WICKEPIN-CORRIGIN ROAD WIDENING BIOLOGICAL SURVEY

Shire of Corrigin

ecoscape



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TABLE OF CONTENTS

Acknowledgements1			
Execut	ive Summary	2	
Acrony	ms and Abbreviations	4	
1 Int	roduction	5	
1.1	Background	5	
1.2	Survey Area	5	
1.3	Survey Requirements	6	
1.4	Compliance	.6	
2 De	sktop Assessment	7	
2.1	Physical Environment	7	
2.1.1	Climate	7	
2.1.2	Land Systems	8	
2.1.3	Wetlands and Drainage	8	
2.1.4	Environmentally Sensitive Areas	8	
2.1.5	Conservation Lands	8	
2.2	Biological Environment	8	
2.2.1	Biogeographic Region	8	
2.2.2	Pre-European Vegetation	9	
2.2.3	Threatened and Priority Ecological Communities	9	
2.2.4	Threatened and Priority Flora	10	
2.2.5	Threatened and Priority Fauna	11	
2.3	Relevant Literature	13	
2.3.1	Previous Surveys	13	
2.3.2	IBSA Data Search	14	
3 Me	thods	15	
3.1	Survey Aims	15	
3.2	Guiding Principles	15	
3.3	Flora and Vegetation Field Survey	15	
3.3.1	Field Survey Methods	15	
3.3.2	Data Management and Analysis	17	
3.4	Fauna Field Survey	18	
3.4.1	Fauna Survey Methods	18	
3.4.2	Targeted Survey Methods	19	
4 Fie	eld Survey Results	20	
4.1	Flora and Vegetation Survey	20	
4.1.1	Flora	20	
4.1.2	Vegetation	23	
4.1.3	Vegetation Significance	28	
4.1.4	Statistical Analysis	28	
4.1.5	Vegetation Condition	30	
4.1.6	Botanical Limitations	30	
4.2	Vertebrate Fauna Survey	33	
4.2.1	Fauna Habitat	33	
4.2.2	Fauna Inventory	36	

4.2.3				
4.2.4	Fauna Survey Limitations	39		
5 Dis	cussion	40		
5.1	Flora Significance			
5.1.1	Flora Significance	40		
5.2	Vegetation Significance	41		
5.2.1 Assessment Against the Wheatbelt Woodlands TEC Criteria				
5.2.2	Priority Ecological Communities	42		
5.2.3	Local and Regional Significance of Vegetation	43		
5.2.4	Vegetation Condition	43		
5.3	Fauna Significance	43		
5.3.1	Fauna Habitat Types	43		
5.3.2	Fauna Inventory	43		
5.3.3	Recorded Conservation-listed Fauna Species	43		
6 Co	nclusions	46		
Referer	lices	48		
Mana				
waps		53		
Append	dix One Legislative Context, Definitions and Criteria	97		
Commonwealth Environment Protection and Biodiversity Conservation Act 1999				
Western Australian Environmental Protection Act 1986				
Westerr	h Australian Biodiversity Conservation Act 2016			
Priority-	listed Flora and Fauna			
	ned and Priority Ecological Communities	101		
Flora Ci	nteria: Other Significant Flora	104		
Voqetet	ion Criterio: Other Significant Vegetation	104		
Environ	montally Sensitive Areas	104		
Conser	ration Estate	104		
•				
Append	dix Two Field Survey Criteria	106		
Append	dix Three Wheatbelt Woodlands TEC Assessment Criteria	113		
Append	lix Four Desktop Assessment Results and Likelihood Assessments	115		
Append	ppendix Five Field Survey Results120			
Append	ppendix Six Floristic Quadrat Data138			
Append	ppendix Seven DBCA Report Forms179			
Append	dix Eight Black Cockatoo Habitat Trees	192		

FIGURES

Figure 1: Survey area location	5
Figure 2: Rainfall and temperature data for the survey area (BoM 2024a)	7
Figure 3: Floristic analysis dendrogram	29
Figure 4: Species accumulation curve	30

Figure 5: Rainfall deciles for the 6 months prior to the field survey (BoM 2024b)

TABLES

Table 1: Acronyms and abbreviations	4
Table 2: Land systems (DPIRD 2020)	8
Table 3: Pre-European vegetation association representation (DBCA 2019a)	9
Table 4: TECs and PECs identified by PMST and DBCA database searches	9
Table 5: EPBC-listed TECs and their Western Australian equivalents	.10
Table 6: Categories for likelihood of occurrence of TF and PF	.11
Table 7: Categories for likelihood of occurrence of conservation-listed fauna	.12
Table 8: PF recorded during the field survey	.21
Table 9: Vegetation types	.24
Table 10: Vegetation condition	.30
Table 11: Botanical limitations	.31
Table 12: Fauna habitat types	.33
Table 13: Recorded fauna species	.36
Table 14: Tree DBH class summary	.37
Table 15: Foraging habitat scoring tool (DAWE 2022) – Woodland habitat	.38
Table 16: Carnaby's Cockatoo foraging value - Shrubland habitat (Bamford Consulting Ecologists 2020)38
Table 17: Carnaby's Cockatoo foraging value – Tall Shrubland Habitat (Bamford Consulting Ecologists	2020) .38
Table 18: Carnaby's Cockatoo foraging value – Woodland Habitat (Bamford Consulting Ecologists 2020))39
Table 19: Fauna survey limitations	.39
Table 20: EPBC Act categories for flora, fauna and ecological communities	.97
Table 21: Conservation codes for Western Australian flora and fauna (DBCA 2020)	.99
Table 22: DBCA definitions and criteria for TECs and PECs (DEC 2013)1	02
Table 23: NVIS structural formation terminology, terrestrial vegetation (NVIS Technical Working Group DotEE 2017)	& 06
Table 24: NVIS height classes (NVIS Technical Working Group & DotEE 2017)1	07
Table 25: Vegetation condition scale for the South West and Interzone Botanical Provinces (EPA 2016a	a)107
Table 26: Grading system for the assessment of potential nest trees for Black Cockatoos (Bamford Consulting Ecologists 2016)	
	07
Table 27: Black Cockatoo foraging quality scoring tool (DAWE 2022)	07 08

Table 29: Key dominant or co-dominant Eucalypt species of the Wheatbelt Woodlands TEC (TSSC	2015)
	113
Table 30: Minimum condition for patches of Eucalypt Woodlands of the Western Australian Wheatb (TSSC 2015)	elt TEC 114
Table 31: Flora database search results, habitat and likelihood assessment	115
Table 32: Fauna database results and likelihood assessments	118
Table 33: Excluded species and reason for exclusion	119
Table 34: Flora inventory (site x species matrix)	120
Table 35: Black Cockatoo habitat tree locations (GDA94, Zone 50)	128

MAPS

Map 1: Soil landscape	.54
Map 2: Pre-European vegetation	.55
Map 3: DBCA database search results – flora and communities	.56
Map 4: DBCA database search results – fauna	.57
Map 5: Vegetation types, quadrat and conservation-listed flora and communities	.58
Map 6: Vegetation condition	.71
Map 7: Fauna habitat and Black Cockatoo trees	.84

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- Shire of Corrigin Chief Executive Officer for organising the works and access permissions
- landholders adjacent to the road for allowing use of their firebreaks to safely access the road corridor.

EXECUTIVE SUMMARY

In order to improve road safety the Shire of Corrigin is proposing to widen the Wickepin-Corrigin Road between Ling Road and Bullaring townsite. The Shire appointed Ecoscape to undertake a biological survey of the road reserve to inform environmental approvals. In order to provide flexibility both sides of the road reserve were assessed to identify areas of lowest impact, noting that only a small portion of the surveyed area is likely to require clearing. Overall, 21.63 ha was assessed from 6 m either side of the cleared road edge.

Ecoscape conducted a Detailed flora and vegetation survey and Basic fauna survey of this area during 7-10 November 2023. The fauna survey incorporated targeted searches for Black Cockatoo (Carnaby's Cockatoo) and their habitat.

The desktop assessment identified the following significant features pertinent to the survey area and assessment process:

- the survey area does not intersect with nor is adjacent to any Environmentally Sensitive Areas or conservation lands, nor are any sufficiently close to be affected by works at the site
- two pre-European vegetation associations intersect the survey area:
 - Association 955: Mosaic: Shrublands; scrub-heath (South East Avon) / Shrublands; Allocasuarina campestris thicket, intersecting 11.49% of the survey area that has between 9.76% of its original extent remaining at local government area scale and 13.51% remaining at IBRA subregion scale
 - Association 1023: *Medium woodland; York gum, wandoo & salmon gum (Eucalyptus salmonophloia)*, intersecting 88.51% of the survey area that has between 7.59% of its original extent remaining at local government area scale and 12.32% remaining at IBRA subregion scale
- the survey area intersects 17 indicatively mapped representatives of the *Eucalypt Woodlands of the Western Australian Wheatbelt* Threatened Ecological Community ('Wheatbelt Woodlands TEC')
- no Threatened or Priority-listed Flora (TF, PF) have been recorded from within the survey area. The DBCA database search indicates 10 TF and 47 PF have been recorded from within 30 km of the survey area (inclusive of another Shire of Corrigin survey area located approximately 8 km to the east)
- no Threatened or Priority-listed Fauna have been recorded from within the survey area. The DBCA database search identified 15 mammals (11 Threatened and four Priority-listed) and 15 birds (four Threatened species and the remainder Priority-listed or otherwise conservation-listed or significant) have been recorded from within 60 km of the survey area (inclusive of the nearby survey area as above).
- the survey area is within the mapped distribution of Carnaby's Cockatoo
- there is a known Carnaby's Cockatoo breeding site located approximately 22 km to the south-west of the survey area and the survey area is approximately 10 km north-west of the buffer edges of a known Carnaby's Cockatoo breeding area.

The flora and vegetation survey identified:

- 221 vascular flora species, 38 (17.2%) of them introduced
- three Priority-listed flora: *Phebalium drummondii* (P3), *Synaphea drummondii* (P3) and *Calothamnus brevifolius* (P4). The post-survey likelihood assessment determined that no other conservation-listed flora were likely to occur.
- seven vegetation types and three mosaics of these were recorded, including representatives of the Wheatbelt Woodlands TEC:
 - o five road reserve occurrences within vegetation type EsEIEkMW (*Eucalyptus salmonophloia*, *Eucalyptus longicornis* and *Eucalyptus kondininensis* mid woodland) and one indicative occurrence in vegetation type EcMW)*Eucalyptus capillosa* mid woodland) within the Bullaring town reserve, noting that this is considered indicative as adjacent similar vegetation was not viewed in detail to determine if it was all suitable to be included (patch included under the precautionary principle).
- vegetation condition ranged from Completely Degraded to Very Good with the majority in Completely Degraded condition and only 16.03% of the vegetated portion of the survey area in Good or Very Good condition.

The fauna survey, incorporating a Black Cockatoo habitat tree assessment, identified:

- three fauna habitat types: Shrubland occupying 1.44 ha, Tall Shrubland occupying 1.83 ha and Woodland occupying 8.39 ha. All habitat types occur commonly in the local area and more regionally and, for the majority of the survey area, are not considered to represent high quality habitat due to the survey area largely consisting of road reserve not connected to larger areas of bushland and interspersed with degraded areas. The portion of the survey area through Bullaring town reserve represents better quality habitat as it is connected to a larger area of bushland with more diverse habitat available.
- 12 vertebrate fauna species were recorded, none of them conservation-listed. The post-survey likelihood
 assessment determined that no conservation-listed fauna species were likely to occur although Peregrine
 Falcon (DBCA OS) and Malleefowl (EPBC and BC Act VU) may occur on occasion but would not be
 dependent on any resources present.
- 269 trees of suitable species and size occurred in the survey area. Nine were potentially suitable for Carnaby's Cockatoo nesting as they had hollows that may be suitable, however, were not investigated in detail to determine if they were hollow or had a chamber of sufficient size for breeding. There were no chew marks to indicate they were or had been used for breeding.
- the survey area was assessed as being poor quality foraging habitat for Carnaby's Cockatoo and, due to distance from known breeding habitat and lack of food sources, is unlikely to be used for breeding (regardless of if the potential tree hollows are suitable) or for foraging. They may occur in the survey area but only during landscape traverses (overflying).

In conclusion, the significant features of the survey area that may affect the environmental approvals process were:

- that the survey area has been largely cleared and there is <10% of the pre-European vegetation associations intersecting the survey area remaining at local government scale
- representatives of the Wheatbelt Woodlands TEC (six)
- three PF species
- nine Class 3 potential Black Cockatoo habitat trees that may have hollows suitable for breeding, although Carnaby's Cockatoo are unlikely to utilise these due to lack of suitable food sources nearby and distance from known breeding habitat.

ACRONYMS AND ABBREVIATIONS

Table 1: Acronyms and abbreviations

Acronyms	
BAM Act	Western Australian Biosecurity and Agriculture Management Act 2007
BC Act	Western Australian Biodiversity Conservation Act 2016
ВоМ	Bureau of Meteorology
C1, C2, C3	Declared Pest categories under the BAM Act
CD	Conservation Dependent (fauna; specially protected species under the Western Australian BC Act)
CR	Critically Endangered (listed under Commonwealth EPBC Act and/or Western Australian BC Act)
DAWE	Commonwealth Department of Agriculture, Water and Environment (2020-2022, now DCCEEW)
DBCA	Western Australian Department of Biodiversity, Conservation and Attractions
DBH	Diameter at Breast Height (1.3 m)
DCCEEW	Commonwealth Department of Climate Change, Energy, the Environment and Water
DEWHA	Commonwealth Department of the Environment, Water, Heritage and the Arts (2007-2010, now DCCEEW)
DPaW	Western Australian Department of Parks and Wildlife (2013-2017, now DBCA)
DotEE	Commonwealth Department of the Environment and Energy (2016-2020)
DPIRD	Western Australian Department of Primary Industries and Regional Development
DSEWPaC	Commonwealth Department of Sustainability, Environment, Water, Population and Communities (2010-2013, now DCCEEW)
DWER	Western Australian Department of Water and Environmental Regulation
EN	Endangered (listed under Commonwealth EPBC Act and/or Western Australian BC Act)
Ecoscape	Ecoscape (Australia) Pty Ltd
EP Act	Western Australian Environmental Protection Act 1986
EPA	Western Australian Environmental Protection Authority
EPBC Act	Commonwealth Environment Protection and Biodiversity Conservation Act 1999
GDA 94	Geographic Datum of Australia 1994
ha	hectare/hectares
IBRA	Interim Biogeographic Regionalisation for Australia
km	kilometre/kilometres
m	metre/metres
MGA	Map Grid of Australia
MA	Marine species (fauna; protected under international agreements and EPBC Act)
МІ	Migratory species (fauna; specially protected species under the Western Australian BC Act, also EPBC Act)
NVIS	National Vegetation Inventory System
MNES	Matters of National Environmental Significance
os	Other specially protected species (fauna; specially protected species under the Western Australian BC Act)
P; P1, P2, P3, P4, P5	Priority Flora and Fauna species rankings (P1-P4) or Priority Ecological Communities (P1-P5)
PEC	Priority Ecological Community
PF	Priority Flora
PMST	Protected Matters Search Tool (hosted by DCCEEW, used to search for MNES)
sp.	Species (generally referring to an unidentified taxon or when a phrase name has been applied)
subsp.	Subspecies (infrataxon)
TEC	Threatened Ecological Community
TF	Threatened Flora (formerly termed Declared Rare Flora, DRF, in Western Australia)
var.	Variety (infrataxon)
VU	Vulnerable (listed under Commonwealth EPBC Act and/or Western Australian BC Act)
WAH	Western Australian Herbarium
WONS	Weeds of National Significance
*	Introduced flora species (i.e. weed)

1 INTRODUCTION

1.1 BACKGROUND

The Shire of Corrigin (the Shire) is a local government authority located in the wheatbelt region, approximately 230 km east of Perth.

In order to improve road safety, the Shire is proposing to widen the Wickepin-Corrigin Road between Ling Road and Bullaring townsite. The Shire appointed Ecoscape to undertake a biological survey of the road reserve to inform the environmental approvals process.

1.2 SURVEY AREA

The Shire of Corrigin project area is known as the 'survey area' in this report (**Figure 1**). The survey area occupies some or all of the road reserve both sides of the Corrigin-Wickepin Road from Ling Road in the north the Bullaring-Gorge Rock Road in the south.

Ecoscape created a survey area shapefile under instruction from the Shire of Corrigin. An 8 m buffer was applied from the edge of the road seal which was manually digitised from aerial imagery; this equates to an approximate 6 m vegetated survey area either side of the road. The total area that was assessed was 21.63 ha.



Figure 1: Survey area location

1.3 SURVEY REQUIREMENTS

The requirements of the survey were to undertake biological surveys to identify the features of the survey area that have the potential to affect the environmental approvals process. The survey was required to be compliant with Environmental Protection Authority (EPA) guidances:

- Technical Guidance Terrestrial vertebrate fauna surveys for environmental impact assessment, known herein as the Fauna Technical Guidance (2020)
- Technical Guidance Flora and Vegetation Surveys for Environmental Impact Assessment, known herein as the Flora and Vegetation Technical Guidance (2016a).

1.4 COMPLIANCE

This environmental assessment was conducted in accordance with Commonwealth and State legislation and guidelines:

- Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)
- Western Australian Environmental Protection Act 1986 (EP Act)
- Western Australian Biodiversity Conservation Act 2016 (BC Act)
- Western Australian Biodiversity Conservation Regulations 2018
- Department of Environment, Water, Heritage and the Arts (DEWHA 2009) *Matters of National Environmental Significance. Significant impact guidelines 1.1 Environment Protection and Biodiversity Conservation Act 1999*
- Department of Sustainability Environment Water Population and Communities (DSEWPaC 2011a) *Survey* guidelines for Australia's threatened mammals
- DSEWPaC (2011b) Survey guidelines for Australia's threatened reptiles
- DEWHA (2010a) Survey guidelines for Australia's threatened bats
- DEWHA (2010b) Survey guidelines for Australia's threatened birds
- Department of Agriculture Water and the Environment (DAWE 2022) Referral guideline for 3 WA threatened black cockatoo species: Carnaby's Cockatoo, Baudin's Cockatoo and the Forest Red-tailed Black-cockatoo
- Environmental Protection Authority (EPA 2019) *EPA Advice: Carnaby's Cockatoo in Environmental Impact Assessment in the Perth and Peel Region*
- Threatened Species Scientific Committee (TSSC 2015) Approved Conservation Advice (including listing advice) for the Eucalypt Woodlands of the Western Australian Wheatbelt.

Summaries of the main Acts under which this assessment was conducted, and related criteria and definitions, are available in **Appendix One**.

As well as those listed above, the assessment complied with Environmental Protection Authority (EPA) requirements for environmental survey and reporting in Western Australia, as outlined in:

- EPA (2016b) Environmental Factor Guideline Flora and Vegetation
- EPA (2016c) Environmental Factor Guideline Terrestrial Fauna
- EPA (2018) Environmental Factor Guideline Landforms
- EPA (2016d) Environmental Factor Guideline Terrestrial Environmental Quality
- EPA (2021) Statement of environmental principles, factors, objectives and aims of EIA.

The following also formed part of the Black Cockatoo assessment:

• Bamford Environmental Consulting (2016) Black Cockatoo potential nest tree grading system.

Additional details (definitions and criteria) relevant to these works are available in Appendix One.

2 DESKTOP ASSESSMENT

2.1 PHYSICAL ENVIRONMENT

2.1.1 CLIMATE

The southwest of Western Australia is generally described as having a Mediterranean-type climate of mild, wet winters and warm to hot, dry summers. The climate of the region is strongly influenced by the position of a band of high pressure known as the sub-tropical ridge. For much of the year the ridge is located to the south allowing the east or south easterly winds to prevail. During the cooler months the ridge periodically moves to the north, allowing cold fronts to pass over the west coast and deliver much of the annual rainfall (Beard 1990).

According to the Köppen-Geiger climate classification, the survey area has a temperate climate with hot, dry summers (Class Csa) (Peel, Finlayson & McMahon 2007). This classification is considered to represent a Mediterranean climate where average summer maximum temperatures exceed 22°C and the average coldest month maximum is between 18° and -3°C, and summer rainfall is less than one third of winter rainfall.

The closest Bureau of Meteorology (BoM) station with long-term consistent rainfall records is Colorado (station 10534, operating since 1913), located approximately 16.6 km to the west (BoM 2024a). The mean annual rainfall is 363.0 mm falling predominantly between May and August. The rainfall during the 6-month period prior to the field survey (May-October 2023) was 72.89% of the long-term average for this period.

The closest BoM station with long-term consistent temperature records is Corrigin, located approximately 23.5 km to the northwest (BoM 2024a). January is the hottest month with a mean maximum temperature of 32.7°C and minimum of 15.8°C. July is the coldest month with a mean maximum of 15.5°C and minimum of 4.9°C.



Figure 2 shows the average rainfall and temperatures of the survey area, with rainfall for the year preceding the field survey.

Figure 2: Rainfall and temperature data for the survey area (BoM 2024a)

2.1.2 LAND SYSTEMS

According to the Department of Primary Industries and Regional Development (DPIRD 2020) soil landscape mapping, the following land systems intersect the survey area (**Table 2** and **Map 1**).

Mapping unit	Land system	Description	Extent (ha)	%
259Ke_3u	Kweda 3 undifferentiated phase	Slopes and rises on colluvium derived from granite and dolerite bedrock with grey sandy duplexes, loamy duplexes and minor gravelly and sandy soils	9.64	44.58%
259Cb_1	Coblinine 1 subsystem	Non-saline broad valley floors and alluvial plains. Grey shallow sandy and loamy duplex soils, usually with alkaline subsoils, and yellow/brown sandy duplex soils. Salmon Gum-Wandoo woodland, Mallee scrub and samphire flats		37.91%
259Ke_1	Kweda 1 subsystem	Gravelly hill crests and upper slopes with sandy gravels and small areas of pale deep sands and loamy gravels	3.79	17.52%

Table 2: Land systems (DPIRD 2020)

2.1.3 WETLANDS AND DRAINAGE

The survey area is in the Swan-Avon catchment (Department of Water and Environmental Regulation [DWER] 2018), with the overall drainage towards Lake Yealering that is southwest of the survey area.

No creeks, rivers or wetlands intersect the survey area (DWER 2022).

2.1.4 ENVIRONMENTALLY SENSITIVE AREAS

The survey area does not intersect any mapped Environmentally Sensitive Areas (ESAs) (DWER 2021). The nearest ESAs (indicated on **Map 3**) are:

- 1.2 km to west, corresponding with the location of a Threatened Flora species
- 3.4 km to the west, corresponding with the location of a Threatened Flora species
- 10.7 km to the south-west, corresponding with the lake system associated with Nonalling Nature Reserve.

2.1.5 CONSERVATION LANDS

The survey area does not intersect any conservation lands.

The nearest lands vested for conservation are Sewell Nature Reserve, located approximately 6.5 km to the south-east.

2.2 BIOLOGICAL ENVIRONMENT

2.2.1 BIOGEOGRAPHIC REGION

Biogeographic regions are delineated on the basis of similar climate, geology, landforms, vegetation and fauna and are defined in the Interim Biogeographical Regionalisation for Australia (IBRA) (Department of Agriculture Water and the Environment 2020).

The survey area is located in the Avon Wheatbelt IBRA region in the Katanning subregion (AW2), described as:

The Avon Wheatbelt is an area of active drainage dissecting a Tertiary plateau in Yilgarn Craton. Gently undulating landscape of low relief. Proteaceous scrubheaths, rich in endemics, on residual lateritic uplands and derived sandplains; mixed eucalypt, Allocasuarina huegeliana and Jam-York Gum woodlands on Quaternary alluvials and eluvials. Within this, AW2 is the erosional surface of gently undulating rises to low hills with abrupt breakaways. Continuous stream channels that flow in most years. Colluvial processes are active. Soil formed in colluvium or in-situ weathered rock. Includes woodland of Wandoo, York Gum and Salmon Gum with Jam and Casuarina. The climate is Semi-arid (Dry) Warm Mediterranean, and area is 3,012,977 ha (Beecham 2002).

2.2.2 PRE-EUROPEAN VEGETATION

During the 1970s, John Beard and associates conducted a systematic survey of native vegetation, describing the vegetation systems in Western Australia at a scale of 1:250,000 in the south-west and at a scale of 1:1,000,000 in less developed areas.

