Lot 32 (No.325) Tom Cullity Drive, Wilyabrup - Native Vegetation Clearing Permit Application – Supporting Information

Attachment 3

Basic Fauna and Targeted Black Cockatoo Assessment (Emerge Associates 2020a)

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Basic Fauna and Targeted Black Cockatoo Assessment

Lot 32 (No.325) Tom Cullity Drive, Wilyabrup

Project No: EP20-088(02)

Prepared for Montague VY No. 1 Pty Ltd ATF Montague Trust
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Executive Summary

Montague VY No. 1 Pty Ltd ATF Montague Trust (Montague Estate) intends to expand existing operations within Lot 32 (No.325) Tom Cullity Drive in Wilyabrup for viticultural and tourism purposes (referred to as the 'site'). Emerge were engaged to conduct a 'basic' fauna and a 'targeted' black cockatoo assessment to provide information on the fauna values within the site to inform the development.

As part of the assessment a desktop review of relevant background information was completed, and a field survey was undertaken on multiple days between 12 August and 28 October 2020. During the field survey the fauna habitat within the site was mapped and its suitability to provide habitat for conservation significant fauna was determined. A targeted black cockatoo survey was also undertaken to determine the presence of habitat for threatened black cockatoo species.

Outcomes of the basic fauna survey include the following:

- Approximately half of the site (47.26%) contains remnant native vegetation which supports high habitat values for native fauna species.
- A total of 29 native fauna species were positively identified to occur within the site, including four threatened species: western ringtail possum (critically endangered), Carnaby's cockatoo (endangered), Baudin's cockatoo (endangered) and forest red-tailed black cockatoo (vulnerable).
- Western ringtail possum was indirectly detected through the presence of a drey and so it is unknown whether western ringtail possums are currently utilising the site. However, marri and jarrah forest and marri and peppermint forest habitats, and to a lesser extent marri and jarrah forest – limited understorey habitat support potentially suitable habitat for this species. Further targeted surveys would need to be undertaken to determine if and to what extent western ringtail possums utilise the site.
- Eight species of conservation significance not recorded during the field survey are also considered to have potential to occur within the site. These species would primarily be associated with the marri and jarrah forest, marri and peppermint forest and to a lesser extent marri and jarrah forest with limited understorey habitats, if they occur at all. Targeted surveys would need to be undertaken to confirm whether these species occur within the site.

Outcomes of the targeted black cockatoo survey include the following:

- The site is located within the modeled distribution and breeding range of all three species of black cockatoo and all three species were recorded in the site during the field survey.
- A total of 337 habitat trees were recorded in the tree survey area, of which three trees contained 'suitable hollow(s)' and two trees contained 'potentially suitable hollow(s)' for breeding by black cockatoos. The tree survey area is therefore considered to provide suitable breeding habitat for all three species of black cockatoo.
- No evidence of black cockatoo roosting activity was observed within the site. Potential roosting habitat that is suitable for all three species of black cockatoo occurs within the site in the form of large native and non-native trees.
- A total of 14.59 ha of primary foraging habitat for Carnaby's cockatoo, 14.39 ha for Baudin's cockatoo and 14.27 ha for forest red-tailed black cockatoo were recorded in the site. Additionally, the site also contains 1.84 ha of secondary foraging habitat for Carnaby's cockatoo,

0.38 ha for Baudin's cockatoo and 0.1 ha for forest red-tailed black cockatoo. Extensive areas of additional remnant native vegetation that may provide foraging habitat for all three species of black cockatoo occur adjacent to and in the wider area of the site.

- The overall black cockatoo habitat quality score for the site was determined to be six (moderate) for Carnaby's cockatoo, five (moderate) for Baudin's cockatoo and seven (high to moderate) for forest red-tailed black cockatoo. The site scored highest for the foraging habitat component due the presence of a relatively high proportion of primary foraging plants.

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Abbreviation Tables

Table A1: Abbreviations – Organisations

Organisations	
EPA	Environmental Protection Authority
DBCA	Department of Biodiversity, Conservation and Attractions
DAWE	Department of Agriculture, Water and the Environment
WA Museum	Western Australian Museum

Table A2: Abbreviations – General terms

General terms	
EN	Endangered
EX	Extinct
VU	Vulnerable
MI	Migratory
P1	Priority 1
P2	Priority 2
P3	Priority 3
P4	Priority 4

Table A3: Abbreviations –Legislation

Legislation	
BAM Act	*Biosecurity and Agriculture Management Act 2007*
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
BC Act	*Biodiversity Conservation Act 2016*

Table A4: Abbreviations – planning

Planning terms	
LPS	Local Planning Scheme

Table A5: Abbreviations – units of measurement

Units of measurement	
DBH	Diameter at breast height
cm	Centimetre
ha	Hectare
km	Kilometre
m	Metre

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1 Introduction

1.1 Project background

Montague VY No. 1 Pty Ltd ATF Montague Trust (Montague Estate) intends to expand existing operations within Lot 32 (No.325) Tom Cullity Drive in Wilyabrup for viticultural and tourism purposes. This lot (referred to herein as the 'site') is located approximately 220 kilometres (km) south-west of the Perth Central Business District within the City of Busselton and is zoned 'viticulture and tourism' under the City of Busselton *Local Planning Scheme No. 21*.

The site is approximately 40.1 hectares (ha) in size and is bound by Tom Cullity Drive to the east and rural lots to the south, west and north. The location and extent of the site is shown in **Figure 1**.

1.2 Purpose and scope of work

Emerge Associates (Emerge) were engaged by Montague Estate to provide environmental consultancy services to support the planning process for the site. The purpose of this assessment is to provide sufficient information on the fauna values within the site to inform this process, with particular focus on identifying habitat for threatened species of black cockatoo.

The scope of work was specifically to conduct a terrestrial vertebrate fauna assessment to the standard required of a 'basic' fauna survey and a 'targeted' black cockatoo survey in accordance with the Environmental Protection Authority's (EPA's) technical guidance (EPA 2020) and the *Environment Protection and Biodiversity Conservation Act* black cockatoo referral guidelines (DSEWPaC 2012b). Given the large size of the site, the black cockatoo breeding habitat survey was limited to potential impact areas. These areas are shown as the 'tree survey area' in **Figure 1**.

As part of this scope of work, the following tasks were undertaken:

- Desktop assessment of relevant background information pertaining to the site and surrounds, including database and literature searches for fauna species.
- Field survey to identify fauna species and fauna habitats within the site, including potential habitat for species of black cockatoo.
- Compilation of a list of fauna species with potential to occur within the site as identified from the desktop assessment and opportunistically recorded as part of the field survey.
- Identification of potential habitat for conservation significant fauna species and an assessment of likelihood of occurrence.
- Mapping of fauna and black cockatoo habitat.
- An assessment of the quality of black cockatoo habitat within the site.
- Documentation of the desktop assessment, survey methodology and results into a report.

2 Environmental Context

2.1 Climate

Climate has a strong influence on the fauna habitat and species present in a region and a site. The south west of Western Australia experiences a Mediterranean climate of hot dry summers and cool wet winters.

An average of 114.2 mm of rainfall was recorded in August and 45.8 mm in October 2020 from the Cowaramup weather station (Bureau of Meteorology (BoM) weather station number 9636), which is the closest weather station, located approximately 4.6 km south-east of the site. Temperatures at the Witchcliffe weather station (BoM weather station number 9746), which is the closest temperature recording weather station, ranged from a mean maximum of 16.3^{o}C to a mean minimum of 8.2^{o}C in August and a mean maximum of 20.9^{o}C to a mean minimum of 9.2^{o}C in October 2020 (BoM 2020).

The average rainfall in August and October 2020 was lower than the average rainfall of 162.5 mm for August and 67.4 mm for October and recorded from the Cowaramup weather station (BoM 2020). The mean maximum and minimum temperatures in August and October 2020 are similar to the average maximum temperature of 16.7^{o}C and average minimum temperature of 8.2^{o}C in August. However, the temperatures in October 2020 where higher than the average maximum temperature of 19.7^{o}C and average minimum temperature of 9.4^{o}C recorded in by the Witchcliffe weather station from 1999-2020 (BoM 2020).

2.2 Geomorphology and soils

Landform and soils influence fauna habitat and species at regional and local scales. The majority of the site lies in the Warren bioregion, as defined by the *Interim Biogeographic Regionalisation of Australia* (IBRA) (Environment Australia 2000). The Warren bioregion follows the coastline from Yallingup in the north-west to Albany in the south-east. A small portion of the north-eastern corner of the site lies in the Jarrah Forest bioregion.

The Department of Primary Industries and Regional Development (DPIRD) has compiled data from various surveys to produce a soil landscape mapping dataset for Western Australia (DPIRD 2018), which places the site within the following four soil landscapes:

- ‘Cowaramup vales phase’ which occurs over the majority of the site and is described as ‘small, narrow V-shaped drainage depressions with gravelly duplex (Forest Grove) soils’.
- ‘Cowaramup ironstone rises phase’ which occurs in the western and eastern portion of the site and is described as ‘flats and gentle slopes (0-5% gradient) with some lateritic outcrop and shallow gravelly sands over laterite’.
- ‘Cowaramup flats phase’ which occurs in the south-western and north-eastern potion of the site and is described as ‘flat (0-2% gradient) with gravelly duplex (Forest Gove) and pale grey mottles (Mungite) soils’.
- ‘Wilyabrup gentle slope phase’ which occurs in the north-western corner of the site and is described as ‘gradients 5-10%’.

- 'Cowaramup wet vales phase' which occurs in the south-eastern corner of the site and is described as 'small, broad U-shaped drainage depressions with swampy floors. Gravelly duplex (Forest Grove) soils on sideslopes and poorly drained alluvial soils on valley floor'.

The soil landscapes mapped within the site are shown in **Figure 2**.

The site is not known to contain any restricted landforms or unique geological features.

2.3 Topography

The elevation of the site ranges from 114 m in relation to the Australian height datum (mAHD) on the eastern side of the site to 90 mAHD on the north-western side of the site (DoW 2008) (**Figure 2**).

2.4 Hydrology and wetlands

Wetlands include "areas of seasonally, intermittently or permanently waterlogged soils or inundated land, whether natural or otherwise, fresh and saline, e.g. waterlogged soils, ponds, billabongs, lakes, swamps, tidal flats, estuaries, rivers and their tributaries" (Wetlands Advisory Committee 1977). Many wetlands provide important fauna habitat and support high levels of fauna biodiversity and endemism.

Wetlands of national or international significance may be afforded special protection under Commonwealth or international agreements. The following lists of important wetlands were checked as part of this assessment:

- *Ramsar List of Wetlands of International Importance* (DBCA 2017d)
- *A Directory of Important Wetlands in Australia* (DBCA 2018a).

No Ramsar or listed 'important wetlands' are located within or near the site.

A review of the regional wetland mapping database *Geomorphic Wetlands Leeuwin Naturaliste Ridge and Donnybrook to Nannup – Unreviewed* (DBCA 2018b) indicates that a palusvale wetland extends in a south-east to north-west direction through the site.

Examination of the Department of Water and Environmental Regulation (DWER) hydrography dataset (DWER 2020) shows three water related features within the site:

- one earth dam occurs in the south-western portion
- part of an earth dam in the central-northern portion
- two tributaries of a waterway in the western and central portion of the site.

Aerial imagery also shows a dam in the central portion of the site, which is not mapped in the DWER (2018) hydrography dataset.

The location of the hydrological features in the site is shown in **Figure 2**.

2.5 Regional vegetation

Vegetation types and resulting fauna habitats strongly influence the diversity and composition of fauna taxa present within an area. Native vegetation is described and mapped at different scales in order to illustrate patterns in its distribution. At a continental scale the *Interim Biogeographic Regionalisation of Australia* (IBRA) places the site on the border of the 'WAR01' (Warren) and 'JAF02' (Southern Jarrah Forest) subregions (Environment Australia 2000).

The majority of the site is located within the Warren subregion, which is characterised as comprising tall *Eucalyptus diversicolor* (karri) on deep loams or forest of *Eucalyptus marginata* (jarrah) to *Corymbia calophylla* (marri) on leached sands and extensive *Melaleuca* (paperbark) and sedge swamps in valleys (Beard 1990). A small area in the far eastern corner of the site is located within the Southern Jarrah Forest subregion, which is characterised as mainly containing *Eucalyptus marginata* (jarrah) forest on lateritic soils of the Plateau and on the loam soils of the valleys, with *Corymbia calophylla* (marri) – *Eucalyptus wandoo* (wandoo) woodland on the drier laterite-free soils (Beard 1990).

Variations in native vegetation within the site can be further classified based on regional vegetation associations. Beard *et al.* (2013) mapping shows the site as comprising vegetation association 'Boranup_3' and the eastern corner as comprising vegetation association 'Chapman 3'. Both of these associations are described as 'mainly jarrah and marri'.

2.6 Historic land use

Review of historical images available from 1996 (WALIA 2020) onwards shows that much of the site was cleared of native vegetation prior to 1996, likely for grazing and/or viticultural purposes.

2.7 Significant fauna

2.7.1 Threatened fauna species

Certain fauna taxa that are considered to be rare or under threat warrant special protection under Commonwealth and/or State legislation. At a Commonwealth level, fauna taxa may be listed as 'threatened' under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Any action likely to have a significant impact on a taxon listed under the EPBC Act requires Ministerial approval.

In Western Australia fauna species may also be classed as 'threatened' under the *Biodiversity Conservation Act 2016* (BC Act). It is an offence to 'take' or 'disturb' threatened fauna without Ministerial approval.

Threatened fauna species listed under the EPBC Act and/or BC Act are assigned a conservation status according to attributes such as population size and geographic distribution. Further information on threatened species and their categories is provided in **Appendix A**. An assessment of the likelihood of occurrence of conservation significant fauna within the site was undertaken (refer to **Sections 3.3.3** and **4.3.3**. and **Appendix E**).

2.7.1.1 Black cockatoos

As part of the targeted black cockatoo survey background information pertaining to species of threatened black cockatoo known to occur within the Warren region were reviewed and are summarised below.

Three threatened species of black cockatoo occur in the Warren region (referred to herein collectively as 'black cockatoos'):

- *Calyptorhynchus latirostris* (Carnaby's cockatoo) which is listed as 'endangered' under the EPBC Act and the BC Act.
- *Calyptorhynchus baudinii* (Baudin's cockatoo) which is listed as 'endangered' under the EPBC Act and the BC Act.
- *Calyptorhynchus banksii naso* (forest red-tailed black cockatoo) which is listed as 'vulnerable' under the EPBC Act and the BC Act.

Black cockatoo habitat is conventionally separated into breeding, roosting and foraging categories:

- Black cockatoos nest in hollows that form in trees which are usually more than ~200 years old. 'Breeding habitat' is therefore described as 'habitat trees' which are trees of a species known to support black cockatoo breeding and which either have a suitably large enough nest hollow or have a large enough diameter at breast height (DBH) to indicate that a suitable nest hollow could develop in time (DSEWPaC 2012b). A minimum DBH for a habitat trees is defined as ≥50 centimetres (cm) for most tree species used by black cockatoos and ≥30 cm for *Eucalyptus wandoo* (wandoo) and *Eucalyptus salmonophloia* (salmon gum) (DSEWPaC 2012b). Breeding habitat is also generally expected to be located within 7 km of food and water resources (Saunders 1990).
- 'Roosting habitat' consists of groups or individual tall trees that are used by black cockatoos for roosting during the day or overnight. Roosts generally comprise the tallest trees in an area and can include native and non-native trees (DSEWPaC 2012b). Roosts are often located within 6 km of water and food resources, with additional foraging ranges within 12 km (Shah 2006; DSEWPaC 2012b; Le Roux 2017). The use of a particular roost site may vary depending on availability of food and water resources.
- Black cockatoos feed on the fruit and seeds of a range of native and non-native plants species. 'Foraging habitat' is therefore vegetation that contains plant species known to be foraged on by black cockatoos.

Each black cockatoo species has a defined breeding season, with Baudin's cockatoo breeding from August/September to February/March and Carnaby's cockatoo breeding from July/August to January/February (DSEWPaC 2012b). Forest red-tailed black cockatoo breeds in October/November but may breed in March/April if there is good autumn rainfall (DSEWPaC 2012b). There is also evidence that forest red-tail black cockatoos breed throughout the year, with peaks in April – June and August – October (Johnstone *et al.* 2013).

Publicly available regional datasets relating to black cockatoo distribution, records and extent of habitat types were reviewed in relation to the site and surrounding area, as summarised in **Table 1**, **Table 2** and **Table 3**, and shown in **Figure 3.** Detailed information on each dataset considered as part of the desktop review is provided in **Appendix A**.

Table 1: Summary of black cockatoo background review

Category		Site context	Source
Species distribution		• Site lies within the modelled distribution range of Baudin's cockatoo and within its known breeding area. • Site is within the modelled distribution of Carnaby's cockatoo but not within its breeding range. • Site is within the modelled distribution for forest red-tailed black cockatoo and within its known breeding range.	(DoEE 2016a, c, b)
Breeding sites		• No nesting records occur within the site. • No breeding records occur within 12 km of the site.	BirdLife Australia database search (2020)
Carnaby's cockatoo breeding areas (12 km radius surrounding breeding sites)		• No confirmed breeding areas intersect the site. • No possible breeding areas intersect the site.	(Glossop *et al.* 2011)
Important bird areas for Carnaby's cockatoo		• None within the site. • None within 12 km of the site.	DPaW (2013)
Roost site		• None within the site. • 7 roost sites within 12 km of the site (see **Figure 3**, **Table 2** and **Table 3**): ○ 4 associated with white-tailed^ black cockatoos ○ 2 associated with forest red-tailed black cockatoos ○ 1 associated with white^ and red-tailed black cockatoos	BirdLife Australia database search (2020)
Foraging habitat	Carnaby's cockatoo, Baudin's cockatoo and forest red-tailed black cockatoo	• Multiple areas of the vegetation in the site are mapped as remnant native vegetation which are likely to contain foraging plant species for black cockatoos as shown in **Figure 3**. • Extensive areas of remnant native vegetation are mapped within the wider local area of the site as shown in **Figure 3**.	DPIRD (2020)
	Carnaby's cockatoo and Baudin's cockatoo	• No pine plantations mapped within the site. • Four pine plantations are located within 12 km of the site.	Forest Products Commission (2017)

^Carnaby's and/or Baudin's cockatoo

Table 2: Number of white-tailed black cockatoos recorded in roosts within 12 km of the site (Birdlife Australia 2020)

Roost ID	Year									
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
AUGGRAR002	NS	NS	NS	7	85	4	26	3	54	89
AUGGRAR003	NS	NS	NS	NS	NS	NS	NS	NS	NS	7
AUGMARR006	NS	NS	NS	NS	NS	NS	NS	2	0	19
BUSMETR002	NS	NS	NS	NS	NS	NS	NS	22	3	150
BUSWILR002	NS	NS	NS	NS	NS	NS	NS	NS	45	10

NS = not surveyed

Table 3: Number of forest red-tailed black cockatoos recorded in roosts within 12 km of the site (Birdlife Australia 2020)

Roost ID	Year					
	2014	2015	2016	2017	2018	2019
AUGCOWR004	NS	NS	NS	NS	4	0
BUSMETR002	NS	NS	NS	0	0	27
BUSYELR001	NS	NS	NS	NS	NS	7

NS = not surveyed

2.7.2 Priority fauna species

Fauna species that do not currently meet the criteria for listing as threatened but are potentially rare or threatened may be added to the Department of Biodiversity, Conservation and Attractions (DBCA) *Priority Fauna List*. These species are classified into 'priority' levels based on threat. Whilst priority species are not under direct statutory protection, they are considered during State approval processes. Further information on priority species and their categories is provided in **Appendix A**.

2.7.3 Migratory fauna species

Migratory fauna species that migrate to Australia and its external territories or pass though or over Australian waters during their annual migrations are protected under Commonwealth and State legislation. At a Commonwealth level, migratory fauna taxa may be listed as 'migratory' under the EPBC Act. Any action likely to have a significant impact on a taxon listed under the EPBC Act requires Ministerial approval. Further information on migratory species is provided in **Appendix A**.

2.7.4 Specially protected fauna species

In Western Australia, fauna species that are of special conservation interest, including migratory species, cetaceans, species subject to international agreement or species otherwise in need of special protection may be listed as 'specially protected' under the BC Act. Further information on specially protected species and their categories is provided in **Appendix A**.

2.7.5 Pest fauna species

The term 'pest fauna' can refer to any animal that requires some form of action to reduce its effect on the economy, the environment, human health and amenity. Pest fauna species are generally not native but some Australian or West Australian fauna may also be considered pests.

A particularly invasive or detrimental pest species may be listed as a 'declared pest' pursuant to Western Australia's *Biosecurity and Agriculture Management Act 2007* (BAM Act), indicating that it warrants special management to limit its spread. Further information on categories of declared pests is provided in **Appendix A.**

2.8 Environmentally sensitive areas

'Environmentally sensitive areas' (ESAs) are prescribed under the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* and have been identified to protect native vegetation values of areas surrounding values such as significant wetlands, threatened flora, threatened communities and *Bush Forever* sites. Within an ESA none of the exemptions under the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* apply. However, exemptions under Schedule 6 of the EP Act still apply, which includes any clearing in accordance with a subdivision approval under the *Planning and Development Act 2005* (a recognised exemption under the Schedule 6 of the EP Act).

No ESAs are present over the site or in close proximity to the site. The closest environmentally sensitive area occurs approximately 5.5 km west of the site as shown in **Figure 4**.

2.9 DBCA managed or legislated lands

DBCA has tenure of or interests in numerous areas of land across the state for a range of purposes. Tenure categories include national parks, nature reserves, conservation parks, marine parks, marine nature reserves, marine management areas, section 5(1)(g) reserves, state forest and timber reserves. These areas are mapped within the *Legislated Lands and Waters* (DBCA 2017a) and *Lands of Interest* (DBCA 2017c) datasets. The *Legislated Lands and Waters* (DBCA 2017a) dataset includes lands subject to the following legislation; the *Conservation and Land Management Act 1984* (CALM Act 1984), Swan and Canning Rivers Management Act 2006 (SCRM Act) and lands identified under the Land Administration Act 1997 (LA Act). The *Lands of Interest* (DBCA 2017c) dataset includes all other lands of which DBCA is recognised as the manager but is not vested under any act. These lands comprise of crown land and freehold land which DBCA has been acknowledged by the Department of Lands as the responsible agency.

No DBCA legislated lands or water occur in or near the site. 'Walburra Nature Reserve' is located approximately 5.5 km north. Additional DBCA legislated lands and waters are located in the wider area of the site and include Yelverton National Park and Leeuwin-Naturaliste National Park. The location of DBCA legislated lands and water near the site is shown in **Figure 4** (DBCA 2017a).

2.10 Ecological linkages

Ecological linkages are linear landscape elements that allow the movement of fauna, flora and genetic material between areas of remnant habitat. The movement of fauna and the exchange of genetic material between vegetation remnants improve the viability of those remnants by allowing greater access to breeding partners and food sources, refuge from disturbances such as fire and maintenance of genetic diversity of plant communities and populations. Ecological linkages are ideally continuous or near-continuous as the more fractured a linkage is, the less ease flora and fauna have in moving within the corridor (Alan Tingay and Associates 1998).

The Perth Biodiversity Project, supported by the Western Australia Local Government Association (WALGA), have identified and mapped regional ecological linkages within the Perth Metropolitan Region (WALGA and PBP 2004). This study was extended beyond the Perth Metropolitan Region

through the South West Biodiversity Project, resulting in the identification and mapping of the South West regional ecological linkages (Molloy *et al.* 2009).

There are no mapped ecological linkages within the site. The site is surrounded by ecological linkages, with linkage No. 151 occurring approximately 3 km south and running east to west, linkage No. 112 occurring approximately 3 km to the east and running north to south and linkage No. 86 occurring to the west and north, running north to south and connecting to linkage number 112 in the east. The location of these linkages are shown in **Figure 4.**

2.11 Previous surveys

A review of published fauna surveys conducted near the site was undertaken. The outcomes of available fauna survey reports are summarised in **Table 4**.

Table 4: Previous fauna surveys undertaken within the wider area of the site

Survey	Details
Harewood (2013) Lots 106 and 107 Caves Road, Wilyabrup	• A 'Level 1 Fauna survey' and 'detailed' black cockatoo and *Pseudocheirus peregrinus occidentalis* (western ringtail possum) fauna assessments were undertaken over an area located approximately 2.2 km west of the site. • The following four fauna species of conservation significance were observed or positively identified from foraging evidence, scats, tracks, skeletons or call; Baudin's cockatoo, Carnaby's cockatoo, forest red-tailed black cockatoo and western ringtail possum.
NGH Environmental (2013) Lot 30 Tom Cullity Drive, Wilyabrup	• A 'Level 1 Fauna Survey and Habitat Assessment' was undertaken over an area located adjacent to the southern portion of the site. • The following three fauna species of conservation significance were observed or positively identified from foraging evidence, scats, tracks, skeletons or call; Baudin's cockatoo, forest red-tailed black cockatoo and western ringtail possum.

3 Methods

3.1 Desktop assessment

A search was conducted for fauna species that have been recorded within a 10 km radius of the site using the *Protected Matters Search Tool* (DAWE 2020a), *NatureMap* (DBCA 2020), DBCA's conservation significant fauna database (reference no. FAUNA6414), previous surveys and literature references.

3.2 Field survey

Two ecologists from Emerge visited the site on multiple days on 12 and 13 August and 26 to 28 October 2020 during the day to conduct the basic fauna survey and targeted black cockatoo field survey. The survey was conducted from approximately 9:00 AM until 4:30 PM.

3.2.1 Basic fauna

Transects were traversed across the site, during the day, and the characteristics of fauna habitat and presence of fauna species was recorded. Microhabitats such as logs, rocks and leaf litter were investigated and secondary evidence of species presence such as tracks, scats, skeletal remains, foraging evidence or calls was also noted.

An opportunistic fauna species list was compiled and fauna habitat values were described, with particular reference to conservation significant fauna species with potential to occur within the site.

3.2.2 Targeted black cockatoo

Transects were traversed across the site and the presence of potential black cockatoo breeding, night roosting and foraging habitat was recorded. If observed, the presence of black cockatoos within or near the site was noted. Active searches for secondary evidence of breeding, roosting and foraging activity such as chew marks, branch clippings, droppings, moulted feathers and chewed marri or banksia fruit were conducted.

3.2.2.1 Breeding habitat

A 'habitat tree' was defined as a native eucalypt that is typically known to support black cockatoo breeding such as marri, jarrah, blackbutt, tuart, wandoo, salmon gum or to a lesser extent flooded gum, with a DBH ≥50 cm or DBH ≥30 cm for wandoo or salmon gum. As any tree that has a suitable hollow may provide breeding habitat for black cockatoos, other tree species were also considered to be habitat trees if they contained a suitable hollow.

To be suitable for use as breeding habitat by black cockatoos it was considered a hollow must:

- have an entrance opening of at least 10 cm but preferably 20-30 cm (Saunders *et al.* 1982; Groom 2010; Johnstone *et al.* 2013) (Groom 2010; Saunders et al. 1982; Johnstone et al 2013)
- be located at least 3 m from the ground (Saunders 1979b; Johnstone and Storr 1998; Groom 2010; Saunders 2014)
- be located in a trunk or branch that is generally large enough to contain a hollow that has a floor diameter of at least 40 cm and depth of 50-200 cm such that it could house an adult black cockatoo and nestlings (Saunders 1979a; Johnstone and Storr 1998; Saunders 2014; DPaW 2015)
- have vertical or near vertical orientation (Johnstone and Kirkby 2008; Johnstone *et al.* 2013).

Occasionally, native eucalypts were encountered that met DBH requirements but did not contain a trunk/branch of a sufficient size to support a hollow suitable for use by black cockatoos. For example, the tree may have been less than 3 m tall or had a trunk that forked between 1.3 m and 3 m in height and after the fork no limbs had a diameter such that they could contain a suitable hollow. These trees were not recorded as habitat trees as the likelihood they would ever form a suitable hollow was low.

Habitat trees within the tree survey area were individually identified, tagged and the attributes outlined in **Table 5** were recorded for each tree.

Table 5: Attributes recorded for each habitat tree in the tree survey area

Attribute	Description
Tag	Unique identifier on a metal tag was nailed to each habitat tree
Image	Each habitat tree was individually photographed
GPS location	The location of each habitat tree was recorded using a handheld GPS unit
Tree species	Species and common name were identified
Diameter at breast height (DBH) (cm)	DBH was measured at breast height (1.3 metres) using a diameter tape
Hollows potentially suitable for breeding by a black cockatoo	Number of hollows potentially suitable for breeding by a black cockatoo (assessed from ground level only)

Hollows that appeared potentially suitable for use by a black cockatoo from the ground were further inspected using a drone and/or a pole-mounted camera. During the hollow inspection the internal dimensions of the hollow were confirmed, if possible, and an assessment was made for signs of use such as chew marks around the hollow entrance, nesting material, feathers or the presence of birds within the hollow.

All recorded habitat trees were assigned to a category listed in **Table 6**.

