrens & Whitefaces												
<i>Acanthiza apicalis</i>	Broad-tailed Thornbill	LC		X	X	X	X	X	X	X	X	X
<i>Acanthiza chrysorrhoa</i>	Yellow-rumped Thornbill	LC		X	X	X	X					X
<i>Acanthiza robustirostris</i>	Slaty-backed Thornbill	LC			X							
<i>Acanthiza uropygialis</i>	Chestnut-rumped Thornbill	LC		X	X	X	X	X	X	X	X	X
<i>Aphelocephala leucopsis</i>	Southern Whiteface	LC			X							
<i>Calamanthus campestris</i>	Rufous Fieldwren	LC					X					
<i>Gerygone fusca</i>	Western Gerygone	LC				X						X
<i>Hylacola cauta whitlocki</i>	Shy Heathwren (western)		X			X		X			X	
<i>Pyrrholaemus brunneus</i>	Redthroat	LC		X	X	X	X	X		X	X	X
<i>Smicrornis brevirostris</i>	Weebill	LC	X	X	X	X	X	X	X	X	X	X
<b>Pardalotidae</b> Pardalotes												
<i>Pardalotus punctatus</i>	Spotted Pardalote	LC										X
<i>Pardalotus striatus</i>	Striated Pardalote	LC		X	X	X	X	X	X	X	X	X

Class Family Species	Common Name	Conservation Status	A	B	C	D	E	F	G	H	I	J
<b>Meliphagidae</b> Honeyeaters, Chats												
<i>Acanthagenys rufogularis</i>	Spiny-cheeked Honeyeater	LC	X	X	X	X	X	X	X	X	X	X
<i>Anthochaera carunculata</i>	Red Wattlebird	LC		X	X	X	X	X		X	X	X
<i>Anthochaera lunulata</i>	Western Little Wattlebird	LC							X			
<i>Certhionyx niger</i>	Black Honeyeater	LC										
<i>Certhionyx variegatus</i>	Pied Honeyeater	LC										X
<i>Epthianura albifrons</i>	White-fronted Chat	LC		X		X						X
<i>Epthianura tricolor</i>	Crimson Chat	LC							X			
<i>Lichenostomus cratitius</i>	Purple-gaped Honeyeater	LC		X								X
<i>Lichenostomus leucotis</i>	White-eared Honeyeater	LC		X	X	X	X	X	X			X
<i>Lichenostomus ornatus</i>	Yellow-plumed Honeyeater	LC		X	X	X	X	X	X	X	X	
<i>Lichenostomus plumulus</i>	Grey-fronted Honeyeater	LC			X							
<i>Lichenostomus virescens</i>	Singing Honeyeater	LC	X	X	X	X	X	X	X	X	X	
<i>Lichmera indistincta</i>	Brown Honeyeater	LC		X	X	X	X	X	X		X	X
<i>Manorina flavigula</i>	Yellow-throated Miner	LC		X	X	X	X	X	X	X	X	X

Class Family Species	Common Name	Conservation Status	A	B	C	D	E	F	G	H	I	J
<i>Melithreptus brevirostris</i>	Brown-headed Honeyeater	LC	X	X	X	X	X		X	X	X	X
<i>Phylidonyris albifrons</i>	White-fronted Honeyeater	LC	X	X	X	X	X		X	X	X	
<i>Phylidonyris nigra</i>	White-cheeked Honeyeater	LC			X							
<b>Petroicidae</b> Australian Robins												
<i>Drymodes brunneopygia</i>	Southern Scrub-robin	LC		X				X				X
<i>Eopsaltria australis griseogularis</i>	Western Yellow Robin	LC		X		X						
<i>Microeca fascinans</i>	Jacky Winter	LC		X	X	X	X		X			X
<i>Petroica cucullata</i>	Hooded Robin	LC			X				X			
<i>Petroica goodenovii</i>	Red-capped Robin	LC		X	X	X	X		X	X	X	X
<b>Pomatostomidae</b> Babblers												
<i>Pomatostomus superciliosus</i>	White-browed Babbler	LC	X	X	X	X	X	X		X		X
<b>Cinclosomatidae</b> Whipbirds, Wedgebills, Quail Thrushes												
<i>Cinclosoma castanotus</i>	Chestnut Quail-thrush	LC		X		X	X	X				X
<b>Neosittidae</b> Sitellas												
<i>Daphoenositta chrysoptera</i>	Varied Sittella	LC			X	X	X				X	X