Beard's vegetation maps attempted to depict the native vegetation as it was presumed to be at the time of settlement and is known as the pre-European vegetation type and extent. Beard's vegetation maps have since been developed in digital form by Shepherd, Beeston & Hopkins (2002), updated by DPIRD (2019) and published by the DBCA (2019a). This mapping indicates that the survey area intersects two pre-European vegetation units:

- Association 955: *Mosaic: Shrublands; scrub-heath (South East Avon) / Shrublands; Allocasuarina campestris thicket*, intersecting 11.49% of the survey area
- Association 1023: *Medium woodland; York gum, wandoo & salmon gum (Eucalyptus salmonophloia)*, intersecting 88.51% of the survey area.

The pre-European vegetation association/s identified from the survey area (DPIRD 2019) and their pre-European and current extents are listed in **Table 3** (DBCA 2019a) and shown on **Map 2**.

Region	Vegetation association	Original extent (ha)	Current extent (ha)	% remaining
Western Australia	955	139,324.02	15,281.57	10.97
	1023	1,601,605.76	172,875.16	10.79
IBRA biogeographic region (Avon	955	120,564.93	12,900.72	10.70
Wheatbelt)	1023	1,522,680.40	165,123.60	10.84
IPPA biogeographic sub region (AW2)	955	35,701.39	4,824.00	13.51
IBRA biogeographic sub-region (Awz)	1023	1,123,736.23	138,408.96	12.32
LCA (Shire of Corrigin)	955	27,299.83	2,663.91	9.76
	1023	196,862.70	14,949.44	7.59

Table 3: Pre-European vegetation association representation (DBCA 2019a)

2.2.3 THREATENED AND PRIORITY ECOLOGICAL COMMUNITIES

Threatened and Priority Ecological Communities (TECs and PECs) intersecting the survey area and nearby were identified by a *Protected Matters Search Tool* (PMST) search (DCCEEW 2024a) using a 30 km buffer around the survey area and a paid DBCA database search request (search reference 10-1023EC-Corrigin-Ecoscape) using a 20 km buffer, noting that the DBCA provided joint results for two Shire of Corrigin survey areas, the other being located approximately 8 km to the east.

The PMST search identifies EPBC-listed TECs that have been recorded from within the search area, designated as 'known' in the first column in **Table 4**, and those that are 'likely' to or 'may' occur within the search area or buffer, based on potentially suitable habitat occurring.

The DBCA database search is provided as shapefiles; communities intersecting the survey area are indicated as 'known' in the second column in **Table 4**, with communities occurring within the search area buffer (but not intersecting the survey area) indicated by an 'x'.

The results of these searches are indicated in **Table 4** and, for the DBCA data, shown on **Map 3**. Some EPBClisted TECs are known by different, similar names or are listed as PECs within Western Australia; these equivalents are indicated in **Table 5**.

PMST	DBCA database	Ecological Community	C'wealth Status	WA status
ʻlikely'	x	Eucalypt woodlands of the Western Australian Wheatbelt	CR	P3 PEC

EPBC-listed TEC	DBCA status	DBCA ecological community name
Eucalypt woodlands of the Western Australian	P3 PEC	Eucalypt woodlands of the Western Australian Wheatbelt
Whealbeil	P3 PEC	Salmon Gum Woodlands of the wheatbelt

The survey area intersects 17 indicatively mapped and overlapping representatives (or their buffers) of the *Eucalypt Woodlands of the Western Australian Wheatbelt* TEC, herein abbreviated to the Wheatbelt Woodlands TEC. This TEC has a detailed assessment methodology to determine if vegetation is representative (TSSC 2015), summarised in **Appendix Three**.

2.2.4 THREATENED AND PRIORITY FLORA

The PMST search (as above) identified 25 EPBC-listed TF that are either known (or habitat is known) to occur within the 30 km search buffer area (eight species), 'species or habitat likely to occur within area' (six) and 'species or species habitat may occur within area' (11)..

The requested DBCA databases (search reference 21-1023FL (Ecoscape Australia)) was conducted using a 30 km buffer around the supplied shapefiles that incorporate a separate Shire of Corrigin survey area located approximately 8 km to the east. The results incorporate the TPFL List, taken from Threatened and Priority Flora Report Forms and DBCA surveys, and WA Herb, taken from vouchered specimens held in the Western Australian Herbarium. **Map 3** shows the locations of conservation-listed flora identified by the DBCA database search. The DBCA search identified 57 taxa: 10 TF, four P1, seven P2, 26 P3 and 10 P4. Three fungi species not included within the survey scope have been deleted from the database search results outlined in this report.

The combined database searches identified 73 species, listed in **Table 31** in **Appendix Four**, consisting of 26 TF (10 from records known to occur within the DBCA database search buffer and a further 16 from the PMST where associated habitat could occur), four P1, seven P2, 26 P3 and 10 P4.

2.2.4.1 Threatened and Priority Flora Likelihood Assessment

Ecoscape conducted a likelihood assessment to identify the TF and PF species that have potential to occur within the survey area. Information to assess the likelihood of a species occurring was largely taken from the ecology as listed on *FloraBase* (WAH 1998-2024, 2024) and incorporated an assessment of habitats likely to be present in the survey area.

The attributes taken into consideration were:

- broad soil type usually associated with the species
- broad landform usually associated with the species
- usual vegetation (characteristic species) with which the species is usually associated
- species having previously been recorded near the survey area ('proximity' or 'close proximity'; see **Table 6**) taking locational accuracy into consideration
- time since recorded (i.e. within the previous 25 years), taking into consideration land use changes since collection
- reliability of record: species identified by only a TPFL record, without an accompanying verified vouchered specimen, may have been incorrectly identified or been subject to taxonomic updates since the record was entered
- number of records for the species
- if the record is for a not naturally occurring population (planted).

The likelihood rating is assigned using the categories listed in **Table 6**.

Likelinood Category	Criteria
Known to occur	Species previously recorded within the survey area.
Likely to occur	Suitable habitat is known to occur within the survey area and multiple records of the
	species exist within close proximity*
May occur	Suitable habitat is expected to occur within the survey area and the species has
	previously been recorded within proximity**
Unlikely to occur	Suitable habitat is expected to occur within the survey area however previous records are
	limited and/or historic and/or not in proximity**
	OR
	Suitable habitat is not expected to occur within the survey area although previous records
	exist in proximity**
Very Unlikely to occur	Suitable habitat is not expected to occur in the survey area
	AND/OR
	previous records are limited and/or historic and/or not in proximity**

Table 6: Categories for likelihood of occurrence of TF and PF

* close proximity = 5 km ($\frac{1}{4}$ of the distance of the database search buffer)

** proximity = 10 km (1/2 of the distance of the database search buffer)

The likelihood assessment is available in **Table 31** in **Appendix Four**. According to the provided GIS data, none have been previously recorded from within the survey area, although *Calothamnus brevifolius* (P4) has been recorded from less than 100 m from the survey area and, based on the location information, is likely to have actually been within at least the road reserve. One TF (*Grevillea scapigera*, known from the Bullaring town reserve), one P3 (*Phebalium drummondii*) and one P4 (*Calothamnus brevifolius*) were identified as being Likely to occur based on the information available during the desktop assessment and were prioritised for field survey.

The likelihood of occurrence was re-evaluated following the field survey when actual survey area characteristics (vegetation types, vegetation condition, visibility for individual species) were better understood, and the level of survey effort was considered. The post-survey likelihood is also incorporated into this table and discussed further in **Section 5.1.1.2**.

2.2.5 THREATENED AND PRIORITY FAUNA

The PMST search (as above) identified 11 EPBC-listed Threatened Fauna that are either known (or habitat is known) to occur within the 30 km search buffer area (one bird), 'species or habitat likely to occur within area' (one mammal and one bird) and 'species or species habitat may occur within area' (three mammals and five birds).

The DBCA database search was conducted (search reference: 7976_-_FaunaSearch_Ecoscape_Atkins7976) using a 60 km buffer around the two Shire of Corrigin survey areas (the other being located approximately 8 km to the west). Twenty-nine conservation-listed species were identified as having previously been recorded from within the search area buffer, consisting of 15 mammals and 14 birds (noting that *Zanda* sp. 'white-tailed black cockatoo' has been combined with *Zanda latirostris* as this is the only species of this genus with a distribution that includes the survey area).

Combined database search results are incorporated into **Table 32** in **Appendix Four**. The combined database searches identified:

- 15 mammals consisting of:
 - o 11 Threatened species (all identified by the DBCA search, four also identified by the PMST search)
 - o four Priority-listed species
- 17 birds consisting of:
 - o six Threatened species (one identified by the PMST search only), two of which are also listed as migratory species
 - o three Priority-listed species
 - o one Conservation Dependent species
 - o one Specially Protected species

o eight migratory species protected under international agreements (two also listed as Threatened).

Species identified by these database searches that are excluded from the field survey and further assessments (including likelihood assessments) are listed in **Table 33** along with the reason for their exclusion. Such excluded species are not further referenced in this document.

2.2.5.1 Threatened and Priority Fauna Likelihood Assessment

The likelihood of conservation-listed fauna species, as identified by the database and literature searches, occurring within the survey area was assessed using the following criteria:

- suitability of habitat types likely to be present within the survey area
- distance between previous record of conservation-listed species and the survey area
- frequency and number of records in the region
- date of record of conservation-listed species (recent or historical)
- the record is naturally occurring (not from a sanctuary or translocated population).

The following were also taken into consideration during the assessment:

- sufficiency of information
- behavioural and ecological characteristics such as cryptic behaviours, size and mobility of species
- record certainty.

The categories of likelihood of occurrence, assessed using the above criteria, are shown in Table 7.

Likelihood Category	Criteria
Known to occur	Species previously recorded within the survey area within 25 years.
Likely to occur	Suitable habitat is expected to occur within the survey area and records of the species within
	25 years exist within close proximity*
May occur	Suitable habitat is expected to occur within the survey area and historic records of the species
	exist within close proximity*
	OR
	Suitable habitat is expected to occur within the survey area and recent (<25yrs) records exist
	within the database search buffer but not in close proximity*
Unlikely to occur	Suitable habitat is expected to occur within the survey area however previous records are
	limited and/or historic and/or not in proximity**
	OR
	Suitable habitat is not expected to occur within the survey area and recent (<25yrs) records
	do not occur in close proximity*
Very Unlikely to occur	Suitable habitat is not expected to occur in the survey area
	AND/OR
	previous records are limited and/or historic and/or not in proximity**

Table 7: Categories for likelihood of occurrence of conservation-listed fauna

* close proximity = 15 km (1/4 of the distance of the database search buffer)

** proximity = 30 km ($\frac{1}{2}$ of the distance of the database search buffer)

The likelihood of species occurring within the survey area are indicated in **Table 32** in **Appendix Four**. Two species were assessed as being Likely to occur within the survey area:

- Falco peregrinus (Peregrine Falcon)
- Leipoa ocellata (Malleefowl).

Likelihood of occurrence does not take into consideration factors such as frequency that a species occurs (or may occur), the duration that such species occupies (or may occupy) the survey area or dependence on habitat or resources within the survey area. Highly mobile species potentially only occur within (or for birds, overflying) the survey area for very brief periods and/or on very infrequent intervals. If a previous observation included in the database search records corresponds with this event it is listed as 'Recorded'; if such a transient visitation is possible in the future the likelihood of such species occurring is likely listed as 'Likely'.

Following the field survey, when actual survey area characteristics are better understood and the level of survey effort was considered, the likelihood of occurrence was re-evaluated. The post-survey likelihood is also incorporated into this table and discussed further in **Section 5.3.3.1**, including providing an indication of dependence of species on the habitat and resources available within the survey area.

2.2.5.2 Black Cockatoos

The survey area is located approximately 22 km north-west of a known Carnaby's Cockatoo breeding site (identified in the DBCA fauna database search). This record, from 2000, is described as 'confirmed' and 'natural' in the DBCA data.

According to DBCA mapping the survey area is located:

- approximately 10 km north-east of confirmed Carnaby's Cockatoo breeding areas (DBCA 2018a)
- over 100 km south-east of unconfirmed (indicative) Carnaby's Cockatoo breeding areas (DBCA 2018b)
- over 100 km south-east or northeast of buffer edges of Black Cockatoo breeding sites (DBCA 2019b)
- over 100 km south-east of confirmed Carnaby's Cockatoo roost sites (DBCA 2018c)
- over 100 km south-east of unconfirmed (indicative) Carnaby's Cockatoo roost sites (DBCA 2018d)
- approximately 73 km north-east of buffer edges of Black Cockatoo roost sites (DBCA 2019c)
- approximately 75 km north-east of areas under investigation as Carnaby's Cockatoo feeding habitat (DBCA 2018e).

Figure 2 in EPA (2019) indicates that the survey area is approximately 100 km north and 100 km south-east of the nearest approximate breeding zone.

2.3 RELEVANT LITERATURE

2.3.1 PREVIOUS SURVEYS

No previous surveys have been identified as having been conducted in areas corresponding with any of the survey area or sufficiently close to provide contextual information.

The following documents have been identified as having regional relevance to current survey:

- Ecoscape (2024) *Kondinin Wind Farm Biological Survey*. Three conservation-listed flora and road reserves representative of the Wheatbelt Woodlands TEC were recorded, however, there was no significant fauna or fauna habitat in the survey area that was located approximately 49 km east of the current survey area. The report largely documented a confirmation survey of an earlier site assessment by SW Environmental (2017).
- Strategen Environmental (2017) *Living Lakes Lake Yealering NVCP Supporting Document*. The Strategen report largely described an area located within the drainage system associated with Lake Yealering. No significant flora, vegetation or fauna were recorded.
- Mills & McPhee (2009) Corrigin BioBlitz Report 2008. This report for the Worldwide Fund for Nature describes a snapshot survey of Corrigin Reserve (Water Reserve 16196 and Shire aerodrome reserve 28131), located 8.5-12.5 km north-east of the current survey area. Some similar vegetation was recorded, including woodland vegetation types, however, the bioblitz focus is on recording flora and fauna species and was conducted by a large team of people in a large area of relatively undisturbed bushland thus has little relevance to the (largely) road reserve vegetation within this survey area.
- Department of Water (2008) Waterway assessment for the Lockhart River: Lake Kurrencutten to the Camm River confluence (WRM 55). Ten areas of remnant vegetation were assessed to identify management issues potentially affecting water quality, approximately 27 km east of the current survey area. Hydrological change was identified as the most significant management issue.
- Grein (1994) *Native Vegetation Handbook for the Shire of Corrigin*. This booklet largely iterates now-dated data available via a desktop assessment and provides only broad flora and vegetation descriptions.

2.3.2 IBSA DATA SEARCH

The Department of Water and Environmental Regulation's (DWER's) *Index of Biodiversity Surveys for Assessments (IBSA)* Portal (DWER 2024) was searched for recent environmental surveys in the vicinity of the survey area.

The search, conducted on 21 March 24, identified five environmental surveys that have been conducted within 30 km of the survey area. Four of these listings did not have a report accessible for review i.e. contained metadata only. The only survey with accessible information is described above (Strategen Environmental 2017).

3 METHODS

3.1 SURVEY AIMS

The aim of the assessment was to identify any significant constraints within the survey area that have potential to affect the Shire's plans for road widening. The results of the survey (this report) will be used as supporting documentation for a Native Vegetation Clearing Permit application and, if required, inform approvals under the Commonwealth EPBC Act.

3.2 GUIDING PRINCIPLES

The flora and vegetation survey was conducted as a Detailed survey according to the Flora and Vegetation Technical Guidance (EPA 2016a). The EPA considers that a Detailed survey requires:

- a comprehensive survey design, including giving consideration to the survey timing that should be conducted during the primary season of survey for the bioregion and disturbance events, and the potential requirement for supplementary surveys
- a minimum of three quadrats (in proportion to the extent of the vegetation unit), located throughout each preliminary vegetation types sampled throughout its geographic range, with additional quadrats and rescoring during supplementary surveys to clarify vegetation unit boundaries
- regional surveys if there is insufficient information available (identified during the desktop assessment) to provide local and regional context
- the survey may include a number of sampling techniques including quadrats, relevés, transects and traverses, as well as opportunistic observations
- the flora inventory should be comprised of data collected from quadrats and relevés, supplemented by opportunistic observations, systematic surveys and targeted inspections of various habitat areas
- it may be appropriate to increase survey effort in areas of unusual habitat
- sampling sites that are placed at representative locations throughout the survey area considering landform, geology, elevation, slope, aspect, surface or groundwater expression and soil type, as well as vegetation structure, composition and condition.

Targeted searches were also conducted in areas of habitat suitable for TF and PF identified during the desktop assessment and previous surveys as having potential to occur.

The fauna and fauna habitat survey was conducted as a Basic survey according to the Fauna Technical Guidance (EPA 2020). The EPA recommends a Basic survey should:

- be conducted as a low intensity survey to gather broad fauna and habitat information
- verify the adequacy of the desktop assessment
- map, describe and photograph habitats
- record opportunistic fauna observations
- identify possible future survey site locations, access and logistics
- determine if a Detailed survey is required.

Targeted surveys were also conducted to gather information on significant fauna and habitats.

3.3 FLORA AND VEGETATION FIELD SURVEY

3.3.1 FIELD SURVEY METHODS

The methods utilised during the field survey followed those outlined in the Flora and Vegetation Technical Guidance (EPA 2016a), conducted as a single phase Detailed survey.

Conservation criteria used in this assessment are outlined in **Table 20**, **Table 21** and **Table 22** in **Appendix One**.

Survey method details are outlined below.

3.3.1.1 Floristic Quadrats

Floristic quadrat ('quadrat') locations were selected using aerial photography, environmental values and field observations to represent the vegetation values existing at the site. The unmarked quadrats were 10 m x 10 m in dimension for mid and ground strata and 20 m x 20 m in dimension (effectively 5 m additional on all sides to the measured mid and ground stratum quadrat) for the upper stratum where present, as required according to the Flora and Vegetation Technical Guidance (EPA 2016a). Where the vegetation consisted of a narrow linear corridor, quadrats were linear but of the same overall size i.e. 400 m² for the upper stratum.

The following information was collected from within each quadrat:

- observer
- date
- quadrat/site number
- GPS location (GDA94) of the northwest corner
- digital photograph (spatially referenced with a reference number), taken from the northwest corner, looking diagonally across the quadrat
- broad soil type and colour
- topography
- list of flora species recorded with the average height and total cover within the quadrat for each species
- vegetation description (as per below)
- vegetation condition.

At least three quadrats per vegetation type were recorded for the Detailed survey where there was sufficient extent. Quadrat locations are displayed on the **Map 5** series.

3.3.1.2 Targeted Searches

Threatened and Priority Flora identified during the desktop analysis and previous surveys as known or having potential to occur were targeted for searches in areas of potential habitat. Searches were conducted in areas of suitable habitat or where target species were observed or had been previously recorded.

The locations of all targeted taxa collected were recorded using a handheld GPS with the following data recorded:

- observer, date and time
- local abundance/population size and/or population boundary, including outside the development envelopes where possible
- landform
- brief vegetation community description
- representative photos of each species and habitat
- collection of representative specimens.

3.3.1.3 Introduced Species

Introduced species (weeds) were recorded during the collection of the overall flora inventory.

3.3.1.4 Vegetation Description and Classification

Vegetation was described from each of the quadrats using the height and estimated cover of dominant and characteristic species of each stratum based on the National Vegetation Information System, recorded at Level V (NVIS Technical Working Group & DotEE 2017) (**Table 23** and **Table 24** in **Appendix Two**). Up to three species per stratum from each stratum (upper, mid and ground) were used to formulate vegetation descriptions for each quadrat and each vegetation type.

Vegetation type descriptions were created by combining quadrat descriptions and modifying, where necessary, based on the wider vegetation. Vegetation codes for these were formulated using the characteristic species of the highest stratum within the vegetation type that had >2% cover (i.e. not scattered) if present, with the first series of letter codes referring to the component species (upper case first letter referring to the genus, lower

case one or two letters referring to the species/subspecies, with the upper case letters at the end referring to the stratum structure e.g. **AaEIIMW** refers to **Acacia acuminata** and **Eucalyptus Ioxophleba** subsp. **Ioxophleba** mid **w**oodland.

3.3.1.5 Vegetation Condition Assessment

Vegetation condition was assessed broadly and continuously throughout the survey area and at each quadrat using the Vegetation Condition Scale for the Southwest Botanical Province (EPA 2016a) (**Table 25** in **Appendix Two**). As quadrats are located in the best condition parts of a vegetation type, the condition rating of the quadrat may not match that of the broader vegetation type due to the scale of mapping.

3.3.1.6 Field Survey Timing

The field survey was conducted during 7-10 November 2023 which is within the optimal period for a primary survey within the bioregion according the Flora and Vegetation Technical Guidance (EPA 2016a).

3.3.2 DATA MANAGEMENT AND ANALYSIS

3.3.2.1 Taxonomic Plant Identification

Any plants that could not be identified with certainty in the field, having potential to be conservation-listed, introduced species and having significance according to the Flora and Vegetation Technical Guidance (EPA 2016a) were collected during the field survey using Western Australian Herbarium collecting protocols.

The majority of post-survey plant collection identification was undertaken by Ecoscape taxonomists (Dr Udani Sirisena) using relevant literature, taxonomic keys and reference specimens held at the Western Australian Herbarium (WAH), including seeking assistance from specialist taxonomists where necessary. Three specimens were submitted to the WAH for formal taxonomic identification.

3.3.2.2 Post-survey Likelihood Assessment

Following the field survey, a post-survey likelihood assessment was conducted to identify conservation-listed species that have potential to occur on site. This assessment was based on survey results, survey effort and habitat identified within in the survey area.

3.3.2.3 Floristic Analysis

PATN© software (Blatant Fabrications Pty Ltd 2013) was used to undertake statistical analysis to generate floristic groups using the data collected from the quadrats and relevés, in order to better understand local significance of floristic units. PATN analysis has been used for several local floristic analyses including Gibson *et al.* (1994) for the Swan Coastal Plain.

PATN is a multivariate analysis tool that generates estimates of association (resemblance, affinity, distance) between sets of objects described by a suite of variables (attributes) and classifies the objects into groups and condenses the information and displays the patterns in the data graphically. It offers a choice of data transformations prior to multivariate analysis.

Floristic groups, identified using a dendrogram output of the analysis, are used as a tool to inform vegetation type groups at various levels and scales.

For this project a variety of analyses were run. The most informative analysis used the Bray Curtis similarity coefficient for columns (sites) as this provides a good estimation of association for ecological applications (Blatant Fabrications Pty Ltd 2013). For this analysis weeds were removed from the data to minimise the influence of vegetation condition. Cover values were used, substituting 0.5 for all species with <1% cover recorded.

Interpretation of these purely floristic groups into recognisable and mappable on-ground units is a tool used to identify broad vegetation types. Generally, quadrats that are closely floristically related on the dendrogram form identifiable vegetation units, however, interpretation is frequently required for imperfect results. Vegetation types are therefore determined as a combination of floristic analysis and on-ground interpretation using dominant and characteristic species.

3.3.2.4 TEC Assessment Criteria

Vegetation potentially representative of the Wheatbelt Woodlands TEC was assessed against the criteria outlined in the Approved Conservation Advice for the community (TSSC 2015).

Reasons that vegetation was considered clearly not representative of the TEC in an indicatively mapped occurrence include the vegetation being a different type to that of the TEC, vegetation condition clearly not meeting the condition thresholds (i.e. Degraded-Completely Degraded condition), and extents too small for inclusion. These can be demonstrated with a photograph.

3.3.2.5 Adequacy of Sampling

In order to demonstrate adequacy of sampling, a species accumulation curve was generated by the software Species Diversity and Richness IV (Pisces Conservation Ltd 2010) using five random selections of sample order, using quadrat data only.

3.4 FAUNA FIELD SURVEY

The methods utilised during the field survey followed those outlined in the Fauna Technical Guidance (EPA 2020), conducted as a Basic survey.

Conservation criteria used in this assessment are included in Table 20 and Table 21 in Appendix One.

Survey method details are outlined below.

3.4.1 FAUNA SURVEY METHODS

The Basic fauna survey incorporated a number of survey techniques as per the Terrestrial Fauna Technical Guidance (EPA 2020) including habitat assessment, active searches (day and night-time), raking of spoil heaps and leaf litter, searches for secondary evidence such as scats and tracks, as well as opportunistic searches.

Terrestrial vertebrate fauna were the main targets of the field survey. Survey techniques included:

- opportunistic bird observations while moving through the survey area, with one fauna observation location where a longer (half hour) fauna recording session was undertaken
- searches for tracks and other signs for other taxonomic groups.

Fauna species were identified opportunistically based on sightings, calls, remains, diggings and other signs. Potential habitats for conservation significant species were identified and evaluated (see **Section 3.4.1.1**) and their likelihood of occurrence re-assessed.