Table 6: Habitat tree categories

Category	Specifications
Nest	The tree contains a hollow used by black cockatoos for breeding as confirmed by records of black cockatoos, their eggs or fledglings or other evidence of recent nesting activity by black cockatoos
Potential nest	The tree contains one or more hollows that are suitable for use by black cockatoos as breeding habitat as confirmed by internal hollow inspection^ and evidence of use by an unidentified bird such as feathers, chew marks or nest material has been recorded within a hollow
Suitable hollow(s)	The tree contains one or more hollows that are suitable for use by black cockatoos as breeding habitat as confirmed by internal hollow inspection^
Potentially suitable hollow(s)	The tree contains or is suspected to contain one or more hollows that have the potential to be suitable for use by black cockatoos when either viewed from the ground or following an internal hollow inspection that was inconclusive^
No suitable hollow(s)	The tree does not contain hollow(s) that have the potential to be suitable for use by black cockatoos when viewed from the ground or contains hollows that were determined to be unsuitable for use by black cockatoos by internal inspection^

^Hollow determined to be suitable for use as breeding habitat by black cockatoos as listed above in **Section 3.1.1**.

3.2.2.2 Roosting habitat

The site was assessed for the presence of active or historical roosts and its potential to provide roosting habitat for black cockatoos. Groups of tall native and non-native trees were generally assumed to provide potential roosting habitat.

No evening roost survey was undertaken within the site. The site was searched during daytime surveys on other dates for secondary evidence of roosting activity, such as branch clippings, droppings or moulted feathers.

3.2.2.3 Foraging habitat

Foraging habitat was identified by comparing the literature on plant species known to be foraged upon by black cockatoos (Davies 1966; Saunders 1980; Johnstone and Storr 1998; Johnstone and Kirkby 1999; Groom 2011; Johnstone *et al.* 2011; DSEWPaC 2012b) against the vegetation within the site.

Foraging habitat was then further classified as primary or secondary foraging habitat. Primary foraging plants were defined as those with historical and contemporary records of regular consumption by black cockatoos. Secondary foraging plants were defined as plants that black cockatoos have been recorded consuming occasionally or that, based on their limited extent or agricultural origin, should not be considered a sustaining resource. Each patch of foraging habitat was assigned a percentage cover of primary and secondary foraging plants. Where plants that had no foraging value occurred amongst foraging plants, they were also assigned a cover value if practicable. A list of plant species classified as primary or secondary foraging plants is provided as **Appendix B.**

Secondary evidence of black cockatoo foraging, such as chewed marri, jarrah, tuart or banksia fruits, was searched for within the site and allocated to a species where possible. The locations of black cockatoo foraging evidence within the site were mapped using a hand-held GPS unit.

3.3 Data analysis, presentation and mapping

3.3.1 Fauna habitat

Fauna habitats were described according to the dominant flora species and vegetation type present, as determined from observations made during the field survey and information provided in the '*Detailed Flora and Vegetation Assessment*' (Emerge Associates 2020). The identified fauna habitats were mapped on aerial photography with the boundaries interpreted from aerial photography, previously identified plant communities (Emerge Associates 2020) and notes taken in the field.

3.3.2 Potential to occur

A total number of species with potential to occur within the site was determined from the results of the desktop assessment.

The habitat requirements of conservation significant vertebrate fauna was specifically reviewed to ensure that any conservation significant fauna species included in the count legitimately had potential to occur within the site or wider area.

3.3.3 Likelihood of occurrence

Information on habitat preferences and distribution of conservation significant fauna species with potential occur within the site or wider area was reviewed and assessed against the general site conditions and fauna habitat types recorded during the field survey.

Based on the results of the desktop assessment and information recorded during the field survey, an assessment of the likelihood of occurrence of conservation significant fauna within the site was undertaken using the categories outlined in **Table 7**.

Table 7: Likelihood of occurrence assessment categories and definitions

Likelihood or occurrence	Definition
Recorded	Species was recorded during the current field survey or during previous field surveys.
Likely	The site contains suitable habitat for the species and it is likely it may occur based on presence of recent literature record(s) within or near to the site.
Possible	The site contains habitat of at least marginal quality and/or extent for the species and it is located within the species current known distribution range.
Unlikely	The site contains no or marginal habitat for the species and/or the site is not located within the species current known distribution range.

3.3.4 Black cockatoo habitat

Habitat trees were classified according to the scheme outlined in **Table 6** and mapped on aerial imagery. A complete summary of the recorded attributes of habitat trees was compiled in a tabular format.

Foraging habitat was mapped on aerial photography with the boundaries interpreted from aerial photography and notes taken in the field.

Foraging habitat was described according to the dominant flora species and vegetation type present, as determined from observations made during the field survey. Primary and secondary foraging habitat was mapped on aerial photography with the boundaries interpreted from aerial photography and notes taken in the field. Patches of vegetation comprising a combination of primary and secondary foraging plants were mapped as 'primary and secondary' foraging habitat. As it was not always possible to separate non-foraging plants from foraging plants, some of the mapped foraging habitat also include a proportion of non-foraging plant species.

3.3.4.1 Overall black cockatoo habitat quality

As part of environmental impact assessment and offset calculation, the Department of Agriculture, Water and the Environment (DAWE) requires that a score out of ten is provided for the overall quality of back cockatoo habitat (DSEWPaC 2012a). DAWE does not provide a methodology for scoring habitat quality but instead specifies that an assessment of quality should be undertaken by an experienced technical expert (DSEWPaC 2012b).

Emerge have developed a method to provide a systematic assessment of overall back cockatoo habitat quality. The method assesses and scores the quality of breeding, roosting and foraging habitat separately and then provides an overall quality score out of ten based on the highest score determined for the respective habitat categories. The assessment methodology is detailed in **Appendix C.**

3.4 Nomenclature and sources of information

Taxonomy and nomenclature of scientific and common names for fauna species follow the *Western Australian Museum* (WAM) *Checklist of the Terrestrial Vertebrate Fauna of Western Australia* (WAM 2020). This is contrary to the recent EPA (2020) advice to follow the *Australian Faunal Directory* (DAWE 2020b) nomenclature for birds. Nomenclature may be adapted once the EPA (2020) technical guidance is further established and generally accepted within the professional community. Where common names were not provided by WAM (2020), these have been derived from other sources.

Literature listed in **Appendix A** represent the main publications used to identify fauna species and habitats within the site.

3.5 Survey limitations

It is important to note the specific constraints imposed on surveys and the degree to which these may have limited survey outcomes. An evaluation of the survey methodology against standard constraints outlined in the EPA's document *Technical Guidance – Terrestrial vertebrate fauna surveys for environmental impact assessment* (EPA 2020) is provided in **Table 8**.

Table 8: Evaluation of survey methodology against standard constraints outlined in the EPA's Technical Guidance – Terrestrial vertebrate fauna surveys for environmental impact assessment (EPA 2020)

Constraint	Degree of limitation	Details
Level of survey	No limitation	A basic survey (desktop study and field survey) in combination with a targeted black cockatoo survey was undertaken. The level of survey and survey effort are considered adequate to assess the fauna and black cockatoo habitat values within the site.
Scope	No limitation	The survey focused on vertebrate fauna and habitat values, with particular focus on black cockatoos and other conservation significant taxa with potential to occur within the site.
Proportion of fauna identified, recorded and/or collected.	No limitation	All observed vertebrate fauna were identified. No reptiles where observed within the site. It is likely that reptiles are present within the site but not detected due to typically low activity during cooler weather.
Sources of information e.g. previously available information (whether historic or recent) as distinct from new data.	No limitation	Adequate information was available from database searches and previous surveys. The guidance currently available from Commonwealth and State agencies on the assessment of black cockatoo habitat is of limited value and relies heavily on technical experts preparing their own assessment methodology.
The proportion of the task achieved and further work which might be needed.	No limitation	The task was achieved in its entirety.
Experience level of personnel	No limitation	This fauna assessment was undertaken by qualified ecologists with ten- and three-years' experience, respectively. Technical review was undertaken by a senior environmental consultant with over 10 years' experience in environmental science in Western Australia.
Suitability of timing, weather and season	Minor limitation	Survey timing is not considered to be of great importance for basic fauna assessments. Nonetheless, the cool seasonal conditions during the field survey likely reduced the detectability of some fauna classes such as reptiles.
Completeness	No limitation	The desktop assessment, field survey and targeted black cockatoo components of the survey were completed comprehensively.
Spatial coverage and access	No limitation	Site coverage was comprehensive (track logged).
	No limitation	All parts of the site could be accessed as required.
Survey intensity	No limitation	The intensity of the survey was adequate given the size of the site.
Influence of disturbance	No limitation	Part of the site is highly modified due to historical disturbance. However, no recent disturbance was noted that may have affected outcomes of the survey.
Adequacy of resources	No limitation	All resources required to perform the survey were available. The guidance currently available from Commonwealth and State agencies on the assessment of black cockatoo habitat is limited and relies heavily on technical experts preparing their own methodology. This assessment applies an internally developed methodology that is considered to provide a systematic and balanced characterisation of black cockatoo habitat.

Table 8: Evaluation of survey methodology against standard constraints outlined in the EPA's Technical Guidance – Terrestrial vertebrate fauna surveys for environmental impact assessment (EPA 2020) (continued)

Constraint	Degree of limitation	Details
Compliance with EPA (2020) guidance	Minor limitation	The EPA guidance requires that a full list of all fauna species with potential to occur within the site is compiled. As part of this assessment a comprehensive list of fauna species of conservation significance was compiled. Non-conservation taxa with potential to occur within the site were not compiled into a list but are provided as raw data in **Appendix D**. Given that all species with potential to occur within the site are still identified within the relevant appendices this is not considered to affect the outcomes of this assessment. The EPA guidance recommends that *the Australian Faunal Directory* (DAWE 2020b) nomenclature is used for bird species. This assessment uses the WAM *Checklist of the Terrestrial Vertebrate Fauna of Western Australia* (WAM 2020) nomenclature for birds and therefore does not strictly comply.

4 Results

4.1 General site conditions

The site comprises a gently undulating landscape with sandy clay soils and lateritic gravel. A creek lies to the north west of the site which divides near the site boundary. One tributary flows in a north-south direction through the western portion of the site and the other flows in a south-easterly direction through the central portion of the site, connecting to a dam.

A large portion of the site supports non-native pasture grasses, planted trees and vineyards. Intact patches of upland and riparian native vegetation occur in the western portion of the site. Patches of upland native vegetation also occur in the eastern portion of the site and have been subject to historical disturbance in the form of grazing.

4.2 Fauna habitat

Seven fauna habitats were identified within the site; '**marri and jarrah forest**', '**marri and jarrah forest - limited understorey**', '**marri and peppermint forest**', '**scattered trees and shrubs**', '**vineyard**', '**waterbody**' and '**predominantly cleared area**'.

A description and the area of each habitat is provided in **Table 9** and representative photographs of each are provided in **Plate 1** to **Plate 6**. The location of each habitat is shown on **Figure 5**.

Table 9: Fauna habitats identified within the site.

Fauna habitat classification	Description	Area (ha)
Marri and jarrah forest	Open forest *Corymbia calophylla* and *Eucalyptus marginata* over scattered low trees *Banksia grandis* over shrubland *Hovea elliptica* and *Xanthorrhoea preissii* over low shrubland *Hibbertia hypericoides* over mixed native herbland (**Plate 1**).	7.09
Marri and jarrah forest - limited understorey	Open forest *Corymbia calophylla* and *Eucalyptus marginata* over sparse native shrubland over sparse native and non-native forbland over non-native grassland (**Plate 2**).	8.99
Marri and peppermint forest	Woodland *Corymbia calophylla* over tall shrubland *Agonis flexuosa* over mixed native shrubs and/or sedges (**Plate 3**).	2.85
Scattered trees and shrubs	Scattered areas or small patches of native or non-native trees and shrubs, including *Corymbia calophylla*, *Agonis flexuosa*, **Eucalyptus camaldulensis*, **Eucalyptus lehmannii* and **Eucalyptus cladocalyx* (**Plate 4**).	1.39
Vineyard	Areas containing planted rows of **Vitis vinifera* (grape vine) (**Plate 5**).	5.47
Waterbody	Temporary or permanent areas of water within farm dams (**Plate 6**).	0.83
Predominantly cleared area	Heavily disturbed areas dominated by turf, bare ground or sealed areas including buildings and roads (**Plate 7**).	13.44

Plate 1: ***Marri and jarrah forest***

Plate 2: ***Marri and jarrah forest - limited understorey***

Plate 3: ***Marri and peppermint forest***

Plate 4: ***Scattered trees and shrubs***

Plate 5: ***Vineyard***

Plate 6: ***Waterbody***

Plate 7: ***Predominantly cleared area***

4.3 Fauna

4.3.1 Desktop assessment

A total of 255 fauna species were identified from database searches as occurring or potentially occurring within 10 km of the site[1] as listed in **Appendix D**.

Of these species, 63 are conservation significant, including 43 threatened, 4 priority, 14 migratory fauna, one conservation dependent and one other specially protected species as listed in **Appendix E**.

4.3.2 Species inventory

A total of 29 native and two introduced fauna species, including four fauna species of conservation significance (Baudin's cockatoo, Carnaby's cockatoo, forest red-tailed black cockatoo and western ringtail possum), were directly or indirectly (from scats, tracks, skeletal remains, presence of drey or foraging evidence) recorded during the field survey. A complete species list is provided in **Appendix F**.

4.3.3 Conservation significant fauna

Four threatened fauna species were directly or indirectly recorded within the site during the field survey; Baudin's cockatoo, Carnaby's cockatoo, forest red-tailed black cockatoo and western ringtail possum.

[1] Includes native and non-native species

Baudin's cockatoos and forest red-tailed black cockatoos were recorded flying over the site and a small group of Carnaby's cockatoos (two adults and one juvenile) were observed foraging in the site on the 13 August 2020. Additionally, evidence of foraging by Carnaby's cockatoo and forest red-tailed black cockatoo was observed in the site in the form of chewed marri fruit.

Western ringtail possum was indirectly identified through the presence of a drey in the **marri and peppermint forest** habitat. No western ringtail possum scats were observed near the drey, suggesting that is may not have been used recently.

In addition to the above, two threatened, three priority, one migratory, one conservation dependent and one other specially protected fauna species were considered to possibly to occur within the site as listed in **Table 10**.

The remainder of the conservation significant fauna species identified in the desktop assessment (51 species) are considered unlikely to occur in the site due to lack of suitable habitat or because the site lies outside of the species known distribution. Fauna species classed as unlikely to occur are listed in **Appendix E**[2].

Table 10: Summary of conservation significant fauna species recorded or deemed possible or likely to occur within the site

Species	Common name	Level of significance		Habitat	Likelihood of occurrence within the site
		BC Act	EPBC Act		
Birds					
Apus pacificus	Pacific swift	MI	MI	Aerial, migratory species that is most often seen over inland plains and sometimes above open areas, foothills or in coastal areas. Sometimes occurs over settled areas, including towns, urban areas and cities (Pizzey and Knight 2012).	Possible
Calyptorhynchus banksii naso	Forest red-tailed black cockatoo	VU	VU	Eucalypt and Corymbia forests, often in hilly interior. More recently also observed in more open agricultural and suburban areas including Perth metropolitan area. Attracted to seeding *Corymbia calophylla*, *Eucalyptus marginata*, introduced *Melia azedarach* and other *Eucalyptus* spp. trees (Johnstone *et al.* 2017).	Recorded

[2] Fauna species with no potential to occur within the site (e.g. marine mammals and marine fish) were excluded from this list.

Table 9: Summary of conservation significant fauna species recorded or deemed possible or likely to occur within the site (continued)

Species	Common name	Level of significance		Habitat	Likelihood of occurrence within the site
		WA	EPBC Act		
Birds					
Calyptorhynchus baudinii	Baudin's cockatoo	EN	EN	Mainly eucalypt forests. Attracted to seeding *Corymbia calophylla*, *Banksia* spp., *Hakea* spp., and to fruiting apples and pears (Johnstone and Storr 1998).	Recorded
Calyptorhynchus latirostris	Carnaby's cockatoo	EN	EN	Mainly proteaceous scrubs and heaths and adjacent eucalypt woodlands and forests; also plantations of *Pinus* spp. Attracted to seeding *Banksia* spp., *Dryandra* spp., *Hakea* spp., *Eucalyptus* spp., *Corymbia calophylla*, *Grevillea* spp., and *Casuarina* spp. (Johnstone and Storr 1998).	Recorded
Falco peregrinus	Peregrine falcon	OS	-	Mainly found around cliffs along coasts, rivers, ranges and around wooded watercourses and lakes (Johnstone and Storr 1998).	Possible
Invertebrate					
Westralunio carteri	Carter's freshwater mussel	VU	VU	Occurs in greatest abundance in slower flowing streams with stable sediments that are soft enough for burrowing amongst woody debris and exposed tree roots. Salinity tolerance quite low (Morgan *et al.* 2011).	Possible
Mammals					
Dasyurus geoffroii	Chuditch	VU	VU	Wide range of habitats from woodlands, dry sclerophyll forests, riparian vegetation, beaches and deserts. Appears to utilise native vegetation along road sides in the wheatbelt (DEC 2012a).	Possible

Table 9: Summary of conservation significant fauna species recorded or deemed possible or likely to occur within the site (continued)

Species	Common name	Level of significance		Habitat	Likelihood of occurrence within the site
		WA	EPBC Act		
Mammals					
Falsistrellus mackenziei	Western false pipistrelle	P4	-	High rainfall forests dominated by jarrah, karri, marri, and tuart. Occupies hollow logs for breeding and resting (Van Dyck and Strahan 2008). Also known to utilise Banksia woodland on the Swan Coastal Plain (Hosken and O'Shea 1995).	Possible
Hydromys chrysogaster	Rakali	P4	-	Areas with permanent water, fresh, brackish or marine. Likely to occur in all major rivers and most of the larger streams as well as bodies of permanent water in the lower south west (Christensen and Strahan 1984).	Possible
Isoodon fusciventer	Quenda	P4	-	Dense scrubby, often swampy, vegetation with dense cover up to one metre high (DEC 2012b).	Possible
Phascogale tapoatafa wambenger	South-western brush-tailed phascogale	CD	-	Dry sclerophyll forests and open woodlands that contain hollow-bearing trees but a sparse ground cover (Triggs 2003).	Possible
Pseudocheirus occidentalis	Western ringtail possum	CR	CR	Dense stands of *Agonis flexuosa,* as well as *Eucalyptus gomphocephala*, *Corymbia calophylla* and *Eucalyptus marginata* forests (DBCA 2017b).	Recorded

4.3.1 Declared pests

One species listed as a declared pest (C3) pursuant to the BAM Act, **Oryctolagus cuniculus* (rabbit), was identified from scats within the site.

4.4 Black cockatoos

4.4.1 Habitat

4.4.1.1 Breeding

A total of 337 black cockatoo habitat trees were recorded within the tree survey area as shown in **Figure 6**.

The habitat trees comprised 234 *Corymbia calophylla* (marri), 83 *Eucalyptus marginata* (jarrah), 12 *Eucalyptus patens* (Swan River blackbutt) and 8 stags (dead trees).

An internal hollow inspection was undertaken for 34 habitat trees that were determined to potentially contain suitable hollows based on the initial inspection from ground level. Of the 34 trees inspected, three were determined to each contain one suitable hollow (Tree IDs 46, 258 and 402), one was determined to contain two potentially suitable hollows (Tree ID 191) and one was determined to contain one potentially suitable hollow (Tree ID 191). The remaining trees contained no suitable hollows for breeding by black cockatoos.

The two trees categorised as containing potentially suitable hollow(s) were deemed as such because the size of the hollow cavities could not be confirmed. The hollows were located above 16 metres (m) high which is beyond the reach of the pole-mounted camera. Instead, a drone was used to inspect the hollow externally, but it could only confirm that cavities are present. The internal hollows dimensions remain unconfirmed.

A summary of the habitat trees recorded within the tree survey area is provided in **Table 11** and an inventory in **Appendix G.** Details of habitat trees with suitable hollows is provided in **Appendix H**.

Table 11: Habitat trees recorded within the site

Category	No. trees	No. suitable hollows
Confirmed nest	0	0
Potential nest	0	0
Suitable hollow(s)	3	3
Potentially suitable hollow(s)	2	3
No suitable hollow(s)	332	0
Total	**337**	**5**

4.4.1.2 Roosting

No roosts or secondary evidence of roosting were observed within the site during the survey.

Native and non-native trees within the site have the potential to provide roosting habitat for black cockatoos.

4.4.1.3 Foraging

Primary foraging habitat in the site is predominantly comprised of *Banksia grandis* (bull banksia), jarrah, marri and Swan River blackbutt trees. Secondary foraging plants include *Agonis flexuosa* (peppermint), *Eucalyptus lehmannii* and *Xanthorrhoea* sp. (grasstree).

A summary of the dominant foraging plant species that occur in the site is provided in **Table 12**.

Table 12: Dominant primary and secondary black cockatoo foraging plants recorded within the site

Common name	Foraging habitat category and black cockatoo species		
	Carnaby's	Baudin's	Forest red-tailed
Peppermint	Secondary	-	-
Bull banksia	Primary	Primary	-
Swan River blackbutt	Primary	-	Primary
Jarrah	Primary	Primary	Primary
Marri	Primary	Primary	Primary
Grass tree	Secondary	Secondary	-

The site contains approximately 15 ha of primary foraging habitat and 2 ha of secondary foraging habitat for species of black cockatoo as detailed in **Table 13** and shown in **Figure 7** to **Figure 9**. The site contains a slightly larger area of foraging habitat for Carnaby's cockatoo than for the other two species of black cockatoo. This is due to the presence of peppermint which is only known to be consumed by Carnaby's cockatoo (Groom 2011). Similarly, the area of foraging habitat for Baudin's cockatoo is slightly larger than the area of foraging habitat for forest red-tailed black cockatoo due to the extent of bull banksia in the site which is not consumed by forest red-tailed black cockatoo.

The majority of the foraging habitat within the site occurs within forest vegetation that also includes other plant species. Hence, the area mapped as foraging habitat for each species also includes a proportion of non-foraging plants as shown in **Table 13.**

Table 13: Proportion of primary, secondary and non-foraging plants within patches of foraging habitat

	Foraging habitat area (ha) and black cockatoo species		
	Carnaby's cockatoo	Baudin's cockatoo	Forest red-tailed black cockatoo
Primary foraging plants	14.59	14.39	14.27
Secondary foraging plants	1.84	0.38	0.10
Non-foraging plants	3.05	4.51	4.97
Total	**19.48**	**19.28**	**19.34**

4.4.1.4 Overall quality

The outcome of the overall black cockatoo habitat quality assessment is provided in **Table 14** and summarised in **Table 15**.

The site was determined to have an overall habitat score of six for Carnaby's cockatoo and five for Baudin's cockatoo which is both 'moderate'.

The site was determined to have an overall habitat score of seven for forest red-tailed out of a maximum possible score of 10, which is 'moderate to high' using the scale provided in **Appendix C**.

The full results of the quality assessment are provided in **Appendix I**.

Table 14: Habitat quality assessment scores

Habitat category	Score		
	Carnaby's	Baudin's	Forest red-tailed
Breeding	5	5	5
Roosting	2	2	2
Foraging	6	5	7
Overall Score	**6** **Moderate**	**5** **Moderate**	**7** **Moderate to high**

Table 15: Summary of attributes contributing to black cockatoo habitat quality scores

Habitat category	Quality component category	Attributes and black cockatoo species		
		Carnaby's	Baudin's	Forest red-tailed
Breeding	Site condition	The site supports habitat trees with suitable hollows.	The site supports habitat trees with suitable hollows.	The site supports habitat trees with suitable hollows.
	Site context	No confirmed Carnaby's nest tree is known to occur within 6 km of the site and 6,320.35 ha of potential remnant native vegetation and/or pine plantation is mapped within 6 km of the site as shown in **Figure 3**.	No confirmed Baudin's nest tree is known to occur within 6 km of the site and 6,320.35 ha of potential remnant native vegetation and/or pine plantation is mapped within 6 km of the site as shown in **Figure 3**.	No confirmed forest red-tailed black cockatoo nest tree is known to occur within 6 km of the site and 6,271.19 ha of remanant native vegetation is mapped within 6 km of the site as shown in **Figure 3**.
	Species stocking rate	N/A – no evidence of breeding was recorded within the site.	N/A – no evidence of breeding was recorded within the site.	N/A – no evidence of breeding was recorded within the site.
Roosting	Site condition	The site supports potential roosting habitat.	The site supports potential roosting habitat.	The site supports potential roosting habitat.
	Site context	The site is located more than 1 km from a large roost and more than 500 m from a small roost	The site is located more than 1 km from a large roost and more than 500 m from a small roost.	The site is located more than 1 km from a large roost and more than 500 m from a small roost
	Species stocking rate	N/A - no evidence of roosting was recorded within the site.	N/A - no evidence of roosting was recorded within the site.	N/A - no evidence of roosting was recorded within the site.
Foraging	Site condition	The site supports foraging habitat that is proportionally of 74.90% primary foraging plants.	The site supports foraging habitat that is proportionally of 74.64% primary foraging plants.	The site supports foraging habitat that is proportionally of 73.78% primary foraging plants.
	Site context	Confirmed white-tailed black cockatoo roosts occur within 6 km of the site, indicating the foraging habitat within the site may be used by the birds utilising the roosts.	Confirmed white-tailed black cockatoo roosts occur within 6 km of the site, indicating the foraging habitat within the site may be used by the birds utilising the roosts.	Confirmed forest red-tailed black cockatoo roosts occur within 6 km of the site, indicating the foraging habitat within the site may be used by the birds utilising the roosts.
	Species stocking rate	Carnaby's cockatoos were observed actively foraging within the site and limited secondary foraging evidence was recorded.	No evidence of Baudin's cockatoo foraging was observed in the site.	Abundant secondary evidence of forest red-tailed black cockatoo foraging was observed in the site.

5 Discussion

5.1 Fauna and fauna habitat values

The majority of the 29 native fauna species opportunistically recorded within the site are all generally common and widespread across the Warren region.

The highest fauna habitat values in the site are associated with the **marri and jarrah forest**, **marri and peppermint forest** and to a lesser extent **marri and jarrah forest with limited understorey** habitats (shown in **Figure 5**). These habitats occur over 47.26% of the site. In particular where vegetation occurs in good or better condition as mapped by Emerge Associates (2020), it provides a cover of native trees, shrubs and ground cover and contains microhabitats such as logs, rocks and leaf litter. Parts of these habitats are also connected to vegetation adjacent to the site and may function as wildlife corridors that facilitate fauna movement across the landscape.

The **scattered trees and shrubs** habitat (see **Figure 5**) provides varying value to native fauna depending on the plant species and density present and extends over 3.47% of the site.

The remainder of the site supports highly modified habitats associated with developed and agricultural areas, including **vineyard, waterbody** and **predominantly cleared area** (49.26%) shown in **Figure 5**. These habitats provide varying value to native fauna depending on the plant species and density present but are likely to be primarily be used by common and widespread native and non-native fauna with non-specific habitat requirements.

5.2 Conservation significant fauna

Four fauna species of conservation significance were recorded within the site; Baudin's cockatoo, Carnaby's cockatoo, forest red-tailed black cockatoo (further discussed in **Section 5.3**) and western ringtail possum.

A drey attributed to western ringtail possum was observed in the **marri and peppermint forest** habitat as shown in **Figure 5**. Although the age of this drey is unknown, the fact that no western ringtail possum scats were observed nearby suggests that is has not been recently used. Nonetheless, much of the site supports marri, jarrah and peppermint trees, which are known food plants for western ringtail possums (DPaW 2017). In particular, the **marri and jarrah forest** and **marri and peppermint** forest habitats, and to a lesser extent **marri and jarrah forest – limited understorey** habitat would provide potentially suitable habitat for this species. Further targeted surveys would need to be undertaken to determine if and to what extent western ringtail possums utilise the site.

Additionally, it is considered possible that a further eight species of conservation significance not recorded during the field survey may occur in the site.

Apus pacificus (pacific swift) and *Falco peregrinus* (peregrine falcon) may opportunistically fly over or forage in the site as part of a much larger home range but the site is considered unlikely to provide important habitat for these species.

The **water body** and **marri and peppermint forest** (where the creek is present) habitats provide potential habitat for *Hydromys chrysogaster* (rakali) and *Westralunio carteri* (Carter's freshwater mussel). The **marri and jarrah forest**, **marri and peppermint forest** and to a lesser extent **marri and jarrah forest with limited understorey** habitats may also provide potential habitat for *Dasyurus geoffroii* (chuditch), *Falsistrellus mackenziei* (western false pipistrelle), *Isodoon fusciventer* (quenda) and *Phascogale tapoatafa wambenger* (south-western brush-tailed phascogale). While it is possible that chuditch may occasionally occur in the site, it would only form part of a much larger home range, if the species occurs at all. Targeted surveys would need to be undertaken to confirm whether any of these fauna species occur in the site.

5.3 Black cockatoos

All three species of black cockatoo were recorded in the site during the field survey. Records for black cockatoos were anticipated as the site lies within the expected range of all three species and suitable habitat occurs within the site and local area.

5.3.1 Habitat

5.3.1.1 Breeding

The tree survey area comprises a total of 337 habitat trees, of which three trees each contained one 'suitable hollow' for breeding by black cockatoos. All three hollows are considered to represent suitable breeding habitat for all three species of black cockatoo. However, no evidence of use for breeding by black cockatoos of any of these hollows was recorded.

The tree survey area also contains two trees with 'potentially suitable hollow(s)' for breeding by black cockatoos. Further investigation of these hollow, such as physical inspection using climbing equipment, would be required to confirm the suitability of these hollow.

The remainder of the habitat trees (332) contained either no hollows or hollows that are unsuitable for breeding by black cockatoos. The reasons a hollow may have been considered unsuitable include that it was in use by European honey bees, had a shallow depth, an uneven base or, most commonly, an internal cavity size that would be too small for a black cockatoo to nest within. Nonetheless, many of the trees within the site have the potential to form suitable hollows in the future but it will likely take many years for hollows to form that are suitable for use by black cockatoos.