Class Family Species	Common Name	Conservation Status	A	B	C	D	E	F	G	H	I	J
<b>Pachycephalidae</b> Crested Shrike-tit, Crested Bellbird, Shrike Thrushes, Whistlers												
<i>Colluricincla harmonica</i>	Grey Shrike-thrush	LC	X	X	X	X	X	X	X	X	X	X
<i>Oreoica gutturalis</i>	Crested Bellbird	LC	X								X	X
<i>Pachycephala rufiventris</i>	Rufous Whistler	LC	X		X	X						X
<b>Dicruridae</b> Monarchs, Magpie Lark, Flycatchers, Fantails, Drongo												
<i>Grallina cyanoleuca</i>	Magpie-lark	LC		X	X	X	X					X
<i>Myiagra inquieta</i>	Restless Flycatcher	LC		X			X					
<i>Rhipidura fuliginosa</i>	Grey Fantail	LC			X							
<i>Rhipidura leucophrys</i>	Willie Wagtail	LC		X	X	X	X	X	X		X	X
<b>Campephagidae</b> Cuckoo-shrikes, Trillers												
<i>Coracina maxima</i>	Ground Cuckoo-shrike	LC		X	X	X			X			
<i>Coracina novaehollandiae</i>	Black-faced Cuckoo-shrike	LC		X	X	X	X		X	X	X	X
<i>Lalage tricolor</i>	White-winged Triller	LC			X		X					

Class Family Species	Common Name	Conservation Status	A	B	C	D	E	F	G	H	I	J
<b>Artamidae</b> Woodswallows, Butcherbirds, Currawongs												
<i>Artamus cinereus</i>	Black-faced Woodswallow	LC		X	X	X	X		X	X		X
<i>Artamus cyanopterus</i>	Dusky Woodswallow	LC		X	X	X	X	X			X	X
<i>Artamus personatus</i>	Masked Woodswallow	LC		X					X		X	X
<b>Cracticidae</b> Currawongs, Magpies & Butcherbirds												
<i>Cracticus nigrogularis</i>	Pied Butcherbird	LC		X	X	X	X			X		X
<i>Cracticus tibicen</i>	Australian Magpie	LC		X	X	X	X	X			X	X
<i>Cracticus torquatus</i>	Grey Butcherbird	LC		X	X	X	X	X	X	X	X	X
<i>Strepera versicolor</i>	Grey Currawong	LC		X	X	X	X	X		X	X	X
<b>Corvidae</b> Ravens, Crows												
<i>Corvus bennetti</i>	Little Crow	LC		X		X						X
<i>Corvus coronoides</i>	Australian Raven	LC		X	X	X	X	X	X	X	X	X
<i>Corvus orru</i>	Torresian Crow	LC				X						X
<b>Motacillidae</b> Old World Pipits, Wagtails												
<i>Anthus australis</i>	Australian Pipit	LC		X	X	X					X	

Class	Common	Conservation										
Family	Name	Status	A	B	C	D	E	F	G	H	I	J
Species												
<b>Estrilidae</b>												
Grass Finches & Mannikins												
<i>Taeniopygia guttata</i>	Zebra Finch	LC			X							
<b>Dicaeidae</b>												
Flowerpeckers												
<i>Dicaeum hirundinaceum</i>	Mistletoebird	LC			X	X	X				X	X
<b>Hirundinidae</b>												
Swallows, Martins												
<i>Cheramoeca leucosternus</i>	White-backed Swallow	LC				X	X		X		X	X
<i>Hirundo ariel</i>	Fairy Martin	LC										X
<i>Hirundo neoxena</i>	Welcome Swallow	LC			X		X					
<i>Hirundo nigricans</i>	Tree Martin	LC		X	X	X	X			X	X	X
<b>Sylviidae</b>												
Old World Warblers												
<i>Cincloramphus cruralis</i>	Brown Songlark	LC										
<i>Cincloramphus mathewsi</i>	Rufous Songlark	LC					X					
<b>Zosteropidae</b>												
White-eyes												
<i>Zosterops lateralis</i>	Silvereye	LC				X	X				X	X