3.4.1.1 Fauna Habitat Assessment

The fauna habitats present within the survey areas were identified and mapped. Fauna habitats were described as an area which is distinguishable from its surrounding area by its landform, vegetation and fauna assemblage occupying the area. In addition, its likelihood to harbour specialised fauna species which are not found in adjacent areas was taken into consideration.

The following information was used to identify and map all fauna habitats within the survey area:

- previous fauna habitat mapping
- land systems
- vegetation type and condition mapping
- aerial imagery
- landforms
- soil characteristic
- fauna assemblage information.

The composition and characteristics of each fauna habitat type was recorded, including noting suitability for various fauna suites or conservation-listed species. Habitat types were delineated in the field and digitised upon return from the field survey.

3.4.2 TARGETED SURVEY METHODS

3.4.2.1 Black Cockatoo Assessment Methods

'Black Cockatoos' refer to three threatened Western Australian species: *Calyptorhynchus latirostris* (Carnaby's Cockatoo; EPBC- and BC Act EN), *Calyptorhynchus baudinii* (Baudin's Cockatoo; EPBC- and BC Act EN) and *Calyptorhynchus banksii naso* (Forest Red-tailed Black Cockatoo; EPBC- and BC Act VU). The survey area is within the mapped distribution of Carnaby's Cockatoo (DAWE 2022) but over 100 km from breeding areas indicated in EPA (2019).

Potential and active (actual) Black Cockatoo breeding trees were assessed as per Commonwealth guidance (DAWE 2022) and Bamford (2016) methods (see below).

The suitability of the survey area for breeding (additional to the specific tree survey) and as foraging was also assessed and mapped (see 'foraging habitat survey methods' below).

Tree Survey Methods

Potential and actual Black Cockatoo habitat trees are:

- tree species as listed in the Commonwealth guidance (DAWE 2022)
- a minimum size of 500 mm diameter at breast height (DBH) for most species, or 300 mm DBH for Salmon Gum and Wandoo.

The following were recorded for each potential and actual habitat tree:

- location, recorded using a handheld GPS device with an accuracy of approximately 5 m
- species
- size class (in 25 cm DBH intervals)
- identifying if tree hollows of suitable size and orientation are present, and recording evidence of use by cockatoos such as chewing at the hollow entrance
- habitat value according to the scoring system developed by Dr Mike Bamford (2016); this score reflects the existing value of the tree characteristics with respect to its potential to be used as a nesting tree (as per Table 26 in Appendix Two)
- photographs of representative trees and those with potentially suitable hollows, showing hollows if possible

Foraging Habitat Survey Methods

The suitability of the survey area for breeding (additional to the specific tree survey) and as foraging habitat was assessed and mapped as per the Commonwealth (DAWE 2022) scoring tool and Bamford (2020) foraging habitat methods.

The Commonwealth (DAWE 2022) scoring tool (Table 27 in Appendix Two) takes into consideration:

- the extent of the site (that must be at least 1 ha to be considered as suitable)
- preferred foraging species
- connectivity to other foraging habitat within 12 km
- proximity to known foraging and breeding habitat within 12 km
- presence of disease, such as *Phytophthora cinnamomi* or Marri Canker (*Quambalaria coyrecup*).

The Bamford (2020) scoring system (Table 28 in Appendix Two) takes into consideration:

- site condition (vegetation composition, condition and structure)
- site context (the site in relation to other native vegetation within a 15 km radius of the site)
- species density (stocking rate: frequency and abundance of Black Cockatoos at the site)
- modification, if needed, for vegetation with little or no foraging value and for pine plantations that provide valuable food sources.

4.1 FLORA AND VEGETATION SURVEY

The flora and vegetation survey was conducted by Lyn Atkins (Principal Ecologist, Flora Collecting Permit FB62000003-2; Threatened Flora Collecting Permit TFL 2223-0089) during 7-10 November 2023.

Taxonomic plant identification was undertaken by Dr Udani Sirisena. Three specimens were submitted to the WAH for formal identification (Accession #: 10,754). They were identified as *Banksia purdieana*, *Olearia imbricata* and *Synaphea drummondii* (P3).

4.1.1 FLORA

4.1.1.1 Flora Inventory

Twenty floristic quadrats were recorded from within the survey area.

In total, 221 vascular flora were recorded from 129 genera and 47 families from the quadrats, opportunistic observations and searches for conservation-listed flora. Of these, 38 were introduced (17.2%) and seven (3.2%) could not be identified to species level due to insufficient diagnostic reproductive material.

The most commonly represented families were Myrtaceae (36 taxa), Fabaceae (27), Poaceae (26), Proteaceae (22) and Asteraceae (20). The most commonly represented genera were *Melaleuca* with 11 taxa, *Eucalyptus* (10), *Acacia* (9) and *Grevillea* (7).

The number of species per quadrat ranged from six in quadrat WC2318 to 38 in quadrat WC2301, with an average species diversity per quadrat of 20.65. The most commonly recorded species were all grasses (Poaceae): *Austrostipa elegantissima* and **Ehrharta longiflora* recorded from 18 quadrats, **Avena barbata* (15) and *Rytidosperma setaceum* (13).

The combined flora inventory is presented in **Table 34** in **Appendix Five**. Quadrat data is presented in **Appendix Six**.

4.1.1.2 Conservation-listed Flora

Threatened Flora

No Commonwealth EPBC Act or Western Australian BC Act-listed TF were recorded during the field survey. No taxa not identified with certainty resembled any currently described TF.

Priority Flora

Three PF were recorded during the field survey:

- Phebalium drummondii (P3)
- Synaphea drummondii (P3)
- Calothamnus brevifolius (P4).

Locations of PF are indicated on the Map 5 series and described in more detail in Table 8.

Table 8: PF recorded during the field survey

Phebalium drummondii (P3)

Description:

According to *FloraBase* (WAH 2024, 1998-2024) *Phebalium drummondii* is an upright shrub to 1.5 m high with yellow flowers, growing in gravelly sand or clay soils.

Within the survey area this species was observed to be a shrub to 0.6 m high. It occurred in *Eucalyptus capillosa* woodland (**EcMW**) but was not a dominant species.



Habitat: Lower slope on duplex yellow-grey sand.

Location: Within the Bullaring town reserve, approximately 0.4 km north of the Pingelly Road intersection.

Survey results: 1 record; the number of plants is unknown as it was identified from collected material.

Populations: 1 population

Known records and distribution: According to Atlas of Living Australia (ALA 2024) there are 36 records of this species from the Avon Wheatbelt, Mallee, Coolgardie and Esperance Plains IBRA regions, with an overall distribution of approximately 350 km (north-south) by 350 km (east-west). The survey area is approximately the most western edge of the species' range, but approximately the centre on the north-south axis.

As it is 5 km from the nearest record indicated in the DBCA data this record represents a new population.

Synaphea drummondii (P3)

Description:

According to *FloraBase* (WAH 2024, 1998-2024) *Synaphea drummondii* is a shrub with leaves to 290 mm long and yellow flowers on a scape to 200 mm long. Flower is between July and September.

From: FloraBase (WAH 1998-2024, photography by S. Patrick))

Within the survey area this species was as described above, growing in vegetation type **AcLeHsMOS**. *Synaphea drummondii* is morphologically similar to *S. interioris* which is not conservation-listed and occurred commonly in the same portion of the survey area. There is potential that these two species may on occasional have been misinterpreted thus *S. drummondii* may occur more frequently than indicated.



Habitat: Mid-lower slope in lateritic sandy clay soil.

Location: Bullaring town reserve and road reserve to the north, approximately 0.5 and 1.2 km north of the Pingelly Road intersection.

Survey results: 3 records in survey area.

Populations: 2 populations, although there may be additional plants between the two foci that would therefore constitute a single population.

Known records and distribution: According to (ALA 2024) there are 24 records of this species from the Avon Wheatbelt, Mallee and Esperance Plains IBRA regions, with an overall distribution of approximately 190 km (north-south) by 340 km (east-west).

The records within survey area are a minor (18 km) range extension at the north-west of the species' usual distribution.



Photo of flowers from: *Atlas of Living Australia* (2024)

Calothamnus brevifolius (P4)

Description:

According to *FloraBase* (WAH 2024, 1998-2024) *Calothamnus brevifolius* is an erect or spreading shrub to 0.8 m high.

Within the survey area this species was observed as an erect shrub. It occurred entirely in disturbed vegetation, including parts otherwise without native vegetation and in Completely Degraded representatives of vegetation types **AcLeHsMOS** and **EsEIEkMW**.



Habitat: Mid-upper slope in lateritic sandy soil.

Location: A single plant south of Sixty Eight Gate Road; eight plants north of Talbot Clarke Road (five outside the survey area) and one plant south. All plants occurred in densely weedy areas.

Survey results: 5 plants in survey area.

Populations: 2 populations.

Known records and distribution: According to (ALA 2024) there are 43 records of this species from the Avon Wheatbelt, Geraldton Sandplains, Mallee and Swan Coastal Plain IBRA regions, with an overall distribution of approximately 320 km (north-south) by 280 km (east-west). The survey area is at the south-eastern edge of the species' usual distribution.

The single plant south of Sixty Eight Gate Road is a new record (new population) for this species.

The plants near Talbot Clarke Road would be part of the know population recorded from this vicinity, although none of the associated species listed on the DBCA record were present, indicating that the vegetation condition had deteriorated since the 1998 collection.

4.1.1.3 Other Significant Flora

Sandalwood (*Santalum spicatum*) was recorded from three locations within the survey area. This species is listed by the *International Union for the Conservation of Nature* (IUCN) as vulnerable (IUCN 2022), however, it is not conservation-listed in Western Australia or protected under the EPBC Act.

No other flora taxa having other significance according to the Flora and Vegetation Technical Guidance (EPA 2016a) were recorded during the field survey.

4.1.1.4 Flora of Taxonomic Interest

No flora of taxonomic interest were recorded during the field survey.

4.1.1.5 Introduced Flora

Thirty-eight introduced flora species (weeds) were recorded during the field survey, representing 17.2% of the overall flora inventory.

Weed density was highly variable throughout the survey area, from 100% ground cover to virtually no weeds.

None of the introduced flora have any specific significance i.e. none are Declared Pest plants or WoNS species.

4.1.2 VEGETATION

4.1.2.1 Vegetation Types

Seven vegetation types were recorded from within the survey area (**Table 9**, **Map 5** series) based on a combination of structural vegetation type as identified in the field, floristic analysis (see **Section 4.1.4**) and subsequent desktop review.

The vegetation types within the survey area were:

- **AaEIIMW**: *Acacia acuminata* and *Eucalyptus loxophleba* subsp. *loxophleba* mid woodland, noting that either of the two-listed species were dominant
- AcLeHsMOS: Allocasuarina campestris, Leptospermopsis erubescens and Hakea scoparia mid open shrubland
- AhMW: Allocasuarina huegeliana mid woodland
- EcMW: Eucalyptus capillosa mid woodland
- EoMMW: Eucalyptus orthostemon mid mallee woodland
- **EsEIEkMW**: *Eucalyptus salmonophloia*, *Eucalyptus longicornis* and *Eucalyptus kondininensis* mid woodland, noting that dominance of these species varied although *Eucalyptus salmonophloia* was the most frequent characteristic and dominant species
- EtEcEaaMMW/LW: Eucalyptus tenera, Eucalyptus capillosa and Eucalyptus arachnaea subsp. arachnaea mid mallee woodland/low woodland.

In addition to the above, woodlands and mallees frequently intergraded, herein termed as 'mosaics':

- EcMW / EsEIEkMW: Mosaic of *Eucalyptus capillosa* mid woodland AND *Eucalyptus salmonophloia*, *Eucalyptus longicornis* and *Eucalyptus kondininensis* mid woodland
- EcMW / EtEcEaaMMW/LW: Mosaic of *Eucalyptus capillosa* mid woodland AND *Eucalyptus tenera*, *Eucalyptus capillosa* and *Eucalyptus arachnaea* subsp. *arachnaea* mid mallee woodland/low *woodland*
- EsEIEkMW / EtEcEaaMMW/LW: Mosaic of Eucalyptus salmonophloia, Eucalyptus longicornis and Eucalyptus kondininensis mid woodland AND Eucalyptus tenera, Eucalyptus capillosa and Eucalyptus arachnaea subsp. arachnaea mid mallee woodland/low woodland.

Table 9: Vegetation types

The bold font floristic quadrat indicates representative photograph.

Mapping unit	Vegetation type	Floristic quadrats	Representative photograph	Other characteristic species	Area (ha) and extent (%)
AaEIIMW	Acacia acuminata and Eucalyptus loxophleba subsp. loxophleba mid woodland over *Bromus diandrus, *Ehrharta longiflora and *Avena barbata low closed grassland NVIS: U+ ^Acacia acuminata,^Eucalyptus loxophleba subsp. loxophleba\^tree\7\i;G ^^Bromus diandrus,Ehrharta longiflora,Avena barbata\^other grass\1\d	WC2314 WC2318 WC2319		Allocasuarina campestris Amphipogon caricinus Austrostipa elegantissima Austrostipa scabra Calothamnus quadrifidus Chamelaucium ciliatum Dampiera lavandulacea Dianella revoluta Dodonaea pinifolia Eucalyptus arachnaea subsp. arachnaea Gahnia sp. dull bases (K.R. Newbey 5111) Grevillea umbellulata Hakea scoparia Lomandra effusa Maireana brevifolia *Romulea rosea Rytidosperma setaceum *Ursinia anthemoides subsp. anthemoides *Vulpia myuros forma myuros	0.89 ha 4.12%
AcLeHsMOS	Allocasuarina campestris, Leptospermopsis erubescens and Hakea scoparia mid open shrubland over *Avena barbata, *Bromus diandrus and Waitzia acuminata var. acuminata low grassland/forbland NVIS: M+ ^Allocasuarina campestris,^Leptospermopsis erubescens,Hakea scoparia\^shrub\3\i;G ^^Avena barbata,Bromus diandrus,Waitzia acuminata var. acuminata\^other grass,forb\1\c	WC2301 WC2317 WC2320		Amphipogon strictus Austrostipa elegantissima Austrostipa hemipogon Austrostipa scabra Calothamnus quadrifidus Caustis dioica Comesperma scoparium Dampiera lavandulacea Dianella revoluta * Ehrharta longiflora Gastrolobium spinosum Grevillea anethifolia Hakea incrassata Lepidobolus preissianus * Lolium perenne x rigidum Melaleuca brophyi Neurachne alopecuroidea Opercularia vaginata Podolepis aristata subsp. aristata * Vulpia myuros forma myuros	1.11 ha 5.15%

Mapping unit	Vegetation type	Floristic quadrats	Representative photograph	Other characteristic species	Area (ha) and extent (%)
AhMW	Allocasuarina huegeliana mid woodland over Gastrolobium spinosum and Banksia sphaerocarpa var. sphaerocarpa mid sparse shrubland over *Bromus diandrus, *Ehrharta longiflora and *Ursinia anthemoides subsp. anthemoides mid dense grassland/forbland NVIS: U+ ^Allocasuarina huegeliana\^tree\7\i;M ^Gastrolobium spinosum,Banksia sphaerocarpa var. sphaerocarpa var. sphaerocarpa\^shrub\3\r;G ^^Bromus diandrus,Ehrharta longiflora,Ursinia anthemoides subsp. anthemoides\^other grass,forb\2\d	WC2309 WC2315 WC2316		Austrostipa elegantissima * Avena barbata Banksia purdieana Comesperma scoparium Dampiera lavandulacea Daviesia hakeoides subsp. hakeoides Dianella revoluta * Ehrharta calycina Grevillea hookeriana Hibbertia polystachya Mesomelaena preissii Opercularia vaginata Rytidosperma setaceum Santalum spicatum * Trifolium hirtum	0.54 ha 2.50%
EcMW	Eucalyptus capillosa mid woodland over Melaleuca marginata, Allocasuarina campestris and Gastrolobium spinosum mid open shrubland over *Ursinia anthemoides subsp. anthemoides, Austrostipa elegantissima and Rytidosperma setaceum low forbland/tussock grassland NVIS: U+ ^Eucalyptus capillosa\^tree\7\i;M ^^Melaleuca marginata,Allocasuarina campestris,Gastrolobium spinosum\^shrub\3\i;G ^Ursinia anthemoides,Austrostipa elegantissima,Rytidosperma setaceum\^forb,tussock grass\1\c	WC2303 WC2305 WC2310 WC2312		Austrostipa scabra *Avena barbata Comesperma scoparium Dianella revoluta *Ehrharta longiflora Enchylaena tomentosa var. tomentosa Eucalyptus rigidula Eucalyptus salmonophloia Eucalyptus tenera Hakea scoparia Helichrysum leucopsideum Leptospermopsis erubescens *Lolium perenne x rigidum Melaleuca scalena Mesembryanthemum nodiflorum Neurachne alopecuroidea *Romulea rosea Santalum acuminatum *Vulpia myuros forma myuros Waitzia acuminata var. acuminata	2.95 ha 13.66%

Mapping unit	Vegetation type	Floristic quadrats	Representative photograph	Other characteristic species	Area (ha) and extent (%)
EoMMW	Eucalyptus orthostemon mid mallee woodland over Santalum acuminatum and Grevillea hakeoides subsp. hakeoides mid scattered shrubs over *Ehrharta longiflora, Austrostipa elegantissima and Gahnia trifida mid grassland/tussock grassland/sedgeland NVIS: U+ ^Eucalyptus orthostemon\^tree mallee\6\i;M ^Santalum acuminatum,^Grevillea hakeoides subsp. hakeoides\^shrub\3\bi;G ^^Ehrharta longiflora,Austrostipa elegantissima,Gahnia trifida\^other grass,tussock grass,sedge\2\c	WC2302		Atriplex semibaccata *Avena barbata *Briza maxima Centrolepis aristata Enchylaena tomentosa var. tomentosa *Eragrostis dielsii *Juncus bufonius *Lolium perenne x rigidum Melaleuca scalena *Mesembryanthemum nodiflorum *Moraea setifolia *Parapholis incurva Pogonolepis stricta Rhagodia preissii subsp. preissii Romulea rosea *Sclerolaena diacantha *Sonchus oleraceus *Spergularia marina Tecticornia sp.	0.33 ha 1.54%
EsEIEkMW	Eucalyptus salmonophloia, Eucalyptus longicornis and Eucalyptus kondininensis mid woodland over Olearia sp. Eremicola (Diels & Pritzel s.n. PERTH 00449628) mid sparse shrubland over *Lolium perenne x rigidum, *Ehrharta longiflora and Austrostipa elegantissima low closed grassland/tussock grassland NVIS: U+ ^^Eucalyptus salmonophloia,Eucalyptus longicornis,Eucalyptus kondininensis\^tree\7\i;M ^Olearia sp. Eremicola (Diels & Pritzel s.n. PERTH 00449628)\^shrub\3\r;G ^^Lolium perenne x rigidum,Ehrharta longiflora,Austrostipa elegantissima\^other grass,tussock grass\1\d	WC2304 WC2307 WC2308		Acacia erinacea Acacia leptopetala Austrostipa scabra *Avena barbata *Bromus diandrus Dianella revoluta Dodonaea bursariifolia Dodonaea viscosa subsp. angustissima Enchylaena tomentosa var. tomentosa Eremophila lehmanniana Lomandra effusa Rytidosperma setaceum Templetonia sulcata *Vulpia myuros forma myuros	3.14 ha 14.52%

Mapping unit	Vegetation type	Floristic quadrats	Representative photograph	Other characteristic species	Area (ha) and extent (%)
EtEcEaaMMW/LW	Eucalyptus tenera, Eucalyptus capillosa and Eucalyptus arachnaea subsp. arachnaea mid mallee woodland/low woodland over Melaleuca scalena and Melaleuca marginata mid open shrubland over *Ehrharta longiflora and Austrostipa elegantissima low closed grassland/tussock grassland NVIS: U+ ^Eucalyptus tenera,^Eucalyptus capillosa,Eucalyptus arachnaea subsp. arachnaea\^tree mallee,tree\6\i;M ^^Melaleuca scalena,^Melaleuca marginata\^shrub\3\i;G ^^Ehrharta longiflora,Austrostipa elegantissima\^other grass,tussock grass\1\c	WC2306 WC2311 WC2313		Austrostipa scabra *Avena barbata Brachyscome pusilla *Bromus diandrus *Bromus rubens Cassytha pomiformis *Cotula bipinnata Enchylaena tomentosa var. tomentosa Gastrolobium trilobum *Lolium perenne x rigidum Melaleuca haplantha *Mesembryanthemum nodiflorum *Moraea setifolia Rytidosperma setaceum *Vulpia myuros forma myuros	1.34 ha 6.19%
EcMW / EsElEkMW	Mosaic of: Eucalyptus capillosa mid woodland AND Eucalyptus salmonophloja, Eucalyptus longicornis and Eucalyptus kondininensis mid woodland				a 3.75%
EcMW / EtEcEaaMMW/LW	Mosaic of: <i>Eucalyptus capillosa</i> mid woodland AND <i>Eucalyptus tenera, Eucalyptus capillosa</i> and <i>Eucalyptus arachnae</i> a subsp. <i>arachnaea</i> mid mallee woodland/low woodland			0.54 h	a 2.49%
EsElEkMW / EtEcEaaMMW/LW	Mosaic of: Eucalyptus salmonophloia, Eucalyptus longicornis and Eucalyptus kondininensis mid woodland AND Eucalyptus tenera, Eucalyptus capillosa and Eucalyptus arachnaea subsp. arachnaea mid mallee woodland/low woodland				a 0.25%
	Not native vegetation (cleared, including roadway)				45.39%
	Revegetation				a 0.46%
	TOTAL EXTENT			21.63 h	1

4.1.3 VEGETATION SIGNIFICANCE

4.1.3.1 TECs and PECs

Database searches (**Section 2.2.3**) identified that the Wheatbelt Woodlands TEC and its Western Australian PEC equivalent has been indicatively mapped as occurring within the survey area. It should be noted that mapped representatives indicated in the DBCA mapping data are indicative only and may not have been ground truthed (Section 3.6.1 in TSSC 2015).

Potentially three vegetation types (**AaEIIMW** where EII – *Eucalyptus loxophleba* subsp. *loxophleba* – is dominant, **EcMW** and **EsEIEkMW**) may be representative of the Wheatbelt Woodlands TEC if they meet the minimum extent (or road reserve width), condition and tree cover thresholds as outlined in the Approved Conservation Advice (TSSC 2015).

Six occurrences were considered to occur within the survey area, indicated on the **Map 5** series, occupying 0.34 ha (1.59% of the survey area). The majority of patches of these vegetation types were not representative as they did not meet the minimum condition threshold of Good or, for the **EcMW** woodland at the northern end of the Bullaring town reserve, did not meet the extent threshold of 5 ha to be representative.

Of note, the mapped TEC representative within the town reserve (**Map 5-13**) should be considered as indicative as the vegetation condition within the entire patch (i.e. outside the survey area, which is taken into account to determine the total extent) has not been ground truthed to verify its condition or if it meets the minimum tree canopy cover.

4.1.3.2 Other Significant Vegetation

No vegetation having other significance according to the Flora and Vegetation Technical Guidance (EPA 2016a) were recorded during the field survey.

4.1.4 STATISTICAL ANALYSIS

4.1.4.1 Floristic Analysis

The floristic analysis dendrogram (Figure 3) indicates:

- vegetation types AhMW, AaEIIMW and EsEIEkMW are structurally and floristically well described units
- vegetation type EtEcEaaMMW/LW forms a moderately discrete floristic vegetation type that shows similarities to vegetation type EcMW – this is unsurprising as *Eucalyptus capillosa* (Ec) is characteristic of both units and these units were observed to intergrade (merge, with dominance of species and structure changing slowly or patchily)
- vegetation type **EoMMW** (one quadrat only) does not have sufficient representatives to form a discrete unit. Within the dendrogram it is associated with quadrats in geographic proximity.
- vegetation type **EcMW** is not adequately described by floristics alone. Potentially, additional quadrats in vegetation characterised by *Eucalyptus capillosa* would have delineated additional vegetation types, likely separating those with an understorey component from those with a largely herbaceous understorey, which may be due to differing substrates (e.g. sand over clay or sand over lateritic clay).
- vegetation type **AcLeHsMOS** is not adequately described by floristics. Additional quadrats would be required to adequately describe the shrubland vegetation, which was observed to have variation in dominant species within the Bullaring town reserve in particular, although more degraded vegetation was usually characterised by *Allocasuarina campestris* (Ac).

Column Fusion Dendrogram



Figure 3: Floristic analysis dendrogram

4.1.4.2 Adequacy of Survey

Adequacy of survey can be demonstrated using a species accumulation curve; if the curve has reached (or almost reached) an asymptote it is considered that most species are likely to have been recorded from the survey area.