Approximate habitat tree densities within the tree survey area were used to provide an estimate of the potential number of additional habitat trees present in the remainder of the site. Based on an estimated density of 40.61 habitat trees per hectare within the eastern portion of the tree survey area, it was predicted that approximately 58 additional habitat trees occur within intact native vegetation in the north-eastern portion of the site. Based on an estimated density of 46.94 habitat trees per hectare within the denser western portion of the tree survey area, it was predicted that approximately 674 additional habitat trees may occur within intact native vegetation the remainder of the site. In total it was predicted that approximately 732 habitat trees, including one tree with a hollow of suitable size for breeding by black cockatoos may occur in the remainder of the site. However, this number provides an estimation only and does not take into consideration trees that occur as scattered or individual trees.

5.3.1.2 Roosting

No signs of roosting were observed during the field survey and the BirdLife Australia dataset does not include any roost records in the site. Therefore, there is no reason to suspect that roosting currently occurs in the site. Nevertheless, the site contains tall trees that have the potential to provide roosting habitat for black cockatoos.

5.3.1.3 Foraging

The site contains approximately 14.59 ha of primary foraging habitat for Carnaby's cockatoo (36% of the site), 14.39 ha for Baudin's cockatoo (35% of the site) and 14.27 ha for forest red-tailed black cockatoo (35% of the site).

Given the relatively high cover of primary foraging plants such as marri and jarrah, the foraging habitat in the site is likely to be of high value for all three species of black cockatoos. Additionally, the site also supports secondary foraging plants for all three species of black cockatoo, that may be used supplementary. Nonetheless, extensive areas of potential foraging habitat of similar value is located adjacent to and in the wider area of the site as shown in **Figure 3.**

5.3.1.4 Overall quality

The vegetation in the site scored highest in the foraging habitat value for all three species of black cockatoo. This is primarily due to the relatively high proportion of primary foraging plants within areas mapped as potential foraging habitat (≥50%).

The overall habitat quality was determined to be six (moderate) for Carnaby's cockatoo, five (moderate) for Baudin's cockatoo and seven (moderate to high) for forest red-tailed black cockatoo.

The foraging habitat and overall quality score was highest for forest red-tailed black cockatoo, as 'abundant' evidence of foraging by this species was recorded in the site. The foraging habitat and overall quality score for Carnaby's cockatoo was assigned on the basis that 'limited' evidence of foraging by this species was recorded in the site. No evidence of foraging by Baudin's cockatoo was recorded in the site, resulting in the lowest foraging habitat and overall quality score of the three black cockatoo species.

No information on black cockatoo breeding sites was available for the wider area of the site. However, this is likely the result of limited survey effort, rather than an indication that black cockatoo breeding does not occur. As such, it should be noted that the relative value of both breeding habitat and foraging habitat in the site would increase if confirmed breeding sites where known to be located within 6-12 km of the site. A nearby record of confirmed nesting is considered to increase the breeding habitat quality of the site as it provides validation that breeding has occurred in the surrounding area. Similarly, the value of foraging habitat is considered to increase if located near breeding sites as it indicates that foraging habitat may more likely be used to support breeding.

The roosting score was consistent between all three species and, as no evidence of roosting was recorded within the site, roosting quality was determined from basic habitat condition attributes (tall trees).

6 Conclusions

6.1 Fauna and fauna habitat

Approximately half of the site (47.26%) contains remnant native vegetation which supports high habitat values for native fauna species.

A total of 29 native fauna species were positively identified to occur within the site, including four threatened species: western ringtail possum (critically endangered), Carnaby's cockatoo (endangered), Baudin's cockatoo (endangered) and forest red-tailed black cockatoo (vulnerable).

Western ringtail possum was indirectly detected through the presence of a drey and so it is unknown whether western ringtail possums are currently utilising the site. However, **marri and jarrah forest** and **marri and peppermint** forest habitats, and to a lesser extent **marri and jarrah forest – limited understorey** habitat support potentially suitable habitat for this species. Further targeted surveys would need to be undertaken to determine if and to what extent western ringtail possums utilise the site.

Eight species of conservation significance not recorded during the field survey are also considered to have potential to occur within the site. These species would primarily be associated with the **marri and jarrah forest**, **marri and peppermint** forest and to a lesser extent **marri and jarrah forest with limited understorey** habitats, if they occur at all. Targeted surveys would need to be undertaken to confirm whether these species occur within the site.

6.2 Black cockatoos

The site is located within the modeled distribution and breeding range of all three species of black cockatoo and all three species were recorded in the site during the field survey.

A total of 337 habitat trees were recorded in the tree survey area, of which three trees contained 'suitable hollow(s)' and two trees contained 'potentially suitable hollow(s)' for breeding by black cockatoos. The tree survey area is therefore considered to provide suitable breeding habitat for all three species of black cockatoo. Based on habitat tree densities within the tree survey area it was predicted that approximately 732 habitat trees, including one tree with hollows of suitable size for breeding black cockatoos, occur in the remainder of the site.

No evidence of black cockatoo roosting activity was observed within the site. Potential roosting habitat that is suitable for all three species of black cockatoo occurs within the site in the form of large native and non-native trees.

A total of 14.59 ha of primary foraging habitat for Carnaby's cockatoo, 14.39 ha for Baudin's cockatoo and 14.27 ha for forest red-tailed black cockatoo were recorded in the site. Additionally, the site also contains 1.84 ha of secondary foraging habitat for Carnaby's cockatoo, 0.38 ha for Baudin's cockatoo and 0.1 ha for forest red-tailed black cockatoo. Extensive areas of additional remnant native vegetation that may provide foraging habitat for all three species of black cockatoo occur adjacent to and in the wider area of the site.

The overall black cockatoo habitat quality score for the site was determined to be six (moderate) for Carnaby's cockatoo, five (moderate) for Baudin's cockatoo and seven (high to moderate) for forest red-tailed black cockatoo. The site scored highest for the foraging habitat component due the presence of a relatively high proportion of primary foraging plants.

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Figures

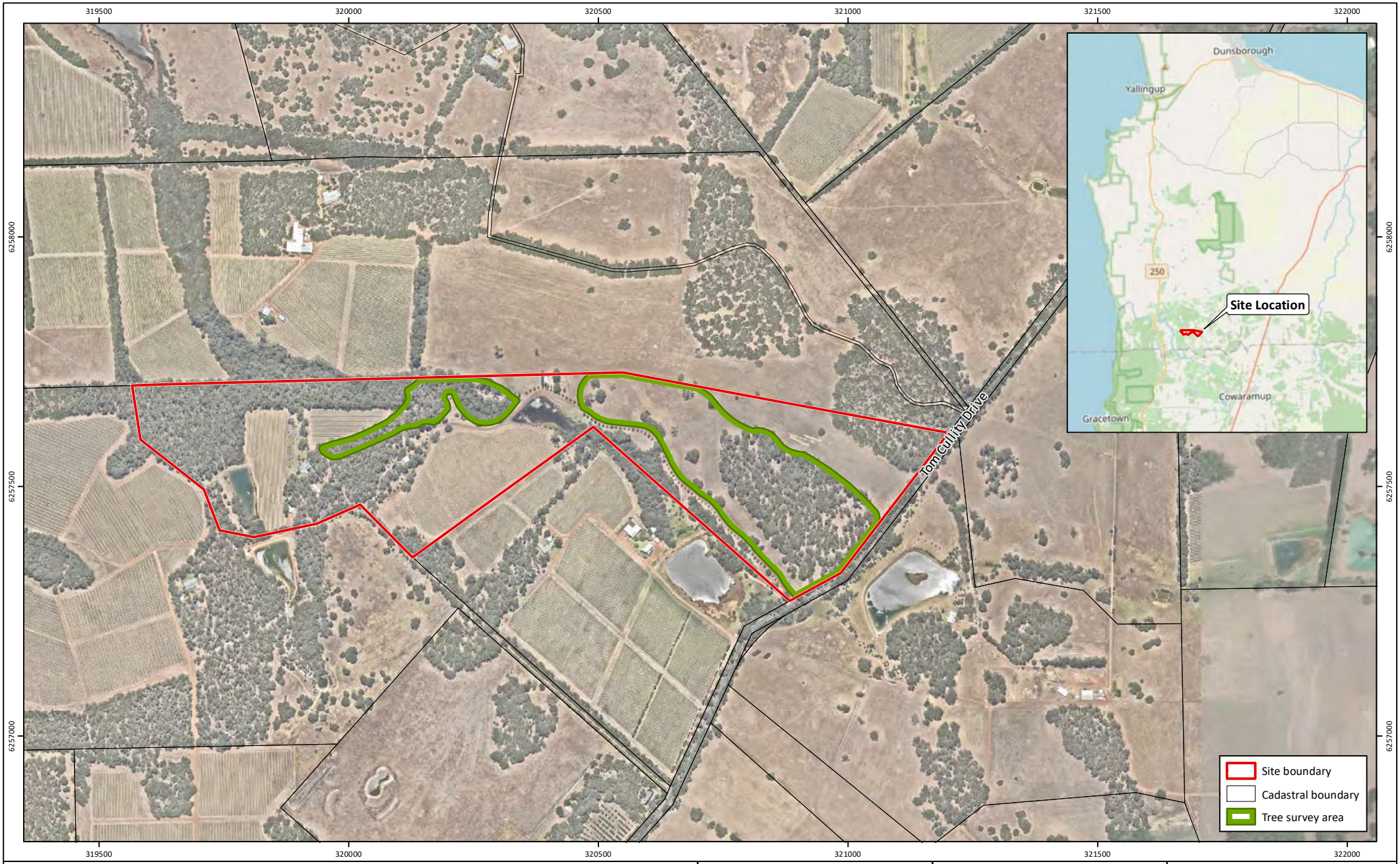

Figure 1: Site Location

Project: Basic Fauna and Targeted Black Cockatoo Assessment
Lot 32 (No.325) Tom Cullity Drive, Wilyabrup
Client: Montague VY No. 1 Pty Ltd ATF Montague Trust

Plan Number:
EP20-088(02)--F08

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Checked:	MS
Approved:	RAW
Date:	03/12/2020

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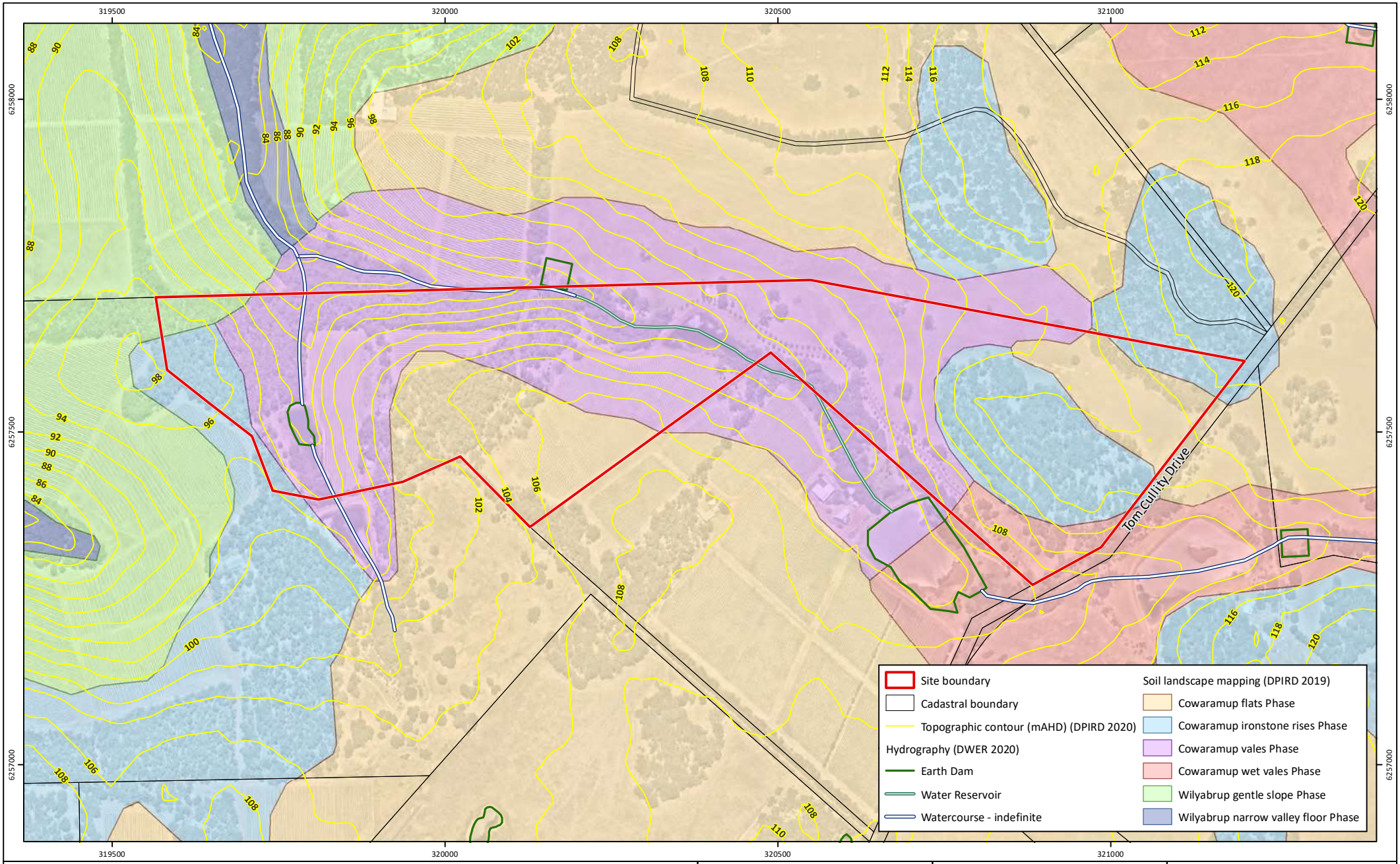

Figure 2: Hydrography, Soils, and Topography

Project: Basic Fauna and Targeted Black Cockatoo Assessment
Lot 32 (No.325) Tom Cullity Drive, Wilyabrup
Client: Montague VY No. 1 Pty Ltd ATF Montague Trust

Plan Number:
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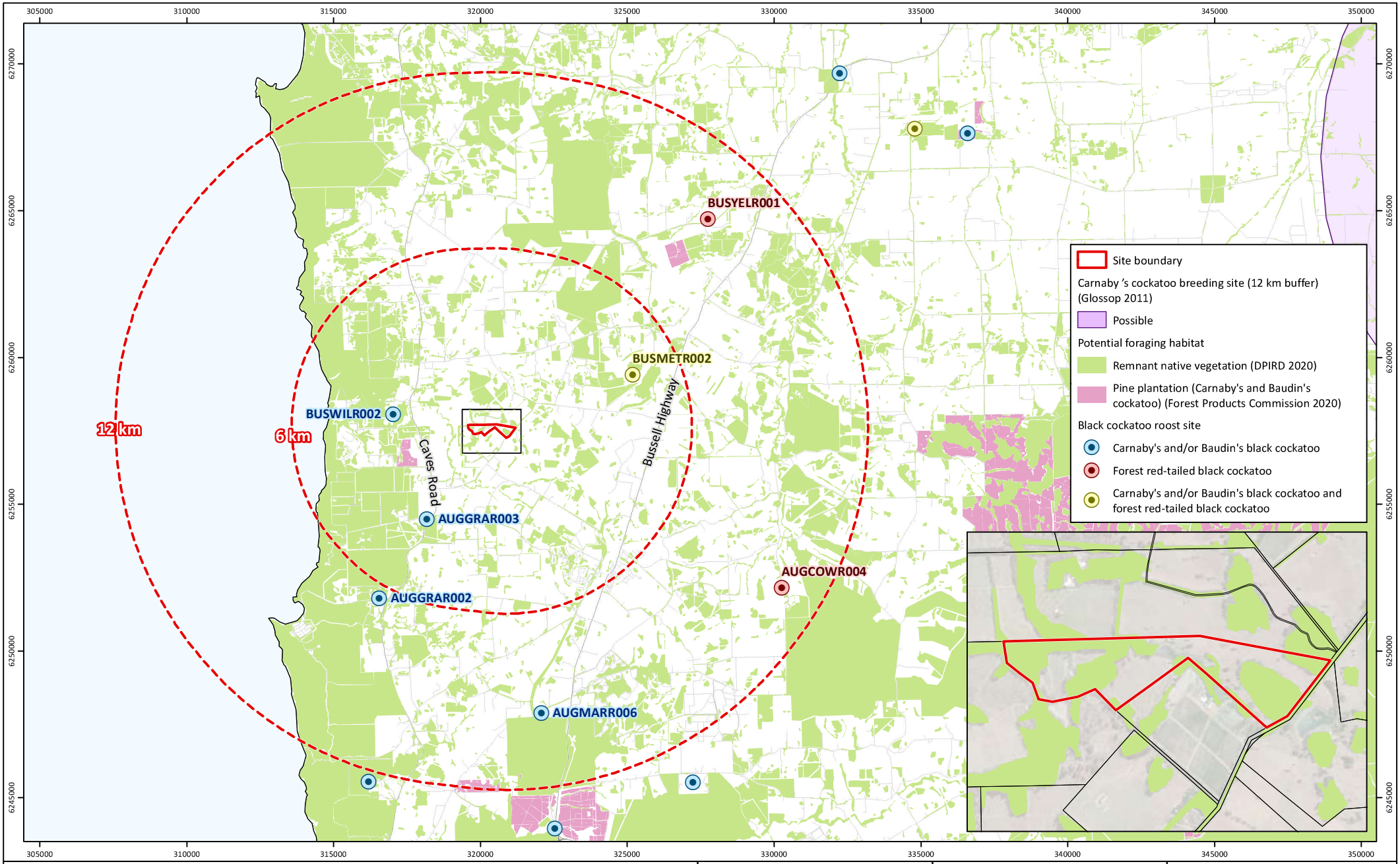

Figure 3: Black Cockatoo Habitat Context

Project: Basic Fauna and Targeted Black Cockatoo Assessment
Lot 32 (No.325) Tom Cullity Drive, Wilyabrup
Client: Montague VY No. 1 Pty Ltd ATF Montague Trust

Plan Number:
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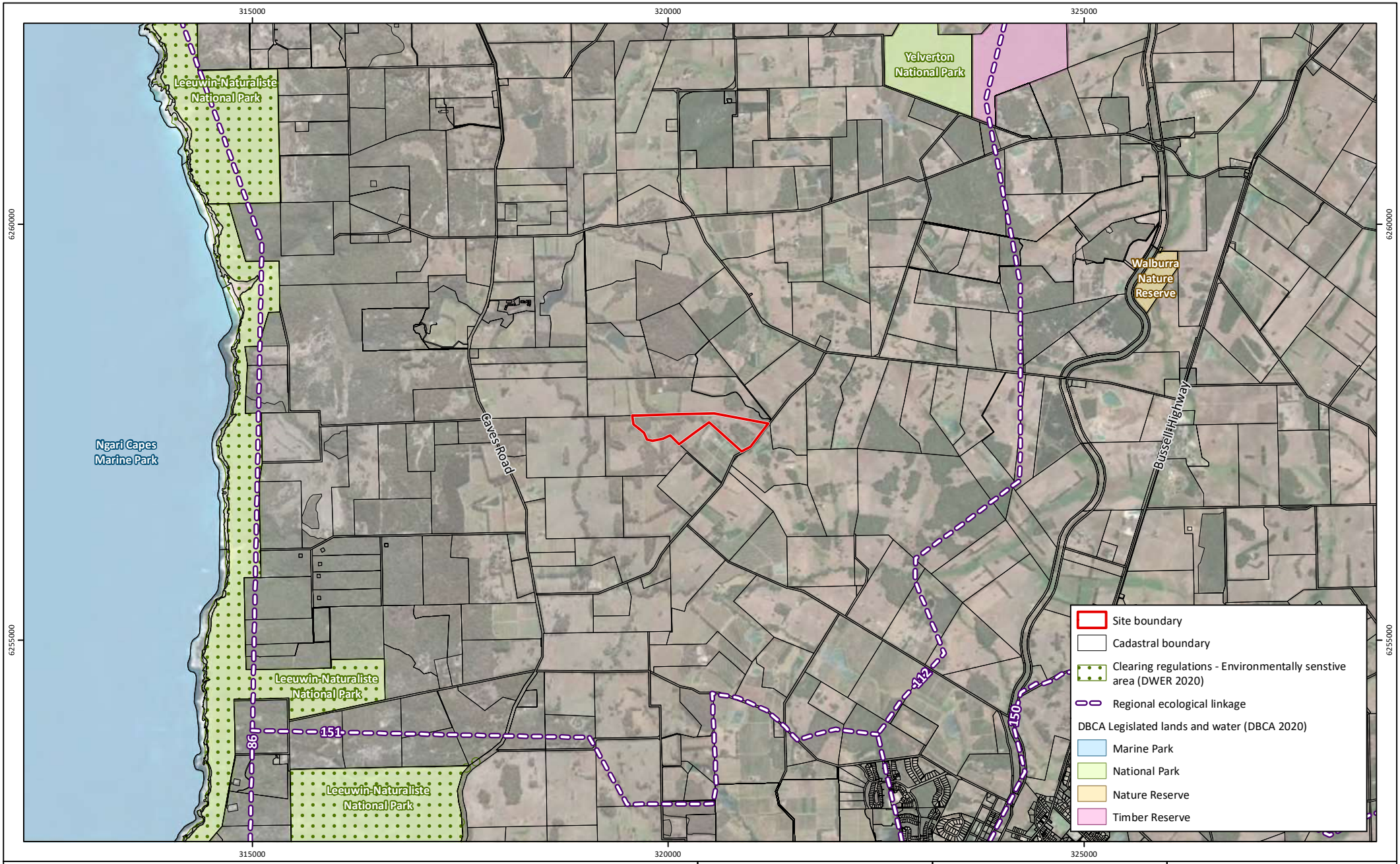

Figure 4: Environmental Features

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Lot 32 (No.325) Tom Cullity Drive, Wilyabrup

Client: Montague VY No. 1 Pty Ltd ATF Montague Trust

Plan Number:
EP20-088(02)--F10

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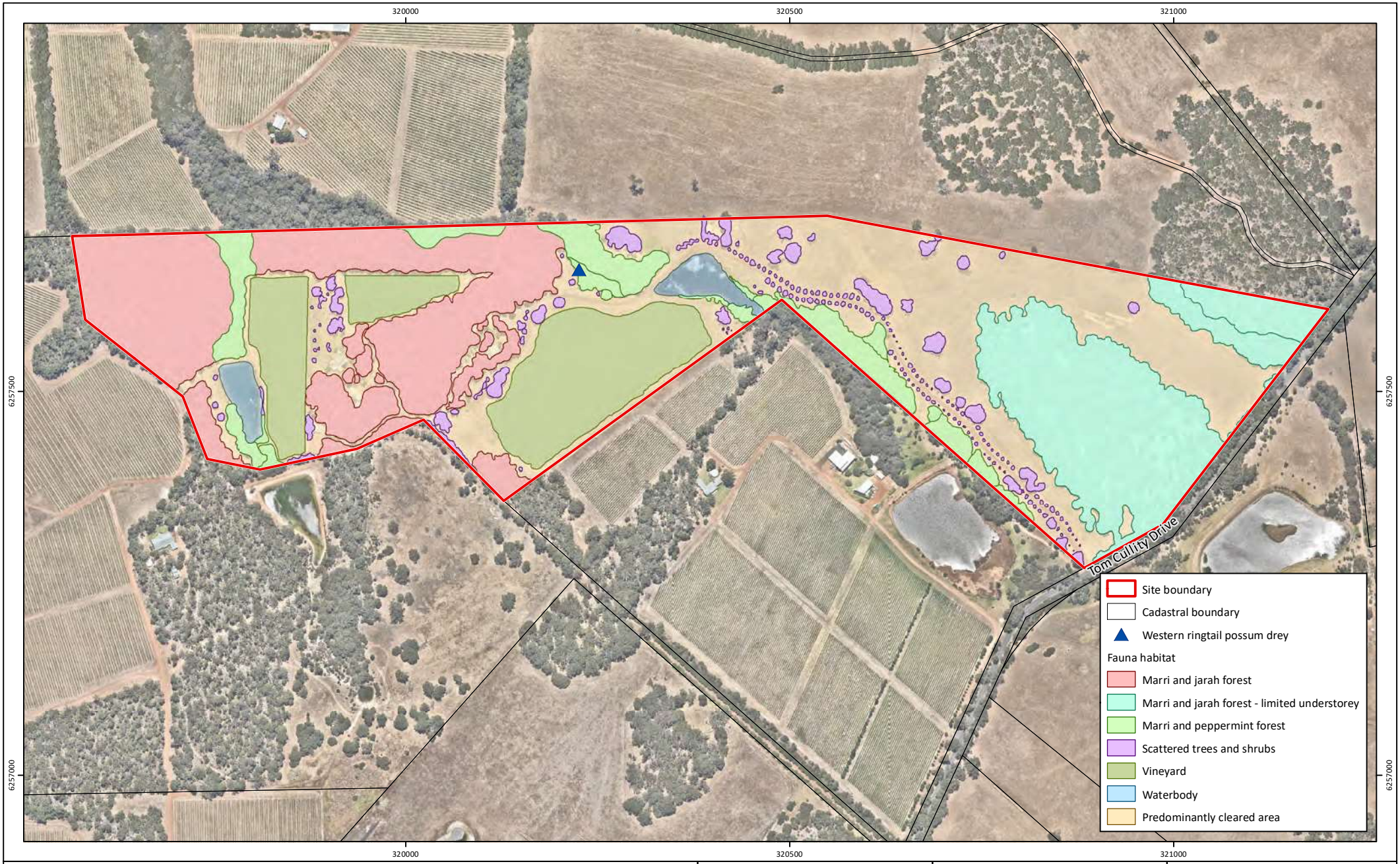

Figure 5: Fauna Habitat

Project: Basic Fauna and Targeted Black Cockatoo Assessment
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Client: Montague VY No. 1 Pty Ltd ATF Montague Trust

Plan Number:
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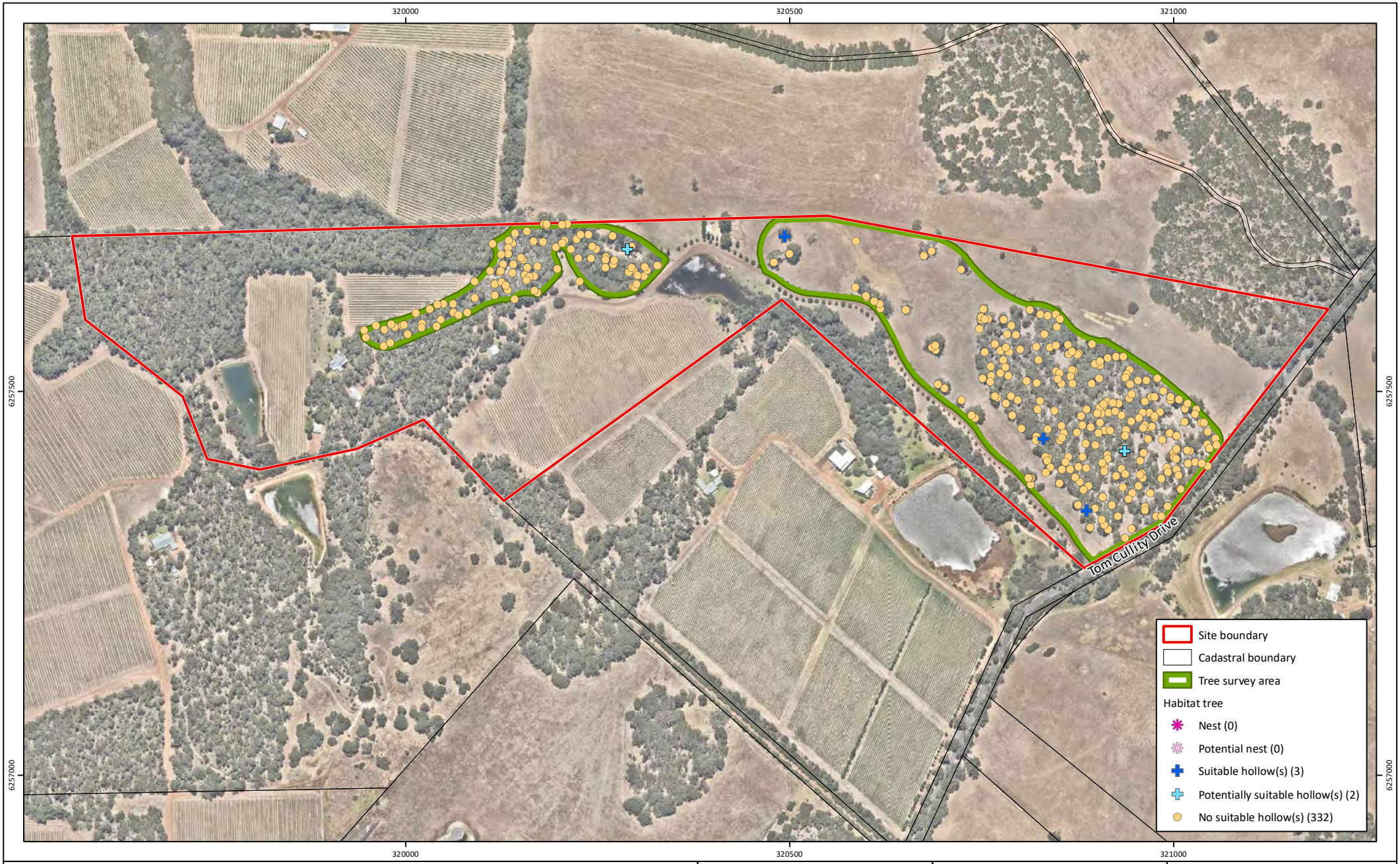

Figure 6: Black Cockatoo Habitat Trees

Project:	Basic Fauna and Targeted Black Cockatoo Assessment Lot 32 (No.325) Tom Cullity Drive, Wilyabrup
Client:	Montague VY No. 1 Pty Ltd ATF Montague Trust

Plan Number:
EP20-088(02)--F13

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Figure 7: Potential Baudin's Cockatoo Foraging Habitat

Project: Basic Fauna and Targeted Black Cockatoo Assessment
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Client: Montague VY No. 1 Pty Ltd ATF Montague Trust

Plan Number:
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GDA 1994 MGA Zone 50

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Figure 8: Potential Carnaby's Cockatoo Foraging Habitat

Project: Basic Fauna and Targeted Black Cockatoo Assessment
Lot 32 (No.325) Tom Cullity Drive, Wilyabrup
Client: Montague VY No. 1 Pty Ltd ATF Montague Trust

Plan Number:
EP20-088(02)--F15a

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Figure 9: Potential Forest Red-tailed Black Cockatoo Foraging Habitat

Project: Basic Fauna and Targeted Black Cockatoo Assessment
Lot 32 (No.325) Tom Cullity Drive, Wilyabrup
Client: Montague VY No. 1 Pty Ltd ATF Montague Trust

Plan Number:
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Appendix A

Additional Information

Flora and Vegetation Report / Fauna Report - Appendix			
Date	**Version**	**Summary of changes**	**Author**
22/05/2020	001	Created appendix from *Emerge Fauna only Report-Appendix A (V010).* Added information regarding black cockatoos	RAW
15/06/2020	002	Added references for Emerge BC datasets and updated State category listings of conservation significant fauna	RAW
19/06/2020	003	Added fauna literature section (previously separate appendix)	MS

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Conservation Significant Fauna

Threatened and priority fauna

Fauna species considered rare or under threat warrant special protection under Commonwealth and/or State legislation. At the Commonwealth level, fauna species can be listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Migratory birds may be recognised under international treaties including:

- *Japan Australia Migratory Bird Agreement 1981* (JAMBA)
- *China Australia Migratory Bird Agreement 1998* (CAMBA)
- *Republic of Korea-Australia Migratory Bird Agreement 2007* (ROKAMBA)
- *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. Fauna species considered 'threatened' pursuant to Schedule 1 of the EPBC Act are assigned categories as outlined in **Table 1**.