Class Family Species	Common Name	Conservation Status	A	B	C	D	E	F	G	H	I	J
<b>Mammalia</b>												
<b>Tachyglossidae</b>												
Echidnas												
<i>Tachyglossus aculeatus</i>	Echidna	LC		X	X	X	X	X			X	
<b>Dasyuridae</b>												
Carnivorous Marsupials												
<i>Ningai ridei</i>	Wongai Ningai	LC			X		X					
<i>Ningai sp.</i>	Ningai	LC						X				
<i>Ningai yvonneae</i>	Southern Ningai	LC		X		X	X		X	X	X	X
<i>Sminthopsis crassicaudata</i>	Fat-tailed Dunnart	LC		X	X	X	X	X				
<i>Sminthopsis dolichura</i>	Little long-tailed Dunnart	LC		X	X	X	X	X	X	X		X
<i>Sminthopsis gilberti</i>	Gilbert's Dunnart	LC						X				
<b>Burramyidae</b>												
Pygmy Possums												
<i>Cercartetus concinnus</i>	Western Pygmy-possum	LC		X	X	X	X	X	X	X	X	X

Class Family Species	Common Name	Conservation Status	A	B	C	D	E	F	G	H	I	J
<b>Macropodidae</b> Kangaroos, Wallabies												
<i>Macropus fuliginosus</i>	Western Grey Kangaroo	LC	X	X	X	X	X				X	X
<i>Macropus robustus</i>	Euro	LC		X	X	X						
<i>Macropus rufus</i>	Red Kangaroo	LC				X	X			X		
<b>Molossidae</b> Freetail Bats												
<i>Austronomus australis</i>	White-striped Freetail-bat	LC			X		X					
<i>Ozimops petersi</i>	Inland Freetail-bat	LC			X			X				
<b>Vespertilionidae</b> Ordinary Bats												
<i>Chalinolobus gouldii</i>	Gould's Wattled Bat	LC					X	X				X
<i>Chalinolobus morio</i>	Chocolate Wattled Bat	LC			X			X				
<i>Nyctophilus geoffroyi</i>	Lesser Long-eared Bat	LC			X			X				
<i>Nyctophilus gouldi</i>	Gould's Long-eared Bat	LC			X							
<i>Nyctophilus major tor</i>	Central Long-eared Bat	P4						X				
<i>Scotorepens balstoni</i>	Inland Broad-nosed Bat	LC			X			X				
<i>Vespadelus regulus</i>	Southern Forest Bat	LC			X			X				



Class Family Species	Common Name	Conservation Status	A	B	C	D	E	F	G	H	I	J
<b>Muridae</b> Rats, Mice												
<i>Mus musculus</i>	House Mouse	Introduced		X	X		X	X	X		X	X
<i>Notomys alexis</i>	Spinifex Hopping-mouse	LC						X				
<i>Notomys mitchellii</i>	Mitchell's Hopping-mouse	LC		X	X		X	X			X	X
<i>Pseudomys bolami</i>	Bolam's Mouse	LC			X	X	X				X	X
<i>Pseudomys hermannsburgensis</i>	Sandy Inland Mouse	LC		X	X	X						
<i>Pseudomys sp.</i>	Native Rodent	LC						X				
<b>Canidae</b> Dogs, Foxes												
<i>Canis lupus dingo</i>	Dingo	LC					X				X	
<i>Canis lupus familiaris</i>	Dog	Introduced										
<i>Vulpes vulpes</i>	Red Fox	Introduced			X							
<b>Felidae</b> Cats												
<i>Felis catus</i>	Cat	Introduced									X	X
<b>Bovidae</b> Horned Ruminants												
<i>Capra hircus</i>	Goat	Introduced										

Class	Common	Conservation										
Family	Name	Status	A	B	C	D	E	F	G	H	I	J
Species												
<b>Camelidae</b>												
Camels												
<i>Camelus dromedarius</i>	Dromedary, Camel	Introduced										
<b>Leporidae</b>												
Rabbits, Hares												
<i>Oryctolagus cuniculus</i>	Rabbit	Introduced					X		X		X	X