A species accumulation curve was generated using quadrat data (**Figure 4**). Opportunistic observations, which increase the number of species recorded, are not included in the analysis.

The species accumulation curve suggests that the curve is flattening indicating that the majority of species present are close to having been documented. This is confirmed by the Bootstrap estimate of species richness of 184.8 which, when taking opportunistic records into account, is well under the total number of species recorded (221).



Figure 4: Species accumulation curve

4.1.5 VEGETATION CONDITION

The vegetation condition within the survey area ranged from Completely Degraded to Very Good condition, with the majority in Completely Degraded condition (**Table 10**, **Map 6** series). The main factor affecting vegetation condition was weediness, which at least in part is due to partial (or almost complete) clearing of the road reserve in the past with few species persisting or sparse regeneration of some species occurring. Fertiliser drift, favouring fast-growing introduced species, may also be a factor affecting vegetation condition.

Poor condition (i.e. Degraded-Completely Degraded condition ratings) is considered to be the most common vegetation condition within the agricultural region of Western Australia, with most road reserved being weedy and disturbed.

Vegetation condition	Extent (ha)	Proportion (%)	Proportion (%) of vegetation
Pristine	-	-	-
Excellent	-	-	-
Very Good	0.83	3.84	7.03
Good	1.06	4.91	9.00
Degraded	3.85	17.80	32.59
Completely Degraded	6.07	28.06	51.38
Not native vegetation/cleared	9.82	45.39	-

Table 10: Vegetation condition

4.1.6 BOTANICAL LIMITATIONS

Survey design and type: Single phase, quadrat-based flora and vegetation survey with targeted searches for conservation-listed flora. Results from previous surveys were considered as part of survey design and the desktop assessment.

Type of vegetation classification system: Vegetation classified at NVIS Level V (NVIS Technical Working Group & DotEE 2017) using largely structural vegetation types defined using dominant and characteristic species and vegetation structure as recorded during the field surveys. Floristic analysis was used to identify major floristic groups and outlier groups of floristic interest.

A full summary of botanical limitations is presented in **Table 11**. The survey track log (survey effort), inclusive of the fauna survey tracks, is shown on the **Map 6 series**.
Table 11: Botanical limitations

Possible limitations	Constraints (yes/no): Significant, moderate or negligible	Comment
Availability of contextual information at a regional and local scale	Negligible	No references were available for comparison that were in close proximity and detailed road reserve vegetation. However, this was considered as only a negligible constraint as broadly similar vegetation has been assessed by the botanist conducting the survey over much of the Western Australian Wheatbelt.
Competence/experience of the team conducting the survey, including experience in the bioregion surveyed	No constraints	The lead botanist conducting the field survey has over 35 years' experience undertaking flora and vegetation surveys in the Avon Wheatbelt bioregion of Western Australia.
Proportion of the flora recorded and/or collected, and any identification issues	No constraints	221 vascular flora taxa were recorded during the field survey of which 3.2% could not be identified with certainty to species level due to the lack of diagnostic reproductive material. This is considered to not represent a constraint as none were similar to any conservation-listed known from the area. None of the unidentified taxa are considered likely to represent any conservation-listed flora from the region.
Was the appropriate area fully surveyed (effort and extent)	No constraints	The survey area was appropriately surveyed to identify the significant flora and vegetation aspects within it. One vegetation type had only one floristic quadrat due to it occupying only a small extent within the survey area, with none in Good or better condition.
Access restrictions within the survey area	No constraints	The area was fully accessible for assessment.
Survey timing, rainfall, season of survey	No constraints	The field survey was conducted during November which is within the primary season for survey in the bioregion. The rainfall in the 6 months prior to the field survey was 72.89% of the mean for this period (Section 2.1.1), also indicated by the rainfall deciles (Figure 5). This does not represent a significant constraint to the survey as all expected species were identifiable.

Possible limitations	Constraints (yes/no): Significant, moderate or negligible	Comment
Disturbance that may have affected the results of the survey e.g. fire, flood, clearing	No constraints	There were no recent disturbances that would have affected the results of the survey.





The star in Figure 5 indicates the approximate location of the field survey.

4.2 VERTEBRATE FAUNA SURVEY

The fauna survey was conducted by Lyn Atkins (Principal Ecologist) during 7-10 November 2023.

The survey was conducted in accordance with the requirements for a Basic survey as outlined in the Fauna Technical Guidance (EPA 2020).

The survey area was traversed on foot or by slow driving traverses along adjacent firebreaks or along the road, with all habitats were assessed for quality and capability of supporting both locally common and significant fauna species.

4.2.1 FAUNA HABITAT

Three fauna habitat types were recorded within the survey area (Table 12):

- Shrubland
- Tall Shrubland
- Woodland.

Areas without native vegetation was not considered to constitute a fauna habitat type.

The quality of each habitat type was based on the field surveyor's experience and takes into consideration the level of disturbance to habitats from weeds, the amount of native vegetation, vegetation cover (density) and the context of the habitat with the surrounding landscape.

Table 12: Fauna habitat types

Habitat type	Description	Photograph
Shrubland	 Shrubland: low height, high diversity of plant species. The Shrubland habitat is of low height, generally <2 m high, with areas of dense cover near to the ground; these dense shrubs provide shelter and nest sites for smaller birds. The Shrubland generally has a higher diversity of plant species and therefore has a range of food sources that could vary throughout the seasons, including flowers, seeds and insects. The soil of this habitat type is generally hard and frequently shallow, overlying laterite or clay, and mostly not suited to burrowing animals, although shallow burrows may be possible. This habitat type is well suited to smaller birds including honeyeaters and insectivores, but less suited to larger species due to the lack of trees suited as perches or nest sites. Ground-feeding granivore birds (e.g. parrots, pigeons) may forage seasonally. It is not considered suitable to support any conservation-listed birds, at least within the road reserve section that constitutes the survey area. Small mammals may inhabit the Shrubland habitat, with larger mammals including kangaroos foraging on occasion. Reptiles may also inhabit the Shrubland habitat, although there are few logs that suit lizards and only shallow burrows are possible for burrowing species. Extent: 1.44 ha; 6.68% 	

Habitat type Description	Photograph
Tall shrubland: vegetation with ground stratum and taller plants (mallee Eucalypts or Rock Oak).The Tall Shrubland habitat is characterised by having a taller plant layer (Rock Oak trees or mallees) over a ground layer of shrubs and/or grasses, and near-continuous canopy joining these plant strata. The taller structure provides more shelter and foraging opportunities than the lower Shrubland habitat type, but less plant species diversity and therefore less food resources. The soil is variously sandy (Sheoak areas; potentially suitable for mammals and reptiles constructing burrows) or shallow duplex soil (mallee areas).Tall ShrublandThis habitat type is suitable for small and medium-sized birds, providing shelter, food and nest sites. Of note, this habitat type is not suited to Malleefowl within the survey area as it does not occur as a larger contiguous area.Smaller mammals may traverse or intermittently forage within this habitat type but it its not suited to long-term occupation by larger species due to the lack of shelter available in most parts, largely due to the survey area being a narrow corridor only. This habitat type is unlikely to be suited to occupation by any conservation-listed species although may be used during traverses of the landscape (e.g. Chuditch during dispersal by young animals). Extent: 1.88 ha; 8.69%	<image/>

Habitat type	Description	Photograph
Woodland	Woodland: trees, frequently without lower shrubs or native groundcover. The Woodland habitat consists of tall- medium height trees with an upper canopy and ground layer of (occasionally) low shrubs or more often grasses, including native species or introduced weeds. There is generally no continuous cover between the trees and ground. The soil is most frequently hard clay loam not suited to burrowing. The Woodland habitat is suited to larger and medium-sized birds as it provides perches and nest sites; these species also frequently forage in the adjacent paddocks and are known colloquially as 'farmland species'. Smaller birds, generally insectivores (e.g. leaf gleaners) may also occur. Although theoretically possible it is unlikely that this habitat type would be significantly utilised by conservation-listed species including Carnaby's Cockatoo which, if it occurred, is likely to visit rather than be resident due to the lack of favoured foraging species. Due to the lack of shelter the Woodland habitat is largely not suited to smaller mammals. Larger mammals e.g. kangaroos would traverse or forage in the habitat type on occasion, however, would preferentially occupy nearby areas that have more continuous habitat and re removed from traffic. Reptiles are likely to be present due to fallen timber providing shelter. Extent: 8.39 ha; 38.78%	<image/>

There is no habitat suitable for waterbirds or waders.

4.2.2 FAUNA INVENTORY

Twelve vertebrate fauna species were recorded during the survey (**Table 13**). None were conservation-listed. The fauna inventory was collected opportunistically throughout the field survey, with only one specific habitat recording site in the Bullaring town reserve (northern edge).

Table	13:	Recorded	fauna	species
Tubic		Recoraca	luullu	Species

Species Common name		Observation type	
Mammals			
Macropus fuliginosus	Western Grey Kangaroo	Scat	
Birds			
Barnardius zonarius	Australian Ringneck	Sighted	
Cacatua pastinator	Western Long-billed Corella	Sighted	
Coracina novaehollandiae	Black-faced Cuckoo-shrike	Sighted	
Corvus coronoides	Australian Raven	Sighted	
Cracticus tibicen	Australian Magpie	Sighted	
Cracticus torquatus	Grey Butcherbird	Sighted	
Eolophus roseicapilla	Galah	Sighted	
Grallina cyanoleuca	Magpie-lark	Sighted	
Gymnorhina tibicen	Australian Magpie	Sighted	
Lophoictinia isura	Square-tailed Kite	Sighted	
Neophema elegans	Elegant Parrot	Sighted	

No introduced fauna species were recorded although it is likely that some (e.g. European Rabbit, Red Fox and Feral Cat) would occur.

Although none of the recorded species were conservation-listed in Western Australia, the Square-tailed Kite was an unusual recording. It was observed soaring at height near Simpson Road and Talbot Clark Road. This species is listed as a historical record in the Shire by BirdLife Western Australia (2017) and is conservation-listed in New South Wales, South Australia and Victoria (ALA 2024). According to ALA, Square-tailed Kite are solitary, widely but not densely distributed, and occupy a wide range of habitat types.

4.2.3 BLACK COCKATOO HABITAT ASSESSMENT

The survey area is within the mapped distribution of Carnaby's Cockatoo (DAWE 2022). None were recorded during the field survey.

4.2.3.1 Breeding Habitat

Black Cockatoo habitat trees were assessed according to the criteria outlined in Commonwealth guidelines (DAWE 2022), with additional information recorded using the Bamford (2016) classifications to identify the potential suitability of trees to be used for nesting based on the presence of, size and orientation of hollows (**Table 26** in **Appendix Two**).

Representative photographs of potential breeding trees are included in **Appendix Eight**; locations are shown on the **Map 7** series.

A total of 269 trees of suitable diameter to be Black Cockatoo habitat trees were recorded. The majority were Wheatbelt Wandoo (*Eucalyptus capillosa*, 138; 51.3%), Salmon Gum (*Eucalyptus salmonophloia*, 118; 43.9%), dead (unspecified species, eight, 3.0%), York Gum (*Eucalyptus loxophleba* subsp. *loxophleba*, four; 1.5%) and Gimlet (*Eucalyptus salubris*, one; 0.4%).

Nine (3.3%) of the trees were Class 3 and potentially had hollows that may be suitable for Carnaby's Cockatoo breeding, noting that none had evidence of use by Carnaby's Cockatoo or other species, and they have not been examined in detail to determine if the broken-off stags are actually hollow on the inside and have a chamber suitable for use. The remainder of the trees were Class 4 which had unsuitable hollows that were not of the size or orientation used by Carnaby's Cockatoo for nesting (32 trees; 11.9%) or Class 5 which did

not have hollows, but which were of sufficient diameter to potentially form hollows in the future (228 trees; 84.8%).

There is no requirement to measure the DBH of all trees (DAWE 2022), only to ensure that all trees that meet the minimum size to be potentially suitable for breeding are recorded. The size of all trees were recorded within 25 cm DBH classes (noting that Wandoo, in this case Wheatbelt Wandoo *Eucalyptus capillosa*, and Salmon Gum *Eucalyptus salmonophloia*'s minimum DBH is 30 cm compared to 50 cm for all other species) and measured where they were near to a size class change. Size classes with species and count of trees in each category are summarised in **Table 14**, which also identified those that are Class 3 (Bamford 2016).

Size class (DBH in cm)	Wheatbelt Wandoo (<i>Eucalyptus</i> <i>capillosa</i>)	Salmon Gum (Eucalyptus salmonophloia)	Dead	York Gum (Eucalyptus loxophleba subsp. loxophleba)	Gimlet (Eucalyptus salubris)
30-50	83	55			
50-75	46	41	5	4	
75-100	5 (1 x Class 3)	15 (1 x Class 3)	2 (1 Class 3)		1
100-125	3 (1 x Class 3)	6	1		
>125	1	1			

Table 14: Tree DBH class summary

4.2.3.2 Roosting Habitat

According to the Commonwealth guidelines (DAWE 2022), Black Cockatoo night roosting habitat is generally in or near riparian areas and includes tall trees, with generally the tallest used for roosting.

The survey area is not near any known roosting areas (DBCA 2018c, 2018d, 2019c).

No riparian habitat occurs within the survey area, nor nearby, although farm dams that are a potential water source occur frequently. Although there are tall trees within the survey area they are unlikely to be used for roosting due to the low amount of suitable water, lack of preferred foraging and there being more suitable roosting habitat in other areas, including Bullaring town reserve and Corrigin water reserve.

4.2.3.3 Foraging Habitat

The suitability of the survey area for breeding (additional to the specific tree survey) and as foraging habitat was assessed and mapped as per the Commonwealth (DAWE 2022) scoring tool (**Table 27** in **Appendix Two**) and Bamford (2020) foraging habitat methods (**Table 28** in **Appendix Two**).

Three fauna habitat types were identified from the survey area. The relevant aspects of these for Carnaby's Cockatoo foraging are:

- Shrubland: Tamma (*Allocasuarina*) over various shrubs including some shrubby *Banksia* spp. (<10% cover)
- Tall Shrubland: Mallee over *Melaleuca* shrubs or Sheoak over shrubs including some Proteaceous species (*Banksia*, *Grevillea*; <10% cover)
- Woodland: Eucalypt trees (small-fruited species) over low shrubs or grasses.

The total extent of suitable foraging habitat within the survey area is 11.71 ha, with the habitat quality scores as below tabulated using the Commonwealth (DAWE 2022) guidelines' example. Foraging habitat quality for the Black Cockatoo species likely to occur was assessed and scored as detailed in **Table 15**. Final scores of 5-10 indicate 'high quality native foraging habitat' and 0-4 indicate 'lower quality native foraging habitat'.

According to the DAWE (2022) calculator none of the Shrubland or Tall Shrubland habitat is considered as foraging habitat as these habitat types are not a native shrubland dominated by proteaceous species or a woodland containing foraging species and therefore do not qualify for a starting score.

Table 15: Foraging habitat scoring tool	I (DAWE 2022) – Woodland habitat
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Habitat Summary for Carnaby's Cockatoo Foraging Habitat	Score
Starting Score:	
 10 if the site is >1 ha in extent, is within the usual range of the species, and is: native shrubland, kwongan heathland or woodland dominated by proteaceous species native woodland or forest containing foraging species, including roadsides, parkland cleared areas and planted native vegetation. 	+10 (Bullaring townsite and road reserves contiguous with bushland)
Context adjustor (subtractions):	
No evidence of foraging	-2
More than 12 km from breeding habitat	-2
More than 20 km from known night roosting habitat	-1
FINAL SCORE	5

According to the DAWE (2022) calculator the Woodland habitat scores 5 of a possible 10, which indicates the lower end of the 'high quality native foraging habitat'. However, the Eucalypts are small-fruited species that are not favoured for foraging and there are virtually no preferred Proteaceous foraging species within the habitat type. Therefore, this score is considered optimistic and the habitat type is more likely to represent 'lower quality foraging habitat'.

The Bamford (2020) foraging value tool (**Table 28** in **Appendix Two**) has been applied to each of the habitat types within the survey area (**Table 16-Table 18**).

Score	Carnaby's Cockatoo	Score
Site condition	Proteaceous species <10% projected cover	2
Site context	No local breeding	0
Species density/stocking rate	Species not regularly reported and no foraging evidence	0
TOTAL SCORE		2

Table 16: Car	maby's Cockatoo fo	oraging value – Shru	u bland habitat (Bamfor	d Consulting Ecologists 2020)
			abiana nabitat (Bannor	

The Shrubland habitat scores 2 of a possible total of 10 (**Table 16**). This represents potentially low value foraging habitat.

Table 17: Carnaby's Cockatoo foraging value – Tall Shrubland H	labitat (Bamford Consulting Ecologists 2020)
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Score	Carnaby's Cockatoo	Score
Site condition	Mallee of small small-fruited (or not preferred species); proteaceous species (where present) <10% cover	2
Site context	No local breeding	0
Species density/stocking rate	Species not regularly reported and no foraging evidence	0
TOTAL SCORE		2

The Tall Shrubland habitat scores 2 of a possible total of 10 (**Table 17**). This represents potentially low value foraging habitat. This score may be slightly pessimistic as the mallees include larger-fruited species which is not taken into consideration in the available descriptions, however, none of the descriptors of any of the other starting scores are applicable. As a consequence, it is possible that '3' is the appropriate starting score, however, this is still regarded as representing low quality foraging habitat.

-	·	-
Score	Carnaby's Cockatoo	Score
Site condition	Woodland of small-fruited species	2
Site context	No local breeding	0
Species density/stocking rate	Species not regularly reported and no foraging evidence	0
TOTAL SCORE		2

 Table 18: Carnaby's Cockatoo foraging value – Woodland Habitat (Bamford Consulting Ecologists 2020)

The Woodland habitat scores 2 of a possible total of 10 (**Table 18**). This represents potentially low value foraging habitat.

Overall, the survey area is considered to represent low quality foraging habitat for Carnaby's Cockatoo.

4.2.4 FAUNA SURVEY LIMITATIONS

Table 19: Fauna survey limitations

Possible limitations	Constraints (yes/no): Significant, moderate or negligible	Comment
Availability of data and information	Negligible constraints	No references were available for comparison that were in close proximity and detailed road reserves. However, this was considered as only a negligible constraint as broadly similar habitats have been assessed by the surveyor over much of the Western Australian Wheatbelt.
Competency/experience of the survey team, including bioregion experience	No constraints	The surveyor has over 30 years conducting biological assessments in the Wheatbelt region of Western Australia.
Scope of survey e.g. excluded fauna groups	No constraints	The assessment was for terrestrial vertebrate fauna.
Timing, weather, season	No constraints	The survey was conducted during November in warm and fine weather. The timing of the survey area was suitable to identify fauna species that were present on during the survey.
Disturbances that may have affected results	No constraints	There were no recent disturbances affecting the survey area that may have influenced the results.
Proportion of fauna identified, recorded, or collected	No constraints	No fauna were collected. All observed species were confidently identified.
Adequacy of survey intensity and proportion of survey achieved	No constraints	The survey intensity was adequate to describe the fauna and habitat present. The survey track log (survey effort), inclusive of the fauna survey tracks, is shown on the Map 6 series .
Access	No constraints	The survey area was fully accessible.
Data and analysis issues including sampling biases	No constraints	No data analysis is required for a Basic fauna survey which is primarily to describe the habitat available and assess suitability for conservation-listed fauna to occur.

5 DISCUSSION

The biological survey utilised a vegetated area approximately 6 m from the road edge, on both sides of the road. This width was manually digitised and chosen to permit sufficient additional area for the Shire to be flexible in regard to where road widening activities occur, noting that it is likely that less than half of the surveyed area and on one side of the road only will be utilised for road widening.

5.1 FLORA SIGNIFICANCE

A total of 221 vascular flora species were recorded from 20 floristic quadrats and opportunistic observations, including during searches for conservation-listed flora. Less than one fifth of the total flora inventory (38 species; 17.2%) were introduced species, however, this underrepresents the weediness of the survey area and, rather, reflects the overall diversity of the native flora particularly in the Bullaring town reserve.

5.1.1 FLORA SIGNIFICANCE

5.1.1.1 Conservation-listed Flora

Threatened Flora

No Threatened Flora species listed for protection under the Commonwealth EPBC Act or Western Australian BC Act were recorded. None of the unidentified taxa resemble any currently described TF.

Priority Flora

Three PF species were recorded (Map 5 series).

Phebalium drummondii (P3) was recorded in the Bullaring town reserve; it is 5 km from the nearest record from the DBCA data thus represents a new population. It was identified from collected material within a floristic quadrat so the number of individuals within the survey area is undefined. However, it is likely to occur at least within the same vegetation type (Wheatbelt Wandoo woodland; vegetation type **EcMW**) within this reserve, including the patch to the north, but is unlikely to occur elsewhere within the survey area. Removal of a small number of individuals is unlikely to significantly affect the local population as the survey area is only on the extreme eastern edge of the vegetation types, and unlikely to affect the regional population as the species has a wide distribution over four bioregions.

Synaphea drummondii (P3) was recorded in the Bullaring town reserve and contiguous road reserve to the north; it is 18 km from the nearest previous record thus represents a new population and a very minor range extension to the north-west. Only four individuals were recorded from the three collection locations, however, this species is morphologically similar to *Synaphea interioris* that was the most common species of this genus occurring in the same area, thus more individuals may occur. It is unlikely to occur elsewhere within the survey area. Removal of a small number of individuals is unlikely to significantly affect the local population as it most likely occurs more widely within the Bullaring town reserve, and unlikely to affect the regional population as the species has a wide distribution over three bioregions.

Calothamnus brevifolius (P4) was recorded from two areas representing two populations. All occurred in very weedy and degraded parts of the survey area. A single plant was recorded from approximately 650 m south of Sixty Eight gate Road, on the western road reserve, representing a new population. Eight plants, five of them just outside the survey area (to the east), near Talbot Clark Road. All were on the eastern road reserve; these are considered to represent a known population as there is a DBCA record in close proximity. Removal of a small number of individuals may significantly affect the local population as it is unlikely that many, if any, additional plants occur elsewhere in close proximity, but is unlikely to affect the regional population as the species has a wide distribution over four bioregions.

None of the unidentified taxa resemble any currently described PF taxa.

5.1.1.2 Post-survey Likelihood Assessment

The likelihood of conservation significant flora occurring in the survey area was revised following the field survey. This revised likelihood, that took into account vegetation condition, disturbance, actual habitat availability and search effort, is included in **Table 31** in **Appendix Four**.

One conservation-listed flora species had previously been recorded from approximately 1 km from the survey area, within the Bullaring town reserve. Aside from the recorded species above, this was the only species considered Likely to occur at desktop assessment stage, and is discussed below.

Grevillea scapigera (TF – EPBC-listed EN, BC-listed CR)

Grevillea scapigera is a low, suckering, prostrate shrub to 0.4 m high and up to 1.8 m wide with white flowers in either February or October-November, growing in sandy or gravelly lateritic soils (FloraBase; WAH 1998-2024). The nearby population is described as having been transplanted in the DBCA data thus is not naturally occurring, however, there is a record in this data from approximately 2.3 km further to the west that appears to be naturally occurring and potentially extant, noting that the now-dated *Interim Recovery Plan* (Department of Environment and Conservation 2008) indicates there are only three individuals surviving in the wild.

Whilst there is suitable habitat within the survey area, no plants were recorded. As *Grevillea scapigera* has a distinctive appearance and should have been flowering at the time of survey it is highly unlikely to have been overlooked, particularly considering that it is likely to have been subject to searches in the vicinity as result of its extreme rarity. Therefore, it has been re-evaluated as being Very Unlikely to occur within the survey area.

5.1.1.3 Other Significant Flora

Sandalwood (*Santalum spicatum*) is listed as vulnerable by the IUCN (2022), however, it has no Commonwealth or Western Australian conservation status. 'Taking' of Sandalwood requires a specific licence under the *Biodiversity Conservation Regulations 2018* and it is understood that this species is being considered for conservation listing. Three individuals were recorded from within the survey area, and an additional large specimen was observed just outside the survey area but within the road reserve.

No species having any other significance according to the Flora and Vegetation Technical Guidance (EPA 2016a) was recorded, nor any flora of taxonomic interest.

5.1.1.4 Introduced Flora

Thirty-eight introduced species were recorded during the field survey. None were considered as significant (none were Declared Pest plants or WoNS species) and all occur commonly within the survey area.

Weed density was variable within the survey area, ranging from almost none (e.g. Bullaring town reserve) to 100% cover in some parts.