Table 1: Definitions of conservation significant fauna species pursuant to the EPBC Act

Conservation Code	Category
X	Threatened Fauna –Extinct There is no reasonable doubt that the last member of the species has died.
EW[#]	Threatened Fauna –Extinct in the Wild Taxa which are known only to survive in cultivation, captivity or as a naturalised population outside its past range, or taxa which have not been recorded in its known and/or expected habitat despite appropriate exhaustive surveys.
CR[#]	Threatened Fauna – Critically Endangered Taxa which are considered to be facing an extremely high risk of extinction in the wild.
EN[#]	Threatened Fauna – Endangered Taxa which are considered to be facing a very high risk of extinction in the wild.
VU[#]	Threatened Fauna – Vulnerable Taxa which are considered to be facing a high risk of extinction in the wild.
Migratory[#]	Migratory Fauna All migratory species that are: (i) native species; and (ii) from time to time included in the appendices to the Bonn Convention; and (b) all migratory species from time to time included in annexes established under JAMBA, CAMBA and ROKAMBA; and All native species from time to time identified in a list established under, or an instrument made under, an international agreement approved by the Minister.
Ma	Marine Fauna Species in the list established under s248 of the EPBC Act

[#]matters of national environmental significance (MNES) under the EPBC Act

In Western Australia, fauna taxa may be classed as 'threatened', 'extinct', or 'specially protected' under the *Biodiversity Conservation Act 2016* (BC Act), which is enforced by Department of Biodiversity Conservation and Attractions (DBCA) (DBCA 2019a). The definitions of these categories are provided in **Table 2**.

Table 2: Definitions of fauna categories listed under the BC Act (DBCA 2019a)

Category	Conservation Code	Definition
Threatened	CR	Critically endangered Threatened species considered to be facing an extremely high risk of extinction in the wild in the immediate future.
	EN	Endangered Threatened species considered to be facing a very high risk of extinction in the wild in the near future.
	VU	Vulnerable Threatened species considered to be facing a high risk of extinction in the wild in the medium-term future.
Extinct	EX	Extinct Species where there is no reasonable doubt that the last member of the species has died.
	EW	Extinct in the wild Species that is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; and it has not been recorded in its known habitat or expected habitat, at appropriate seasons, anywhere in its past range, despite surveys over a time frame appropriate to its life cycle and form. Note that no species are currently listed as EW.
Specially protected	MI	Migratory species Fauna that periodically or occasionally visit Australia or an external Territory or the exclusive economic zone; or the species is subject of an international agreement that relates to the protection of migratory species and that binds the Commonwealth Includes birds that 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.
	CD	Species of special conservation interest (conservation dependent fauna) Fauna of special conservation need being species dependent on ongoing conservation intervention to prevent it becoming eligible for listing as threatened.
	OS	Other specially protected species Fauna otherwise in need of special protection to ensure their conservation.

Fauna species that may be threatened or near threatened but lack sufficient information to be legislatively listed may be added to the DBCA's *Priority Fauna List* (DBCA 2018). Species listed under priorities 1-3 comprise possible threatened species that do not meet survey criteria or are otherwise data deficient. Species listed under priority 4 are those that are adequately known, are rare but not threatened, or meet criteria for near threatened, or that have been recently removed from the threatened species or other specially protected fauna lists for other than taxonomic reasons (DBCA 2019a).

Priority fauna species are considered during State approval processes. Priority fauna categories and definitions are listed in **Table 3** (DBCA 2019a).

Table 3: Definitions of priority fauna categories on DBCA's Priority Fauna List (DBCA 2019a)

Conservation Code	Category
P1	Priority 1 – Poorly known 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 2 – Poorly known 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	Priority 3 – Poorly known 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.
P4	(a) Priority 4 – Rare species Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection but could be if present circumstances change. These species are usually represented on conservation lands. (b) Priority 4 – 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. (c) Priority 4 – Other Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.

Black cockatoos

Three threatened species of black cockatoo occur on the Swan Coastal Plain (referred to herein collectively as 'black cockatoos'):

- *Calyptorhynchus latirostris* (Carnaby's cockatoo) which is listed as 'endangered' under the EPBC Act and the BC Act.
- *Calyptorhynchus baudinii* (Baudin's cockatoo) which is listed as 'endangered' under the EPBC Act and the BC Act.
- *Calyptorhynchus banksii naso* (forest red-tailed black cockatoo) which is listed as 'vulnerable' under the EPBC Act and the BC Act.

There are a range of regional studies and spatial datasets available which provide information on black cockatoo records and potential habitat mapping. These are detailed below.

Species distribution and breeding range

Broad-scale maps are available for the modelled distribution of Baudin's cockatoo, Carnaby's cockatoo and forest red-tailed black cockatoo (DSEWPaC 2011; DoEE 2016a, b).

The modelled distribution maps also include 'known breeding areas' and 'predicted breeding range' for Baudin's cockatoo and 'breeding range' and 'non-breeding range' for Carnaby's cockatoo.

No breeding range modelling is available for forest red-tailed black cockatoo but the species is known to breed mainly in the jarrah forest region (DBCA 2017) and in small populations on the Swan Coastal Plain within the Baldivis, Stake Hill, Lake McLarty and Capel area and increasingly in the Perth metropolitan area (DAWE 2020).

Breeding habitat

Department of Environment and Conservation (DEC, now Department of Biodiversity, Conservation and Attractions (DBCA)) and fauna experts, have identified and mapped Carnaby's cockatoo habitat on the Swan Coastal Plain and Jarrah Forest regions (Glossop *et al.* 2011). This dataset includes mapping of Carnaby's cockatoo breeding sites based on point records of breeding from a range of sources. Breeding sites were classified as 'confirmed' where eggs or chicks were recorded and 'possible' where observations relating to Carnaby's cockatoo breeding that did not include actual records of eggs or chicks (e.g. chewed hollows or records of breeding or nesting behaviour by an expert observer).

A 12 km buffer applies to each site to 'reflect the flexible use of these areas by cockatoos and to indicate the important zone for access to potential feeding habitat' (Glossop *et al.* 2011). Glossop *et al.* (2011) state that the areas mapped in the dataset are not a comprehensive record of Carnaby's cockatoo breeding and that many nesting sites are not known.

While this dataset only applies to Carnaby's cockatoo, the information it contains is also applicable for Baudin's cockatoo and forest red-tailed black cockatoo as they have similar breeding habitat requirements. That is, breeding sites that are suitable for Carnaby's cockatoo may also be suitable for

Baudin's cockatoo and forest red-tailed black cockatoo, if located within their distribution/breeding ranges.

BirdLife Australia also maintain a database of confirmed black cockatoo breeding sites which is accessible via a paid search system. BirdLife Australia have advised that their database is comprised of data collected during surveys by staff and volunteers of which most (>99%) surveys are of Carnaby's cockatoo. They have also advised that the dataset is not comprehensive and that an absence of known nests does not necessarily indicate a lack of breeding activity.

The Carnaby's cockatoo recovery plan also identifies 13 'important bird areas' for Carnaby's cockatoo, which are identified as 'sites of global bird conservation importance' (DPaW 2013). These 'important bird areas' comprise sites supporting at least 20 breeding pairs or 1% of the population regularly utilising an area in the non-breeding part of the range.

Confirmed roost sites

BirdLife Australia undertakes annual monitoring of black cockatoo overnight roost sites as part of the annual 'Great Cocky Count' community-based survey. Information gathered from these monitoring events provides roost locations and recorded black cockatoo numbers (Peck *et al.* 2019).

Native foraging habitat

Glossop et al. (2011) also mapped 'areas requiring investigation as Carnaby's cockatoo feeding habitat' for the Swan Coastal Plain and Jarrah Forest regions, based on regional vegetation mapping that may contain plant species known to be foraged upon by Carnaby's cockatoo. Note that this dataset does not include observations or point records of Carnaby's cockatoo feeding. This dataset represents areas of vegetation that may potentially provide foraging habitat for Carnaby's cockatoo.

Given this dataset was created in 2011 and in order to account for clearing of native vegetation that has occurred since this time, Emerge have updated this dataset using the current native vegetation extent as provided by DPIRD (2019a) to only show potential foraging habitat that currently exists (Emerge Associates 2020a).

Pine plantations also provide an important food source for Carnaby's cockatoo, but were not included in the Glossop et al. (2011) dataset. Mapping of pine plantations is available from the Forest Products Commission (Forest Products Commission 2020).

The Glossop et al. (2011) dataset is broadly applicable to other black cockatoos as many plant species that are foraged upon by Carnaby's cockatoo are also consumed by Baudins' cockatoo (e.g. fruit of *Banksia* spp., *Corymbia calophylla* (marri) and *Eucalyptus marginata* (jarrah)) and forest red-tailed black cockatoo (e.g. jarrah and marri fruit). However, using the Glossop et al. (2011) potential foraging habitat dataset for forest red-tailed cockatoos likely overestimates available foraging habitat as it includes multiple plant species that are not consumed by this species (e.g. *Banksia* spp.), and to a lesser extent the foraging value is also over-estimated for Baudin's cockatoo.

Emerge Associates (2020b) have used a similar methodology to Glossop et al. (2011) to define potential foraging habitat for forest-red tailed cockatoos. Specifically, DBCA (2019b) regional vegetation complex mapping has been used to determine which areas of remnant vegetation

support plant species known to be foraged upon by forest red-tailed cockatoos, including *Allocasuarina fraseriana* (sheoak), *Corymbia calophylla* (marri), *Eucalyptus gomphocephala* (tuart) and *Eucalyptus marginata* (jarrah). Where these vegetation complexes intersect remnant vegetation mapped by DPIRD (2019b) they were considered to represent potential foraging habitat for forest red-tailed cockatoos.

Pest fauna

A number of legislative and policy documents exist in relation to pest fauna management at state and national levels. The *Biosecurity and Agriculture Management Act 2007* (BAM Act) is the principle legislation guiding pest fauna management in Western Australia and lists declared pest species.

Declared Pests

Part 2.3.23 of the BAM Act requires a person must not; "*a) keep, breed or cultivate the declared pest; b) keep, breed or cultivate an animal, plant or other thing that is infected or infested with the declared pest; c) release into the environment the declared pest, or an animal, plant or other thing that is infected or infested with the declared pest; or d) intentionally infect or infest, or expose to infection or infestation, a plant, animal or other thing with a declared pest*".

Under the BAM Act, all declared pests are assigned a legal status, as described in **Table 4**. Species assigned to the 'declared pest, prohibited - s12' category are placed in one of three control categories, as described in

Table 5.

The *Biosecurity and Agriculture Management Regulations 2013* specify keeping categories for species assigned to the 'declared pest - s22(2)' category, which relate to the purposes of which species can be kept, as well as the entities that can keep them. The categories are described in **Table 6**.

The Western Australian Organism List (WAOL) provides the status of organisms which have been categorised under the BAM Act (DAFWA 2016).

Table 4: Legal status of declared pest species listed under the BAM Act (DAFWA 2016)

Category	Description
Declared Pest Prohibited - s12	May only be imported and kept subject to permits. Permit conditions applicable to some species may only be appropriate or available to research organisations or similarly secure institutions.
Declared Pest s22(2)	Must satisfy any applicable import requirements when imported, and may be subject to an import permit if they are potential carriers of high-risk organisms. They may also be subject to control and keeping requirements once within Western Australia

Table 5: Control categories of declared pest species listed under the BAM Act (DAFWA 2016)

Category	Description
C1	Exclusion Not established in Western Australia and control measures are to be taken, including border checks, in order to prevent them entering and establishing in the State.
C2	Eradication Present in Western Australia in low enough numbers or in sufficiently limited areas that their eradication is still a possibility.
C3	Management Established in Western Australia but it is feasible, or desirable, to manage them in order to limit their damage. Control measures can prevent a C3 pest from increasing in population size or density or moving from an area in which it is established into an area which currently is free of that pest.

Table 6: Keeping categories of declared pest species listed under the BAM Act (DAFWA 2016)

Category	Description
Prohibited	Can only be kept under a permit for public display and education purposes, and/or genuine scientific research, by entities approved by the state authority.
Exempt	No permit or conditions are required for keeping.
Restricted	Organisms which, relative to other species, have a low risk of becoming a problem for the environment, primary industry or public safety and can be kept under a permit by private individuals.

Literature

The main literature used for identifying fauna and fauna habitats is listed in **Table 7** below.

Table 7: Standard literature used for identifying fauna species and habitats.

Conservation Code	Category
Birds	Johnstone and Storr (1998b), Johnstone and Storr (1998a), Pizzey and Knight (2012), Slater *et al.* (2003)
Mammals	Menkhorst and Knight (2011), Triggs (2003)
Amphibia	Tyler and Doughty (2009), Bush *et al.* (2002)
Reptiles	Bush *et al.* (2002)

References

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Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) 2011, *Modelled distribution of Carnaby's black cockatoo (Calyptorhynchus latirostris)*, Commonwealth of Australia, Canberra, Australian Capital Territory.

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Pizzey, G. and Knight, F. 2012, *The Fieldguide to the Birds of Australia*, Harper Collins Publishers, Sydney, Australia.

Slater, P., Slater, P. and Slater, R. 2003, *The Slater Field Guide to Australian Birds*, Reed New Holland, Australia.

Triggs, B. 2003, *Tracks, Scats and Other Traces A Field Guide to Australian Mammals*, Oxford University Press Australia, Melbourne, Victoria.

Tyler, M. J. and Doughty, P. 2009, *Field Guide to Frogs of Western Australia*, Western Australian Museum, Perth, Western Australia.

Appendix B

Black Cockatoo Foraging Plants

		Foraging category as assigned by Emerge			
Species name	**Common name**	**CBC**	**BBC**	**FRTBC**	**Literature references**
Acacia baileyana	Cootamundra wattle	Secondary			Groom 2011
Acacia pentadenia	Karri wattle	Secondary			Groom 2011
Acacia saligna	Orange wattle	Secondary			Groom 2011
Agonis flexuosa	Peppermint tree	Secondary			Groom 2011
Allocasuarina fraseriana	Sheoak		Secondary	Secondary	Johnstone & Storr 1998; Johnstone et al. 2010; Johnstone 2017
Allocasuarina spp.		Secondary		Secondary	Johnstone et al. 2010; Groom 2011; DSEWPaC 2012; DoEE 2017
Anigozanthos flavidus	Tall kangaroo paw		Secondary		Johnstone et al. 2010; DSEWPaC 2012; DoEE 2017
Araucaria heterophylla	Norfolk island pine	Secondary			Groom 2011
Banksia ashbyi	Ashby's banksia	Primary			Saunders 1980; Groom 2011
Banksia attenuata	Slender banksia	Primary			Saunders 1980; Johnstone et al. 2010; Groom 2011
Banksia baxteri	Baxter's banksia	Primary			Johnstone et al. 2010; Groom 2011
Banksia carlinoides	Pink dryandra	Primary			Johnstone et al. 2010; Groom 2011
Banksia coccinea	Scarlet banksia	Primary			Johnstone et al. 2010; Groom 2011
Banksia dallanneyi	Couch honeypot dryandra	Primary			Groom 2011
Banksia ericifolia	Heath-leaved banksia	Primary			Johnstone et al. 2010; Groom 2011
Banksia fraseri		Primary			Johnstone et al. 2010; Groom 2011
Banksia gardneri	Prostrate banksia	Primary			Groom 2011
Banksia grandis	Bull banksia	Primary	Primary		Saunders 1980; Johnstone & Storr 1998; Johnstone et al. 2010; Groom 2011
Banksia hookeriana	Hooker's banksia	Primary			Johnstone et al. 2010; Groom 2011
Banksia ilicifolia	Holly banksia	Primary	Primary		Johnstone et al. 2010; Groom 2011; Johnstone & Storr 1998
Banksia kippistiana		Primary			Groom 2011
Banksia leptophylla		Primary			Groom 2011
Banksia lindleyana	Porcupine banksia	Primary	Primary		Johnstone et al. 2010

Species name	Common name	Foraging category as assigned by Emerge			Literature references
		CBC	BBC	FRTBC	
Banksia littoralis	Swamp banksia	Primary	Primary		Saunders 1980; Groom 2011Johnstone & Storr 1998; Johnstone et al. 2010
Banksia menziesii	Firewood banksia	Primary			Saunders 1980; Johnstone et al. 2010; Groom 2011
Banksia mucronulata	Swordfish dryandra	Primary			Groom 2011
Banksia nivea	Honeypot dryandra	Primary			Saunders 1980; Groom 2011
Banksia nobilis	Golden dryandra	Primary			Saunders 1980; Groom 2011
Banksia praemorsa	Cut-leaf banksia	Primary	Primary		Saunders 1980; Johnstone et al. 2010; Groom 2011
Banksia prionotes	Acorn banksia	Primary			Johnstone et al. 2010; Groom 2011
Banksia prolata		Primary			Johnstone et al. 2010
Banksia quercifolia	Oak-leaved banksia	Primary	Primary		Johnstone & Storr 1998; Johnstone et al. 2010; Groom 2011
Banksia sessilis	Parrot bush	Primary	Primary		Saunders 1980; Johnstone & Storr 1998; Johnstone et al. 2010; Groom 2011
Banksia speciosa	Showy banksia	Primary			Johnstone et al. 2010; Groom 2011
Banksia spp.		Primary	Primary		Saunders 1979; DSEWPaC 2012; DoEE 2017
Banksia squarrosa	Pingle	Primary	Primary		Johnstone et al. 2010; Groom 2011
Banksia tricuspis	Pine banksia	Primary			Groom 2011
Banksia undata	Urchin dryandra	Primary			Groom 2011
Banksia verticillata	Granite banksia	Primary			Saunders 1980; Groom 2011
Brassica campestris	Canola	Secondary			Groom 2011; DoEE 2017
Callistemon spp.		Secondary	Secondary		Johnstone et al. 2010; DoEE 2017
Callistemon viminalis	Captain cook bottlebrush	Secondary			Groom 2011
Callitris sp.		Secondary			Johnstone et al. 2010; Groom 2011
Carya illnoinensis	Pecan	Primary	Secondary		Johnstone et al. 2010; Groom 2011; Groom 2014; DoEE 2017
Casuarina cunninghamiana	River sheoak	Secondary			Groom 2011
Citrullus lanatus	Pie or afghan melon	Secondary			Johnstone et al. 2010; Groom 2011

Species name	Common name	Foraging category as assigned by Emerge			Literature references
		CBC	BBC	FRTBC	
Corymbia calophylla	Marri	Primary	Primary	Primary	Johnstone & Storr 1998; Johnstone & Kirkby 1999; Johnstone et al. 2010; DSEWPaC 2012; DoEE 2017; Johnstone 2017; Saunders 1979; Johnstone & Kirkby 2008
Corymbia citriodora	Lemon scented gum	Secondary	Secondary	Secondary	Johnstone et al. 2010; DSEWPaC 2012; Groom 2011; Johnstone 2017
Corymbia ficifolia	Red flowering gum	Secondary			Groom 2011
Corymbia haematoxylon	Mountain marri	Secondary		Secondary	Groom 2011; DoEE 2012; DoEE 2017
Darwinia citriodora	Lemon-scented darwinia	Secondary	Secondary		Groom 2011; Johnstone et al. 2010
Diospryros sp.	Sweet persimmon	Secondary	Secondary		Johnstone et al. 2010; Groom 2011; DSEWPaC 2012; DoEE 2017
Eremophila glabra	Tarbush	Secondary			Groom 2011
Erodium aureum		Secondary			Groom 2011
Erodium botrys	Long storksbill	Secondary	Secondary		Groom 2011; Johnstone & Storr 1998; Johnstone et al. 2010
Erodium spp.		Secondary	Secondary		Johnstone et al. 2010; DoEE 2017
Eucalyptus caesia	Silver princess	Secondary		Secondary	Johnstone et al. 2010; Groom 2011; DSEWPaC 2012; DoEE 2017; Johnstone 2017
Eucalyptus camaldulensis	River red gum			Secondary	DoEE 2012; DoEE 2017
Eucalyptus decipiens	Red heart/moit			Secondary	Johnstone 2017
Eucalyptus diversicolor	Karri			Primary	Johnstone et al. 2010; DSEWPaC 2012; DoEE 2017; Johnstone & Storr 1998
Eucalyptus erythrocorys	Illyarrie	Secondary		Secondary	DSEWPaC 2012; DoEE 2017; Johnstone 2017, Johnstone et al. 2010
Eucalyptus gomphocephala	Tuart	Secondary		Secondary	Johnstone et al. 2010; Groom 2011; DSEWPaC 2012; DoEE 2017
Eucalyptus grandis	Flooded gum, rose gum			Secondary	DoEE 2012; DoEE 2017
Eucalyptus lehmannii	Bushy yate			Secondary	Johnstone 2017
Eucalyptus leucoxylon	Yellow gum	Secondary			Groom 2014

		Foraging category as assigned by Emerge			
Species name	**Common name**	**CBC**	**BBC**	**FRTBC**	**Literature references**
Eucalyptus loxophleba	York gum	Secondary			Johnstone et al. 2010; Groom 2011; DSEWPaC 2012; DoEE 2017
Eucalyptus marginata	Jarrah	Primary	Primary	Primary	Saunders 1980; Johnstone et al. 2010; Groom 2011; DSEWPaC 2012; DoEE 2017; Johnstone & Storr 1998; Johnstone & Kirkby 1999; Johnstone 2017
Eucalyptus patens	Blackbutt	Primary		Primary	Johnstone & Storr 1998; Johnstone & Kirkby 1999; Johnstone et al. 2010; DSEWPaC 2012; DoEE 2017; Johnstone 2017; Groom 2011
Eucalyptus pleurocarpa	Tallerack	Secondary			Groom 2011
Eucalyptus preissiana	Bell-fruited mallee	Secondary			Groom 2011
Eucalyptus robusta	Swamp mahogany	Secondary			Johnstone et al. 2010; Groom 2011
Eucalyptus salmonophloia	Salmon gum	Primary			Johnstone et al. 2010; Groom 2011; DSEWPaC 2012; DSEWPaC 2012; DoEE 2017
Eucalyptus staeri	Albany blackbutt			Secondary	Johnstone & Storr 1998
Eucalyptus todtiana	Coastal blackbutt	Secondary			Saunders 1980; Johnstone et al. 2010; Groom 2011; Johnstone & Kirkby 2008
Eucalyptus wandoo	Wandoo	Primary	Secondary	Primary	Saunders 1980; Johnstone et al. 2010; Groom 2011; DSEWPaC 2012; DoEE 2017
Ficus sp.	Fig	Secondary			Groom 2011
Grevillea armigera	Prickly toothbrushes	Primary			Groom 2011
Grevillea bipinnatifida	Fuschia grevillea	Primary			Groom 2011
Grevillea hookeriana	Red toothbrushes	Primary			Groom 2011
Grevillea hookeriana subsp. api	Black toothbrushes	Primary			Groom 2011
Grevillea paniculata	Kerosene bush	Primary			Groom 2011
Grevillea paradoxa	Bottlebrush grevillea	Primary			Groom 2011
Grevillea petrophiloides	Pink poker	Primary			Groom 2011
Grevillea robusta	Silky oak	Primary			Johnstone et al. 2010; Groom 2011

Species name	Common name	Foraging category as assigned by Emerge			Literature references
		CBC	BBC	FRTBC	
Grevillea spp.		Primary			Saunders 1979; Johnstone et al. 2010; DSEWPaC 2012; DoEE 2017
Grevillea wilsonii	Native fuchsia		Primary		Johnstone et al. 2010
Hakea auriculata		Primary			Saunders 1980; Groom 2011
Hakea candolleana		Primary			Groom 2011
Hakea circumalata	Coastal hakea	Primary			Groom 2011
Hakea commutata		Primary			Groom 2011
Hakea conchifolia	Shell-leaved hakea	Primary			Groom 2011
Hakea costata	Ribbed hakea	Primary			Groom 2011
Hakea cristata	Snail hakea	Primary	Primary		Groom 2011; Johnstone et al. 2010
Hakea cucullata	Snail hakea	Primary			Groom 2011
Hakea cyclocarpa	Ramshorn	Primary			Saunders 1980; Groom 2011
Hakea eneabba		Primary			Groom 2011
Hakea erinacea	Hedgehog hakea	Primary	Primary		Johnstone et al. 2010; Groom 2011
Hakea falcata	Sickle hakea	Primary			Groom 2011
Hakea flabellifolia	Fan-leaved hakea	Primary			Groom 2011
Hakea gilbertii		Primary			Saunders 1980; Groom 2011
Hakea incrassata	Golfball or marble hakea	Primary			Johnstone et al. 2010; Groom 2011
Hakea lasiantha	Woolly flowered hakea	Primary			Johnstone et al. 2010; Groom 2011
Hakea lasianthoides		Primary	Primary		Johnstone et al. 2010; Groom 2011
Hakea laurina	Pin-cushion hakea	Primary			Johnstone et al. 2010; Groom 2011
Hakea lissocarpha	Honeybush	Primary	Primary		Saunders 1980; Johnstone et al. 2010; Groom 2011
Hakea marginata			Primary		Johnstone et al. 2010
Hakea megalosperma	Lesueur hakea	Primary			Groom 2011
Hakea multilineata	Grass leaf hakea	Primary			Groom 2011
Hakea neospathulata		Primary			Groom 2011
Hakea obliqua	Needles and corks	Primary			Saunders 1980; Groom 2011
Hakea oleifolia	Dungyn	Primary			Groom 2011

Species name	Common name	Foraging category as assigned by Emerge			Literature references
		CBC	BBC	FRTBC	
Hakea pandanicarpa subsp. crassifolia	Thick-leaved hakea	Primary			Groom 2011
Hakea petiolaris	Sea urchin hakea	Primary			Groom 2011
Hakea polyanthema		Primary			Groom 2011
Hakea preissii	Needle tree	Primary			Groom 2011
Hakea prostrata	Harsh hakea	Primary	Primary		Saunders 1980; Johnstone et al. 2010; Groom 2011
Hakea psilorrhyncha		Primary			Groom 2011
Hakea ruscifolia	Candle hakea	Primary	Primary		Saunders 1980; Groom 2011; Johnstone et al. 2010
Hakea scoparia	Kangaroo bush	Primary			Groom 2011
Hakea smilacifolia		Primary			Groom 2011
Hakea spp.		Primary	Primary		Saunders 1979; DSEWPaC 2012; DoEE 2017
Hakea stenocarpa	Narrow-fruited hakea	Primary	Primary		Johnstone et al. 2010; Groom 2011
Hakea sulcata	Furrowed hakea	Primary			Groom 2011
Hakea trifurcata	Two-leaved hakea	Primary	Primary		Saunders 1980; Johnstone et al. 2010; Groom 2011
Hakea undulata	Wavy-leaved hakea	Primary	Primary		Saunders 1980; Johnstone et al. 2010; Groom 2011
Hakea varia	Variable-leaved hakea	Primary	Primary		Saunders 1980; Groom 2011
Harpephyllum caffrum	Kaffir plum			Secondary	Johnstone 2017
Helianthus annuus	Sunflower	Secondary			Johnstone et al. 2010; Groom 2011
Hibiscus sp.	Hibiscus	Secondary			Groom 2011
Isopogon scabriusculus		Secondary			Groom 2011
Jacaranda mimosifolia	Jacaranda	Secondary	Secondary		Johnstone et al. 2010; Groom 2011
Jacksonia furcellata	Grey stinkwood	Secondary			Groom 2011
Kingia australis	Kingia		Secondary		Johnstone et al. 2010
Lambertia inermis	Chittick	Secondary			Johnstone & Storr 1998; Groom 2011
Lambertia multiflora	Many-flowered honeysuckle	Secondary			Saunders 1980; Groom 2011

Species name	Common name	Foraging category as assigned by Emerge			Literature references
		CBC	BBC	FRTBC	
Liquidamber styraciflua	Liquid amber	Primary		Secondary	Johnstone et al. 2010; Groom 2011; Groom 2014; Personal observation
Lupinus sp.	Lupin	Secondary			Saunders 1980; Groom 2011
Macadamia integrifolia	Macadamia	Primary	Secondary		Johnstone et al. 2010; Grooms 2011; Groom 2014
Malus domestica	Apple	Secondary	Secondary		Johnstone et al. 2010; Johnstone & Storr 1998; DSEWPaC 2012; DoEE 2017; Groom 2011
Melaleuca leuropoma		Secondary			Saunders 1980; Groom 2011
Melia azedarach	Cape lilac or white cedar	Secondary		Primary	Johnstone et al. 2010; Groom 2011
Mesomeleana spp.		Secondary			Johnstone et al. 2010; Groom 2011
Olea europea	Olive			Secondary	Johnstone 2017
Persoonia longifolia	Snottygobble			Secondary	Johnstone & Storr 1998; Johnstone & Kirkby 1999; Johnstone et al. 2010; DSEWPaC 2012; DoEE 2017
Pinus canariensis	Canary island pine	Primary			Johnstone et al. 2010; Groom 2011
Pinus caribea	Caribbean pine	Primary			Johnstone et al. 2010; Groom 2011
Pinus pinaster	Pinaster or maritime pine	Primary			Groom 2011
Pinus radiata	Radiata pine	Primary	Secondary		Johnstone et al. 2010; Groom 2011
Pinus spp.		Primary	Secondary		Johnstone & Storr 1998; Saunders 1979; Johnstone et al. 2010; DSEWPaC 2012; DoEE 2017
Protea 'Pink Ice'		Secondary			Groom 2011
Protea repens		Secondary			Groom 2011
Protea spp.		Secondary			Johnstone et al. 2010
Prunus amygdalus	Almond tree	Secondary			Johnstone & Storr 1998; Johnstone et al. 2010; Groom 2011; DoEE 2017
Pyrus communis	European pear		Secondary		Johnstone & Storr 1998; Johnstone et al. 2010; DSEWPaC 2012; DoEE 2017
Quercus spp.	Oak		Secondary		Johnstone et al. 2010

Species name	Common name	Foraging category as assigned by Emerge			Literature references
		CBC	BBC	FRTBC	
Raphanus raphanistrum	Wild radish	Secondary			Groom 2011; DoEE 2017
Reedia spathacea			Secondary		Johnstone et al. 2010
Rumex hypogaeus	Doublegee	Secondary			Saunders 1980
Stenocarpus sinuatus		Secondary			Johnstone et al. 2010
Syzygium smithii	Lilly pilly	Secondary			Groom 2014
Tipuana tipu	Tipu or rosewood tree	Primary			Groom 2011, Groom 2014
Xanthorrhoea preissii	Grass tree	Secondary	Secondary		Groom 2011; Johnstone et al. 2010
Xylomelum occidentale	Woody pear	Secondary			Groom 2014

CBC=Carnaby's cockatoo, BBC=Baudin's cockatoo and FRTBC=Forest red-tailed black

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Appendix C

Black Cockatoo Habitat Quality Assessment (Emerge 2020)

Black Cockatoo Habitat Quality Assessment Appendix			
Date	**Version**	**Summary of changes**	**Author**
13/06/2020	001	Initial report	RAW/MS/TAA
17/06/2020	002	Update to methodology text	RAW
30/06/2020	003	Extremely important minor changes for no particular reason	TAA
04/08/2020	004	Updates to site condition component in quality scale and scoring tool	RAW

IMPORTANT: DELETE THIS PAGE

Introduction

As part of environmental impact assessment and offset calculation, the Department of Agriculture, Water and the Environment (DAWE) requires that a score out of ten is provided for the overall quality of back cockatoo habitat within a site (DAWE 2020). DAWE does not provide a methodology for scoring habitat quality, specifying instead that an assessment of quality should be undertaken by an experienced technical expert (DSEWPaC 2012).

Emerge Associates (Emerge) have developed this method to provide a systematic assessment of overall black cockatoo habitat quality. Black cockatoo habitat is conventionally separated into breeding, roosting and foraging categories. Our method assesses and scores the quality of breeding, roosting and foraging habitat separately and then provides an overall quality score (out of ten) based on the highest score determined for the respective habitat categories.

Methodology

The International Organization for Standardization defines 'quality' as the "*degree to which a set of inherent characteristics fulfils requirements*" (ISO 9000 2020). Developing an objective scoring system for quality is therefore challenging, as quality is both relative and, to some extent, subjective. An ecological value like habitat may also have a wide range of characteristics, with varying relevance to the requirements of a species and that may be independent, interdependent or contrasting with other characteristics, such that habitat quality must be assessed holistically to be properly understood.

The three categories of black cockatoo habitat are intrinsically linked in that breeding and roosting activity is directly related to the availability of foraging and watering resources surrounding nests or roosts (Saunders 1990; Shah 2006; Le Roux 2017). Black cockatoos can also move over large distances within their range to access breeding and foraging habitat and will not necessarily return to the same locations within a year or across years (Saunders 1980; Johnstone and Kirkby 2008; Johnstone *et al.* 2017; Peck *et al.* 2019). Therefore, evaluating the overall quality of black cockatoo habitat requires acknowledgement of the relationships between the different habitat categories and the potential for use of all habitats within a site, given the condition of each habitat, the sites' location and the history of use of habitat within a site by black cockatoos.

While breeding, roosting and foraging habitat are interrelated, we suggest that the different habitat categories should not be scored cumulatively as this can overestimate quality. That is, if a site contains multiple categories of habitat it does not necessarily contain greater quality habitat. For example, a site that contains a roost is not necessarily of higher overall quality if it also contains breeding habitat.

Alternatively, averaging the scores from all three habitat categories can act to underestimate habitat, since certain types of habitat are recorded less frequently than others and therefore their absence would act to devalue quality. For example, the likelihood of recording a roost is generally low compared to recording foraging or breeding habitat but a site that lacks a roost is not necessarily of lower overall quality.

Hence, our scoring system selects the highest habitat category score to represent overall habitat quality. Adopting the highest score from any habitat category within a site avoids over or under estimating habitat quality because the most important value always drives, or is reflected in, the overall score.

To provide a score for each habitat category, the following three 'quality components' are considered as recommended by DAWE (DAWE 2020):

- Site condition which is the "*condition of a site in relation to the ecological requirements of a threatened species or ecological community. This includes considerations such as vegetation condition and structure, the diversity of habitat species present, and the number of relevant habitat features".*
- Site context which is the "*relative importance of a site in terms of its position in the landscape, taking into account the connectivity needs of a threatened species or ecological community. This includes considerations such as movement patterns of the species, the proximity of the site in relation to other areas of suitable habitat, and the role of the site in relation to the overall population or extent of a species or community*".
- Species stocking rate which is the "*usage and/or density of a species at a particular site...It includes considerations such as survey data for a site in regards to a particular species population or, in the case of a threatened ecological community this may be a number of different populations. It also includes consideration of the role of the site population in regards to the overall species population viability or community extent*".

A habitat quality assessment should aim to combine current information on the status of black cockatoos and habitat characteristics within a site with the best available information regarding the status of black cockatoo populations and black cockatoo habitat within areas surrounding a site. Black cockatoo habitat assessments for a given site don't typically allow scope for physical survey of areas surrounding a site and so the ability to obtain new information is usually limited to that which can be obtained within a site. Therefore, we considered that, when assessing the above components, site condition is best defined from a current survey, site context is best defined from literature and relevant databases (Glossop *et al.* 2011; DPaW 2013; DoEE 2016a, c, b; Peck *et al.* 2019) and information on species stocking rate is best obtained from a combination of current survey, previous survey or databases (Glossop *et al.* 2011; DPaW 2013; DoEE 2016a, c, b; Peck *et al.* 2019).

Method

The *Habitat Quality Scale* provided as **Plate 1** outlines the attributes measured within each habitat category and quality component. It also shows the associated quality classification (low, moderate or high) and score (1-10).

As shown in the *Habitat Quality Scale*, the highest scores are reserved for habitat that has active or historical roosts or nests as it is considered that the presence of black cockatoos provides the best indication of the quality of habitat. Foraging habitat is weighted lower than breeding and roosting habitat as the occurrence of roost or nests provides the best confirmation that foraging habitat surrounding a site is adequate and therefore worthy of a higher quality score. Therefore, a maximum

total of ten is achievable for breeding habitat and a total of eight is achievable for both roosting and foraging habitat (refer **Plate 1**).

The *Habitat Scoring Tool* provided as **Plate 2** is an *Excel* spreadsheet document that is used to determine a quality score for each habitat category component by answering queries about habitat within and surrounding the site. A quality score is calculated for each habitat category by summing maximum scores for each query. Because maximum scores are selected, multiple answers may be provided for any query where appropriate without exaggerating the quality score. For key confirmed habitat such as roosts or nests, the scoring tool ensures that relevant, higher scores are achieved irrespective of whether all preceding queries have been answered positively (for example a roost always scores 7 or 8 irrespective of whether other quality criteria have been met).

The highest score from any of the three habitat categories is then adopted as the overall score for black cockatoo habitat quality within the site.

Emerge Black Cockatoo Habitat Quality Assessment - Scale

		Habitat Quality Score									
		Low			Moderate			Moderate - High	High		
	Quality Component	1	2	3	4	5	6	7	8	9	10
Breeding habitat	Site condition	Habitat trees with suitable hollows occur within the site AND / OR habitat trees without suitable hollows occur within the site					Habitat trees with suitable hollows occur within the site			N/A	
	Site context	No nest has been recorded within 12 km of the site AND <100 ha of potential foraging habitat occurs within 6 km of the site	A nest(s) (active, historical or potential) has been recorded within 12 km of the site AND / OR >100 ha of potential native foraging habitat occurs within 6 km of the site				A nest(s) (active, historical or potential) has been recorded within 6 km of the site AND / OR >1000 ha of potential native foraging habitat occurs within 6 km of the site				
	Species stocking rate	No evidence of black cockatoos nesting has been recorded within the site						A potential nest(s) occurs within the site OR a historical nest(s) has been recorded within the site	A Potential nest(s) occurs within the site AND a historical nest(s) has been recorded within the site	An active nest(s) occurs within the site	An active nest(s) occurs within the site AND a historical nest(s) has been recorded within the site
Roosting habitat	Site condition	Trees potentially suitable for roosting occur within the site						N/A			
	Site context	No water source occurs within or nearby the site	A water source occurs within or nearby the site OR no water source occurs within or nearby the site								
		No roost has been recorded within 1 km of the site	A small roost (active or historical) has been recorded within 500 m of the site OR a large roost (active or historical) has been recorded within 1 km of the site OR no roost has been recorded within 1 km of the site								
	Species stocking rate	No roost has been recorded within the site				A small roost (active or historical) has been recorded within the site	A large roost (active or historical) has been recorded within the site	An active small roost occurs within the site	An active large roost occurs within the site		
	Site condition	Foraging habitat with 1-10% primary foraging plants occurs within the site	Foraging habitat with 1-50% primary foraging plants occurs within the site		Foraging habitat with 1-100% primary foraging plants occurs within the site		Foraging habitat with 10-100% primary foraging plants occurs within the site	Foraging habitat with 50-100% primary foraging plants occurs within the site		N/A	
	Site context	No nest or roost has been recorded within 12 km of the site	A nest(s) (active, potential or historical) AND / OR a roost(s) (active or historical) has been recorded within 12 km of the site					A nest(s) (active, potential or historical) has been recorded within 6 km of the site			
	Species stocking rate	No evidence of foraging by black cockatoos has been recorded within the site	Evidence of foraging by black cockatoos may have been recorded within the site (limted or abundant)						Abundant evidence of foraging by black cockatoos has been recorded in the site		

Note that breeding, roosting and foraging habitat are assessed separately and the highest score is the overall quality score.

Black Cockatoo Habitat Scale definitions

'Habitat tree' is a native eucalypt that is typically known to support black cockatoo breeding such as marri, jarrah, blackbutt, tuart, wandoo, salmon gum or to a lesser extent flooded gum, with a DBH ≥50 cm or DBH ≥30 cm for wandoo or salmon gum (DSEWPaC 2012).

'Nest' is a hollow in which black cockatoo breeding has been recorded. A nest is **'active'** if breeding was recorded within the last 2 years and **'historical'** if breeding was recorded more than 2 years ago. A hollow with potential secondary signs of breeding (e.g. chew marks) or a hollow with potential signs of breeding that could not be attributed to a bird species is a **'potential'** nest.

'Roost' is a black cockatoo roost site confirmed by a roost survey (e.g. BirdLife Australia Great Cocky Count). A roost is considered **'large'** if more than 150 individuals were recorded and **'small'** if less than 150 individuals were recorded (BirdLife Australia 2019). A roost is **'active'** if roosting was

'Primary foraging plants' are plants with historical and/or contemporary records of regular consumption by black cockatoos, including native and non-native plant species.

Plate 1: Black Cockatoo Habitat Quality Scale

Black Cockatoo Habitat Quality Assessment - Scoring Tool (Carnaby's cockatoo)
<insert site name>

		Query		Answer	Potential score	Site score	Sum
Breeding habitat	Site condition	1.1	The site contains:				
			habitat tree(s) with suitable hollow(s)		2.0	0.0	0.0
			habitat tree(s) without suitable hollow(s)		1.0	0.0	
	Site context	1.2	The site is located:				
			within 6 km of a nest(s) (active, historical or potential)		1.0	0.0	0.0
			6-12 km from a nest(s) (active, historical or potential)		0.5	0.0	
		1.3	The site is located within 6 km of:				
			>1000 ha of potential foraging habitat		3.0	0.0	0.0
			100 to 1000 ha of potential foraging habitat		1.0	0.0	
	Species stocking rate	1.4	The site contains:				
			historical nest(s)		1.0	0	0.0
			The site contains:				
			active nest(s)		3.0	0	
			potential nest(s)		1.0	0	0.0
			Score	0	10.0		
Roosting habitat	Site condition	2.1	The site contains trees potentially suitable for roosting		1.0	0.0	0.0
		2.2	The site contains a water source or one exists nearby		1.0	0.0	
	Site context	2.3	The site is located:				
			within 1 km of a large roost (≥150 individuals) (active or historical)		1.0	0.0	0.0
			within 500 m of a small roost (< 150 individuals) (active or historical)		1.0	0.0	
	Species stocking rate	2.4	The site contains:				
			a historical record of a large roost (≥150 individuals)		2.0	0	
			a historical record of a small roost (<150 individuals)		1.0	0	0.0
			The site contains:				
			an active record of a large roost (≥150 individuals)		2.0	0.0	0.0
			an active record of a small roost (<150 individuals)		1.0	0.0	
			Score	0	7.0		
Foraging habitat	Site condition	3.1	The site contains foraging habitat comprising:				
			≥50% primary foraging plants		4.0	0.0	0.0
			≥10% to <50% primary foraging plants		2.0	0.0	
			<10% primary foraging plants		1.0	0.0	
	Site context	3.2	The site is located:				
			within 6 km of a nest(s) (active, historical or potential)		2.0	0.0	0.0
			6-12 km from a nest(s) (active, historical or potential)		1.00	0.0	
		3.3	The site is located:				
			within 6 km of a roost(s) (active or historical)		1.0	0.0	
			6-12 km from a roost(s) (active or historical)		0.5	0.0	
	Species stocking rate	3.4	The site contains:				
			abundant evidence of foraging		2.0	0.0	0.0
			limited evidence of foraging		1.0	0.0	
			Score	0	8.0		

SUMMARY		
Habitat category	**Score**	**Habitat quality**
Breeding	0	No habitat
Roosting	0	No habitat
Foraging	0	No habitat
Overall habitat quality score	**0**	No habitat

Note:
1. Within the breeding category, a score of 9 applies if an active nest(s) occurs within the site and a score of 10 applies if an active nest(s) and a historical nest(s) occurs within the site, regardless of the answer to other queries in this category
2. Within the roosting category, a score of 7 applies if a small roost occurs within the site and a score of 8 applies if a large roost occurs within the site, regardless of the answer to other queries in this category.
3. The final score consists of the highest score from each habitat category

Plate 2: Black Cockatoo Habitat Scoring Tool

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Appendix D

Database Search Results

NatureMap
Mapping Western Australia's biodiversity

NatureMap Species Report

Created By Guest user on 25/11/2020

Kingdom	Animalia
Current Names Only	Yes
Core Datasets Only	Yes
Method	'By Circle'
Centre	115° 03' 32" E,33° 48' 22" S
Buffer	10km
Group By	Conservation Status

Conservation Status	Species	Records
Non-conservation taxon	192	1478
Other specially protected fauna	2	21
Priority 4	5	47
Protected under international agreement	3	13
Rare or likely to become extinct	18	179
TOTAL	**220**	**1738**

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
Rare or likely to become extinct					
1.	41326	*Ardenna carneipes (Flesh-footed Shearwater, Fleshy-footed Shearwater)*		T	
2.	34110	*Austroassiminea letha (Cape Leeuwin Freshwater Snail)*		T	
3.	24731	*Calyptorhynchus banksii subsp. naso (Forest Red-tailed Black Cockatoo)*		T	
4.	24733	*Calyptorhynchus baudinii (Baudin's Cockatoo, White-tailed Long-billed Black Cockatoo)*		T	
5.	24734	*Calyptorhynchus latirostris (Carnaby's Cockatoo, White-tailed Short-billed Black Cockatoo)*		T	
6.	48400	*Calyptorhynchus sp. (white-tailed black cockatoo)*		T	
7.	25335	*Caretta caretta (Loggerhead Turtle)*		T	
8.	25575	*Charadrius leschenaultii (Greater Sand Plover)*		T	
9.	24092	*Dasyurus geoffroii (Chuditch, Western Quoll)*		T	
10.	33946	*Engaewa reducta (Dunsborough Burrowing Crayfish)*		T	
11.	24557	*Leipoa ocellata (Malleefowl)*		T	
12.	24168	*Macrotis lagotis (Bilby, Dalgyte, Ninu)*		T	
13.	24166	*Pseudocheirus occidentalis (Western Ringtail Possum, ngwayir)*		T	
14.	24145	*Setonix brachyurus (Quokka)*		T	
15.	34135	*Thalassarche cauta (Shy Albatross)*		T	
16.	34007	*Thalassarche chlororhynchos (Atlantic Yellow-nosed Albatross)*		T	
17.	44607	*Thalassarche melanophris (Black-browed Albatross)*		T	
18.	34113	*Westralunio carteri (Carter's Freshwater Mussel)*		T	
Protected under international agreement					
19.	41323	*Actitis hypoleucos (Common Sandpiper)*		IA	
20.	48591	*Pandion cristatus (Osprey, Eastern Osprey)*		IA	
21.	48597	*Thalasseus bergii (Crested Tern)*		IA	
Other specially protected fauna					
22.	25624	*Falco peregrinus (Peregrine Falcon)*		S	
23.	48070	*Phascogale tapoatafa subsp. wambenger (South-western Brush-tailed Phascogale, Wambenger)*		S	
Priority 4					
24.	24189	*Falsistrellus mackenziei (Western False Pipistrelle, Western Falsistrelle)*		P4	
25.	24215	*Hydromys chrysogaster (Water-rat, Rakali)*		P4	
26.	48588	*Isoodon fusciventer (Quenda, southwestern brown bandicoot)*		P4	
27.	48022	*Notamacropus irma (Western Brush Wallaby)*		P4	
28.	48135	*Thinornis rubricollis (Hooded Plover, Hooded Dotterel)*		P4	
Non-conservation taxon					
29.	24260	*Acanthiza apicalis (Broad-tailed Thornbill, Inland Thornbill)*			
30.	24261	*Acanthiza chrysorrhoa (Yellow-rumped Thornbill)*			
31.	24262	*Acanthiza inornata (Western Thornbill)*			
32.	24560	*Acanthorhynchus superciliosus (Western Spinebill)*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
33.		*Acariformes sp.*			
34.	25535	*Accipiter cirrocephalus (Collared Sparrowhawk)*			
35.	25536	*Accipiter fasciatus (Brown Goshawk)*			
36.	42368	*Acritoscincus trilineatus (Western Three-lined Skink)*			
37.	25544	*Aegotheles cristatus (Australian Owlet-nightjar)*			
38.		*Aeshnidae sp.*			
39.		*Aetapcus maculatus*			
40.		*Akamptogonus novarae*			
41.		*Alabes brevis*			
42.		*Aname mainae*			
43.		*Aname tepperi*			
44.	24312	*Anas gracilis (Grey Teal)*			
45.	24316	*Anas superciliosa (Pacific Black Duck)*			
46.		*Ancylidae sp.*			
47.	47414	*Anhinga novaehollandiae (Australasian Darter)*			
48.	24088	*Antechinus flavipes subsp. leucogaster (Yellow-footed Antechinus, Mardo)*			
49.	24561	*Anthochaera carunculata (Red Wattlebird)*			
50.	24562	*Anthochaera lunulata (Western Little Wattlebird)*			
51.	24285	*Aquila audax (Wedge-tailed Eagle)*			
52.	25558	*Ardea ibis (Cattle Egret)*			
53.	24341	*Ardea pacifica (White-necked Heron)*			
54.	24353	*Artamus cyanopterus (Dusky Woodswallow)*			
55.		*Artoria linnaei*			
56.		*Artoria taeniifera*			
57.		*Austracantha minax*			
58.		*Australomimetus diabolicus*			
59.		*Australomimetus tasmaniensis*			
60.		*Baetidae sp.*			
61.		*Baiami tegenarioides*			
62.		*Barnardius zonarius*			
63.		*Bennelongia australis lineage*			
64.	24319	*Biziura lobata (Musk Duck)*			
65.	25716	*Cacatua sanguinea (Little Corella)*			
66.	25598	*Cacomantis flabelliformis (Fan-tailed Cuckoo)*			
67.		*Caenidae sp.*			
68.	25717	*Calyptorhynchus banksii (Red-tailed Black-Cockatoo)*			
69.		*Ceratopogonidae sp.*			
70.		*Cercophonius sulcatus*			
71.	24187	*Chalinolobus morio (Chocolate Wattled Bat)*			
72.	24377	*Charadrius ruficapillus (Red-capped Plover)*			
73.	24321	*Chenonetta jubata (Australian Wood Duck, Wood Duck)*			
74.	33939	*Cherax cainii (Marron)*			
75.		*Cherax destructor*			
76.		*Chironominae sp.*			
77.		*Chroicocephalus novaehollandiae*			
78.	25675	*Colluricincla harmonica (Grey Shrike-thrush)*			
79.	24399	*Columba livia (Domestic Pigeon)*	Y		
80.	25568	*Coracina novaehollandiae (Black-faced Cuckoo-shrike)*			
81.		*Corduliidae sp.*			
82.		*Corixidae sp.*			
83.		*Cormocephalus aurantiipes*			
84.	25592	*Corvus coronoides (Australian Raven)*			
85.	24671	*Coturnix pectoralis (Stubble Quail)*			
86.	25595	*Cracticus tibicen (Australian Magpie)*			
87.	25596	*Cracticus torquatus (Grey Butcherbird)*			
88.	25398	*Crinia georgiana (Quacking Frog)*			
89.	25399	*Crinia glauerti (Clicking Frog)*			
90.	25401	*Crinia pseudinsignifera (Bleating Froglet)*			
91.		*Culicidae sp.*			
92.		*Cyclosa trilobata*			
93.	24322	*Cygnus atratus (Black Swan)*			
94.	30901	*Dacelo novaeguineae (Laughing Kookaburra)*	Y		
95.	25673	*Daphoenositta chrysoptera (Varied Sittella)*			
96.		*Darwinula sp.*			
97.		*Dytiscidae sp.*			
98.	25096	*Egernia kingii (King's Skink)*			
99.		*Egretta novaehollandiae*			
100.	47937	*Elseyornis melanops (Black-fronted Dotterel)*			
101.		*Emertonella maga*			
102.		*Empididae sp.*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
103.		*Eolophus roseicapillus*			
104.	24652	*Eopsaltria georgiana (White-breasted Robin)*			
105.	24567	*Epthianura albifrons (White-fronted Chat)*			
106.	25621	*Falco berigora (Brown Falcon)*			
107.	25622	*Falco cenchroides (Australian Kestrel, Nankeen Kestrel)*			
108.	25623	*Falco longipennis (Australian Hobby)*			
109.	25727	*Fulica atra (Eurasian Coot)*			
110.	34028	*Galaxias occidentalis (Western Minnow)*			
111.		*Gelastocoridae sp.*			
112.	25530	*Gerygone fusca (Western Gerygone)*			
113.		*Gomphodella aff. maia (SAP)*			
114.	24443	*Grallina cyanoleuca (Magpie-lark)*			
115.		*Gripopterygidae sp.*			
116.		*Gyrinidae sp.*			
117.	25627	*Haematopus fuliginosus (Sooty Oystercatcher)*			
118.	24487	*Haematopus longirostris (Pied Oystercatcher)*			
119.	24295	*Haliastur sphenurus (Whistling Kite)*			
120.		*Helcogramma decurrens*			
121.		*Hemicorduliidae sp.*			
122.	25118	*Hemiergis peronii subsp. tridactyla*			
123.		*Heteroclinus sp.*			
124.	47965	*Hieraaetus morphnoides (Little Eagle)*			
125.	24491	*Hirundo neoxena (Welcome Swallow)*			
126.		*Histiophryne cryptacanthus*			
127.		*Hydraenidae sp.*			
128.		*Hydrophilidae sp.*			
129.	43384	*Hydrophis platurus (Yellow-bellied Seasnake)*			
130.		*Hydroptilidae sp.*			
131.		*Hyriidae sp.*			
132.		*Isopeda leishmanni*			
133.		*Lepidoblennius marmoratus*			
134.		*Leptoceridae sp.*			
135.		*Leptophlebiidae sp.*			
136.		*Libellulidae sp.*			
137.	25661	*Lichmera indistincta (Brown Honeyeater)*			
138.	41416	*Liopholis pulchra subsp. pulchra (South-western Rock Skink, Spectacled Rock Skink)*			
139.		*Lissocampus runa*			
140.	25378	*Litoria adelaidensis (Slender Tree Frog)*			
141.	25388	*Litoria moorei (Motorbike Frog)*			
142.		*Lophoictinia isura*			
143.		*Lycosa gilberta*			
144.	25650	*Malurus elegans (Red-winged Fairy-wren)*			
145.	25654	*Malurus splendens (Splendid Fairy-wren)*			
146.		*Megapodagrionidae sp.*			
147.	24598	*Merops ornatus (Rainbow Bee-eater)*			
148.		*Microcarbo melanoleucos*			
149.	25240	*Morelia spilota subsp. imbricata (Carpet Python)*			
150.	25191	*Morethia lineoocellata*			
151.	48008	*Morus serrator (Australasian Gannet)*			
152.	25610	*Myiagra inquieta (Restless Flycatcher)*			
153.		*Nannoperca vittata*			
154.		*Neopataecus waterhousii*			
155.	24738	*Neophema elegans (Elegant Parrot)*			
156.	25252	*Notechis scutatus (Tiger Snake)*			
157.		*Notonectidae sp.*			
158.		*Oligochaeta sp.*			
159.		*Oplegnathus woodwardi*			
160.		*Orthocladiinae sp.*			
161.	25680	*Pachycephala rufiventris (Rufous Whistler)*			
162.	24693	*Pachyptila desolata (Antarctic Prion)*			
163.		*Palaemonidae sp.*			
164.		*Parastacidae sp.*			
165.	25255	*Parasuta nigriceps*			
166.	25681	*Pardalotus punctatus (Spotted Pardalote)*			
167.	25682	*Pardalotus striatus (Striated Pardalote)*			
168.	24648	*Pelecanus conspicillatus (Australian Pelican)*			
169.		*Perthiidae sp.*			
170.	48061	*Petrochelidon nigricans (Tree Martin)*			
171.	48066	*Petroica boodang (Scarlet Robin)*			
172.	25697	*Phalacrocorax carbo (Great Cormorant)*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
173.	24667	*Phalacrocorax sulcirostris (Little Black Cormorant)*			
174.	25699	*Phalacrocorax varius (Pied Cormorant)*			
175.	24409	*Phaps chalcoptera (Common Bronzewing)*			
176.	25587	*Phaps elegans (Brush Bronzewing)*			
177.	24596	*Phylidonyris novaehollandiae (New Holland Honeyeater)*			
178.		*Physidae sp.*			
179.		*Platycephalus chauliodous*			
180.	25720	*Platycercus icterotis (Western Rosella)*			
181.	25703	*Podargus strigoides (Tawny Frogmouth)*			
182.	25722	*Polytelis anthopeplus (Regent Parrot)*			
183.	25731	*Porphyrio porphyrio (Purple Swamphen)*			
184.		*Protochelifer cavernarum*			
185.	25259	*Pseudonaja affinis subsp. affinis (Dugite)*			
186.		*Purpureicephalus spurius*			
187.	24243	*Rattus fuscipes (Western Bush Rat)*			
188.	24245	*Rattus rattus (Black Rat)*	Y		
189.	30818	*Rhinoplocephalus bicolor (Square-nosed Snake)*			
190.	48096	*Rhipidura albiscapa (Grey Fantail)*			
191.	25614	*Rhipidura leucophrys (Willie Wagtail)*			
192.		*Richardsonianidae sp.*			
193.		*Sarscypridopsis aculeata*			
194.		*Scirtidae sp.*			
195.		*Scolopendra laeta*			
196.	25534	*Sericornis frontalis (White-browed Scrubwren)*			
197.		*Servaea spinibarbis*			
198.		*Simuliidae sp.*			
199.	30948	*Smicrornis brevirostris (Weebill)*			
200.		*Spinicrus minimus*			
201.	24645	*Stagonopleura oculata (Red-eared Firetail)*			
202.		*Staphylinidae sp.*			
203.	24536	*Sterna vittata (Antarctic Tern)*			Y
204.	25655	*Stipiturus malachurus (Southern Emu-wren)*			
205.		*Synthemistidae sp.*			
206.	25705	*Tachybaptus novaehollandiae (Australasian Grebe, Black-throated Grebe)*			
207.	24331	*Tadorna tadornoides (Australian Shelduck, Mountain Duck)*			
208.		*Tanypodinae sp.*			
209.	24167	*Tarsipes rostratus (Honey Possum, Noolbenger)*			
210.		*Telephlebiidae sp.*			
211.		*Temnocephalidea sp.*			
212.	24845	*Threskiornis spinicollis (Straw-necked Ibis)*			
213.		*Tipulidae sp.*			
214.	25549	*Todiramphus sanctus (Sacred Kingfisher)*			
215.	25723	*Trichoglossus haematodus (Rainbow Lorikeet)*			
216.	25521	*Trichosurus vulpecula (Common Brushtail Possum)*			
217.	24158	*Trichosurus vulpecula subsp. vulpecula (Common Brushtail Possum)*			
218.		*Urodacus novaehollandiae*			
219.		*Veliidae sp.*			
220.	25765	*Zosterops lateralis (Grey-breasted White-eye, Silvereye)*			