5.1.1.5 Local and Regional Significance of Flora

Aside from the conservation-listed species recorded during the survey, none of the other recorded flora species are considered to have any particular local or regional significance as all (including *Santalum spicatum*) occur commonly throughout the local area and most have a wide regional distribution.

5.2 VEGETATION SIGNIFICANCE

Seven vegetation types and three mosaics of these were recorded from the survey area:

- **AaEIIMW**: *Acacia acuminata* and *Eucalyptus loxophleba* subsp. *loxophleba* mid woodland (0.89 ha, 4.12% of the survey area)
- AcLeHsMOS: Allocasuarina campestris, Leptospermopsis erubescens and Hakea scoparia mid open shrubland (1.11 ha, 5.15%)
- AhMW: Allocasuarina huegeliana mid woodland (0.54 ha, 2.50%)
- EcMW: Eucalyptus capillosa mid woodland (2.95 ha, 13.66%)
- **EoMMW**: *Eucalyptus orthostemon* mid mallee woodland (0.33 ha, 1.54%)

- EsEIEkMW: Eucalyptus salmonophloia, Eucalyptus longicornis and Eucalyptus kondininensis mid woodland (3.14 ha, 14.52%)
- EtEcEaaMMW/LW: Eucalyptus tenera, Eucalyptus capillosa and Eucalyptus arachnaea subsp. arachnaea mid mallee woodland/low woodland (1.34 ha, 6.19%)
- EcMW / EsEIEkMW: Mosaic of *Eucalyptus capillosa* mid woodland AND *Eucalyptus salmonophloia*, *Eucalyptus longicornis* and *Eucalyptus kondininensis* mid woodland (0.81 ha, 3.75%)
- EcMW / EtEcEaaMMW/LW: Mosaic of *Eucalyptus capillosa* mid woodland AND *Eucalyptus tenera*, *Eucalyptus capillosa* and *Eucalyptus arachnaea* subsp. *arachnaea* mid mallee woodland/low *woodland* (0.54 ha, 2.49%)
- EsEIEkMW / EtEcEaaMMW/LW: Mosaic of Eucalyptus salmonophloia, Eucalyptus longicornis and Eucalyptus kondininensis mid woodland AND Eucalyptus tenera, Eucalyptus capillosa and Eucalyptus arachnaea subsp. arachnaea mid mallee woodland/low woodland (0.05 ha, 0.25%).

Similar woodland and mallee vegetation has been observed to occur commonly throughout the local area and, broadly, more regionally throughout the Wheatbelt.

Shrubland vegetation, in this case described by vegetation type **AcLeHsMOS**, is more variable and may be more locally floristically unique.

5.2.1 ASSESSMENT AGAINST THE WHEATBELT WOODLANDS TEC CRITERIA

The survey area intersects 17 indicatively mapped and intersecting occurrences of the EPBC-listed critically endangered Wheatbelt Woodlands TEC or their 200 m buffers (DBCA data).

The field survey identified six representatives of the TEC within the survey area where the patch met the following requirements according to the Approved Conservation Advice (TSSC 2015):

- the vegetation was a Eucalypt woodland dominated by listed species (Table 2 in TSSC 2015) and the tree canopy cover is over 10%
- the vegetation condition was Good (or better) according to the Keighery (1994) condition scale, which is the equivalent of the scale outlined in the Flora and Vegetation Technical Guidance (EPA 2016a) and used during the survey
- for road reserves, the vegetated width is more than 5 m
- for remnant bushland, the woodland extent is more than 5 ha if in Good condition or more than 2 ha if in Very Good or better condition, taking into consideration contiguous bushland.

Two road reserve representatives identified during the field survey are not within existing indicatively mapped representatives (the most northern occurrences, indicated on **Map 5-2**). These are considered as Category B representatives.

Another three road reserve occurrences (**Map 5-9**) were in Good condition; these were located within an indicatively mapped occurrence and the buffers of an overlapping occurrence. They are considered to be Category B (eastern road reserve; two occurrences) and Category D (western road reserve).

The Bullaring town reserve is largely within a mapped indicative occurrence of the Wheatbelt Woodlands TEC; in addition, further intersecting mapped indicative occurrences overlap inside the larger occurrence (**Map 3**).

The recoded occurrence within the Bullaring town reserve (**Map 5-13**) is considered as indicative and is included in the data under the precautionary principle. The total area of woodland within the town reserve has not been surveyed and its vegetation condition is not well understood outside of the survey area, nor has the tree density been evaluated, or the woodland extent been accurately mapped. Assuming that the vegetation condition, tree canopy cover and weed cover remain consistent throughout (i.e. similar to as near the roadside) this indicative occurrence would likely to be considered as a Category C representative.

5.2.2 PRIORITY ECOLOGICAL COMMUNITIES

Aside from the PEC equivalence of the Wheatbelt Woodlands TEC, no other PECs are known to occur near the survey area. No vegetation similar to any currently described PEC was observed within the survey area.

5.2.3 LOCAL AND REGIONAL SIGNIFICANCE OF VEGETATION

None of the woodland or mallee vegetation types within the survey area are considered to have any local or regional significance except where they are representative of the Wheatbelt Woodlands TEC (see above) or within the Bullaring town reserve (see below).

The vegetation within the Bullaring town reserve is significant as a representative of relatively intact vegetation within a largely cleared and, for remaining native vegetation, disturbed and degraded area within the Wheatbelt region. As estimated from the 2018 Statewide Vegetation Statistics (DBCA 2019a), 91.41% of the Shire of Corrigin has been cleared, thus any vegetation in Good or better condition should be considered to be at least locally significant.

5.2.4 VEGETATION CONDITION

The vegetation ranged from Completely Degraded to Very Good condition with the majority (51.38% of the vegetated extent) in Completely Degraded condition. Degraded-Completely Degraded condition vegetation, which accounted for 83.97% of the total vegetated extent (i.e. not including the roadway or areas completely devoid of native vegetation), is generally not considered to represent extant native vegetation.

5.3 FAUNA SIGNIFICANCE

5.3.1 FAUNA HABITAT TYPES

Three fauna habitat types were recorded during the field survey (Section 4.2.1):

- Shrubland (1.44 ha)
- Tall Shrubland (1.88 ha)
- Woodland (8.39 ha).

All of the habitat types are commonly encountered within the local area and more regionally. None are considered suitable to support conservation-listed fauna species. Utilisation of these habitat types by fauna species is likely to be low as, for the majority, the survey area consists of road reserve not connected to larger areas of bushland and interspersed with sections devoid of native vegetation. The portion of the survey area through Bullaring town reserve has greater probability of fauna utilising the habitat as it is part of a larger and more diverse area.

Disturbed road reserves without native vegetation are not considered to represent fauna habitat, although fauna species are likely to occur within them.

5.3.2 FAUNA INVENTORY

Twelve vertebrate fauna species were recorded during the field survey (**Section 4.2.2**). None are conservation-listed and, excluding the Square-tailed Kite, all occur commonly within the local area and more regionally. Additional introduced species (Feral Cat, Red Fox, European Rabbit) are likely to occur but were not recorded during the field survey.

The Square-tailed Kite is listed as a historical record in the Shire by BirdLife Western Australia (2017) and is conservation-listed in New South Wales, South Australia and Victoria, but not in Western Australia or under Commonwealth legislation (ALA 2024). According to ALA, Square-tailed Kite are solitary, widely but not densely distributed, and occupy a wide range of habitat types. There is no particular significance to be attributed to this occurrence.

The species count is considered to be low for the extent surveyed and likely reflects the fragmented nature of the landscape with the road reserve being also fragmented (broken) by sections devoid of native vegetation and therefore not serving as a linkage between larger bushland areas.

5.3.3 RECORDED CONSERVATION-LISTED FAUNA SPECIES

No conservation-listed fauna were recorded during the field survey.

5.3.3.1 Post-survey Likelihood Assessment

The post-survey likelihood assessment is incorporated into Table 32 in Appendix Four.

Conservation-listed fauna species identified during the desktop assessment as having a High ('Likely') or Medium ('May occur') likelihood of occurring that were not recorded during the field survey are discussed below with respect to each species' habitat requirements, taking into consideration the findings of the field survey and survey effort.

High Likelihood Species ('Likely' to occur)

Falco peregrinus (Peregrine Falcon) –DBCA status: OS

The Peregrine Falcon occupies a wide range of habitats throughout Australia, although it prefers to nest in coastal or inland areas with cliffs or woodlands with fresh water. It requires abundant prey, feeding on small and medium-sized vertebrates (Australian Museum 2019).

There are 23 records of this species from within the DBCA database search buffer, including a recent (from 2001) from less than 3.5 km from the survey area. Tall trees suitable for breeding occur within the survey area and adjacent bushland, however, there is unlikely to be abundant prey present and as such the survey area is unlikely to be used for breeding. As a wide-ranging species, Peregrine Falcon May occur within the survey area on occasion during landscape traverses, however, is unlikely to breed in the survey area and would not be dependent on any resources available within it.

Leipoa ocellata (Malleefowl) - EPBC status; EPBC- and BC Act status: VU

The Malleefowl is a medium-sized mound-building bird occurring in semi-arid to arid shrublands and woodlands, generally characterised by mallee Eucalypts, throughout much of southern mainland Australia (Benshemesh 2007). Breeding habitat is understood to require a generally sandy substrate and an abundance of leaf-litter (*ibid*.). Sandy substrate does occur within the survey area (in areas mapped as vegetation type **AhMW** which is included in the Tall Shrubland habitat type) but all areas are weedy, most are narrow road reserves and there is little leaf litter present. Mallee woodlands also occur (vegetation type **EtEcEaaMMW/LW** which is included in the Tall Shrubland habitat type), however, most have little leaf litter and occupy narrow road reserves. Therefore, the majority of the survey area is considered to be unsuitable for breeding, although the Bullaring town reserve may be suitable in areas away from the road reserve (i.e. outside the survey area) where leaf litter is more likely to be present.

The DBCA data indicates 90 records of Malleefowl from within the database search buffer, however, there are no recent records (since 2000) from within 35 km of the survey area. As the survey area is not suitable for breeding, Malleefowl May occur on occasion during landscape traverses or during dispersal of young. They would not be dependent on any resources within the survey area.

Medium Likelihood Species ('May occur')

Dasyurus geoffroii (Chuditch, Western Quoll) - EPBC- and BC Act status: VU

Chuditch is the largest extant carnivorous marsupial in Western Australia and is an important keystone species for the ecosystems it inhabits. It is now restricted to forests and woodlands in the south-western corner of Western Australia where it forages nocturnally for small mammals, birds and invertebrates and shelters during the day in hollow logs or burrows (DCCEEW 2024b). The Chuditch occupies only 5% of its former distribution (Department of Environment and Conservation 2012).

There is only one recent record of this species occurring within the DBCA data (from 2009), located approximately 51 km north of the survey area although there are additional closer records that are older. As a nocturnal species it is unlikely to be frequently sighted thus may still exist within the survey area vicinity, although there was little suitable denning habitat observed within the survey area itself.

The post-survey likelihood of this species occurring within the survey area remains as medium ('May occur'), although only during landscape traversals or dispersal of young. As there is little denning (breeding) habitat

and there are unlikely to be significant food sources within the survey area and adjacent bushland, if Chuditch does occur it would be only as a transient visitor and it would not be dependent on the survey area for any resources.

Phascogale calura (Red-tailed Phascogale, Kenngoor)

The Red-tailed Phascogale is a small, arboreal carnivorous mammal with a bushy tail; males grow to 12.2 cm in length, plus tail of up to 14.5 cm, and females grow to 10.5 cm long (plus tail). It is confined to old-growth woodlands with hollow-forming Eucalypts, primarily Wandoo (*Eucalyptus wandoo*) and York Gum (*Eucalyptus loxophleba*), frequently with Rock Sheoak (*Allocasuarina huegeliana*) (TSSC 2016), and riparian areas with Swamp Oak (*Casuarina obesa*) interspersed with largely dead Eucalypts and various other vegetation types that provide dense cover (Short, Hide & Stone 2011). Females are considered to require a home range of 20-40 ha (*ibid*.).

Suitable habitat occurs within the survey area as both Wandoo (in this case *Eucalyptus capillosa*, which is morphologically almost identical to *Eucalyptus wandoo*) and Rock Sheoak (*Allocasuarina huegeliana*) occur. However, Red-tailed Phascogales are unlikely to inhabit road reserve vegetation due to the small contiguous extent of suitable native vegetation. They are therefore unlikely to occur over the majority of the survey area on this basis although sufficient suitable habitat may occur within the Bullaring town reserve. However, as there is only one recent (within the last 25 years) record from within 20 km of the survey area and they have therefore been re-evaluated as being Unlikely to occur.

Zanda latirostris (Carnaby's Cockatoo) -EPBC- and BC Act status: EN

Carnaby's Cockatoo are large cockatoos that forage over a large area, feed on a variety of resources and require large trees with suitable hollows for nesting. They have been documented as foraging in areas up to 12 km from their nest sites during the breeding season and 20 km or more from their roosting sites during the non-breeding season. They require a source of fresh water usually within 2 km of their roost sites (DAWE 2022). They are adaptable in terms of utilising a number of food sources, including native and non-native sources, that aid their survival, however, they are considered dependent on resources available in bushland, including remnant bushland across the agricultural region that forms part of their distribution.

There is a recent (from 2000) reported Carnaby's Cockatoo nest approximately 21.5 km to the south southeast. However, all other records of Carnaby's Cockatoo from the DBCA database search (27 as '*Zanda latirostris*' and 10 as '*Zanda* sp. 'white-tailed black cockatoo'') are from more than 17.7 km from the survey area, which is greater than the distance documented for flights during the breeding season (DAWE 2022). DBCA (2018a) data indicates that the survey area is approximately 10 km from known Carnaby's Cockatoo breeding areas, however, this data has been buffered by 12 km (Glossop et al. 2011) thus the actual known breeding range is more than the documented flight distance during the breeding season (DAWE 2022).

Nine trees (of a total of 269) were assessed as being potentially suitable for breeding i.e. they were Class 3 according to the Bamford (2016) scale, indicating that they had hollows that may be of sufficient size and suitable orientation. None had visible chew marks, and they were not investigated to determine if the stags were hollow or not, or if the chamber within was suitably sized for Carnaby's Cockatoo breeding.

As there are no records of Carnaby's Cockatoo from within the usual range of daily flight during breeding season (i.e. within 12 km) it is unlikely that the survey area would be used for breeding.

The Bamford (2020) foraging value score of all three fauna habitat types identified the survey area as being of low value for foraging. As such, it is unlikely that Carnaby's Cockatoo would depend on any resources within the survey area and, although they May occur (i.e. have a medium likelihood of occurring) it is unlikely to be for breeding or foraging and only likely as an overfly or temporary roost during landscape traverses.

6 CONCLUSIONS

The desktop and field assessment identified the following significant features pertinent to the survey area and assessment process:

- the survey area does not intersect with nor is adjacent to any ESAs or conservation lands, nor are any sufficiently close to be affected by works at the site
- two pre-European vegetation associations intersect the survey area:
 - Association 955 Mosaic: Shrublands; scrub-heath (South East Avon) / Shrublands; Allocasuarina campestris thicket, intersects 11.49% of the survey area; it has between 13.51% of its original extent remaining at IBRA sub-region scale and 9.76% at local government area scale
 - Association 1023 Medium woodland; York gum, wandoo & salmon gum (Eucalyptus salmonophloia) intersects 88.51% of the survey area and has between 12.32% of its original extent remaining at IBRA sub-region scale and 7.59% remaining at local government area scale
- the survey area intersects 17 indicatively mapped and overlapping representatives (or their buffers) of the Wheatbelt Woodlands TEC. The field survey identified six representatives of the TEC that met the criteria outlined in the Approved Conservation Advice (TSSC 2015) for the community. Two of these representatives are not within indicatively mapped occurrences outlined in the DBCA database data; both are road reserve patches. Three representatives are within previously mapped occurrences; all are road reserve patches. The remaining representative is considered to be an indicative occurrence; it is located within the Bullaring town reserve but contiguous vegetation has not been assessed in detail thus its indicative status; it occurs within an indicative representative identified in the DBCA data.
- no TF have been identified as occurring within the survey area either historically or currently i.e. none were recorded during the field survey, and none are considered likely to occur
- three PF species were recorded:
 - o Phebalium drummondii (P3), recorded from the Bullaring town reserve
 - o *Synaphea drummondii* (P3); three records (potentially two populations) from Bullaring town reserve and road reserve to the north
 - o Calothamnus brevifolius (P4); two populations in degraded road reserves
- no other PF are considered likely to occur
 - o three fauna habitat types were identified: Shrubland (1.44 ha), Tall Shrubland consisting of Rock Oak and Eucalypt mallees (1.88 ha), Woodland (8.39 ha)
- 12 vertebrate fauna species were recorded during the field survey
- no Threatened or Priority-listed Fauna have been recorded from within the survey area either historically
 (as identified by the DBCA database search) or during the field survey. None are considered likely to occur
 although *Falco peregrinus* (Peregrine Falcon; DBCA OS) and *Leipoa ocellata* (Malleefowl; EPBC and BC
 Acts VU) may occur on occasion but only during landscape traverses and neither would breed within the
 survey area nor be dependent on any resources within it.
- the survey area is within the mapped distribution of Carnaby's Cockatoo and there is a known Carnaby's Cockatoo breeding site located approximately 22 km to the south-east. The survey area is approximately 10 km north-east of the buffer edges of a known Carnaby's Cockatoo breeding area, noting that the buffer is 12 km (Glossop et al. 2011).
- 269 trees of suitable size and species to be potentially used for Carnaby's Cockatoo for breeding were
 recorded. Nine potentially had hollows of suitable size and orientation; these were without chew marks to
 indicate that it is has been used for breeding and were not investigated in detail to determine if the hollow
 was of suitable depth and width for breeding. It was considered unlikely to be used for breeding due to lack
 of suitable foraging nearby and distance from known breeding areas.
- the survey area was poor quality foraging habitat for Carnaby's Cockatoo.

In conclusion, the significant features of the survey area that may affect the environmental approvals process were:

- that the survey area has been largely cleared and there is <10% of the pre-European vegetation associations intersecting the survey area remaining at local government scale
- representatives of the Wheatbelt Woodlands TEC (six)
- three PF species
- nine Class 3 potential Black Cockatoo habitat trees that may have hollows suitable for breeding, although Carnaby's Cockatoo are unlikely to utilise these due to lack of suitable food sources nearby.

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MAPS



LEGE	END				
-	Survey Area				
Soil L	Soil Land Systems				
	259Cb_1: Non-saline broad valley floors and alluvial plains. Grey shallow sandy and loamy duplex soils, usually with alkaline subsoils, and yellow/brown sandy duplex soils. Salmon Gum-Wandoo woodland, Mallee scrub and samphire flats				
	259Cb_2: Broad valley floors and alluvial plains with significant areas of saline wet soils (30-40%) as well as alkaline grey shallow sandy duplex soils and grey deep sandy duplex soils				
	259Cb_3: Saline broad alluvial plains. Mainly saline wet soils with small areas of alkaline grey shallow sandy, and less commonly loamy, duplex soils and hard cracking clays				
	259Co_1: Subdued, moderately indurated lateritic crests and ridges, shallow gravel and loamy gravel. Extensive colluvial backslopes with duplex sandy gravel, loamy gravel, reticulite deep sandy duplex, yellow sandy earths. Heath vegetation				
	259Co_1s: Gravelly pale deep sands in vales and on midslopes where sandy colluvial surface wash can accumulate, often on granites and gniesses associated with fracture zones. Ti-tree dominates vegetation				
	259Co_3d: Red and brown clays and loams, usually calcareous, associated with dolerite dykes and vegetated by York Gum/Jam woodlands				
	259Co_3g: Coarse gritty sands and sandy duplexes associated with rock outcrops and vegetated by York Gum/Jam and Wandoo woodlands, with areas of Allocasuarina woodland				
	259Co_3u: Colluvial and residual mantle, gently undulating slopes, with acid to neutral duplexes under mallee on upper to mid slopes and Mallee, Gimlet and Salmon Gum vegetation on neutral to alkaline duplexes and clays in lower positions				
	259Ke_1: Gravelly hill crests and upper slopes with sandy gravels and small areas of pale deep sands and loamy gravels				
	259Ke_1s: Small areas of pale deep sands and gravelly pale deep sands with Melaleuca uncinata and Leptospermum erubescens vegetation within the lateritic landscapes of the Kweda system				
	259Ke_3d: Dolerite and diorite dykes in largely unlateritised areas of the Kweda system. Shallow and loamy gravels form on well drained rises with heath vegetation, elsewhere soils are red-brown loams, duplexes and non- cracking clays under York Gum				
	259Ke_3g: Granite outcrop and granitic soils in irregularly undulating terrain in unlateritised areas of the Kweda system. Soils comprise shallow and deep sands, sandy earths and duplexes with York Gum and Wandoo vegetation				
	259Ke_3r: Rock outcrops within irregularly undulating terrain				
	259Ke_3u: Slopes and rises on colluvium derived from granite and dolerite bedrock with grev sandy duplexes. Joamy duplexes and minor gravelly and				
	sandy soils				
	259Kk_1: Gravelly crests and slopes, at times extending down lower slopes. Deep sandy and loamy gravels, shallow gravels with minor sandy duplex soils,				
	deep sands and sandy earths. Heath and Mallee vegetation				
	259Kk_5: Variably lateritised smoothly undulating uplands with shallow gravels, deep sandy gravels, deep sands and gravelly duplex soils. Vegetated by proteaceous heath				
	ecoscape				





LEGEND

- Survey Area
- Minor Town

Conservation-listed Flora

- Threatened
- \triangle Priority 1
- \triangle Priority 2
- Priority 3 \triangle
- Priority 4

Road Hierarchy

- Primary Road
- Secondary Road
- Local Road
- Environmentally Sensitive Areas (DWER-046)
- DBCA Legislated Lands and Waters (DBCA-011)

TEC/PEC

Eucalypt woodlands of the Western Australian Wheatbelt (Priority 3) Salmon Gum Woodlands of the wheatbelt (Priority 3)

DATA SOURCES: SOURCE DATA: CONSERVATION-LISTED FLORA AND ECOLOGICAL COMMUNITIES (DBCA 2023), DBCA-LEGISLATED LANDS AND WATERS (DBCA-011) (DBCA 2022), ROAD HIERARCHY (MRWA 2023) AND TOWNS (STREETPRO 2009) BASEMAP: ESRI WORLD TOPOGRAPHIC MAP SERVICE LAYERS: WORLD TOPOGRAPHIC MAP: ESRI, HERE, GARMIN, FAO, NOAA, USGS WORLD TOPOGRAPHIC MAP: ESRI, HERE, GARMIN, USGS, NGA WORLD TOPOGRAPHIC MAP: ESRI, HERE, GARMIN, USGS, MET/MASA

ecoscape

DBCA DATABASE SEARCH RESULTS - FLORA AND COMMUNITIES

WICKEPIN-CORRIGIN ROAD WIDENING BIOLOGICAL SURVEY

SHIRE OF

1























LEGEND


































LEGEND

Survey Area



































6404400



570300



FAUNA HABITAT AND **BLACK COCKATOO TREES**

ecoscape



DATA SOURCES: SOURCE DATA: FAUNA HABITAT AND HABITAT TREES (ECOSCAPE 2024) IMAGERY: LOCATE MOSAIC (LGATE-322) (2016) BASEMAP: ESRI TOPOGRAPHIC SERVICE LAYERS: WORLD TOPOGRAPHIC MAP: ESRI, HERE, GARMIN, USGS, NGA LANDGATE LOCATE MOSAIC: LANDGATE / SLIP

LEGEND Survey Area Habitat Tree Eucalyptus capillaris 🛆 Class 4 Class 5 Fauna Habitat Shrubland Woodland N/A

APPENDIX ONE LEGISLATIVE CONTEXT, DEFINITIONS AND CRITERIA

COMMONWEALTH ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999

The EPBC Act is a legal framework to protect and manage matters of national environmental significance (MNES) including important flora, fauna, ecological communities and heritage areas listed under the Act.

Threatened taxa (flora and fauna) are protected under the EPBC Act, which lists species and ecological communities that have been assessed as meeting the criteria to be listed as Critically Endangered, Endangered, Vulnerable, Conservation Dependant, Extinct, or Extinct in the Wild, as detailed in **Table 20**.

Threatened Ecological Communities protected under the EPBC Act are categorised as Critically Endangered, Endangered or Vulnerable, also detailed in this table.