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

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

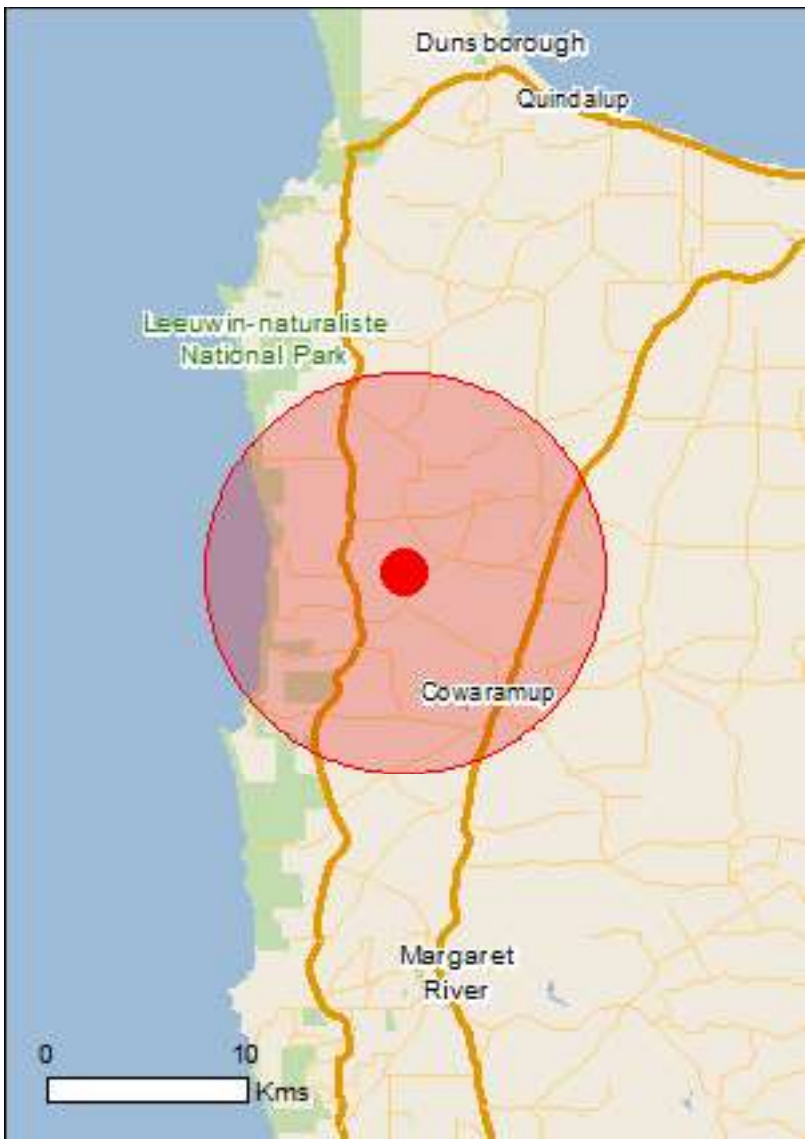
EPBC Act Protected Matters Report

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

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

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

Report created: 03/08/20 11:01:45



Coordinates
Buffer: 10.0Km

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

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	1
Listed Threatened Species:	54
Listed Migratory Species:	43

Other Matters Protected by the EPBC Act

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

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

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

Commonwealth Land:	1
Commonwealth Heritage Places:	None
Listed Marine Species:	67
Whales and Other Cetaceans:	13
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

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

State and Territory Reserves:	14
Regional Forest Agreements:	1
Invasive Species:	23
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Listed Threatened Ecological Communities [Resource Information]

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

Name	Status	Type of Presence
Banksia Woodlands of the Swan Coastal Plain ecological community	Endangered	Community likely to occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Anous tenuirostris melanops Australian Lesser Noddy [26000]	Vulnerable	Species or species habitat may occur within area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat may occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calyptorhynchus banksii naso Forest Red-tailed Black-Cockatoo, Karrak [67034]	Vulnerable	Species or species habitat known to occur within area
Calyptorhynchus baudinii Baudin's Cockatoo, Long-billed Black-Cockatoo [769]	Endangered	Breeding known to occur within area
Calyptorhynchus latirostris Carnaby's Cockatoo, Short-billed Black-Cockatoo [59523]	Endangered	Species or species habitat known to occur within area
Diomedea amsterdamensis Amsterdam Albatross [64405]	Endangered	Species or species habitat may occur within area
Diomedea dabbenena Tristan Albatross [66471]	Endangered	Species or species habitat may occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area

Grey Falcon [929]	Vulnerable	Species or species habitat may occur within area
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area
Limosa lapponica baueri Bar-tailed Godwit (baueri), Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat may occur within area
Limosa lapponica menzbieri Northern Siberian Bar-tailed Godwit, Bar-tailed Godwit (menzbieri) [86432]	Critically Endangered	Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pachyptila turtur subantarctica Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat likely to occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Species or species habitat may occur within area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Breeding likely to occur within area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Foraging, feeding or related behaviour may occur within area
Thalassarche cauta Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Crustaceans		

Nannatherina balstoni Balston's Pygmy Perch [66698]	Vulnerable	Species or species habitat may occur within area
Mammals		
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Bettongia penicillata ogilbyi Woylie [66844]	Endangered	Species or species habitat likely to occur within area
Dasyurus geoffroii Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat known to occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Breeding known to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Congregation or aggregation known to occur within area
Neophoca cinerea Australian Sea-lion, Australian Sea Lion [22]	Vulnerable	Species or species habitat may occur within area
Pseudocheirus occidentalis Western Ringtail Possum, Ngwayir, Womp, Woder, Ngoor, Ngoolangit [25911]	Critically Endangered	Foraging, feeding or related behaviour likely to occur within area
Other		
Westralunio carteri Carter's Freshwater Mussel, Freshwater Mussel [86266]	Vulnerable	Species or species habitat known to occur within area
Plants		
Banksia nivea subsp. uliginosa Swamp Honeypot [82766]	Endangered	Species or species habitat may occur within area
Banksia squarrosa subsp. argillacea Whicher Range Dryandra [82769]	Vulnerable	Species or species habitat may occur within area
Caladenia excelsa Giant Spider-orchid [56717]	Endangered	Species or species habitat likely to occur within area
Caladenia huegelii King Spider-orchid, Grand Spider-orchid, Rusty Spider-orchid [7309]	Endangered	Species or species habitat may occur within area
Drakaea micrantha Dwarf Hammer-orchid [56755]	Vulnerable	Species or species habitat likely to occur within area
Eucalyptus x phylacis Meelup Mallee [87817]	Endangered	Species or species habitat may occur within area
Gastrolobium papilio		

Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat known to occur within area
Sharks		
Carcharias taurus (west coast population) Grey Nurse Shark (west coast population) [68752]	Vulnerable	Species or species habitat known to occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area

Listed Migratory Species [Resource Information]

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

Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardenna carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Species or species habitat likely to occur within area
Diomedea amsterdamensis Amsterdam Albatross [64405]	Endangered	Species or species habitat may occur within area
Diomedea dabbenena Tristan Albatross [66471]	Endangered	Species or species habitat may occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Hydroprogne caspia		

Onychoprion anaethetus Bridled Tern [82845]		Foraging, feeding or related behaviour likely to occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Foraging, feeding or related behaviour may occur within area
Thalassarche cauta Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Migratory Marine Species		
Balaena glacialis australis Southern Right Whale [75529]	Endangered*	Breeding known to occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Caperea marginata Pygmy Right Whale [39]		Species or species habitat may occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat may occur within area

Giant Manta Ray, Chevron Manta Ray, Pacific Manta Ray, Pelagic Manta Ray, Oceanic Manta Ray [84995]		Species or species habitat may occur within area
[Megaptera novaeangliae](#)		
Humpback Whale [38]	Vulnerable	Congregation or aggregation known to occur within area
[Natator depressus](#)		
Flatback Turtle [59257]	Vulnerable	Species or species habitat known to occur within area
[Orcinus orca](#)		
Killer Whale, Orca [46]		Species or species habitat may occur within area
[Rhincodon typus](#)		
Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area
Migratory Terrestrial Species		
[Motacilla cinerea](#)		
Grey Wagtail [642]		Species or species habitat may occur within area
Migratory Wetlands Species		
[Actitis hypoleucos](#)		
Common Sandpiper [59309]		Species or species habitat known to occur within area
[Calidris acuminata](#)		
Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
[Calidris canutus](#)		
Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
[Calidris ferruginea](#)		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
[Calidris melanotos](#)		
Pectoral Sandpiper [858]		Species or species habitat may occur within area
[Limosa lapponica](#)		
Bar-tailed Godwit [844]		Species or species habitat may occur within area
[Numenius madagascariensis](#)		
Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
[Pandion haliaetus](#)		
Osprey [952]		Species or species habitat known to occur within area
[Tringa nebularia](#)		
Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area

Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Name
Commonwealth Land -

Listed Marine Species [Resource Information]

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

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Anous tenuirostris melanops Australian Lesser Noddy [26000]	Vulnerable	Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Species or species habitat likely to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Catharacta skua Great Skua [59472]		Species or species habitat may occur within area
Diomedea amsterdamensis Amsterdam Albatross [64405]	Endangered	Species or species habitat may occur within area
Diomedea dabbenena Tristan Albatross [66471]	Endangered	Species or species habitat may occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans		

White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pachyptila turtur Fairy Prion [1066]		Species or species habitat likely to occur within area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Species or species habitat may occur within area
Puffinus assimilis Little Shearwater [59363]		Foraging, feeding or related behaviour known to occur within area
Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		Species or species habitat likely to occur within area
Sterna anaethetus Bridled Tern [814]		Foraging, feeding or related behaviour likely to occur within area
Sterna caspia Caspian Tern [59467]		Foraging, feeding or related behaviour known to occur within area

Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
[Thalassarche melanophris](#) Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
[Thalassarche steadi](#) White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
[Thinornis rubricollis](#) Hooded Plover [59510]		Species or species habitat known to occur within area
[Tringa nebularia](#) Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area
Fish		
[Acentronura australe](#) Southern Pygmy Pipehorse [66185]		Species or species habitat may occur within area
[Campichthys galei](#) Gale's Pipefish [66191]		Species or species habitat may occur within area
[Heraldia nocturna](#) Upside-down Pipefish, Eastern Upside-down Pipefish, Eastern Upside-down Pipefish [66227]		Species or species habitat may occur within area
[Hippocampus angustus](#) Western Spiny Seahorse, Narrow-bellied Seahorse [66234]		Species or species habitat may occur within area
[Hippocampus breviceps](#) Short-head Seahorse, Short-snouted Seahorse [66235]		Species or species habitat may occur within area
[Hippocampus subelongatus](#) West Australian Seahorse [66722]		Species or species habitat may occur within area
[Histiogamphelus cristatus](#) Rhino Pipefish, Macleay's Crested Pipefish, Ring-back Pipefish [66243]		Species or species habitat may occur within area
[Lissocampus caudalis](#) Australian Smooth Pipefish, Smooth Pipefish [66249]		Species or species habitat may occur within area
[Lissocampus fatiloquus](#) Prophet's Pipefish [66250]		Species or species habitat may occur within area
[Lissocampus runa](#) Javelin Pipefish [66251]		Species or species habitat may occur within area
[Maroubra perserrata](#) Sawtooth Pipefish [66252]		Species or species habitat

Leafy Seadragon [66267]		Species or species habitat may occur within area
Phyllopteryx taeniolatus Common Seadragon, Weedy Seadragon [66268]		Species or species habitat may occur within area
Pugnaso curtirostris Pugnose Pipefish, Pug-nosed Pipefish [66269]		Species or species habitat may occur within area
Solegnathus lettiensis Gunther's Pipehorse, Indonesian Pipefish [66273]		Species or species habitat may occur within area
Stigmatopora argus Spotted Pipefish, Gulf Pipefish, Peacock Pipefish [66276]		Species or species habitat may occur within area
Stigmatopora nigra Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277]		Species or species habitat may occur within area
Urocampus carinirostris Hairy Pipefish [66282]		Species or species habitat may occur within area
Vanacampus margaritifer Mother-of-pearl Pipefish [66283]		Species or species habitat may occur within area
Vanacampus phillipi Port Phillip Pipefish [66284]		Species or species habitat may occur within area
Vanacampus poecilolaemus Longsnout Pipefish, Australian Long-snout Pipefish, Long-snouted Pipefish [66285]		Species or species habitat may occur within area
Mammals		
Arctocephalus forsteri Long-nosed Fur-seal, New Zealand Fur-seal [20]		Species or species habitat may occur within area
Neophoca cinerea Australian Sea-lion, Australian Sea Lion [22]	Vulnerable	Species or species habitat may occur within area
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat known to occur within area

Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Caperea marginata Pygmy Right Whale [39]		Species or species habitat may occur within area
Delphinus delphis Common Dophin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Breeding known to occur within area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Congregation or aggregation known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Stenella attenuata Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area
Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area

Extra Information

State and Territory Reserves	[Resource Information]
Name	State
Bramley	WA
Leeuwin-Naturaliste	WA
NTWA Bushland covenant (0044A)	WA
NTWA Bushland covenant (0044B)	WA
NTWA Bushland covenant (0044C)	WA
NTWA Bushland covenant (0065A)	WA
NTWA Bushland covenant (0065B)	WA
NTWA Bushland covenant (0130)	WA
NTWA Bushland covenant (0152)	WA
NTWA Bushland covenant (0164)	WA

Invasive Species

[Resource Information]

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

Name	Status	Type of Presence
Birds		
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Streptopelia senegalensis Laughing Turtle-dove, Laughing Dove [781]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		

Boneseed [16905]	Species or species habitat likely to occur within area
Genista linifolia Flax-leaved Broom, Mediterranean Broom, Flax Broom [2800]	Species or species habitat likely to occur within area
Genista monspessulana Montpellier Broom, Cape Broom, Canary Broom, Common Broom, French Broom, Soft Broom [20126]	Species or species habitat likely to occur within area
Genista sp. X Genista monspessulana Broom [67538]	Species or species habitat may occur within area
Lycium ferocissimum African Boxthorn, Boxthorn [19235]	Species or species habitat likely to occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]	Species or species habitat may occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]	Species or species habitat likely to occur within area
Tamarix aphylla Athel Pine, Athel Tree, Tamarisk, Athel Tamarisk, Athel Tamarix, Desert Tamarisk, Flowering Cypress, Salt Cedar [16018]	Species or species habitat likely to occur within area

and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

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

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

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

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

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

- migratory and
- marine

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

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

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

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

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

Coordinates

-33.80609 115.059

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

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

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

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Appendix E

Conservation Significant Species and Likelihood of Occurrence Assessment

Species	Common name	Level of		Habitat	Likelihood of occurrence
		BC Act	EPBC Act		
Anous tenuirostris melanops	*Australian lesser noddy*	EN	VU	Very common in blue-water seas around the Abrolhos (endemic to this area, accidental occurrences on lower west coast of Australia) (Johnstone and Storr 1998).	**Unlikely** No suitable habitat
Apus pacificus	*Pacific swift*	MI	MI	Aerial, migratory species that is most often seen over inland plains and sometimes above open areas, foothills or in coastal areas. Sometimes occurs over settled areas, including towns, urban areas and cities (Pizzey & Knight 2012).	**Possible** May opportunistically occur in or fly over the site on commute or while searching for prey.
Ardenna carneipes	*Flesh-footed shearwater*	VU	MI	Marine species that breeds on islands off south coast from near Cape Leeuwin (Johnstone and Storr 1998).	**Unlikely** No suitable habitat
Botaurus poiciloptilus	*Australasian bittern*	EN	EN	In or over water, in tall reedbeds, sedges, rushes, cumbungi, lignum. Also occurs in ricefields, drains in tussocky paddocks and occasionally in saltmarshes and brackish wetlands.	**Unlikely** No suitable habitat
Calidris acuminata	*Sharp-tailed sandpiper*	MI	MI	Occurs in tidal mudflats, saltmarshes and mangroves, as well as, shallow fresh,brackish or saline inland wetlands. It is also known from floodwaters, irrigated pastures and crops, sewage ponds, saltfields.	**Unlikely** No suitable habitat
Calidris canutus	*Red knot*	EN	EN (MI)	Mud and sand flats in estuaries and on sheltered coasts. Also near-coastal saltlakes, including saltwork ponds.	**Unlikely** No suitable habitat

		BC Act	EPBC Act		
Calidris ferruginea	*Curlew sandpiper*	CR	CR (MI)	Mainly shallows of estuaries and near-coastal saltlakes (including saltwork ponds) and drying near-coastal freshwater lakes and swamps. Also beaches and near-coastal sewage ponds.	**Unlikely** No suitable habitat
Calidris melanotos	*Pectoral sandpiper*	MI	MI	Mainly fresh waters (swamps, lagoons, river pools, irrigation channels and sewage ponds); also samphire flats around estuaries and saltlakes (Johnstone & Storr 1998).	**Unlikely** No suitable habitat
Calidris ruficollis	*Red-necked stint*	MI	MI	Tidal mudflats, saltmarshes, sandy or shelly beaches, saline and freshwater wetlands (coastal and inland), saltfields, sewage ponds (Pizzey and Knight 2012).	**Unlikely** No suitable habitat
Calyptorhynchus banksii naso	*Forest red-tailed black cockatoo*	VU	VU	Eucalypt and Corymbia forests, often in hilly interior. More recently also observed in more open agricultural and suburban areas including Perth metropolitan area. Attracted to seeding Corymbia calophylla, Eucalyptus marginata, introduced Melia azdarach and Eucalyptus spp. trees.	**Recorded**
Calyptorhynchus baudinii	*Baudin's cockatoo*	EN	EN	Mainly eucalypt forests. Attracted to seeding Corymbia calophylla, Banksia spp., Hakea spp., and to fruiting apples and pears (Johnstone and Storr 1998).	**Recorded**
Calyptorhynchus latirostris	*Carnaby's cockatoo*	EN	EN	Mainly proteaceous scrubs and heaths and adjacent eucalypt woodlands and forests; also plantations of Pinus spp. Attracted to seeding Banksia spp., Dryandra spp., Hakea spp., Eucalyptus spp., Corymbia calophylla, Grevillea spp., and Allocasuarina spp. (Johnstone and Storr 1998).	**Recorded**

		BC Act	EPBC Act		
Charadrius leschenaultii	*Great sand plover*	VU	VU (MI)	Wide sandy or shelly beaches, sandpits, tidal mudflats, reefs, sand cays, mangroves, saltmarsh, dune wilderness, bare paddocks, seldom far inland (Pizzey & Knight 2012).	**Unlikely** No suitable habitat
Diomedea amsterdamensis	*Amsterdam albatross*	CR	EN (MI)	The Amsterdam albatross is a marine, pelagic seabird. It nests in open patchy vegetation (among tussocks, ferns or shrubs) near exposed ridges or hillocks (Weimerskirch et al. 1985). It sleeps and rests on ocean waters when not breeding (Marchant and Higgins 1990)	**Unlikely** No suitable habitat
Diomedea dabbenena	*Tristan albatross*	CR	EN (MI)	The Tristan albatross is a marine, pelagic seabird. It forages in open water in the Atlantic Ocean near the Cape of Good Hope, South Africa. It sleeps and rests on ocean waters when not breeding (Marchant and Higgins 1990).	**Unlikely** No suitable habitat
Diomedea epomophora	*Southern royal albatross*	VU	VU (MI)	Rare visitor to Western Australian seas; it breeds on subantarctic islands south of New Zealand (Johnstone and Storr 1998).	**Unlikely** No suitable habitat
Diomedea exulans	*Wandering albatross*	VU	VU (MI)	Marine, pelagic and aerial species. It breeds on Macquarie Island and feeds in Australian portions of the Southern Ocean (DoE 2018).	**Unlikely** No suitable habitat
Diomedea sanfordi	*Northern royal albatross*	EN	EN	Species is marine, pelagic and aerial. Habitat includes subantarctic, subtropical, and occasionally Antarctic waters (Marchant & Higgins 1990). Rare visitors to south Western Australian waters.	**Unlikely** No suitable habitat

		BC Act	EPBC Act		
Falco hypoleucos	*Grey falcon*	VU	-	Lightly wooded coastal and riverine plains (Johnstone & Storr 1998).	Unlikely Site is located outside of species distribution range.
Falco peregrinus	*Peregrine falcon*	OS	-	Mainly found around cliffs along coasts, rivers, ranges and around wooded watercourses and lakes (Johnstone and Storr 1998).	**Possible** May opportunistically occur in or fly over the site on commute or while searching for prey.
Halobaena caerulea	*Blue petrel*	MI	VU (MI)	Marine species that breeds on southern subantarctic and northern artic islands. Only an accidental or uncommon visitor to Western Australian waters (Johnstone & Storr 1998).	**Unlikely** No suitable habitat
Leipoa ocellata	*Mallefowl*	VU	VU	Scrubs and thickets of Eucalyptus spp., Melaleuca lanceolata and Acacia linophylla; also other dense litter-forming shrublands. Attracted to fallen wheat in stubbles and along roads (Johnstone and Storr 1998).	**Unlikely** Locally extinct
Limosa lapponica	*Bar-tailed godwit*	MI	MI	Estuarine sand and mudflats and sandy beaches with loads of seaweed; also reef flats and near-coastal saltlakes (including saltwork ponds) (Johnstone and Storr 1998).	**Unlikely** No suitable habitat
Limosa lapponica baueri	*Bar-tailed godwit*	VU	VU	Estuarine sand and mudflats and sandy beaches with loads of seaweed; also reef flats and near-coastal saltlakes (including saltwork ponds) (Johnstone and Storr 1998).	**Unlikely** No suitable habitat

		BC Act	EPBC Act		
Limosa lapponica menzbieri	*Bar-tailed godwit*	CR	CR	Mainly coastal habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays. Has also been recorded in coastal sewage farms and saltworks, saltlakes and brackish wetlands near coasts, sandy ocean beaches, rock platforms, and coral reef-flats (Higgins and Davies 1996).	**Unlikely** No suitable habitat
Macronectes giganteus	*Southern giant-petrel*	MI	EN (MI)	Breeds on southern subantarctic and antarctic islands. May visit Western Australian waters from February to December (mostly June to September) (Johnstone and Storr 1998).	**Unlikely** No suitable habitat
Macronectes halli	*Northern giant petrel*	MI	VU (MI)	Breeds on subantarctic islands. May visit Western Australian water from February to September (Johnstone and Storr 1998).	**Unlikely** No suitable habitat
Motacilla cinerea	*Grey wagtail*	MI	MI	In Australia mostly near running water in disused quarries, sandy and rocky streams in escarpments and rainforests, sewage ponds, ploughed fields and airfields (Pizzey & Knight 2012).	**Unlikely** Rarely occurs in general area.
Numenius madagascariensis	*Eastern curlew*	CR	CR (MI)	Mainly tidal mudflats; also reef flats, sandy beaches and rarely near-coastal lakes (including saltwork ponds) (Johnstone and Storr 1998).	**Unlikely** No suitable habitat
Numenius phaeopus	*Whimbrel*	MI	MI	Estuaries, mangroves, tidal flats, coral cays, exposed reefs, flooded paddocks, sewage ponds, bare grasslands, sportsgrounds and lawns.	**Unlikely** No suitable habitat
Onychoprion anaethetus	*Bridled tern*	MI	MI	Tropical and subtropical seas, offshore islands, rarely coasts (Pizzey & Knight).	**Unlikely** No suitable habitat

		BC Act	EPBC Act		
Pachyptila turtur subantarctica	*Fairy prion*	-	VU	Breeds on subantarctic islands and is presumed to frequent subtropical waters during non-breeding period (TSSC 2015).	**Unlikely** No suitable habitat
Pandion haliaetus	*Osprey*	MI	MI	Coasts, estuaries, bays, inlets, islands, and surrounding waters; coral atolls, reefs, lagoons, rock cliffs, stacks (Pizzey & Knight 2012).	**Unlikely** No suitable habitat
Phoebetria fusca	*Sooty albatross*	EN	VU (MI)	Marine, pelagic species that tolerates a wide range of sea surface temperatures and salinities. breeds on subtropical and subantarctic islands in the Indian and Atlantic Oceans, on vegetated cliffs and steep slopes that are sheltered from prevailing winds, often amongst tussock grass.	**Unlikely** No suitable habitat
Pterodroma mollis	*Soft-plumaged petrel*	MI	VU (MI)	Marine species that breeds on temperate and subantarctic islands in south Atlantic and south Indian Ocean. Visitor to West Australian waters from March to September. Rarely observed inshore (Johnstone & Storr 1998).	**Unlikely** No suitable habitat
Sterna bergii	*Crested tern*	MI	MI	Mainly blue-water seas (especially within 3 km of land), including southern estuaries in summer and autumn (when free of silt); also tidal creeks in north, but not penetrating far into larger estuaries.	**Unlikely** No suitable habitat
Sterna caspia	*Caspian tern*	MI	MI	Mainly sheltered areas, estuaries (when not laden with silt) and tidal creeks; occasionally near-coastal saltlakes (including saltwork ponds) and brackish pools in lower courses of rivers; rarely fresh waters.	**Unlikely** No suitable habitat

		BC Act	EPBC Act		
Sterna hirundo	*Common tern*	MI	MI	Offshore waters, beaches, reefs, bays, estuaries, sandflats, saltfields, sewage ponds, freshwater wetlands (Pizzey & Knight 2012).	**Unlikely** No suitable habitat
Sternula nereis nereis	*Australian fairy tern*	VU	VU	Sheltered blue-water seas close to land, estuaries (when free of silt) and near-coastal lakes (Johnstone and Storr 1998).	**Unlikely** No suitable habitat
Thalassarche carteri	*Indian yellow-nosed albatross*	EN	VU (MI)	Marine species that inhabits seas of south and west coast of Western Australia and breeds on islands in the south Indian Ocean and in the south Atlantic (Johnstone & Storr 1998).	**Unlikely** No suitable habitat
Thalassarche cauta cauta	*Shy albatross*	VU	VU (MI)	Scarce visitor (late May to mid-October) to southwestern and western seas. Breeds on islands off Tasmania and south New Zealand (Johnstone and Storr 1998).	**Unlikely** No suitable habitat
Thalassarche chlororhynchos	*Atlantic yellow-nosed albatross*	VU	MI	Marine migratory species that breeds on the Tristan da Cunha group and on Gough Island. Sparse visitor to Australian waters/shores (ACAP, undated)	**Unlikely** No suitable habitat
Thalassarche melanophris	*Black-browed albatross*	EN	VU (MI)	Seas of south and west coasts. Visitor to Western Australian mainland from January to early November (mostly May to September). Breeds on southern subantarctic and antarctic islands (Johnstone and Storr 1998).	**Unlikely** No suitable habitat
Thalassarche melanophris impavida	*Campbell albatross*	VU	VU (MI)	Scarce visitor to south western and western seas. Breeds on Campbell island.	**Unlikely** No suitable habitat

		BC Act	EPBC Act		
Thalassarche steadi	*White-capped albatross*	VU	VU (MI)	Marine species that occurs in subantarctic and subtropical waters. It reaches tropical areas associated with the cool Humboldt Current off South America (Marchant & Higgins 1990). The species has been noted in shelf-waters around breeding islands and over adjacent rises. During the non-breeding season, birds have been observed over continental shelves around continents. The species occurs both inshore and offshore (Marchant 1977) and enters harbours and bays (Jehl 1973). Birds gather to scavenge at commercial fishing grounds.	**Unlikely** No suitable habitat
Thinornis rubricollis	*Hooded plover*	P4	VU	Margins and shallows of saltlakes, sandy and seaweedy beaches and estuaries; also dams (Johnstone & Storr 1998).	**Unlikely** No suitable habitat
Tringa hypoleucos	*Common sandpiper*	MI	MI	Edge of sheltered waters salt or fresh, e.g. estuaries, mangrove creeks, rocky coasts, near-coastal saltlakes (including saltwork ponds), river pools, lagoons, claypans, drying swamps, flood waters, dams and sewage ponds. Preferring situations wherelow perches are available (Johnstone & Storr 1998).	**Unlikely** No suitable habitat
Tringa nebularia	*Common greenshank*	MI	MI	Mudflats, estuaries, saltmarshes, margins of lakes, wetlands, claypans (fresh amd saline), commercial saltfields, sewage ponds (Pizzey & Knight 2012).	**Unlikely** No suitable habitat

		BC Act	EPBC Act		
Cherax tenuimanus	*Margaret River hairy marron*	CR	CR	Occurs primarily in the upper reaches of the Margaret River. Prefers sandy areas, particularly where detritus (organic matter) accumulates, and requires in-stream structural diversity for protection (DoE 2013)	Unlikely Site is located outside of species distribution range.
Engaewa reducta	*Dunsborough burrowing crayfish*	EN	CR	Occurs in a variety of habitats that provide moist sandy/loamy soils and an accessible watertable. These include vegetated seepages, swamp plains and swampy headwaters of streams. Vegetation associated with these habitats is is native heaths dominated by myrtaceous shrubs (DEWHA 2009).	**Unlikely** Site is located outside of species distribution range.
Nannatherina balstoni	*Balston's pygmy perch*	VU	VU	Acidic, tannin-stained freshwater pools, streams and lakes in peat flats within 30 km of the coast of south-west Western Australia, preferring shallow water, and commonly associated with tall sedge thickets and inundated riparian vegetation (DAWE 2020).	**Unlikely** Site is located outside of species distribution range.
Austroassiminea letha	*Cape Leeuwin freshwater snail*	VU	-	Natural freshwater seepages and springs emerging from limestone or lime sands in coastal areas (Ponder et al. 2016)	**Unlikely** No suitable habitat
Westralunio carteri	*Carter's freshwater mussel*	VU	VU	Occurs in greatest abundance in slower flowing streams with stable sediments that are soft enough for burrowing amongst woody debris and exposed tree roots. Also occupies lentic systems including large water supply dams and even on-stream farm dams. Salinity tolerance quite low (Morgan et al. 2011).	**Possible** Potentially suitable habitat present.