Migratory species subject to international agreements are also protected under the EPBC Act. The definition of a migratory species under the Act follows that prescribed by the Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention) (DCCEEW 2023). The list of migratory species established under section 209 of the EPBC Act comprises:

- migratory species which are native to Australia and are included in the appendices to the Bonn Convention (Convention on the Conservation of Migratory Species of Wild Animals Appendices I and II);
- migratory species included in annexes established under the Japan-Australia Migratory Bird Agreement (JAMBA) and the China-Australia Migratory Bird Agreement (CAMBA); and
- native, migratory species identified in a list established under, or an instrument made under, an international agreement approved by the Minister, such as the Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA).

Category	Threatened species	Threatened Ecological Communities
Extinct	A native species is eligible to be included in the extinct category at a particular time if, at that time, there is no reasonable doubt that the last member of the species has died.	n/a
Extinct in the wild	A native species is eligible to be included in the extinct in the wild category at a particular time if, at that time: (a) it is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; or (b) it has not been recorded in its known and/or expected habitat, at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.	n/a
Critically Endangered (CR)	A native species is eligible to be included in the <i>critically endangered</i> category at a particular time if, at that time, it is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria.	An ecological community is eligible to be included in the <i>critically endangered</i> category at a particular time if, at that time, it is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria
Endangered (EN)	A native species is eligible to be included in the <i>endangered</i> category at a particular time if, at that time: (a) it is not critically endangered; and (b) it is facing a very high risk of extinction in the wild in the near future, as determined in accordance with the prescribed criteria.	An ecological community is eligible to be included in the <i>endangered</i> category at a particular time if, at that time: (a) it is not critically endangered; and (b) it is facing a very high risk of extinction in the wild in the near future, as determined in accordance with the prescribed criteria.

Table 20: EPBC Act categories for flora, fauna and ecological communities

Category	Threatened species	Threatened Ecological Communities
Vulnerable (VU)	A native species is eligible to be included in the <i>vulnerable</i> category at a particular time if, at that time: (a) it is not critically endangered or endangered; and (b) it is facing a high risk of extinction in the wild in the medium term future, as determined in accordance with the prescribed criteria.	An ecological community is eligible to be included in the <i>vulnerable</i> category at a particular time if, at that time: (a) it is not critically endangered or endangered; and (b) it is facing a high risk of extinction in the wild in the medium term future, as determined in accordance with the prescribed criteria.
Conservation Dependent	A native species is eligible to be included in the conservation dependent category at a particular time if, at that time: (a) the species is the focus of a specific conservation program the cessation of which would result in the species becoming vulnerable, endangered or critically endangered; or (b) the following subparagraphs are satisfied: (i) the species is a species of fish; (ii) the species is the focus of a plan of management that provides for management actions necessary to stop the decline of, and support the recovery of, the species so that its chances of long-term survival in nature are maximised; (iii) the plan of management is in force under a law of the Commonwealth or of a State or Territory; (iv) cessation of the plan of management would adversely affect the conservation status of the species.	n/a

WESTERN AUSTRALIAN ENVIRONMENTAL PROTECTION ACT 1986

The Western Australian EP Act was created to provide for an Environmental Protection Authority (the EPA) that has the responsibility for:

- prevention, control and abatement of pollution and environmental harm
- conservation, preservation, protection, enhancement and management of the environment
- matters incidental to or connected with the above.

The EPA is responsible for providing the guidance and policy under which environmental assessments are conducted. It conducts environmental impact assessments (based on the information provided by the proponent), initiates measures to protect the environment and provides advice to the Minister responsible for environmental matters.

WESTERN AUSTRALIAN BIODIVERSITY CONSERVATION ACT 2016

The Western Australian BC Act provides for the conservation, protection and ecologically sustainable use of biodiversity and biodiversity components in Western Australia.

Threatened species (both flora and fauna) and ecological communities that meet the categories listed within the BC Act are protected under this legislation and require authorisation by the Minister to take or disturb. These are known as Threatened Flora, Threatened Fauna and Threatened Ecological Communities. The conservation categories of Critically Endangered, Endangered and Vulnerable are detailed in **Table 21**; these categories align with those of the EPBC Act. Some State-listed threatened species and ecological communities are provided with additional protection as they are also listed under the Commonwealth EPBC Act (see **Table 20** for conservation status category descriptions).

The most recent Western Australian flora and fauna listings were published in the Government Gazette on 06 October 2023 (Western Australian Government 2023a).

PRIORITY-LISTED FLORA AND FAUNA

Flora are listed as PF where populations are geographically restricted or threatened by local processes, or where there is insufficient information to formally assign them to TF categories. Whilst PF are not specifically listed in the BC Act, some may qualify as being of special conservation interest and thereby have a greater level of protection than unlisted species.

There are three categories covering Western Australian-listed TF and four categories covering PF species which are outlined in **Table 21**. PF for Western Australia are regularly reviewed by the DBCA whenever new information becomes available, with species status altered or removed from the list when data indicates that they no longer meet these requirements.

Conservation significant fauna species are listed by the DBCA as Priority Fauna where populations are geographically restricted or threatened by local processes, or where there is insufficient information to formally assign them to threatened fauna categories. Whilst Priority Fauna are not specifically listed in the BC Act, these have a greater level of significance than other native species. The categories covering Priority Fauna species are outlined in **Table 21**.

Flora and fauna species may be listed as being of special conservation interest if they have a naturally low population, have a restricted natural range, are subject to or recovering from a significant population decline or reduction of range or are of special interest, and the Minister considers that taking may result in depletion of the species. Migratory species and those subject to international agreement are also listed under the Act. These are known as 'specially protected species' in the BC Act.

Table 21: Conservation codes for Western Australian flora and fauna (DBCA 2020)

Conservation Codes for Western Australian Flora and Fauna

Threatened, Extinct and Specially Protected fauna or flora ¹ are species ² which have been adequately searched for and are deemed to be, in the wild, threatened, extinct or in need of special protection, and have been gazetted as such.			
The Wildlife Conservation (Specially Protected Fauna) Notice 2018 and the Wildlife Conservation (Rare Flora) Notice 2018 have been transitioned under regulations 170, 171 and 172 of the Biodiversity Conservation Regulations 2018 to be the lists of Threatened, Extinct and Specially Protected species under Part 2 of the Biodiversity Conservation Act 2016.			
Categories of	of Threatened, Extinct and Specially Protected fauna and flora are:		
	Threatened species		
т	Listed by order of the Minister as Threatened in the category of critically endangered, endangered or vulnerable under section 19(1), or is a rediscovered species to be regarded as threatened species under section 26(2) of the <i>Biodiversity Conservation Act 2016</i> (BC Act).		
	Threatened fauna is the species of fauna that are listed as critically endangered, endangered or vulnerable threatened species.		
	Threatened flora is the species of flora that are listed as critically endangered, endangered or vulnerable threatened species.		
	The assessment of the conservation status of threatened species is in accordance with the BC Act listing criteria and the requirements of Ministerial Guideline (Number 1) and Ministerial Guideline (Number 2) that adopts the use of the International Union for Conservation of Nature (IUCN) Red List of Threatened Species Categories and Criteria4, and is based on the national distribution of the species		

Conserva	tion Codes for Western Australian Flora and Fauna	
	Critically endangered species	
CR	Threatened species considered to be "facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with criteria set out in the ministerial guidelines".	
	Listed as critically endangered undersection 19(1)(a) of the BC Act in accordance with the criteria set out in section 20 and the ministerial guidelines.	
	Endangered species	
EN	Threatened species considered to be "facing a very high risk of extinction in the wild in the near future, as determined in accordance with criteria set out in the ministerial guidelines".	
	Listed as endangered under section 19(1)(b) of the BC Act in accordance with the criteria set out in section 21 and the ministerial guidelines.	
	Vulnerable species	
VU	Threatened species considered to be "facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with criteria set out in the ministerial guidelines".	
	Listed as vulnerable undersection 19(1)(c) of the BC Act in accordance with the criteria set out in section 22 and the ministerial guidelines.	
Extinct spec Listed by or	cies der of the Minister as extinct under section 23(1) of the BC Act as extinct or extinct in the wild.	
	Extinct species	
EX	Species where "there is no reasonable doubt that the last member of the species has died", and listing is otherwise in accordance with the ministerial guidelines (section 24 of the BC Act).	
	Extinct in the wild species	
EW	Species that "is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; and it has not been recorded in its known habitat or expected habitat, at appropriate seasons, anywhere in its past range, despite surveys over a time frame appropriate to its life cycle and form", and listing is otherwise in accordance with the ministerial quidelines (section 25of the BC Act).	
Specially pr	otected species	
Listed by ord categories: s species othe	er of the Minister as specially protected under section 13(1) of the BC Act. Meeting one or more of the following pecies of special conservation interest; migratory species; cetaceans; species subject to international agreement; or rwise in need of special protection.	
Species that cannot also b	are listed as threatened species (critically endangered, endangered or vulnerable) or extinct species under the BC Act be listed as Specially Protected species.	
	Migratory species	
мі	Fauna that periodically or occasionally visit Australia or an external Territory or the exclusive economic zone; or the species is subject of an international agreement that relates to the protection of migratory species and that binds the Commonwealth; and listing is otherwise in accordance with the ministerial guidelines (section 15of the BC Act).	
	Includes birds that are subject to an agreement between the government of Australia and the governments of Japan (JAMBA), China (CAMBA) and The Republic of Korea (ROKAMBA), and fauna subject to the <i>Convention on the Conservation of Migratory Species of Wild Animals</i> (Bonn Convention), an environmental treaty under the United Nations Environment Program. Migratory species listed under the BC Act are a subset of the migratory animals that are known to visit Western Australia, protected under the international agreements or treaties, excluding species that are listed as Threatened species.	
	Species of special conservation interest (conservation dependent)	
CD	Species of special conservation need that are dependent on ongoing conservation intervention to prevent it becoming eligible for listing as threatened, and listing is otherwise in accordance with the ministerial guidelines (section 14 of the BC Act)	
	Other specially protected species	
OS	Fauna otherwise in need of special protection to ensure their conservation, and listing is otherwise in accordance with the ministerial guidelines (section 18of the BC Act).	
	Priority species	
	Priority is not a listing category under the BC Act.	
Ρ	All fauna and flora are protected in WA following the provisions in Part 10 of the BC Act. The protection applies even when a species is not listed as threatened or specially protected, and regardless of land tenure (State managed land (Crown land), private land, or Commonwealth land).	
	Species that may possibly be threatened species that do not meet the criteria for listing under the BC Act because of insufficient survey or are otherwise data deficient, are added to the Priority Fauna or Priority Flora Lists under Priorities 1, 2 or 3. These three categories are ranked in order of prioritisation for survey and evaluation of conservation status so that consideration can be given to potential listing as threatened.	
	Species that are adequately known, meet criteria for near threatened, or are rare but not threatened, or that have been recently removed from the threatened species list or conservation dependent or other specially protected fauna lists for other than taxonomic reasons, are placed in Priority 4. These species require regular monitoring.	
	Assessment of priority status is based on the Western Australian distribution of the species, unless the distribution in WA is part of a contiguous population extending into adjacent States, as defined by the known spread of locations.	

Conservation	Codes for Western Australian Flora and Fauna	
	Priority 1: Poorly-known species – known from few locations, none on conservation lands	
1	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, for example, 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. These species are in urgent need of further survey.	
2	Priority 2: Poorly-known species – known from few locations, some on conservation lands	
	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, for example, 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 for threatened listing and appear to be under threat from known threatening processes. These species are in urgent need of further survey.	
3	Priority 3: Poorly-known species – known from several locations	
	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. These species need further survey.	
4	Priority 4: Rare, Near Threatened and other species in need of monitoring	
	(a) Rare. Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection but could be if present circumstances change. These species are usually represented on conservation lands.	
	(b) Near Threatened. Species that are considered to have been adequately surveyed and that are close to qualifying for vulnerable but are not listed as Conservation Dependent.	
	(c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.	
¹ The definition of flora includes algae, fungi and lichens. ² Species includes all taxa (plural of taxon - a classificatory group of any taxonomic rank e.g. a family genus, species or any infraspecific		
category i.e. subsp	ecies or variety, or a distinct population).	

THREATENED AND PRIORITY ECOLOGICAL COMMUNITIES

Western Australian TECs are protected under the BC Act and are categorised much like those of the EPBC Act. Western Australian definitions and criteria for TECs are shown in **Table 22**.

Currently described TECs are listed in the Government Gazette on 26 May 2023 (Western Australian Government 2023b).

DBCA also maintains a list of Priority Ecological Communities (PECs). PECs include potential TECs that do not meet survey criteria, or that are not adequately defined. They are not protected under legislation but are taken into consideration as part of the environmental approvals process.

Currently described PECs are listed on the DBCA website, with the most recent list dated 19 June 2023 (Species and Communities Program, DBCA 2023). Definitions and criteria for PECs are shown in **Table 22**.

Table 22: DBCA definitions and criteria for TECs and PECs (DEC 2013)

Criteria	Definition				
Threatened Ecological Communities					
	An ecological community that has been adequately searched for but for which no representative occurrences have been located. The community has been found to be totally destroyed or so extensively modified throughout its range that no occurrence of it is likely to recover its species composition and/or structure in the foreseeable future.				
Presumed Totally Destroyed (PD)	An ecological community will be listed as presumed totally destroyed if there are no recent records of the community being extant and either of the following applies (A or B):				
	 Records within the last 50 years have not been confirmed despite thorough searches of known or likely habitats or All occurrences recorded within the last 50 years have since been destroyed 				
Critically Endangered (CR)	 An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or that was originally of limited distribution and is facing severe modification or destruction throughout its range in the immediate future, or is already severely degraded throughout its range but capable of being substantially restored or rehabilitated. An ecological community will be listed as Critically Endangered when it has been adequately surveyed and is found to be facing an extremely high risk of total destruction in the immediate future. This will be determined on the basis of the best available information, by it meeting any one or more of the following criteria (A, B or C): A. The estimated geographic range, and/or total area occupied, and/or number of discrete occurrences since European settlement have been reduced by at least 90% and either or both of the following apply (i or ii): geographic range, and/or total area occupied and/or number of discrete occurrences are continuing to decline such that total destruction of the community is imminent (within approximately 10 years); modification throughout its range is continuing such that in the immediate future (within approximately 10 years) the community is unlikely to be capable of being substantially rehabilitated. B. Current distribution is limited, and one or more of the following apply (i, ii or iii): geographic range and/or number of discrete occurrences, and/or area occupied is highly restricted and the community is currently subject to known threatening processes which are likely to result in total destruction throughout its range in the immediate future (within approximately 10 years); there are very few occurrences, each of which is small and/or isolated and extremely vulnerable to known threatening processes: 				
	 extremely vulnerable to known threatening processes; iii. there may be many occurrences but total area is very small and each occurrence is small and/or isolated and extremely vulnerable to known threatening processes. C. The ecological community exists only as highly modified occurrences that may be capable of being rehabilitated if such work begins in the immediate future (within approximately 10 years). 				
Endangered (EN)	 An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or was originally of limited distribution and is in danger of significant modification throughout its range or severe modification or destruction over most of its range in the near future. An ecological community will be listed as Endangered when it has been adequately surveyed and is not Critically Endangered but is facing a very high risk of total destruction in the near future. This will be determined on the basis of the best available information by it meeting any one or more of the following criteria (A, B, or C): A. The geographic range, and/or total area occupied, and/or number of discrete occurrences have been reduced by at least 70% since European settlement and either or both of the following apply (i or ii): i. the estimated geographic range, and/or total area occupied and/or number of discrete occurrences are continuing to decline such that total destruction of the community is likely in the short term future (within approximately 20 years); ii. modification throughout its range is continuing such that in the short term future (within approximately and/or number of discrete occurrences, and/or number of thure (within approximately 20 years) the community is unlikely to be capable of being substantially restored or rehabilitated. B. Current distribution is limited, and one or more of the following apply (i, ii or iii): i. geographic range and/or number of discrete occurrences, and/or area occupied is highly restricted and the community is currently subject to known threatening processes which are likely to result in total destruction throughout its range in the short term future (within approximately 20 years);				
Criteria	Definition				
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	An ecological community that has been adequately surveyed and is found to be declining and/or has declined in distribution and/or condition and whose ultimate security has not yet been assured and/or a community that is still widespread but is believed likely to move into a category of higher threat in the near future if threatening processes continue or begin operating throughout its range.				
Vulnerable (VU)	An ecological community will be listed as Vulnerable when it has been adequately surveyed and is not Critically Endangered or Endangered but is facing a high risk of total destruction or significant modification in the medium to long-term future. This will be determined on the basis of the best available information by it meeting any one or more of the following criteria (A, B or C):				
	 A. The ecological community exists largely as modified occurrences that are likely to be capable of being substantially restored or rehabilitated. B. The ecological community may already be modified and would be vulnerable to threatening processes, is restricted in area and/or range and/or is only found at a few locations. C. The ecological community may be still widespread but is believed likely to move into a category of higher threat in the medium to long term future because of existing or impending threatening processes. 				
Priority ecological communities					
Friendy ecological communities	Poorly known ecological communities				
Priority One	Ecological communities with apparently few, small occurrences, all or most not actively managed for conservation (e.g. within agricultural or pastoral lands, urban areas, active mineral leases) and for which current threats exist. Communities may be included if they are comparatively well-known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under immediate threat from known threatening processes across their range.				
	Poorly known ecological communities				
Priority Two	Communities that are known from few small occurrences, all or most of which are actively managed for conservation (e.g. within national parks, conservation parks, nature reserves, state forest, unallocated Crown land, water reserves, etc.) and not under imminent threat of destruction or degradation. Communities may be included if they are comparatively well known from one or more localities, but do not meet adequacy of survey requirements, and / or are not well defined, and appear to be under threat from known threatening processes.				
	Poorly known ecological communities				
Priority Three	 i. Communities that are known from several to many occurrences, a significant number or area of which are not under threat of habitat destruction or degradation or; ii. Communities known from a few widespread occurrences, which are either large or within significant remaining areas of habitat in which other occurrences may occur, much of it not under imminent threat, or; iii. Communities made up of large, and/or widespread occurrences, that may or may not be represented in the reserve system, but are under threat of modification across much of their range from processes such as grazing by domestic and/or feral stock, and inappropriate fire regimes. 				
	Communities may be included if they are comparatively well known from several localities, but do not meet adequacy of survey requirements and / or are not well defined, and known threatening processes exist that could affect them.				
	Ecological communities that are adequately known, rare but not threatened or meet criteria for Near Threatened, or that have been recently removed from the threatened list. These communities require regular monitoring.				
Priority Four	 i. Rare. Ecological communities known from few occurrences 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 communities are usually represented on conservation lands. ii. Near Threatened. Ecological communities that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable. iii. Ecological communities that have been removed from the list of threatened communities during the past five years. 				
	Conservation Dependent Ecological Communities				
Priority Five	Ecological Communities that are not threatened but are subject to a specific conservation program, the cessation of which would result in the community becoming threatened within five years.				

FLORA CRITERIA: OTHER SIGNIFICANT FLORA

According to the Flora and Vegetation Technical Guidance (EPA 2016a) other than being listed as Threatened or Priority Flora, a species can be considered as significant if it is considered to be:

- locally endemic or association with a restricted habitat type (e.g. Groundwater Dependent Ecosystems, Sheet Flow Dependent Vegetation)
- a new species or has anomalous features that indicate a potential new species
- at the extremes of range, recently discovered range extensions (generally considered greater than 100 km or in a different bioregion), or isolated outliers of the main range
- unusual species, including restricted subspecies, varieties or naturally occurring hybrids
- relictual status, being representative of taxonomic groups that no longer occur widely in the broader landscape.

INTRODUCED FLORA

Introduced plant species, known as weeds, are plants that are not indigenous to an area and have been introduced either directly or indirectly (unintentionally) through human activity. Species are regarded as introduced if they are listed as 'alien' on *FloraBase* (WAH 1998-2024) and are designated with an asterisk (*) in this document.

Weeds of National Significance

At a national level there are 32 weed species listed as Weeds of National Significance (WoNS) (Weeds Australia & Centre for Invasive Species Solutions 2021). The Commonwealth *Australian Weeds Strategy 2017-2027* (Invasive Plants and Animals Committee 2016) describes broad goals and objectives to manage these species.

Declared Pest Plants

The Western Australian Organism List (WAOL) details organisms listed as Declared Pests under the *Biosecurity and Agriculture Management Act 2007* (BAM Act). Under the BAM Act, Declared Pests are listed as one of the three categories, or exempt:

- C1 (exclusion), that applies to pests not established in Western Australia; control measures are to be taken to prevent their entry and establishment
- C2 (eradication), that applies to pests that are present in Western Australia but in low numbers or in limited areas where eradication is still a possibility
- C3 (management), that applies to established pests where it is not feasible or desirable to manage them in order to limit their damage
- exempt (no category).

VEGETATION CRITERIA: OTHER SIGNIFICANT VEGETATION

According to the Flora and Vegetation Technical Guidance (EPA 2016a) other than being listed as a TEC or PEC, vegetation can be considered as significant if it is considered to have:

- restricted distribution
- a degree of historical impact from threatening processes
- a role as a refuge
- provides an important function required to maintain ecological integrity of a significant ecosystem.

ENVIRONMENTALLY SENSITIVE AREAS

There are a number of areas within Western Australia identified as being of environmental significance within which the exemptions to the Native Vegetation Clearing Regulations do not apply. These are referred to as Environmentally Sensitive Areas (ESAs), and are declared under section 51B of the EP Act and described in the *Environmental Protection (Environmentally Sensitive Areas) Notice*.

CONSERVATION ESTATE

The National Reserve System is a network of protected areas managed for conservation under international guidelines. The objective of placing areas of bushland into the Conservation Estate is to achieve and maintain a comprehensive, adequate and representative reserve system for Western Australia. The Conservation and Parks Commission is the vesting body for conservation lands, forest and marine reserves that are managed by DBCA (Government of Western Australia 2018).

APPENDIX TWO

FIELD SURVEY CRITERIA

 Table 23: NVIS structural formation terminology, terrestrial vegetation (NVIS Technical Working Group & DotEE 2017)

	Cover characteristics							
	Foliage cover *	70-100	30-70	10-30	<10	» 0 (scattered)	0-5 (clumped)	unknown
	Cover code	d	с	i	r	bi	bc	unknown
Growth Form	Height Ranges (m)	Structural Fo	ormation Clas	Ses				
tree, palm	<10,10-30, >30	closed forest	open forest	woodland	open woodland	isolated trees	isolated clumps of trees	tree, palm
tree mallee	<3, <10, 10-30	closed mallee forest	open mallee forest	mallee woodland	open mallee woodland	isolated mallee trees	isolated clumps of mallee trees	tree mallee
shrub, cycad, grass-tree, tree- fern	<1,1-2,>2	closed shrubland	shrubland	open shrubland	sparse shrubland	isolated shrubs	isolated clumps of shrubs	shrub, cycad, grass-tree, tree-fern
mallee shrub	<3, <10, 10-30	closed mallee shrubland	mallee shrubland	open mallee shrubland	sparse mallee shrubland	isolated mallee shrubs	isolated clumps of mallee shrubs	mallee shrub
heath shrub	<1,1-2,>2	closed heathland	heathland	open heathland	sparse heathland	isolated heath shrubs	isolated clumps of heath shrubs	heath shrub
chenopod shrub	<1,1-2,>2	closed chenopod shrubland	chenopod shrubland	open chenopod shrubland	sparse chenopod shrubland	isolated chenopod shrubs	isolated clumps of chenopod shrubs	chenopod shrub
samphire shrub	<0.5,>0.5	closed samphire shrubland	samphire shrubland	open samphire shrubland	sparse samphire shrubland	isolated samphire shrubs	isolated clumps of samphire shrubs	samphire shrub
hummock grass	<2,>2	closed hummock grassland	hummock grassland	open hummock grassland	sparse hummock grassland	isolated hummock grasses	isolated clumps of hummock grasses	hummock grass
tussock grass	<0.5,>0.5	closed tussock grassland	tussock grassland	open tussock grassland	sparse tussock grassland	isolated tussock grasses	isolated clumps of tussock grasses	tussock grass
other grass	<0.5,>0.5	closed grassland	grassland	open grassland	sparse grassland	isolated grasses	isolated clumps of grasses	other grass
sedge	<0.5,>0.5	closed sedgeland	sedgeland	open sedgeland	sparse sedgeland	isolated sedges	isolated clumps of sedges	sedge
rush	<0.5,>0.5	closed rushland	rushland	open rushland	sparse rushland	isolated rushes	isolated clumps of rushes	rush
forb	<0.5,>0.5	closed forbland	forbland	open forbland	sparse forbland	isolated forbs	isolated clumps of forbs	forb
fern	<1,1-2,>2	closed fernland	fernland	open fernland	sparse fernland	isolated ferns	isolated clumps of ferns	fern
bryophyte	<0.5	closed bryophyte- land	bryophyte- land	open bryophyteland	sparse bryophyteland	isolated bryophytes	isolated clumps of bryophytes	bryophyte
lichen	<0.5	closed lichenland	lichenland	open lichenland	sparse lichenland	isolated lichens	isolated clumps of lichens	lichen
vine	<10,10-30, >30	closed vineland	vineland	open vineland	sparse vineland	isolated vines	isolated clumps of vines	vine

Height		Growth form				
Height Class	Height Range (m)	Tree, vine (M & U), palm (single- stemmed)	Shrub, heath shrub, chenopod shrub, ferns, samphire shrub, cycad, tree-fern, grass-tree, palm (multi-stemmed)	Tree mallee, mallee shrub	Tussock grass, hummock grass, other grass, sedge, rush, forbs, vine (G)	Bryophyte, lichen, seagrass, aquatic
8	>30	tall	NA	NA	NA	NA
7	10-30	mid	NA	tall	NA	NA
6	<10	low	NA	mid	NA	NA
5	<3	NA	NA	low	NA	NA
4	>2	NA	tall	NA	tall	NA
3	1-2	NA	mid	NA	tall	NA
2	0.5-1	NA	low	NA	mid	tall
1	<0.5	NA	low	NA	low	low
Source: (Source: (based on Walker & Hopkins 1990)					

Table 24: NVIS height classes (NVIS Technical Working Group & DotEE 2017)

Table 25: Vegetation condition scale for the South West and Interzone Botanical Provinces (EPA 2016a)

Condition rating	Description
Pristing	Pristine or nearly so, no obvious signs of disturbance or damage caused by human activities
Flistille	since European settlement.
	Vegetation structure intact, disturbance affecting individual species and weeds are non-
Excellent	aggressive species. Damage to trees caused by fire, the presence of non-aggressive weeds
	and occasional vehicle tracks.
	Vegetation structure altered, obvious signs of disturbance. Disturbance to vegetation
Very Good	structure caused by repeated fires, the presence of some more aggressive weeds, dieback,
	logging and grazing.
	Vegetation structure significantly altered by very obvious signs of multiple disturbances.
Good	Retains basic vegetation structure or ability to regenerate it. Disturbance to vegetation
0000	structure caused by very frequent fires, the presence of very aggressive weeds, partial
	clearing, dieback and grazing.
	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not
Degraded	to a state approaching good condition without intensive management. Disturbance to
Degraded	vegetation structure caused by very frequent fires, the presence of very aggressive weeds at
	high density, partial clearing, dieback and grazing.
	The structure of the vegetation is no longer intact and the area is completely or almost
Completely Degraded	completely without native species. These areas are often described as 'parkland cleared' with
	the flora comprising weed or crop species with isolated native trees and shrubs.