		BC Act	EPBC Act		
Bettongia penicillata ogilbyi	*Woylie*	CR	EN	Woodlands and adjacent heaths with a dense understorey of shrubs, particularly Gastrolobium spp. (TSSC 2018).	**Unlikely** Locally extinct
Dasyurus geoffroii	*Chuditch*	VU	VU	Wide range of habitats from woodlands, dry sclerophyll forests, riparian vegetation, beaches and deserts. Appears to utilise native vegetation along road sides in the wheatbelt (DEC 2012b).	**Possible** Potentially suitable habitat present.
Falsistrellus mackenziei	*Western false pipistrelle*	P4	-	High rainfall forests dominated by jarrah, karri, marri, and tuart. Occupies hollow logs for breeding and resting (Van Dyck and Strahan 2008).	**Possible** Potentially suitable habitat present.
Hydromys chrysogaster	*Rakali*	P4	-	Areas with permanent water, fresh, brackish or marine. Likely to occur in all major rivers and most of the larger streams as well as bodies of permanent water in the lower south west (Christensen et al. 1985).	**Possible** Potentially suitable habitat present.
Isoodon fusciventer	*Quenda*	P4	-	Dense scrubby, often swampy, vegetation with dense cover up to one metre high (DEC 2012)	**Possible** Potentially suitable habitat present.
Macrotis lagotis	*Bilby*	VU	VU	Open tussock grassland on uplands and hills, mulga woodland/shrubland growing on ridges and rises and hummock grassland (spinifex) growing on sandplains and dunes, drainage systems, salt lake systems and other alluvial areas (DBCA 2017a).	**Unlikely** Locally extinct
Notamacropus irma	*Western brush wallaby*	P4	-	Dry sclerophyll forest, Banksia spp. woodlands and shrublands, typically favouring dense low vegetation that provides dense cover (Christensen and Strahan 1983).	**Unlikely** Site is located outside of species distribution range.

		BC Act	EPBC Act		
Phascogale tapoatafa wambenger	*South-western brush-tailed phascogale*	CD	-	Dry sclerophyll forests and open woodlands that contain hollow-bearing trees but a sparse ground cover (Triggs 2003).	**Possible** Potentially suitable habitat present.
Pseudocheirus occidentalis	*Western ringtail possum*	CR	CR	Dense stands of Agonis flexuosa, as well as Eucalyptus gomphocephala, Corymbia calophylla and Eucalyptus marginata forests (DBCA 2017b).	**Recorded**
Setonix brachyurus	*Quokka*	VU	VU	On the mainland mostly dense streamside vegetation or shrubland and heath areas, particularly around swamps (Cronin 2007).	**Unlikely** Locally extinct

Note: CE=critically endangered, EN=endangered, VU=vulnerable, CD=conservation dependent, MI=migratory, OS=other specially protected, P1=Priority 1, P2=Priority 2, P3=Priority 3, P4=Priority 4. Species recorded or considered to potentially occur within the site are shaded green.

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Appendix F

Species List

Fauna List
Lot 32 (No.325) Tom Cullity Drive, Wilyabrup

Category	Status	Species name	Common name	Record type
Birds				
		Crinia georgiana	Quacking frog	Call
		Crinia glauerti	Clicking frog	Call
		Geocrinia leai	Ticking frog	Call
		Acanthiza chrysorrhoa	Yellow-rumped thornbill	Sight, call
		Anas superciliosa	Pacific black duck	Sight
		Ardea novaehollandiae	White-faced heron	Sight
		Cacatua roseicapilla	Galah	Sight, call
	VU	*Calyptorhynchus banksii naso*	Forest red-tailed black cockatoo	Sight, call, foraging evidence
	EN	*Calyptorhynchus baudinii*	Baudin's cockatoo	Sight, call
	EN	*Calyptorhynchus latirostris*	Carnaby's cockatoo	Sight, call, foraging evidence
		Chenonetta jubeta	Australian wood duck	Sight
		Corvus coronoides	Australian raven	Sight, call
		Cracticus tibicen	Australian magpie	Sight, call
	*	*Dacelo novaehollandiae*	Laughing kookaburra	Sight, call
		Gerygone fusca	Western gerygone	Call
		Grallina cyanoleuca	Magpie-lark	Sight
		Malurus splendens	Splendid fairy-wren	Sight, call
		Pachycephala occidentalis	Western whistler	Call
		Pardalotus striatus	Striated pardalote	Call
		Petroica boodang	Scarlet robin	Sight
		Platycercus spurius	Rd-capped parrot	Sight
		Platycercus zonarius	Australian ringneck	Sight, call
		Rhipidura albiscapa	Grey fantail	Sight, call
		Smicrornis brevirostris westraliensis	Weebill	Sight, call
		Tadoma radjah	Radjah Shelduck	Sight
		Zosterops occidentalis	Silvereye	Sight, call
		Phaps chalcoptera	Common bronzewing	Sight
Mammals				
		Macropus fuliginosus melanops	Western grey kangaroo	Scats, sight

Category	Status	Species name	Common name	Record type
	*DP	*Oryctolagus cuniculus*	Rabbit	Digging, scats
	CR	*Pseudocheirus occidentalis*	Western ringtail possum	Drey
		Trichosurus vulpecula hypoleucus	Common brushtail possum	Scat

Note: * denotes introduced fauna species, DP=declared pest under the BAM Act, EN=Endangered under the EPBC Act, VU = Vulnerable under the EPBC Act, CR = Critically

Appendix G

Black Cockatoo Habitat Tree Data

Tag No.	Easting	Northing	DBH (cm)	Species	Category	Notes
1	320945.62	6257321.49	217	*Corymbia calophylla*	No suitable hollow(s)	
3	320936.78	6257309.24	56	*Corymbia calophylla*	No suitable hollow(s)	
6	320962.77	6257345.42	102	*Corymbia calophylla*	No suitable hollow(s)	
7	320962.96	6257350.21	51	*Eucalyptus marginata*	No suitable hollow(s)	
8	320969.74	6257367.65	97	*Corymbia calophylla*	No suitable hollow(s)	
9	320977.73	6257337.51	83	*Corymbia calophylla*	No suitable hollow(s)	
12	320984.40	6257337.64	63	*Corymbia calophylla*	No suitable hollow(s)	
16	320992.30	6257350.55	303	*Corymbia calophylla*	No suitable hollow(s)	
23	321009.48	6257372.82	81	*Corymbia calophylla*	No suitable hollow(s)	
28	321006.90	6257391.09	52	*Corymbia calophylla*	No suitable hollow(s)	
34	320586.12	6257635.88	112	*Corymbia calophylla*	No suitable hollow(s)	
37	320954.20	6257377.33	75	*Eucalyptus marginata*	No suitable hollow(s)	
38	320946.41	6257368.09	53	*Eucalyptus marginata*	No suitable hollow(s)	
39	320934.32	6257375.74	89	*Eucalyptus marginata*	No suitable hollow(s)	
40	320937.61	6257392.66	59	*Eucalyptus marginata*	No suitable hollow(s)	
41	320941.29	6257359.67	57	*Corymbia calophylla*	No suitable hollow(s)	
42	320927.53	6257337.78	53	*Corymbia calophylla*	No suitable hollow(s)	
43	320914.80	6257320.24	53	*Corymbia calophylla*	No suitable hollow(s)	
44	320909.78	6257326.13	61	*Corymbia calophylla*	No suitable hollow(s)	
45	320891.59	6257323.25	71	*Corymbia calophylla*	No suitable hollow(s)	
46	320886.84	6257344.78	123	*Corymbia calophylla*	Suitable hollow(s)	Hollow inspected using a pole-mounted camera. Hollow apaears suitable. No signs of use by black cockatos observed.
47	320897.97	6257348.43	67	*Eucalyptus marginata*	No suitable hollow(s)	
48	320906.50	6257333.39	55	*Corymbia calophylla*	No suitable hollow(s)	
49	320919.76	6257352.28	98	*Corymbia calophylla*	No suitable hollow(s)	
50	320907.71	6257362.48	63	*Corymbia calophylla*	No suitable hollow(s)	
51	320925.43	6257390.22	79	*Eucalyptus marginata*	No suitable hollow(s)	
52	320932.21	6257399.22	94	*Corymbia calophylla*	No suitable hollow(s)	
53	320910.68	6257401.48	77	*Corymbia calophylla*	No suitable hollow(s)	
54	320910.14	6257396.14	53	*Corymbia calophylla*	No suitable hollow(s)	

Tag No.	Easting	Northing	DBH (cm)	Species	Category	Notes
55	320889.37	6257377.33	55	*Eucalyptus marginata*	No suitable hollow(s)	
56	320875.76	6257352.56	69	*Corymbia calophylla*	No suitable hollow(s)	
57	320882.72	6257371.88	55	*Corymbia calophylla*	No suitable hollow(s)	
58	320878.26	6257382.34	59	*Eucalyptus marginata*	No suitable hollow(s)	
59	320871.76	6257388.21	65	*Corymbia calophylla*	No suitable hollow(s)	
60	320885.99	6257399.79	53	*Corymbia calophylla*	No suitable hollow(s)	
61	320851.54	6257380.28	53	*Corymbia calophylla*	No suitable hollow(s)	
62	320854.99	6257398.43	68	*Eucalyptus marginata*	No suitable hollow(s)	
63	320865.54	6257399.07	59	*Corymbia calophylla*	No suitable hollow(s)	
64	320876.22	6257402.38	92	*Corymbia calophylla*	No suitable hollow(s)	
65	320881.73	6257414.69	70	*Eucalyptus marginata*	No suitable hollow(s)	
66	320885.66	6257432.29	92	*Eucalyptus marginata*	No suitable hollow(s)	
67	320898.20	6257430.08	54	*Eucalyptus marginata*	No suitable hollow(s)	
68	320902.07	6257445.80	56	*Corymbia calophylla*	No suitable hollow(s)	
69	320892.57	6257453.72	115	*Corymbia calophylla*	No suitable hollow(s)	
70	320904.67	6257460.05	70	*Corymbia calophylla*	No suitable hollow(s)	
71	320910.25	6257449.28	80	*Corymbia calophylla*	No suitable hollow(s)	
72	320917.37	6257449.64	52	*Corymbia calophylla*	No suitable hollow(s)	
73	320900.75	6257471.62	67	*Corymbia calophylla*	No suitable hollow(s)	
74	320887.05	6257476.25	56	*Corymbia calophylla*	No suitable hollow(s)	
75	320879.79	6257468.35	55	*Corymbia calophylla*	No suitable hollow(s)	
76	320881.03	6257456.72	79	*Eucalyptus marginata*	No suitable hollow(s)	
77	320873.89	6257447.05	87	*Corymbia calophylla*	No suitable hollow(s)	
78	320852.06	6257436.32	86	*Eucalyptus marginata*	No suitable hollow(s)	
79	320857.05	6257446.28	61	*Corymbia calophylla*	No suitable hollow(s)	
80	320863.00	6257415.67	53	*Eucalyptus marginata*	No suitable hollow(s)	
81	320859.45	6257407.50	78	*Corymbia calophylla*	No suitable hollow(s)	
82	320837.00	6257414.51	63	*Eucalyptus marginata*	No suitable hollow(s)	
83	320833.65	6257415.56	63	*Corymbia calophylla*	No suitable hollow(s)	
84	320835.89	6257409.72	57	*Corymbia calophylla*	No suitable hollow(s)	
85	320839.94	6257401.14	61	*Corymbia calophylla*	No suitable hollow(s)	

Tag No.	Easting	Northing	DBH (cm)	Species	Category	Notes
86	320834.05	6257394.16	55	*Corymbia calophylla*	No suitable hollow(s)	
87	320811.11	6257387.62	67	*Corymbia calophylla*	No suitable hollow(s)	
88	320854.76	6257440.03	54	*Eucalyptus marginata*	No suitable hollow(s)	
89	320903.74	6257480.00	73	*Eucalyptus marginata*	No suitable hollow(s)	
90	320908.63	6257481.42	92	*Corymbia calophylla*	No suitable hollow(s)	
91	320906.59	6257471.62	76	*Corymbia calophylla*	No suitable hollow(s)	
92	320915.37	6257472.56	62	*Corymbia calophylla*	No suitable hollow(s)	
93	320908.95	6257483.87	60	*Corymbia calophylla*	No suitable hollow(s)	
94	320913.80	6257487.18	84	*Corymbia calophylla*	No suitable hollow(s)	
95	320921.14	6257485.76	52	*Eucalyptus marginata*	No suitable hollow(s)	
96	320928.76	6257484.02	105	*Corymbia calophylla*	No suitable hollow(s)	
97	320924.13	6257474.17	58	*Corymbia calophylla*	No suitable hollow(s)	
98	320932.20	6257468.89	64	*Eucalyptus marginata*	No suitable hollow(s)	
99	320942.24	6257491.48	74	*Corymbia calophylla*	No suitable hollow(s)	
100	320479.47	6257668.38	139	*Corymbia calophylla*	No suitable hollow(s)	
101	320741.66	6257466.30	90	*Corymbia calophylla*	No suitable hollow(s)	
102	320737.25	6257469.33	63	*Corymbia calophylla*	No suitable hollow(s)	
103	320723.92	6257488.71	73	*Corymbia calophylla*	No suitable hollow(s)	
104	320702.14	6257504.28	82	*Corymbia calophylla*	No suitable hollow(s)	
105	320693.33	6257509.77	75	*Corymbia calophylla*	No suitable hollow(s)	
106	320690.28	6257553.97	72	*Corymbia calophylla*	No suitable hollow(s)	
107	320685.59	6257557.21	101	*Corymbia calophylla*	No suitable hollow(s)	
108	320689.60	6257560.73	102	*Corymbia calophylla*	No suitable hollow(s)	
109	320747.27	6257581.67	92	*Corymbia calophylla*	No suitable hollow(s)	
110	320749.91	6257593.93	78	*Corymbia calophylla*	No suitable hollow(s)	
111	320749.67	6257596.92	71	*Corymbia calophylla*	No suitable hollow(s)	
112	320752.44	6257607.17	70	*Corymbia calophylla*	No suitable hollow(s)	
113	320758.41	6257594.86	61	*Corymbia calophylla*	No suitable hollow(s)	
114	320754.34	6257594.79	67	*Corymbia calophylla*	No suitable hollow(s)	
115	320814.73	6257387.58	63	*Corymbia calophylla*	No suitable hollow(s)	
116	320811.94	6257387.75	56	*Corymbia calophylla*	No suitable hollow(s)	

Tag No.	Easting	Northing	DBH (cm)	Species	Category	Notes
117	321044.58	6257403.35	106	*Corymbia calophylla*	No suitable hollow(s)	
118	321054.72	6257439.13	54	*Corymbia calophylla*	No suitable hollow(s)	
119	321044.65	6257447.92	73	*Corymbia calophylla*	No suitable hollow(s)	
120	321044.40	6257431.28	54	*Corymbia calophylla*	No suitable hollow(s)	
121	321046.82	6257425.89	68	*Corymbia calophylla*	No suitable hollow(s)	
122	321056.18	6257430.50	59	*Corymbia calophylla*	No suitable hollow(s)	
123	321021.68	6257423.09	58	*Corymbia calophylla*	No suitable hollow(s)	
124	321017.59	6257423.90	55	*Corymbia calophylla*	No suitable hollow(s)	
125	321027.98	6257408.45	92	*Corymbia calophylla*	No suitable hollow(s)	
126	321036.90	6257406.62	50	*Corymbia calophylla*	No suitable hollow(s)	
127	321018.58	6257406.05	73	*Corymbia calophylla*	No suitable hollow(s)	
128	321004.14	6257425.42	55	*Corymbia calophylla*	No suitable hollow(s)	
129	321000.25	6257420.13	62	*Corymbia calophylla*	No suitable hollow(s)	
130	321000.84	6257413.60	64	*Corymbia calophylla*	No suitable hollow(s)	
131	321003.55	6257412.43	56	*Corymbia calophylla*	No suitable hollow(s)	
132	321003.81	6257398.23	53	*Eucalyptus marginata*	No suitable hollow(s)	
133	320991.35	6257401.44	79	*Corymbia calophylla*	No suitable hollow(s)	
134	320993.12	6257395.59	87	*Corymbia calophylla*	No suitable hollow(s)	
135	320984.21	6257386.66	50	*Corymbia calophylla*	No suitable hollow(s)	
136	320959.84	6257387.53	133	*Corymbia calophylla*	No suitable hollow(s)	
137	320956.06	6257391.68	66	*Eucalyptus marginata*	No suitable hollow(s)	
138	320959.08	6257393.51	84	*Corymbia calophylla*	No suitable hollow(s)	
139	320956.74	6257410.12	55	*Eucalyptus marginata*	No suitable hollow(s)	
140	320960.90	6257419.84	53	*Eucalyptus marginata*	No suitable hollow(s)	
141	320985.11	6257437.47	59	*Eucalyptus marginata*	No suitable hollow(s)	
142	320995.23	6257446.11	53	*Corymbia calophylla*	No suitable hollow(s)	
143	321004.19	6257442.28	53	*Eucalyptus marginata*	No suitable hollow(s)	
144	321036.38	6257459.20	52	*Corymbia calophylla*	No suitable hollow(s)	
145	321039.98	6257459.60	57	*Corymbia calophylla*	No suitable hollow(s)	
146	321029.85	6257476.60	108	*Corymbia calophylla*	No suitable hollow(s)	
147	321028.11	6257470.24	66	*Corymbia calophylla*	No suitable hollow(s)	

Tag No.	Easting	Northing	DBH (cm)	Species	Category	Notes
148	321014.91	6257478.32	52	*Corymbia calophylla*	No suitable hollow(s)	
149	321018.40	6257484.37	75	*Corymbia calophylla*	No suitable hollow(s)	
150	321007.19	6257489.93	78	*Corymbia calophylla*	No suitable hollow(s)	
151	320996.28	6257488.62	87	*Corymbia calophylla*	No suitable hollow(s)	
152	320996.10	6257493.50	73	*Corymbia calophylla*	No suitable hollow(s)	
153	321014.59	6257460.78	52	*Corymbia calophylla*	No suitable hollow(s)	
154	320982.31	6257473.05	54	*Corymbia calophylla*	No suitable hollow(s)	
155	320975.37	6257468.26	50	*Corymbia calophylla*	No suitable hollow(s)	
156	320975.23	6257465.59	108	*Corymbia calophylla*	No suitable hollow(s)	
157	320967.50	6257453.13	65	*Eucalyptus marginata*	No suitable hollow(s)	
158	320971.92	6257454.32	51	*Eucalyptus marginata*	No suitable hollow(s)	
159	320962.89	6257456.71	50	*Corymbia calophylla*	No suitable hollow(s)	
160	320960.47	6257452.78	52	*Corymbia calophylla*	No suitable hollow(s)	
161	320967.22	6257438.48	62	*Eucalyptus marginata*	No suitable hollow(s)	
162	320937.14	6257442.58	63	*Eucalyptus marginata*	No suitable hollow(s)	
163	320936.58	6257423.15	110	*Corymbia calophylla*	Potentially suitable holl	Cavity observed with drone. Hollow appears sutiable from the outside. Internal dimensions unconfirmed.
164	320913.99	6257417.73	74	*Eucalyptus marginata*	No suitable hollow(s)	
165	320914.27	6257412.53	63	*Corymbia calophylla*	No suitable hollow(s)	
166	320907.06	6257407.18	75	*Eucalyptus marginata*	No suitable hollow(s)	
167	320987.16	6257500.87	50	*Corymbia calophylla*	No suitable hollow(s)	
168	320979.35	6257517.25	64	*Corymbia calophylla*	No suitable hollow(s)	
170	320964.77	6257514.54	55	*Corymbia calophylla*	No suitable hollow(s)	
171	320970.73	6257493.02	50	*Eucalyptus marginata*	No suitable hollow(s)	
172	320975.46	6257493.00	53	*Corymbia calophylla*	No suitable hollow(s)	
173	320945.85	6257496.43	72	*Corymbia calophylla*	No suitable hollow(s)	
176	320960.09	6257472.74	79	*Corymbia calophylla*	No suitable hollow(s)	
177	320955.23	6257465.33	58	*Corymbia calophylla*	No suitable hollow(s)	
178	320945.21	6257461.25	57	*Corymbia calophylla*	No suitable hollow(s)	
179	320938.57	6257450.04	54	*Eucalyptus marginata*	No suitable hollow(s)	
180	320814.34	6257378.36	70	*Corymbia calophylla*	No suitable hollow(s)	

Tag No.	Easting	Northing	DBH (cm)	Species	Category	Notes
181	320329.53	6257664.11	80	*Corymbia calophylla*	No suitable hollow(s)	
182	320328.14	6257663.97	61	*Corymbia calophylla*	No suitable hollow(s)	
183	320314.54	6257658.17	72	*Corymbia calophylla*	No suitable hollow(s)	
184	320962.97	6257487.21	50	*Corymbia calophylla*	No suitable hollow(s)	
184	320311.40	6257662.55	50	*Corymbia calophylla*	No suitable hollow(s)	
185	320968.98	6257472.91	60	*Corymbia calophylla*	No suitable hollow(s)	
185	320301.98	6257651.50	60	*Corymbia calophylla*	No suitable hollow(s)	
186	320297.04	6257658.17	77	*Eucalyptus patens*	No suitable hollow(s)	
187	320290.42	6257655.60	102	*Corymbia calophylla*	No suitable hollow(s)	
188	320294.38	6257661.45	50	*Corymbia calophylla*	No suitable hollow(s)	
189	320270.50	6257665.99	66	*Corymbia calophylla*	No suitable hollow(s)	
190	320271.98	6257670.79	50	*Corymbia calophylla*	No suitable hollow(s)	
191	320288.65	6257685.75	166	*Corymbia calophylla*	Potentially suitable holl	Cavity observed with drone. Hollow appears sutiable from the outside. Internal dimensions unconfirmed.
192	320294.32	6257689.63	105	*Corymbia calophylla*	No suitable hollow(s)	
193	320269.52	6257703.03	72	*Corymbia calophylla*	No suitable hollow(s)	
194	320260.87	6257675.68	62	*Eucalyptus patens*	No suitable hollow(s)	
195	320260.01	6257672.23	59	*Eucalyptus patens*	No suitable hollow(s)	
196	320260.21	6257661.69	54	*Eucalyptus patens*	No suitable hollow(s)	
197	320240.91	6257673.31	55	*Corymbia calophylla*	No suitable hollow(s)	
198	320241.54	6257674.21	56	*Corymbia calophylla*	No suitable hollow(s)	
199	320247.98	6257686.31	140	*Corymbia calophylla*	No suitable hollow(s)	
200	320243.11	6257689.10	59	*Corymbia calophylla*	No suitable hollow(s)	
201	320754.23	6257551.30	85	*Corymbia calophylla*	No suitable hollow(s)	
202	320767.36	6257562.19	68	*Eucalyptus marginata*	No suitable hollow(s)	
203	320774.85	6257552.90	52	*Eucalyptus marginata*	No suitable hollow(s)	
204	320761.79	6257533.35	76	*Corymbia calophylla*	No suitable hollow(s)	
205	320762.50	6257520.39	70	*Corymbia calophylla*	No suitable hollow(s)	
206	320751.62	6257517.41	59	*Corymbia calophylla*	No suitable hollow(s)	
207	320761.62	6257512.94	51	*Eucalyptus marginata*	No suitable hollow(s)	
208	320770.71	6257492.36	95	*Corymbia calophylla*	No suitable hollow(s)	

Tag No.	Easting	Northing	DBH (cm)	Species	Category	Notes
209	320767.35	6257493.85	50	*Eucalyptus marginata*	No suitable hollow(s)	
210	320774.75	6257523.95	55	*Corymbia calophylla*	No suitable hollow(s)	
211	320785.27	6257521.04	56	*Eucalyptus marginata*	No suitable hollow(s)	
212	320781.18	6257531.72	74	*Corymbia calophylla*	No suitable hollow(s)	
213	320778.40	6257541.43	54	*Eucalyptus marginata*	No suitable hollow(s)	
214	320786.37	6257551.23	106	*Corymbia calophylla*	No suitable hollow(s)	
215	320781.99	6257557.14	65	*Corymbia calophylla*	No suitable hollow(s)	
216	320783.51	6257574.92	100	*Corymbia calophylla*	No suitable hollow(s)	
217	320794.73	6257574.02	66	*Corymbia calophylla*	No suitable hollow(s)	
218	320779.09	6257593.48	67	*Corymbia calophylla*	No suitable hollow(s)	
219	320788.96	6257585.78	79	*Corymbia calophylla*	No suitable hollow(s)	
220	320813.20	6257606.54	120	*Corymbia calophylla*	No suitable hollow(s)	
221	320827.01	6257600.81	58	*Corymbia calophylla*	No suitable hollow(s)	
222	320835.93	6257599.32	58	*Corymbia calophylla*	No suitable hollow(s)	
223	320846.47	6257600.51	74	*Corymbia calophylla*	No suitable hollow(s)	
224	320852.33	6257593.97	50	*Corymbia calophylla*	No suitable hollow(s)	
226	320862.86	6257561.10	126	*Corymbia calophylla*	No suitable hollow(s)	
227	320846.94	6257560.58	54	*Corymbia calophylla*	No suitable hollow(s)	
228	320848.26	6257584.24	76	*Corymbia calophylla*	No suitable hollow(s)	
229	320831.58	6257574.94	52	*Eucalyptus marginata*	No suitable hollow(s)	
230	320821.14	6257558.54	74	*Corymbia calophylla*	No suitable hollow(s)	
231	320800.46	6257555.05	87	*Corymbia calophylla*	No suitable hollow(s)	
232	320788.55	6257494.25	51	*Eucalyptus marginata*	No suitable hollow(s)	
233	320797.08	6257488.53	56	*Eucalyptus marginata*	No suitable hollow(s)	
234	320808.74	6257513.71	63	*Eucalyptus marginata*	No suitable hollow(s)	
235	320824.25	6257541.19	79	*Corymbia calophylla*	No suitable hollow(s)	
236	320839.04	6257557.22	107	*Corymbia calophylla*	No suitable hollow(s)	
237	320867.93	6257552.66	58	*Eucalyptus marginata*	No suitable hollow(s)	
238	320863.92	6257548.92	85	*Corymbia calophylla*	No suitable hollow(s)	
239	320847.29	6257527.09	63	*Eucalyptus marginata*	No suitable hollow(s)	
240	320851.71	6257523.84	50	*Eucalyptus marginata*	No suitable hollow(s)	