Table 26: Grading system for the assessment of potential nest trees for Black Cockatoos (Bamford Consulting Ecologists 2016)

Class	Description of tree and hollows/activity
1	Active nest observed; adult (or immature) bird seen entering or emerging from hollow.
2	Hollow of suitable size and angle (i.e. near-vertical) visible with chew marks around entrance.
3	Potentially suitable hollow visible but no chew marks present; or potentially suitable hollow present (as suggested by structure of tree, such as large, vertical trunk broken off at a height of >10m).
4	Tree with large hollows or broken branches that might contain large hollows but hollows or potential hollows are not vertical or near-vertical; thus a tree with or likely to have hollows of sufficient size but not to have hollows of the angle preferred by Black Cockatoos.
5	Tree lacking large hollows or broken branches that might have large hollows; a tree with more or less intact branches and a spreading crown.

Table 27: Black Cockatoo foraging quality scoring tool (DAWE 2022)

Foraging quality scoring tool template					
Starting Score	e	Carnaby's Cockatoo	Baudin's Cockatoo	Forest Red-tailed Black Cockatoo	
10		Start at a score of 10 if your site is native shrubland, kwongan heathland or woodland, dominated by proteaceous plant species such as Banksia spp. (including Dryandra spp.), Hakea spp. and Grevillea spp., as well as native eucalypt woodland and forest that contains foraging species, within the range of the species, including along roadsides and parkland cleared areas. Also includes planted native vegetation. This tool only applies to sites equal to or larger than 1 hectare in size.	Start at a score of 10 if your site is native eucalypt woodlands and forest, and proteaceous woodland and heath, particularly Marri, within the range of the species, including along roadsides and parkland cleared areas. Can include planted vegetation. This tool only applies to sites equal to or larger than 1 hectare in size	Start at a score of 10 if your site is Jarrah or Marri woodland and/or forest, or if it is on the edge of Karri forest, or if Wandoo and Blackbutt occur on the site, within the range of the subspecies, including along roadsides and parkland cleared areas. This tool only applies to sites equal to or larger than 1 hectare in size.	
Attribute	Sub- tractions	Context adjustor (attribute	es reducing functional	ity of foraging habitat)	
Foraging Potential	-2	Subtract 2 from your score if there is no evidence of feeding debris on your site.	Subtract 2 from your score if there is no evidence of feeding debris on your site.	Subtract 2 from your score if there is no evidence of feeding debris on your site.	
Connectivity	-2	Subtract 2 from your score if you have evidence to conclude that there is no other foraging habitat within 12 km of your site.	Subtract 2 from your score if you have evidence to conclude that there is no other foraging habitat within 12 km of your site.	Subtract 2 from your score if you have evidence to conclude that there is no other foraging habitat within 12 km of your site.	
Proximity to breeding	-2	Subtract 2 if you have evidence to conclude that your site is more than 12 km from breeding habitat.	Subtract 2 if you have evidence to conclude that your site is more than 12 km from breeding habitat.	Subtract 2 if you have evidence to conclude that your site is more than 12 km from breeding habitat.	
Proximity to roosting	-1	Subtract 1 if you have evidence to conclude that your site is more than 20 km from a known night roosting habitat.	Subtract 1 if you have evidence to conclude that your site is more than 20 km from a known night roosting habitat.	Subtract 1 if you have evidence to conclude that your site is more than 20 km from a known night roosting habitat.	
Impact from significant plant disease	-1	Subtract 1 if your site has disease present (e.g. Phytophthora spp. or Marri canker) and the disease is affecting more than 50% of the preferred food plants present.	Subtract 1 if your site has disease present (e.g. Phytophthora spp. or Marri canker) and the disease is affecting more than 50% of the preferred food plants present.	Subtract 1 if your site has disease present (e.g. Phytophthora spp. or Marri canker) and the disease is affecting more than 50% of the preferred food plants present.	
Total Score		Enter score	Enter score	Enter score	

Foraging quality scoring tool template							
Starting Score	Carnaby's Cockatoo	Baudin's Cockatoo	Forest Red-tailed Black Cockatoo				
Appraisal	To support your habitat score, you should provide an overall appraisal of the habitat on the impact site and within 20km of the impact area to clearly explain and justify the score. It should include discussion on the foraging habitat's proximity to other resources (e.g. exact distance to proximate resources), frequency of use of proximate sites, the degree of evidence and description of vegetation type and condition.						

Table 28: Black Cockatoo foraging value scoring system (Bamford Consulting Ecologists 2020)

Site condition: vegetation composition, condition and structure scoring							
Site Score	Carnaby's Cockatoo	Baudin's Cockatoo	Forest Red-tailed Black Cockatoo				
0	No foraging value: no Proteaceae, Eucalypts or other potential sources of food. Examples: • Water bodies (e.g. salt lakes, dams, rivers) • Bare ground • Developed sites devoid of vegetation (e.g. infrastructure, roads, gravel pits) or with vegetation of no food value (e.g. some suburban landscapes) • Mown grass.	No foraging value: no Eucalypts or other potential sources of food. Examples: • Water bodies (e.g. dams, rivers) • Bare ground • Developed sites devoid of vegetation (e.g. infrastructure, roads, gravel pits).	No foraging value: no Eucalypts or other potential sources of food. Examples: • Water bodies (e.g. dams, rivers) • Bare ground • Developed sites devoid of vegetation (e.g. infrastructure, roads, gravel pits).				
1	 Negligible to low foraging value. Examples: Scattered specimens of known food plants but projected foliage cover of these is < 2%. This could include urban areas with scattered foraging trees. Paddocks that are lightly vegetated with melons or other known food-source (weeds e.g. <i>Erodium</i> spp.) that represent a short-term and/or seasonal food source Blue Gum plantations (foraging by Carnaby's Cockatoos has been reported but appears to be unusual). 	Negligible to low foraging value. Scattered specimens of known food plants but projected foliage cover of these < 1%. This could include urban areas with scattered foraging trees.	Negligible to low foraging value. Scattered specimens of known food plants but projected foliage cover of these < 1%. Could include urban areas with scattered foraging trees.				

Site condition: vegetation composition, condition and structure scoring						
Site Score	Carnaby's Cockatoo	Baudin's Cockatoo	Forest Red-tailed Black Cockatoo			
2	Low foraging value. Examples: • Shrubland in which species of foraging value, such as shrubby banksias, have < 10% projected foliage cover • Woodland with tree banksias 2-5% projected foliage cover • Open eucalypt woodland/mallee of small- fruited species • Paddocks that are densely vegetated with melons or other known food-source (weeds e.g. <i>Erodium</i> spp.) that represent a short-term and/or seasonal food source.	Low foraging value. Examples: • Woodland with scattered specimens of known food plants (e.g. Marri and Jarrah) 1-5% projected foliage cover • Urban areas with scattered foraging trees.	 Low foraging value. Examples: Woodland with scattered specimens of known food plants (e.g. Marri, Jarrah or Sheoak) 1-5% projected foliage cover Urban areas with scattered food plants such as Cape Lilac, <i>Eucalyptus caesia</i> and <i>E. erythrocorys</i>. 			
3	Low to Moderate foraging value. Examples: • Shrubland in which species of foraging value, such as shrubby banksias, have 10- 20% projected foliage cover • Woodland with tree banksias 5-20% projected foliage cover • Eucalypt Woodland/Mallee of small-fruited species • Eucalypt Woodland with Marri < 10% projected foliage cover.	Low to Moderate foraging value. Examples: • Eucalypt Woodland with known food plants (especially Marri) 5-20% projected foliage cover • Parkland-cleared Eucalypt Woodland/Forest with known food plants 10- 40% projected foliage cover (poor long-term viability without management) • Younger areas of (managed) revegetation with known food plants 10-40% projected foliage cover (establishing food sources with good long- term viability).	Low to Moderate foraging value. Examples: • Eucalypt Woodland with known food plants (especially Marri and Jarrah) 5- 20% projected foliage cover • Parkland-cleared Eucalypt Woodland/Forest with known food plants 10-40% projected foliage cover (poor long-term viability without management) • Younger areas of (managed) revegetation with known food plants 10- 40% projected foliage cover (establishing food sources with good long-term viability).			

Site condition:	vegetation composition, conditi	on and struct	ure scoring	
Site Score	Carnaby's Cockatoo	Baudin's Co	ckatoo	Forest Red-tailed Black Cockatoo
4	Moderate foraging value. Examples: • Woodland/low forest with tree banksias (of key species <i>B.</i> <i>attenuata</i> and <i>B. menziesii</i>) 20- 40% projected foliage cover • Kwongan/Shrubland in which species of foraging value, such as shrubby banksias, have 20-40% projected foliage cover • Eucalypt Woodland/Forest with Marri 20-40% projected foliage cover.	Moderate foraging value. Examples: Marri-Jarrah Woodland/Forest with 20-40% projected foliage cover Marri-Jarrah Forest with 40-60% projected foliage cover but vegetation condition reduced due to weed invasion and/or some tree deaths Eucalypt Woodland/Forest with diverse, healthy understorey and known food trees (especially Marri) 10-20% projected foliage cover Orchards with highly desirable food sources (e.g. apples, pears, some stone fruits)		Moderate foraging value. Examples: • Marri-Jarrah Woodland/Forest with 20- 40% projected foliage cover • Marri-Jarrah Forest with 40-60% projected foliage cover but vegetation condition reduced due to weed invasion and/or some tree deaths • Sheoak Forest with 40-60% projected foliage cover.
5	Moderate to High foraging value. Examples: • Banksia Low Forest (of key species <i>B. attenuata</i> and <i>B. menziesii</i>) with 40-60% projected foliage cover • Banksia Low Forest (of key species <i>B. attenuata</i> and <i>B. menziesii</i>) with > 60% projected foliage cover but vegetation condition reduced due to weed invasion and/or some tree deaths • Pine plantations with trees more than 10 years old (but see pine modifier score if relevant).	Moderate to High foraging value. Examples: • Marri-Jarrah Forest with 40-60% projected foliage cover • Marri-Jarrah Forest with > 60% projected foliage cover but vegetation condition reduced due to weed invasion and/or some tree deaths.		Moderate to High foraging value. Examples: • Marri-Jarrah Forest with 40-60% projected foliage cover • Marri-Jarrah Forest with > 60% projected foliage cover but vegetation condition reduced due to weed invasion and/or some tree deaths • Sheoak Forest with > 60% projected foliage cover.
6	 High foraging value. Example: Banksia Low Forest (of key species <i>B. attenuata</i> and <i>B. menziesii</i>) with > 60% projected foliage cover and vegetation condition good with low weed invasion and/or low tree deaths (indicating it is robust and unlikely to decline in the medium term). 	High foraging value. Example: • Marri-Jarrah Forest with > 60% projected foliage cover and vegetation condition good with low weed invasion and/or low tree deaths (indicating it is robust and unlikely to decline in the medium term).		 High foraging value. Example: Marri-Jarrah Forest with > 60% projected foliage cover and vegetation condition good with low weed invasion and/or low tree deaths (indicating it is robust and unlikely to decline in the medium term).
Site context	Percentage of the 'local' (i.e. withi	n 15 km) area	native vegetat	ion that the survey area represents
Score	'Local' breeding known/likely		'Local' bree	ding unlikely
3	>5%			
2	0.4.49/		5-10%	
	0.1%		۲-5% ∠10/	
U	<0.1%		<1%	

Site condition: vegetation composition, condition and structure scoring						
Site Score	Carnaby's Cockatoo Baudin's Cockatoo Forest Red-tailed Black Cockatoo					
Species density/stocking rate						
1	Species is regularly reported/recorded and/or abundant foraging evidence or Direct evidence lacking but at least moderate condition score and site is part of connected habitat where Black Cockatoos are known to occur.					
0	Species is irregularly or very infre	equently reported and little or	no foraging evidence is present.			

APPENDIX THREE WHEATBELT WOODLANDS TEC ASSESSMENT CRITERIA

The *Eucalypt Woodlands of the Western Australian Wheatbelt* was listed as a Critically Endangered TEC under the EPBC Act. This TEC occurs in the southwest of Western Australia, between the Darling Range and western edge of the goldfields, in the Avon Wheatbelt IBRA region and the Mallee IBRA subregion MAL02 Western Mallee. The TEC is defined as being dominated by eucalypt species with a tree or mallet form over a highly variable understorey (TSSC 2015).

The key characteristics for vegetation to be included in this TEC (TSSC 2015) are that:

- it occurs in the Western Australian Wheatbelt (and a few occurrences on adjacent IBRA regions), located on the Yilgarn Craton and receives less than 600 mm mean annual rainfall
- it has a tree canopy dominated by one or more of 31 taxa of Eucalypt (*Eucalyptus*) species having tree or mallet form (i.e. a single trunk) (Table 24). These Eucalypts do not include those that are limited to specified landscapes (e.g. granite outcrops, lateritic hills or other rocky rises) or whose main distribution is outside the Wheatbelt.
- the upper stratum (tree canopy) in a mature woodland must be greater than 10% crown cover (unless the loss of canopy cover is temporary e.g. fire)
- the associated non dominant (or not co-dominant) canopy species are listed; these include Acacia acuminata (Jam), Allocasuarina huegeliana (Rock Oak), Corymbia calophylla (Marri) and a number of other (mostly mallee-form) Eucalyptus species (although the list provided is not considered to be comprehensive)
- the understorey (mid and ground strata) is highly variable, and includes sparse to absent forms, herbs, scrubs and heaths, chenopods, thickets (predominantly *Melaleuca* species) and salt tolerant species (including *Tecticornia*). The species must be predominantly native.
- meets the condition threshold, according to the table below (**Table 29**)
- it includes the following DBCA-listed Priority Ecological Communities: Brown mallet (*Eucalyptus astringens*) communities in the western Wheatbelt on alluvial flats (Priority 1), Red Morrel woodland of the Wheatbelt (Priority 1), Yate (*Eucalyptus occidentalis*) dominated alluvial claypans of the Jingalup soil system (Priority 2).

Eucalyptus accedensEucalyptus longicornisEucalyptus salicolaEucalyptus aequiopertaEucalyptus loxophlebasubsp. loxophlebaEucalyptus salmonophloiaEucalyptus alipesEucalyptus melanoxylonEucalyptus salubrisEucalyptus astringenssubsp. subsp.Eucalyptus mimica subsp. continens Eucalyptus capillosaEucalyptus mimica subsp. continens Eucalyptus densa subsp. densaEucalyptus extensaEucalyptus myriadenaEucalyptus spathulata subsp. spathulataEucalyptus falcataEucalyptus ornataEucalyptus urnaEucalyptus gardneri subsp. gardneriEucalyptus rectaEucalyptus wandoo subsp. pulvereaEucalyptus kondininensisEucalyptus rudis subsp. rudisEucalyptus wandoo subsp. wandoo	Species			
Eucalyptus aequiopertaEucalyptus loxophlebasubsp.Eucalyptus salmonophloiaEucalyptus alipesEucalyptus melanoxylonEucalyptus salubrisEucalyptus astringenssubsp.Eucalyptus mimica subsp. continens astringensEucalyptus mimica subsp. continens Eucalyptus capillosaEucalyptus mimica subsp. continens Eucalyptus mimica subsp. mimicaEucalyptus capillosaEucalyptus mimica subsp. mimicaEucalyptus singularisEucalyptus densa subsp. densaEucalyptus myriadenaEucalyptus spathulataEucalyptus extensaEucalyptus occidentalisEucalyptus spathulata subsp. salinaEucalyptus falcataEucalyptus ornataEucalyptus urmaEucalyptus gardneri subsp. gardneriEucalyptus rectaEucalyptus wandoo subsp. pulvereaEucalyptus kondininensisEucalyptus rudis subsp. rudisEucalyptus wandoo subsp. wandoo	Eucalyptus accedens	Eucalyptus longicornis	Eucalyptus salicola	
Eucalyptus alipesEucalyptus melanoxylonEucalyptus salubrisEucalyptus astringenssubsp.Eucalyptus mimica subsp. continensEucalyptus sargentii subsp. sargentiiastringensEucalyptus capillosaEucalyptus mimica subsp. mimicaEucalyptus singularisEucalyptus capillosaEucalyptus mimica subsp. mimicaEucalyptus singularisEucalyptus densa subsp. densaEucalyptus myriadenaEucalyptus spathulatasubsp.Eucalyptus extensaEucalyptus occidentalisEucalyptus spathulata subsp. salinaEucalyptus falcataEucalyptus ornataEucalyptus urnaEucalyptus gardneri subsp. gardneriEucalyptus rectaEucalyptus wandoo subsp. pulvereaEucalyptus kondininensisEucalyptus rudis subsp. rudisEucalyptus wandoo subsp. wandoo	Eucalyptus aequioperta	Eucalyptus loxophleba subsp. loxophleba	Eucalyptus salmonophloia	
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Eucalyptus goniocarpaEucalyptus rudis subsp. rudisEucalyptus wandoo subsp. wandooEucalyptus kondininensis	Eucalyptus gardneri subsp. gardneri	Eucalyptus recta	Eucalyptus wandoo subsp. pulverea	
Eucalyptus kondininensis	Eucalyptus goniocarpa	Eucalyptus rudis subsp. rudis	Eucalyptus wandoo subsp. wandoo	
	Eucalyptus kondininensis			

Table 29: Key dominant or co-dominant Eucalypt species of the Wheatbelt Woodlands TEC (TSSC 2015)

The following characteristics indicate that the TEC is unlikely to be present (i.e. contraindications):

- the dominant Eucalypts have a mallee form (including *Eucalyptus loxophleba* subsp. *supralaevis* that can be tree or mallee form, this taxon has been explicitly excluded from being representative of the TEC)
- the dominant canopy tree is not a Eucalypt
- tree canopy is less than 10% cover
- the woodland is in an adjacent bioregion

- the woodland is on a granite outcrop or rocky rise, although woodlands at the base of outcrops may be included
- the woodland is a small, fragmented patch^A (including isolated paddock trees, narrow stands including windbreaks or shelterbelts)
- narrow roadside (or other) remnants <5 m wide including where the tree canopy is <10% cover or the understorey has lost considerable elements of its native structure or diversity.

Table 30: Minimum condition for patches of Eucalypt Woodlands of the Western Australian Wheatbelt TEC (TSSC 2015)

Cover of exotic plants (weeds) AND	Mature trees (1) AND	Minimum patch size (non-roadside patches) (2) AND	Minimum patch width (roadside patches only) (3)
Category A: Patches likely to correspond to a High RCV (RCC 2014, available in DPaW 2	a condition of Pristine / Ex 2015)(RCC 2014, availa	able in DPaW 2015).	I. Keighery 1994) or a
Exotic plant species account for 0 to 30% of total vegetation cover in the understory layers (i.e. below the tree canopy).	Mature trees may be present or absent.	2 ha or more	5 m or more
Category B: Patches likely to correspond to a 2014, available in DPaW 2015) AND retain	a condition of Good (B. J. s important habitat feature	Keighery 1994) or a M es.	edium-High RCV (RCC
Exotic plant species account for more than 30, to 50% of total vegetation cover in the understory layers (i.e. below the tree canopy).	Mature trees are present with at least 5 trees per 0.5 ha.	2 ha or more	5 m or more
Category C: Patches likely to correspond to a 2014, available in DPaW 2015).	a condition of Good (B. J.	Keighery 1994) or a M	edium-High RCV (RCC
Exotic plant species account for more than 30, to 50% of total vegetation cover in the understorey layers (i.e. below the tree canopy).	Mature trees either absent or less than 5 trees per 0.5 ha are present.	5 ha or more	5 m or more
Category D: Patches likely to correspond to a to Medium-High RCV (RCC 2014, available	a condition of Degraded to in DPaW 2015) BUT ret	Good (B. J. Keighery 1 ains important habitat fea	1994) or a Medium-Low tures.
Exotic plant species account for more than 50 to 70% of total vegetation cover in the understorey layers (i.e. below the tree canopy).	Mature trees are present with at least 5 trees per 0.5 ha.	5 ha or more	5 m or more

(1) Mature trees have a minimum diameter at breast height (DBH) of 30 cm.

(2) Minimum patch size thresholds apply to native vegetation remnants, not to road verges where width thresholds apply.

(3) This applies only to narrow roadside remnants and recognises their importance as wildlife corridors, habitats for threatened species or other reasons as defined by Jackson (2002) and RCC (DPaW 2015). The defined width is that of the native understorey component, not tree canopy width. Breaks of over 50 m or separation by a sealed road define separate 'patches'.

^A A 'patch' refers to an area of the same broad vegetation within a larger remnant. Remnants may have several patches of the same vegetation that are not joined i.e. they are separated by vegetation of a different type or significant roads.

For this TEC a 'patch' refers to a combined Eucalypt woodland regardless of characteristic species and may include more than one woodland vegetation type the extents of which are combined (when adjacent) to form the extents used to calculate if the appropriate thresholds are met.