Tag No.	Easting	Northing	DBH (cm)	Species	Category	Notes
241	320849.17	6257515.92	77	*Corymbia calophylla*	No suitable hollow(s)	
242	320821.84	6257511.41	54	*Eucalyptus marginata*	No suitable hollow(s)	
243	320826.45	6257488.20	60	*Eucalyptus marginata*	No suitable hollow(s)	
244	320822.76	6257477.15	90	*Corymbia calophylla*	No suitable hollow(s)	
245	320723.59	6257658.88	125	*Eucalyptus patens*	No suitable hollow(s)	
246	320684.80	6257682.78	106	*Corymbia calophylla*	No suitable hollow(s)	
247	320675.27	6257677.06	110	*Corymbia calophylla*	No suitable hollow(s)	
248	320893.96	6257561.91	75	*Corymbia calophylla*	No suitable hollow(s)	
249	320876.86	6257550.38	78	*Stag*	No suitable hollow(s)	
250	320875.05	6257548.13	58	*Eucalyptus marginata*	No suitable hollow(s)	
251	320870.25	6257527.52	58	*Eucalyptus marginata*	No suitable hollow(s)	
252	320867.45	6257529.02	60	*Corymbia calophylla*	No suitable hollow(s)	
253	320866.13	6257520.01	58	*Corymbia calophylla*	No suitable hollow(s)	
254	320868.64	6257509.85	64	*Eucalyptus marginata*	No suitable hollow(s)	
255	320854.37	6257510.36	57	*Corymbia calophylla*	No suitable hollow(s)	
256	320844.85	6257474.79	68	*Eucalyptus marginata*	No suitable hollow(s)	
257	320836.31	6257451.00	52	*Eucalyptus marginata*	No suitable hollow(s)	
258	320830.63	6257438.36	111	*Corymbia calophylla*	Suitable hollow(s)	Hollow inspected using a pole-mounted camera. Hollow apaears suitable. No signs of use by black cockatos observed.
259	320821.39	6257441.84	57	*Corymbia calophylla*	No suitable hollow(s)	
260	320801.94	6257452.13	51	*Corymbia calophylla*	No suitable hollow(s)	
261	320789.95	6257469.21	60	*Eucalyptus marginata*	No suitable hollow(s)	
262	320781.60	6257484.47	60	*Eucalyptus marginata*	No suitable hollow(s)	
263	320820.66	6257436.17	62	*Eucalyptus marginata*	No suitable hollow(s)	
264	320854.39	6257455.11	72	*Corymbia calophylla*	No suitable hollow(s)	
266	320893.55	6257510.09	79	*Corymbia calophylla*	No suitable hollow(s)	
267	320903.14	6257517.15	56	*Corymbia calophylla*	No suitable hollow(s)	
268	320897.60	6257535.91	82	*Corymbia calophylla*	No suitable hollow(s)	
269	320904.39	6257539.36	53	*Corymbia calophylla*	No suitable hollow(s)	
270	320904.21	6257534.26	112	*Corymbia calophylla*	No suitable hollow(s)	

Tag No.	Easting	Northing	DBH (cm)	Species	Category	Notes
271	320914.21	6257543.76	52	*Corymbia calophylla*	No suitable hollow(s)	
272	320925.21	6257545.08	54	*Corymbia calophylla*	No suitable hollow(s)	
273	320934.75	6257545.04	69	*Corymbia calophylla*	No suitable hollow(s)	
274	320942.84	6257528.44	71	*Corymbia calophylla*	No suitable hollow(s)	
275	320939.25	6257522.27	85	*Corymbia calophylla*	No suitable hollow(s)	
276	320937.67	6257517.91	80	*Corymbia calophylla*	No suitable hollow(s)	
277	320942.25	6257510.68	52	*Eucalyptus marginata*	No suitable hollow(s)	
278	320944.03	6257509.49	65	*Corymbia calophylla*	No suitable hollow(s)	
279	320954.03	6257514.23	74	*Eucalyptus marginata*	No suitable hollow(s)	
280	320651.42	6257606.16	98	*Corymbia calophylla*	No suitable hollow(s)	
281	320618.41	6257608.20	112	*Corymbia calophylla*	No suitable hollow(s)	
282	320617.09	6257614.50	86	*Eucalyptus patens*	No suitable hollow(s)	
283	320610.26	6257618.03	78	*Eucalyptus patens*	No suitable hollow(s)	
284	320600.17	6257622.61	78	*Corymbia calophylla*	No suitable hollow(s)	
285	320599.57	6257625.04	66	*Corymbia calophylla*	No suitable hollow(s)	
286	320586.20	6257695.90	99	*Stag*	No suitable hollow(s)	
287	320310.33	6257650.43	96	*Eucalyptus patens*	No suitable hollow(s)	
288	320296.15	6257636.63	62	*Corymbia calophylla*	No suitable hollow(s)	
289	320298.57	6257635.79	78	*Eucalyptus patens*	No suitable hollow(s)	
290	320226.55	6257643.86	72	*Corymbia calophylla*	No suitable hollow(s)	
291	320225.24	6257674.23	73	*Eucalyptus patens*	No suitable hollow(s)	
292	320222.94	6257698.15	55	*Stag*	No suitable hollow(s)	
293	320206.66	6257697.07	52	*Corymbia calophylla*	No suitable hollow(s)	
294	320178.92	6257694.77	73	*Stag*	No suitable hollow(s)	
295	320166.95	6257695.88	100	*Corymbia calophylla*	No suitable hollow(s)	
296	320158.01	6257708.51	63	*Corymbia calophylla*	No suitable hollow(s)	
297	320142.31	6257706.06	76	*Eucalyptus marginata*	No suitable hollow(s)	
298	320139.39	6257693.58	53	*Eucalyptus marginata*	No suitable hollow(s)	
299	320134.06	6257696.36	55	*Corymbia calophylla*	No suitable hollow(s)	
300	320113.30	6257692.64	65	*Eucalyptus marginata*	No suitable hollow(s)	
301	320238.28	6257704.65	126	*Corymbia calophylla*	No suitable hollow(s)	

Tag No.	Easting	Northing	DBH (cm)	Species	Category	Notes
302	320227.73	6257704.46	58	*Corymbia calophylla*	No suitable hollow(s)	
303	320210.52	6257718.33	55	*Corymbia calophylla*	No suitable hollow(s)	
304	320203.34	6257717.41	65	*Corymbia calophylla*	No suitable hollow(s)	
305	320182.42	6257717.17	52	*Eucalyptus patens*	No suitable hollow(s)	
306	320179.97	6257718.39	59	*Eucalyptus patens*	No suitable hollow(s)	
307	320183.60	6257716.82	53	*Corymbia calophylla*	No suitable hollow(s)	
308	320152.68	6257671.98	65	*Corymbia calophylla*	No suitable hollow(s)	
309	320133.49	6257687.37	88	*Eucalyptus marginata*	No suitable hollow(s)	
310	320133.72	6257680.05	72	*Stag*	No suitable hollow(s)	
311	320124.11	6257678.98	89	*Corymbia calophylla*	No suitable hollow(s)	
312	320126.94	6257666.50	53	*Eucalyptus marginata*	No suitable hollow(s)	
313	320110.16	6257657.42	57	*Eucalyptus marginata*	No suitable hollow(s)	
314	320122.60	6257656.10	50	*Eucalyptus marginata*	No suitable hollow(s)	
315	320123.69	6257657.01	50	*Corymbia calophylla*	No suitable hollow(s)	
316	320140.29	6257665.75	50	*Corymbia calophylla*	No suitable hollow(s)	
317	320149.94	6257674.37	53	*Corymbia calophylla*	No suitable hollow(s)	
318	320158.44	6257661.10	67	*Corymbia calophylla*	No suitable hollow(s)	
319	320171.82	6257663.57	52	*Eucalyptus marginata*	No suitable hollow(s)	
320	320089.69	6257643.27	91	*Eucalyptus marginata*	No suitable hollow(s)	
321	320061.53	6257613.90	90	*Corymbia calophylla*	No suitable hollow(s)	
322	320049.29	6257614.78	51	*Eucalyptus marginata*	No suitable hollow(s)	
323	320041.35	6257613.74	57	*Stag*	No suitable hollow(s)	
324	320031.55	6257607.56	64	*Eucalyptus marginata*	No suitable hollow(s)	
325	320013.41	6257602.34	59	*Eucalyptus marginata*	No suitable hollow(s)	
326	319997.78	6257586.51	68	*Corymbia calophylla*	No suitable hollow(s)	
327	319981.37	6257587.42	68	*Eucalyptus marginata*	No suitable hollow(s)	
328	319961.67	6257586.05	63	*Corymbia calophylla*	No suitable hollow(s)	
329	319946.13	6257580.10	52	*Eucalyptus marginata*	No suitable hollow(s)	
401	320499.91	6257680.08	127	*Corymbia calophylla*	No suitable hollow(s)	

Tag No.	Easting	Northing	DBH (cm)	Species	Category	Notes
402	320493.55	6257702.59	106	*Corymbia calophylla*	Suitable hollow(s)	Hollow inspected using a pole-mounted camera. Hollow apaears suitable. No signs of use by black cockatos observed.
403	320116.24	6257639.78	60	*Corymbia calophylla*	No suitable hollow(s)	
404	320125.07	6257642.72	56	*Corymbia calophylla*	No suitable hollow(s)	
405	320130.62	6257638.61	64	*Eucalyptus marginata*	No suitable hollow(s)	
406	320138.93	6257654.52	64	*Stag*	No suitable hollow(s)	
407	320155.09	6257652.16	57	*Eucalyptus marginata*	No suitable hollow(s)	
408	320090.08	6257622.20	92	*Corymbia calophylla*	No suitable hollow(s)	
409	320061.92	6257603.26	73	*Stag*	No suitable hollow(s)	
410	320045.52	6257593.85	51	*Eucalyptus marginata*	No suitable hollow(s)	
411	320021.63	6257588.63	63	*Corymbia calophylla*	No suitable hollow(s)	
412	320020.90	6257583.18	76	*Corymbia calophylla*	No suitable hollow(s)	
413	319994.82	6257586.12	70	*Eucalyptus marginata*	No suitable hollow(s)	
414	319985.69	6257584.40	53	*Eucalyptus marginata*	No suitable hollow(s)	
415	319972.51	6257580.93	100	*Corymbia calophylla*	No suitable hollow(s)	
416	319948.44	6257570.83	66	*Corymbia calophylla*	No suitable hollow(s)	
437	320301.09	6257639.61	72	*Corymbia calophylla*	No suitable hollow(s)	
438	320214.83	6257686.24	89	*Eucalyptus marginata*	No suitable hollow(s)	
439	320195.99	6257688.10	69	*Corymbia calophylla*	No suitable hollow(s)	
440	320204.32	6257693.57	73	*Corymbia calophylla*	No suitable hollow(s)	
441	320183.59	6257717.81	76	*Corymbia calophylla*	No suitable hollow(s)	
442	320171.55	6257628.73	72	*Corymbia calophylla*	No suitable hollow(s)	
443	320167.88	6257631.66	52	*Corymbia calophylla*	No suitable hollow(s)	
444	320197.26	6257659.95	77	*Corymbia calophylla*	No suitable hollow(s)	
445	320167.90	6257650.30	78	*Corymbia calophylla*	No suitable hollow(s)	
446	320161.16	6257649.39	60	*Corymbia calophylla*	No suitable hollow(s)	
447	320157.44	6257645.44	52	*Eucalyptus marginata*	No suitable hollow(s)	
448	320142.17	6257620.08	149	*Corymbia calophylla*	No suitable hollow(s)	
449	320132.87	6257632.00	108	*Corymbia calophylla*	No suitable hollow(s)	
450	320116.14	6257625.58	63	*Corymbia calophylla*	No suitable hollow(s)	

Tag No.	Easting	Northing	DBH (cm)	Species	Category	Notes
451	320080.08	6257602.82	71	*Corymbia calophylla*	No suitable hollow(s)	
452	320068.56	6257599.72	51	*Eucalyptus marginata*	No suitable hollow(s)	
453	320040.22	6257585.10	61	*Corymbia calophylla*	No suitable hollow(s)	
454	320003.00	6257574.96	82	*Corymbia calophylla*	No suitable hollow(s)	
455	319980.43	6257563.78	54	*Eucalyptus marginata*	No suitable hollow(s)	
456	319971.25	6257559.16	63	*Corymbia calophylla*	No suitable hollow(s)	

Appendix H

Black Cockatoo Habitat Tree Hollow Data

Black Cockatoo Hollow Data

Lot 32 (No.325) Tom Cullity Drive, Wilyabrup

Tree ID	**46**		
Project no.:	EP20-088(2)	**Inspection date:**	26/10/2020
DBH (cm):	123	**Species:**	*Stag*
No. hollows:	1	**Hollow suitability:**	1 suitable hollow.

Hollow ID	**1**
Hollow type:	Top-entry
Inspection type(s):	Ground
	Pole camera

Hollow characteristics

Hollow entrance >10cm
Hollow distance from ground >3 m
Hollow internal diameter >30 cm
Hollow depth approx 50-200 cm
Hollow orientation vertical or near vertical

Evidence of nesting

Fledglings:	No
Egg/s or egg fragments:	No
Feathers:	No
Nest material	No
Other:	N/A

Evidence of hollow use

Fauna observed in/around hollow:	None
Chew marks:	None
Other	N/A

Determined hollow category

~~Confirmed nest~~
~~Potential nest~~
Suitable hollow(s)
~~Potentially suitable hollow(s)~~
~~No suitable hollow(s)~~

Reason:
Hollow dimensions suitable for black cockatoos but no evidence of use by black cockatoos.

Black Cockatoo Hollow Data

Lot 32 (No.325) Tom Cullity Drive, Wilyabrup

Tree ID	**163**		
Project no.:	EP20-088(2)	**Inspection date:**	28/10/2020
DBH (cm):	110	**Species:**	*Corymbia calophylla*
No. hollows:	3	**Hollow suitability:**	2 potentially suitable hollows and 1 unsuitable hollows.

Hollow ID	**1**
Hollow type:	Side-entry
Inspection type(s):	Ground Drone

Hollow characteristics

Hollow entrance >10cm
Hollow distance from ground >3 m
Hollow internal diameter unconfirmed
Hollow depth unconfirmed
Hollow orientation vertical or near vertical

Evidence of nesting

Fledglings:	No
Egg/s or egg fragments:	No
Feathers:	No
Nest material	No
Other:	N/A

Evidence of hollow use

Fauna observed in/around hollow:	None
Chew marks:	None
Other	N/A

Determined hollow category

~~Confirmed nest~~
~~Potential nest~~
~~Suitable hollow(s)~~
Potentially suitable hollow(s)
~~No suitable hollow(s)~~

Reason:
Hollows located too high off the ground to insepct with pole-mounted camera. Hollow dimensions appear suitable from the outside but the internal dimensions are unconfirmed.

Black Cockatoo Hollow Data

Lot 32 (No.325) Tom Cullity Drive, Wilyabrup

Tree ID	**191**		
Project no.:	EP20-088(2)	**Inspection date:**	27/10/2020
DBH (cm):	166	**Species:**	*Corymbia calophylla*
No. hollows:	2	**Hollow suitability:**	1 potentially suitable hollow and 1 unsuitable hollow.

Hollow ID	**1**
Hollow type:	Side-entry
Inspection type(s):	Ground Drone

Hollow characteristics

Hollow entrance >10cm
Hollow distance from ground >3 m
Hollow internal diameter >40 cm
Hollow depth approx 50-200 cm
Hollow orientation vertical or near vertical

Evidence of nesting

Fledglings:	No
Egg/s or egg fragments:	No
Feathers:	No
Nest material	No
Other:	N/A

Evidence of hollow use

Fauna observed in/around hollow:	None
Chew marks:	None
Other	N/A

Determined hollow category

~~Confirmed nest~~
~~Potential nest~~
~~Suitable hollow(s)~~
Potentially suitable hollow(s)
~~No suitable hollow(s)~~

Reason:
Hollow located too high off the ground to insepct with pole-mounted camera. Hollow dimensions appear suitable from the outside but the internal dimensions are unconfirmed.

Black Cockatoo Hollow Data

Lot 32 (No.325) Tom Cullity Drive, Wilyabrup

Tree ID	**258**		
Project no.:	EP20-088(2)	**Inspection date:**	26/10/2020
DBH (cm):	111	**Species:**	*Corymbia calophylla*
No. hollows:	1	**Hollow suitability:**	1 suitable hollow.

Hollow ID	**1**
Hollow type:	Top-entry
Inspection type(s):	Ground
	Pole camera

Hollow characteristics

Hollow entrance >10cm
Hollow distance from ground >3 m
Hollow internal diameter unconfirmed
Hollow depth unconfirmed
Hollow orientation vertical or near vertical

Evidence of nesting

Fledglings:	No
Egg/s or egg fragments:	No
Feathers:	No
Nest material	No
Other:	N/A

Evidence of hollow use

Fauna observed in/around hollow:	None
Chew marks:	None
Other	N/A

Determined hollow category

~~Confirmed nest~~
~~Potential nest~~
Suitable hollow(s)
~~Potentially suitable hollow(s)~~
~~No suitable hollow(s)~~

Reason:
Hollow dimensions suitable for black cockatoos but no evidence of use by black cockatoos.

Black Cockatoo Hollow Data

Lot 32 (No.325) Tom Cullity Drive, Wilyabrup

Tree ID	**402**		
Project no.:	EP20-088(2)	**Inspection date:**	27/10/2020
DBH (cm):	106	**Species:**	*Corymbia calophylla*
No. hollows:	2	**Hollow suitability:**	1 suitable hollow.

Hollow ID	**1**
Hollow type:	Top-entry
Inspection type(s):	Ground
	Pole camera

Hollow characteristics

Hollow entrance >10cm
Hollow distance from ground >3 m
Hollow internal diameter >40 cm
Hollow depth approx 50-200 cm
Hollow orientation vertical or near vertical

Evidence of nesting

Fledglings:	No
Egg/s or egg fragments:	No
Feathers:	No
Nest material	No
Other:	N/A

Evidence of hollow use

Fauna observed in/around hollow:	None
Chew marks:	None
Other	N/A

Determined hollow category

~~Confirmed nest~~
~~Potential nest~~
Suitable hollow(s)
~~Potentially suitable hollow(s)~~
~~No suitable hollow(s)~~

Reason:
Hollow dimensions suitable for black cockatoos but no evidence of use by black cockatoos.

Black Cockatoo Hollow Data

Lot 32 (No.325) Tom Cullity Drive, Wilyabrup

Tree ID	**163**		
Project no.:	EP20-088(2)	**Inspection date:**	28/10/2020
DBH (cm):	110	**Species:**	*Corymbia calophylla*
No. hollows:	3	**Hollow suitability:**	2 potentially suitable hollows and 1 unsuitable hollows.

Hollow ID	**2**
Hollow type:	Top-entry
Inspection type(s):	Ground
	Drone

Hollow characteristics

Hollow entrance >10cm
Hollow distance from ground >3 m
Hollow internal diameter unconfirmed
Hollow depth unconfirmed
Hollow orientation vertical or near vertical

Evidence of nesting

Fledglings:	No
Egg/s or egg fragments:	No
Feathers:	No
Nest material	No
Other:	N/A

Evidence of hollow use

Fauna observed in/around hollow:	None
Chew marks:	None
Other	N/A

Determined hollow category

~~Confirmed nest~~
~~Potential nest~~
~~Suitable hollow(s)~~
Potentially suitable hollow(s)
~~No suitable hollow(s)~~

Reason:
Hollows located too high off the ground to insepct with pole-mounted camera. Hollow dimensions appear suitable from the outside but the internal dimensions are unconfirmed.

Appendix I

Overall Habitat Quality Assessment

Black Cockatoo Habitat Quality Assessment - Scoring Tool (Carnaby's cockatoo)
Lot 32 (No.325) Tom Cullity Drive, Wilyabrup

		Query		Answer	Potential score	Site score	Sum
Breeding habitat	**Site condition**	1.1	The site contains:				
			habitat tree(s) with suitable hollow(s)	Y	2.0	2.0	2.0
			habitat tree(s) without suitable hollow(s)	Y	1.0	1.0	
	Site context	1.2	The site is located:				
			within 6 km of a nest(s) (active, historical or potential)	N	1.0	0.0	0.0
			6-12 km from a nest(s) (active, historical or potential)	N	0.5	0.0	
		1.3	The site is located within 6 km of:				
			>1000 ha of potential foraging habitat	Y	3.0	3.0	3.0
			100 to 1000 ha of potential foraging habitat	N	1.0	0.0	
	Species stocking rate	1.4	The site contains:				
			historical nest(s)	N	1.0	0	0.0
			The site contains:				
			active nest(s)	N	3.0	0	
			potential nest(s)	N	1.0	0	0.0
			Score	5	10.0		
Roosting habitat	**Site condition**	2.1	The site contains trees potentially suitable for roosting	Y	1.0	1.0	2.0
		2.2	The site contains a water source or one exists nearby	Y	1.0	1.0	
	Site context	2.3	The site is located:				
			within 1 km of a large roost (≥150 individuals) (active or historical)	N	1.0	0.0	0.0
			within 500 m of a small roost (< 150 individuals) (active or historical)	N	1.0	0.0	
	Species stocking rate	2.4	The site contains:				
			a historical record of a large roost (≥150 individuals)	N	2.0	0	
			a historical record of a small roost (<150 individuals)	N	1.0	0	0.0
			The site contains:				
			an active record of a large roost (≥150 individuals)	N	2.0	0.0	0.0
			an active record of a small roost (<150 individuals)	N	1.0	0.0	
			Score	2	7.0		
Foraging habitat	**Site condition**	3.1	The site contains foraging habitat comprising:				
			≥50% primary foraging plants	Y	4.0	4.0	4.0
			≥10% to <50% primary foraging plants	N	2.0	0.0	
			<10% primary foraging plants	N	1.0	0.0	
	Site context	3.2	The site is located:				
			within 6 km of a nest(s) (active, historical or potential)	N	2.0	0.0	1.0
			6-12 km from a nest(s) (active, historical or potential)	N	1.00	0.0	
		3.3	The site is located:				
			within 6 km of a roost(s) (active or historical)	Y	1.0	1.0	
			6-12 km from a roost(s) (active or historical)	Y	0.5	0.5	
	Species stocking rate	3.4	The site contains:				
			abundant evidence of foraging	N	2.0	0.0	1.0
			limited evidence of foraging	Y	1.0	1.0	
			Score	6	8.0		

SUMMARY		
Habitat category	**Score**	**Habitat quality**
Breeding	5	Moderate
Roosting	2	Low
Foraging	6	Moderate

Overall habitat quality score	**6**	Moderate

Note:

1. Within the breeding category, a score of 9 applies if an active nest(s) occurs within the site and a score of 10 applies if an active nest(s) and a historical nest(s) occurs within the site, regardless of the answer to other queries in this category
2. Within the roosting category, a score of 7 applies if a small roost occurs within the site and a score of 8 applies if a large roost occurs within the site, regardless of the answer to other queries in this category.
3. The final score consists of the highest score from each habitat category

Black Cockatoo Habitat Quality Assessment - Scoring Tool (Baudin's cockatoo)
Lot 32 (No.325) Tom Cullity Drive, Wilyabrup

		Query		Answer	Potential score	Site score	Sum
Breeding habitat	**Site condition**	1.1	The site contains:				
			habitat tree(s) with suitable hollow(s)	Y	2.0	2.0	2.0
			habitat tree(s) without suitable hollow(s)	Y	1.0	1.0	
	Site context	1.2	The site is located:				
			within 6 km of a nest(s) (active, historical or potential)	N	1.0	0.0	0.0
			6-12 km from a nest(s) (active, historical or potential)	N	0.5	0.0	
		1.3	The site is located within 6 km of:				
			>1000 ha of potential foraging habitat	Y	3.0	3.0	3.0
			100 to 1000 ha of potential foraging habitat	N	1.0	0.0	
	Species stocking rate	1.4	The site contains:				
			historical nest(s)	N	1.0	0	0.0
			The site contains:				
			active nest(s)	N	3.0	0	
			potential nest(s)	N	1.0	0	0.0
			Score	5	10.0		
Roosting habitat	**Site condition**	2.1	The site contains trees potentially suitable for roosting	Y	1.0	1.0	2.0
		2.2	The site contains a water source or one exists nearby	Y	1.0	1.0	
	Site context	2.3	The site is located:				
			within 1 km of a large roost (≥150 individuals) (active or historical)	N	1.0	0.0	0.0
			within 500 m of a small roost (< 150 individuals) (active or historical)	N	1.0	0.0	
	Species stocking rate	2.4	The site contains:				
			a historical record of a large roost (≥150 individuals)	N	2.0	0	
			a historical record of a small roost (<150 individuals)	N	1.0	0	0.0
			The site contains:				
			an active record of a large roost (≥150 individuals)	N	2.0	0.0	0.0
			an active record of a small roost (<150 individuals)	N	1.0	0.0	
			Score	2	7.0		
Foraging habitat	**Site condition**	3.1	The site contains foraging habitat comprising:				
			≥50% primary foraging plants	Y	4.0	4.0	4.0
			≥10% to <50% primary foraging plants	N	2.0	0.0	
			<10% primary foraging plants	N	1.0	0.0	
	Site context	3.2	The site is located:				
			within 6 km of a nest(s) (active, historical or potential)	N	2.0	0.0	1.0
			6-12 km from a nest(s) (active, historical or potential)	N	1.00	0.0	
		3.3	The site is located:				
			within 6 km of a roost(s) (active or historical)	y	1.0	1.0	
			6-12 km from a roost(s) (active or historical)	Y	0.5	0.5	
	Species stocking rate	3.4	The site contains:				
			abundant evidence of foraging	N	2.0	0.0	0.0
			limited evidence of foraging	N	1.0	0.0	
			Score	5	8.0		

SUMMARY		
Habitat category	**Score**	**Habitat quality**
Breeding	5	Moderate
Roosting	2	Low
Foraging	5	Moderate

Overall habitat quality score	**5**	Moderate

Note:
1. Within the breeding category, a score of 9 applies if an active nest(s) occurs within the site and a score of 10 applies if an active nest(s) and a historical nest(s) occurs within the site, regardless of the answer to other queries in this category
2. Within the roosting category, a score of 7 applies if a small roost occurs within the site and a score of 8 applies if a large roost occurs within the site, regardless of the answer to other queries in this category.
3. The final score consists of the highest score from each habitat category

Black Cockatoo Habitat Quality Assessment - Scoring Tool (Forest red-tailed black cockatoo)
Lot 32 (No.325) Tom Cullity Drive, Wilyabrup

		Query		Answer	Potential score	Site score	Sum
Breeding habitat	**Site condition**	1.1	The site contains:				
			habitat tree(s) with suitable hollow(s)	Y	2.0	2.0	2.0
			habitat tree(s) without suitable hollow(s)	Y	1.0	1.0	
	Site context	1.2	The site is located:				
			within 6 km of a nest(s) (active, historical or potential)	N	1.0	0.0	0.0
			6-12 km from a nest(s) (active, historical or potential)	N	0.5	0.0	
		1.3	The site is located within 6 km of:				
			>1000 ha of potential foraging habitat	Y	3.0	3.0	3.0
			100 to 1000 ha of potential foraging habitat	N	1.0	0.0	
	Species stocking rate	1.4	The site contains:				
			historical nest(s)	N	1.0	0	0.0
			The site contains:				
			active nest(s)	N	3.0	0	
			potential nest(s)	N	1.0	0	0.0
			Score	5	10.0		
Roosting habitat	**Site condition**	2.1	The site contains trees potentially suitable for roosting	Y	1.0	1.0	2.0
		2.2	The site contains a water source or one exists nearby	Y	1.0	1.0	
	Site context	2.3	The site is located:				
			within 1 km of a large roost (≥150 individuals) (active or historical)	N	1.0	0.0	0.0
			within 500 m of a small roost (< 150 individuals) (active or historical)	N	1.0	0.0	
	Species stocking rate	2.4	The site contains:				
			a historical record of a large roost (≥150 individuals)	N	2.0	0	
			a historical record of a small roost (<150 individuals)	N	1.0	0	0.0
			The site contains:				
			an active record of a large roost (≥150 individuals)	N	2.0	0.0	0.0
			an active record of a small roost (<150 individuals)	N	1.0	0.0	
			Score	2	7.0		
Foraging habitat	**Site condition**	3.1	The site contains foraging habitat comprising:				
			≥50% primary foraging plants	Y	4.0	4.0	4.0
			≥10% to <50% primary foraging plants	N	2.0	0.0	
			<10% primary foraging plants	N	1.0	0.0	
	Site context	3.2	The site is located:				
			within 6 km of a nest(s) (active, historical or potential)	N	2.0	0.0	1.0
			6-12 km from a nest(s) (active, historical or potential)	N	1.00	0.0	
		3.3	The site is located:				
			within 6 km of a roost(s) (active or historical)	Y	1.0	1.0	
			6-12 km from a roost(s) (active or historical)	Y	0.5	0.5	
	Species stocking rate	3.4	The site contains:				
			abundant evidence of foraging	Y	2.0	2.0	2.0
			limited evidence of foraging	N	1.0	0.0	
			Score	7	8.0		

SUMMARY		
Habitat category	**Score**	**Habitat quality**
Breeding	5	Moderate
Roosting	2	Low
Foraging	7	Moderate - High

Overall habitat quality score	**7**	Moderate - High

Note:

1. Within the breeding category, a score of 9 applies if an active nest(s) occurs within the site and a score of 10 applies if an active nest(s) and a historical nest(s) occurs within the site, regardless of the answer to other queries in this category
2. Within the roosting category, a score of 7 applies if a small roost occurs within the site and a score of 8 applies if a large roost occurs within the site, regardless of the answer to other queries in this category.
3. The final score consists of the highest score from each habitat category