APPENDIX FOUR DESKTOP ASSESSMENT RESULTS AND LIKELIHOOD ASSESSMENTS

Table 31: Flora database search results, habitat and likelihood assessment

Blue shading indicates high likelihood; dark blue indicates species is known (recorded) from the survey area

Databas	e		Conservati	on status ³	Closest	Number		Likelihood of	occurrence
PMST ¹	DBCA ²	Taxon	EPBC	WA	(km) ⁴	of records⁴	Habitat	Desktop	Post-survey
		Threatened Flora	,					•	
Likely		Acacia ataxiphylla subsp. magna	EN	TF (EN)	-	-	Sandy soils. Lateritic ironstone rises, flats.	Very unlikely	Very unlikely
n/a	WAH	Acacia caesariata	-	TF (VU)	14	1	Gritty loam & clay.	Unlikely	Very unlikely
May		Acacia cochlocarpa subsp. cochlocarpa	EN	TF (CR)	-	-	Clayey, sandy, often gravelly soils.	Very unlikely	Very unlikely
May		Acacia insolita subsp. recurva	EN	TF (CR)	-	-	Lateritic ridges.	Very unlikely	Very unlikely
May		Acacia volubilis	EN	TF (CR)	-	-	Gravelly sand, sandy clay.	Very unlikely	Very unlikely
May		Andersonia gracilis	EN	TF (VU)	-	-	White/grey sand, sandy clay, gravelly loam. Winter-wet areas, near swamps.	Very unlikely	Very unlikely
Known		Banksia cuneata	EN	TF (EN)			Grey, yellow or yellow-brown sand.	Very unlikely	Very unlikely
Known	WAH, TPFL	Banksia ionthocarpa subsp. chrysophoenix (PMST as Banksia ionthocarpa)	EN	TF (CR)	29	4	Brown sandy loam, sandy clays, laterite, granite. Undulating sandplains, winter-damp sites.	Unlikely	Unlikely
Likely	WAH	Boronia capitata subsp. capitata	EN	TF (VU)	21	1	Sand, often over laterite. Sandplains.	Very unlikely	Very unlikely
May		Caladenia hoffmanii	EN	TF (EN)	-	-	Clay, loam, laterite, granite. Rocky outcrops and hillsides, ridges, swamps and gullies.	Very unlikely	Very unlikely
May		Dasymalla axillaris	CR	TF (CR)	-	-	Sandy soils.	Very unlikely	Very unlikely
May		Diuris micrantha	VU	TF (VU)			Brown loamy clay. Winter-wet swamps, in shallow water.	Very unlikely	Very unlikely
May		Eremophila resinosa	EN	TF (EN)	-	-	Clay loam, gravelly sandy clay. Road verges.	Very unlikely	Very unlikely
Likely		Eremophila verticillata	EN	TF (CR)	-	-	Clay loam, loam over limestone.	Very unlikely	Very unlikely
May		Eremophila viscida	EN	TF (EN)	-	-	Granitic soils, sandy loam. Stony gullies, sandplains.	Very unlikely	Very unlikely
May		Gastrolobium diabolophyllum	CR	TF (CR)	-	-	Yellow-brown sand over laterite. Broadly undulating dunes.	Very unlikely	Very unlikely
Known	WAH, TPFL	Grevillea dryandroides subsp. hirsuta	EN	TF (EN)	11	6	White or yellow sand, laterite.	Unlikely	Very unlikely
Known	WAH, TPFL	Grevillea scapigera	EN	TF (CR)	1	35	Sandy or gravelly lateritic soils.	Likely	Very unlikely
Known	WAH, TPFL	Guichenotia seorsiflora	CR	TF (CR)	18	4	Sandy clay with lateritic gravel. Breakaways.	Unlikely	Very unlikely
Known	WAH, TPFL	Rhizanthella gardneri	CR	TF (CR)	7	5	Sand. Grows in association with <i>Melaleuca</i> uncinata.	Мау	Мау
Likely		Roycea pycnophylloides	EN	TF (VU)	-	-	Sandy soils, clay. Saline flats.	Very unlikely	Very unlikely
Known	WAH, TPFL	Stylidium applanatum	CR	TF (CR)	8	8	Clay loam over laterite. Hillslopes, Mallee shrubland.	Мау	Мау
Likely	WAH	Symonanthus bancroftii	EN	TF (CR)	31	1	Clay over granite; wetland edges.	Very unlikely	Very unlikely

DESKTOP ASSESSMENT RESULTS AND LIKELIHOOD ASSESSMENTS

Databas	9	- -	Conservatio	on status ³	Closest	Number		Likelihood of	occurrence
PMST ¹	DBCA ²	Taxon	EPBC	WA	(km)⁴	or records⁴	Habitat	Desktop	Post-survey
Known	TPFL	Thelymitra stellata	EN	TF (EN)	11	1	Sand, gravel, lateritic loam.	May	Unlikely
Likely		Verticordia fimbrilepis subsp. fimbrilepis	EN	TF (VU)	-	-	Gravelly sandy or clayey soils. Flats, road verges.	Very unlikely	Very unlikely
May		Verticordia staminosa var. cylindracea	EN	TF (CR)	-	-	Soil pockets. Granite outcrops.	Very unlikely	Very unlikely
		Priority 1							
	WAH, TPFL	Acacia sclerophylla var. teretiuscula			18	2	Clay & loamy soils.	Unlikely	Very unlikely
	WAH, TPFL	Acacia tetraneura			24	5	Clay & lateritic gravel. Ridges & low rises.	Very unlikely	Very unlikely
	TPFL	Pterostylis elegantissima			18	1	Shallow soil on granite outcrops.	Very unlikely	Very unlikely
	WAH	Thysanotus sabulosus			33	1	Sand, lateritic gravel.	Very unlikely	Very unlikely
		Priority 2							
	WAH	Acacia arcuatilis			11	3	Sand or sandy loam, sometimes with lateritic gravel. Undulating plains, rises.	Unlikely	Very unlikely
	WAH	Andersonia carinata			16	1	White sand, gravelly lateritic soils. Plains.	Unlikely	Very unlikely
	WAH, TPFL	Banksia dallanneyi subsp. agricola			6	26	Sandy loam or sand over laterite.	May	Unlikely
	WAH	Banksia densa			10	9	Sand, clay, loam, gravel, laterite	May	Unlikely
	WAH	<i>Darwinia</i> sp. Corrigin (T. Erickson TEE 308)			12	3	Granite outcrop.	Very unlikely	Very unlikely
	WAH, TPFL	Leucopogon amplectens			14	3	Sandy soils.	Unlikely	Very unlikely
	WAH	Oxymyrrhine cordata			18	2	Sandy soils, sand over laterite.	Very unlikely	Very unlikely
		Priority 3						_	
	WAH	Acacia anarthros			9	1	Lateritic gravelly soils. Slopes.	May	Unlikely
	WAH, TPFL	Acacia campylophylla			11	5	Lateritic gravelly soils.	Unlikely	Unlikely
	WAH, TPFL	Acacia deflexa			10	6	Yellow & gravelly lateritic sand, gravelly sandy loam. Plains.	Мау	Unlikely
	WAH, TPFL	Acacia inophloia			25	2	Yellow sand, gravelly granitic soils.	Unlikely	Unlikely
	WAH, TPFL	Acacia phaeocalyx			15	2	Yellow or white sand, often over laterite. Flats, hillsides	Unlikely	Very unlikely
	WAH	Anigozanthos bicolor subsp. exstans			25	1	White sand, sandy clay loam.	Very unlikely	Very unlikely
	WAH	Banksia fasciculata			11	6	Lateritic clay, sand over laterite.	Unlikely	Unlikely
	WAH, TPFL	Banksia horrida			11	7	Sand, sometimes with gravel.	Unlikely	Very unlikely
	WAH, TPFL	Banksia meganotia			24	4	Sand, sandy loam or clay loam over laterite.	Very unlikely	Very unlikely
	WAH, TPFL	Banksia rufa subsp. obliquiloba			10	17	Sand over laterite.	Unlikely	Unlikely
	WAH	Beaufortia burbidgeae			9	12	Ironstone (massive laterite) on hilltops, occ. Sand over laterite.	Мау	Unlikely
	WAH	Brachyloma mogin			6	8	Grey clayey sand. Swamp flat.	Unlikely	Very unlikely
	WAH	Dampiera triloba			13	1	Damp/wet sand.	Very unlikely	Very unlikely
	WAH	Daviesia implexa			27	1	Sand & laterite.	Very unlikely	Very unlikely

DESKTOP ASSESSMENT RESULTS AND LIKELIHOOD ASSESSMENTS

Database	•	- -	Conserva	tion status ³	Closest	Number		Likelihood of	occurrence
PMST ¹	DBCA ²	Taxon	EPBC	WA	(km)⁴	of records⁴	Habitat	Desktop	Post-survey
	WAH	Daviesia nudiflora subsp. drummondii			20	1	White or grey sand. Undulating low rises.	Very unlikely	Very unlikely
	WAH	Daviesia uncinata			11	3	Gravelly lateritic sand, loamy sand. Undulating plains.	Unlikely	Unlikely
	WAH	Dicrastylis reticulata			15	1	Sandy soils, often over granite. Amongst granite rock, hills, flats.	Unlikely	Unlikely
	WAH	Eucalyptus erythronema subsp. inornata			11	5	Sandy-loam soils.	May	Very unlikely
	WAH	Guichenotia impudica			14	1	Laterite.	Unlikely	Unlikely
	WAH	Microcorys cephalantha			12	10	Sandy loam with lateritic gravel. Rises, sandplains	Unlikely	Unlikely
	WAH	Phebalium drummondii			5	1	Gravelly sandy or clayey soils. Flats, roadsides.	Likely	Known
	WAH, TPFL	Pterostylis echinulata			19	2	Open woodland.	Unlikely	Unlikely
	WAH	Stylidium asteroideum			20	1	Damp soil.	Very unlikely	Very unlikely
	WAH	Styphelia papillosa			25	1	Heath or open mallee woodland, in sandy soils, usually over laterite.	Very unlikely	Very unlikely
	WAH	Synaphea drummondii			18	2	Sand over laterite.	May	Known
	WAH, TPFL	Thysanotus tenuis			27	2	Clay, sandy clay, sand.	Very unlikely	Very unlikely
		Priority 4						-	
	TPFL	Caladenia x triangularis			19	1		Very unlikely	Very unlikely
	WAH	Calothamnus brevifolius			0.01	4	White/grey or yellow sand.	Likely	Known
	WAH, TPFL	Darwinia sp. Chiddarcooping (S.D. Hoppe	r 6944)		28	2	Sand, clay, loam, granite. Rock outcrops.	Very unlikely	Very unlikely
	WAH, TPFL	Daviesia oxylobium			11	16	Sandy lateritic soils. Undulating plains.	Unlikely	Unlikely
	WAH, TPFL	Eremophila veneta			11	7	Clay to loam, white/grey sand. Plains & flats, slopes.	Unlikely	Very unlikely
	WAH	Eucalyptus dissimulata subsp. dissimulata			14	2	White or yellow sand. Sandplains.	Unlikely	Very unlikely
	WAH	Eucalyptus loxophleba x wandoo			27	1	Sandy clay or loam.	Very unlikely	Very unlikely
	WAH	Grevillea asteriscosa			13	7	Gravelly or granitic soils. Gravel rises, granite outcrops.	Unlikely	Very unlikely
	WAH, TPFL	Lechenaultia pulvinaris			13	11	White/grey sand.	Unlikely	Unlikely
	WAH	Rinzia affinis			14	1	Yellow sand, loam or sand with lateritic pebbles. Hills.	Unlikely	Unlikely

¹ PMST likelihood of occurrence or likelihood of habitat occurring

² WAH = herbarium record (vouchered specimen), TP = Threatened and Priority Flora Report Form record; may be unconfirmed i.e. without vouchered specimen

³ Commonwealth EPBC Act and Western Australian BC Act conservation status or DBCA Priority status

⁴ DBCA database record

Table 32: Fauna database results and likelihood assessments

Blue shading indicates high likelihood; darker blue indicates species is known (recorded) from the survey area.

Databas	se			Conserv	vation status ³	Closest	Number	Likelihood of c	occurrence
PMST ¹	DBCA ²	Species	Common name	EPBC	WA	(km) ⁴	of records⁴	Desktop	Post-survey
		Mammals		•			•		
May	Х	Bettongia penicillata ogilbyi	Woylie, Brush-tailed Bettong	EN	CR	32	16	Very unlikely	Very unlikely
May	Х	Dasyurus geoffroii	Chuditch, Western Quoll	VU	VU	8	7	May	May
	Х	Isoodon fusciventer	Quenda, Southwestern Brown Bandicoot		P4	34	9	Very unlikely	Very unlikely
	Х	Lagostrophus fasciatus fasciatus	Banded Hare-wallaby, Mernine	VU	VU	32	2	Very unlikely	Very unlikely
	Х	Macrotis lagotis	Bilby, Dalgyte, Ninu	VU	VU	15	12	Very unlikely	Very unlikely
May	Х	Myrmecobius fasciatus	Numbat, Walpurti	EN	EN	12	17	Very unlikely	Very unlikely
	Х	Notamacropus eugenii derbianus	Tammar Wallaby		P4	9	28	Very unlikely	Very unlikely
	Х	Notamacropus irma	Western Brush Wallaby		P4	14	5	Unlikely	Unlikely
	х	Perameles bougainville	Shark Bay Bandicoot, Western Barred Bandicoot, Little Marl	EN	VU	32	1	Very unlikely	Very unlikely
	х	Petrogale lateralis lateralis	Black-flanked Rock-wallaby, Black-footed Rock- wallaby, Moororong	EN	EN	49	36	Very unlikely	Very unlikely
Likely	Х	Phascogale calura	Red-tailed Phascogale, Kenngoor	VU	CD	14	117	Мау	Unlikely
	х	Phascogale tapoatafa wambenger	South-western Brush-tailed Phascogale, Wambenger		CD	29	1	Very unlikely	Very unlikely
	х	Pseudocheirus occidentalis	Western Ringtail Possum, Ngwayir	CR	CR	40	1	Very unlikely	Very unlikely
	Х	Pseudomys occidentalis	Western Mouse		P4	57	2	Very unlikely	Very unlikely
	Х	Pseudomys shortridgei	Heath Mouse, Heath Rat, Dayang	EN	VU	32	2	Very unlikely	Very unlikely
		Birds							
	Х	Actitis hypoleucos	Common Sandpiper	MI	MI	16	12	Very unlikely	Very unlikely
May		Aphelocephala leucopsis	Southern Whiteface	VU				Very unlikely	Very unlikely
	Х	Apus pacificus	Fork-tailed Swift	MI	MI	24	1	Very unlikely	Very unlikely
	Х	Cacatua pastinator pastinator	Muir's Corella		CD	39	3	Very unlikely	Very unlikely
May		Calidris acuminata	Sharp-tailed Sandpiper	VU & MI				Very unlikely	Very unlikely
May	х	Calidris ferruginea	Curlew Sandpiper	CR & MI	CR	45	1	Very unlikely	Very unlikely
	Х	Calidris ruficollis	Red-necked Stint	MI	MI	43	5	Very unlikely	Very unlikely
May		Falco hypoleucos	Grey Falcon	VU				Very unlikely	Very unlikely
	Х	Falco peregrinus	Peregrine Falcon		OS	3	23	Likely	May

DESKTOP ASSESSMENT RESULTS AND LIKELIHOOD ASSESSMENTS

Databas	se			Conserv	vation status ³	Closest	Number	Likelihood of c	occurrence
PMST ¹	DBCA ²	Species		EPBC	WA	(km)4	of records ⁴	Desktop	Post-survey
Likely	Х	Leipoa ocellata	Malleefowl	VU	VU	7	93	Likely	May
	Х	Oxyura australis	Blue-billed Duck		P4	18	3	Very unlikely	Very unlikely
	х	Platycercus icterotis xanthogenys	Western Rosella (Inland)		P4	12	8	Very unlikely	Very unlikely
	х	Plegadis falcinellus	Glossy Ibis	MI	MI	39	2	Very unlikely	Very unlikely
	Х	Stercorarius longicaudus	Long-tailed Jaeger, Long-tailed Skua	MI	MI	45	1	Very unlikely	Very unlikely
	Х	Thinornis cucullatus	Hooded Plover, Hooded Dotterel		P4	42	1	Very unlikely	Very unlikely
May	Х	Tringa nebularia	Common Greenshank	MI	MI	28	11	Very unlikely	Very unlikely
Known	Х	Zanda latirostris	Carnaby's Cockatoo	EN	EN	18	37	Мау	May

¹ PMST likelihood of occurrence or likelihood of habitat occurring

² DBCA database record (X)

³ Commonwealth EPBC Act and Western Australian BC Act conservation status, DBCA Priority status or other DBCA status

⁴ DBCA database record

Table 33: Excluded species and reason for exclusion

Spacios	Common name	Conserva	ation status	Passon avaluated from assessment
Species		EPBC Act	WA	Reason excluded non assessment
Branchinella simplex	A fairy shrimp (inland WA)		P1	Invertebrate; not within the scope of the project
Idiosoma schoknechtorum	Mortlock River shield-backed trapdoor spider		P3	Invertebrate; not within the scope of the project
Ixalodectes flectocercus	Beverley shield-back		P3	Invertebrate; not within the scope of the project
Parartemia contracta	A brine shrimp (Wheatbelt)		P1	Invertebrate; not within the scope of the project
Westralunio carteri	Carter's freshwater mussel	VU	VU	Invertebrate; not within the scope of the project

APPENDIX FIVE FIELD SURVEY RESULTS

Table 34: Flora inventory (site x species matrix)

'X' indicates presence

Family	Species	Naturalised	Cons. status	WC2301	WC2302	WC2303	WC2304	WC2305	WC2306	WC2307	WC2308	WC2309	WC2310	WC2311	WC2312	WC2313	WC2314	WC2315	WC2316	WC2317	WC2318	WC2319	WC2320	Opp.
Aizoaceae	Aizoaceae sp.	*																						Х
	Carpobrotus edulis	*																						х
	Mesembryanthemum nodiflorum	*			Х			Х	Х				Х	Х		Х								
Amaranthaceae	Ptilotus drummondii										Х													
	Ptilotus polystachyus																			Х				
Asparagaceae	Dichopogon fimbriatus					Х																		
	Laxmannia squarrosa																						Х	
	Lomandra effusa						Х			Х	Х				Х							Х		
	Thysanotus patersonii					Х												Х						
Asteraceae	Arctotheca calendula	*		Х																				
	Blennospora drummondii																							х
	Brachyscome pusilla			Х					Х					Х										
	Cotula bipinnata	*														Х								
	Dittrichia graveolens	*																		Х				
	Gnephosis tenuissima			Х																				
	Helichrysum leucopsideum					Х							Х											
	Hypochaeris glabra	*								Х								Х		Х				
	Monoculus monstrosus	*													Х					Х				
	Olearia imbricata																							х
	Olearia muelleri						Х																	
	<i>Olearia</i> sp. Eremicola (Diels & Pritzel s.n. PERTH 00449628)									х	х													
	Panaetia lessonii											Х												
	Podolepis aristata subsp. aristata			Х																				
	Podotheca gnaphalioides			х		х																		

Family	Species	Naturalised	Cons. status	WC2301	WC2302	WC2303	WC2304	WC2305	WC2306	WC2307	WC2308	WC2309	WC2310	WC2311	WC2312	WC2313	WC2314	WC2315	WC2316	WC2317	WC2318	WC2319	WC2320	Opp.
Asteraceae cont'	Pogonolepis stricta				Х																			
	Siloxerus pygmaeus																							Х
	Sonchus oleraceus	*		х	х					х														
	Ursinia anthemoides subsp. anthemoides	*		х		х						х	х		Х		Х	х	Х			Х		
	Waitzia acuminata var. acuminata			х		х						Х			х								Х	
Boraginaceae	Halgania anagalloides																							Х
Boryaceae	Borya sphaerocephala																							Х
Brassicaceae	Brassica tournefortii	*																						Х
Campanulaceae	Lobelia cleistogamoides			Х																				
Caryophyllaceae	Spergularia marina				Х																			
Casuarinaceae	Allocasuarina campestris					Х							Х		Х		Х	Х		Х			Х	
	Allocasuarina huegeliana											Х						Х	Х					
	Allocasuarina microstachya																							Х
Centrolepidaceae	Centrolepis aristata			Х	Х																			
	Centrolepis pilosa			Х																				
	Centrolepis polygyna			Х																				
Chenopodiaceae	Atriplex semibaccata				Х					Х			Х											
	Enchylaena tomentosa var. tomentosa			Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х		Х								
	Maireana brevifolia							Х													Х			
	Rhagodia preissii subsp. preissii				х	Х																		
	Sclerolaena diacantha				Х																			
	<i>Tecticornia</i> sp.				Х																			
Crassulaceae	Crassula sp.			Х																				
Cyperaceae	Caustis dioica			Х																				
	Gahnia sp. dull bases (K.R. Newbey 5111)							Х									Х							
	Gahnia trifida				Х																			
	Lepidosperma ?costale										Х				Х					Х				

Family	Species	Naturalised	Cons. status	WC2301	WC2302	WC2303	WC2304	WC2305	WC2306	WC2307	WC2308	WC2309	WC2310	WC2311	WC2312	WC2313	WC2314	WC2315	WC2316	WC2317	WC2318	WC2319	WC2320	Opp.
Cyperaceae cont'	Lepidosperma drummondii											Х												
	Lepidosperma sp. Bandalup Scabrid (N. Evelegh 10798)												х											
	<i>Lepidosperma</i> sp. P1 small head (M.D. Tindale 166A)																						х	
	Lepidosperma tenue					Х																		
	Mesomelaena preissii											Х						Х		х				
	Mesomelaena stygia					Х																		
	Schoenus calcatus																						Х	
	Schoenus sp. smooth culms (K.R. Newbey 7823)			х																				
Dilleniaceae	Hibbertia acerosa																							Х
	Hibbertia exasperata																							Х
	Hibbertia polystachya											Х			Х			Х					Х	
Ericaceae	Lysinema pentapetalum																						Х	
	Styphelia dielsiana																							Х
	Styphelia serratifolia														Х									
Fabaceae	Acacia acanthoclada subsp. acanthoclada										Х													
	Acacia acuminata																Х				Х	Х		
	Acacia acutata																							Х
	Acacia erinacea									Х	Х													
	Acacia lasiocarpa var. sedifolia					Х				Х														
	Acacia leptopetala					Х				Х	Х													
	Acacia leptospermoides subsp. leptospermoides																							Х
	Acacia sphacelata subsp. sphacelata			Х																				
	Acacia stenoptera											Х			Х									
	Bossiaea spinescens																							Х
	Chorizema aciculare																							Х
	Chorizema rhynchotropis											Х												

		Ituralised	ons. status	C2301	C2302	C2303	C2304	C2305	C2306	C2307	C2308	C2309	C2310	C2311	C2312	C2313	C2314	C2315	C2316	C2317	C2318	C2319	C2320	op.
Family	Species	Na	ပိ	Ň	Ň	Ň	Ň	Ň	Ň	Ň	Ň	Ň	Ň	Ň	Ň	Ň	Ň	Ň	Ň	Ň	Ň	ž	Ň	Q
Fabaceae cont'	Daviesia aphylla									Х														
	Daviesia brachyphylla																							Х
	Daviesia hakeoides subsp. hakeoides											Х												
	Daviesia pachyloma									Х														
	Dillwynia uncinata																							Х
	Gastrolobium hookeri					Х						х												
	Gastrolobium spinosum			х		х						Х			Х								Х	
	Gastrolobium trilobum							Х	Х					Х										
	Gompholobium marginatum																							Х
	Jacksonia racemosa			Х																				
	Templetonia sulcata									Х	Х													
	Trifolium arvense	*																Х						
	Trifolium glomeratum	*																						Х
	Trifolium hirtum	*																	Х	Х				
	Vicia sativa	*																						Х
Geraniaceae	Erodium botrys	*																		Х				
Goodeniaceae	Coopernookia strophiolata																							Х
	Dampiera lavandulacea			Х		Х						Х					Х		Х	Х			Х	
	Goodenia helmsii																							Х
	Goodenia trichophylla											Х												
Haloragaceae	Glischrocaryon aureum														Х								Х	
Hemerocallidaceae	Dianella revoluta			Х		Х				Х	Х	х	Х		Х		Х	Х	Х	Х				
	Tricoryne tenella																							Х
Iridaceae	Moraea setifolia	*			х								Х	Х										
	Romulea rosea	*			х								Х		Х		Х		Х	Х				
Juncaceae	Juncus bufonius	*		Х	х																			
	Juncus pallidus																							Х

		aturalised	ons. status	/C2301	/C2302	/C2303	/C2304	/C2305	/C2306	/C2307	/C2308	/C2309	/C2310	/C2311	/C2312	/C2313	/C2314	/C2315	/C2316	/C2317	/C2318	/C2319	/C2320	pp.
Family	Species	Z	С С	>	>	>	>	>	>	>	>	>	>	>	>	5	>	>	>	>	>	>	5	0
Lamiaceae	Westringia discipulorum									Х														
Lauraceae	Cassytha pomiformis	_							Х			Х	Х	Х									└── ╹	ļ
	Cassytha sp.																							Х
Lythraceae	Lythrum hyssopifolia	*																					ļ!	Х
Marsileaceae	Marsilea drummondii																							Х
Montiaceae	Calandrinia sp.							Х																
Myrtaceae	Baeckea muricata																							Х
	Beaufortia schaueri																							Х
	Calothamnus brevifolius		4																	Х				
	Calothamnus quadrifidus																Х						х	
	Calytrix leschenaultii																							Х
	Chamelaucium ciliatum												Х									Х		
	Ericomyrtus drummondii																						Х	
	Ericomyrtus serpyllifolia																							Х
	Eucalyptus arachnaea subsp. arachnaea															х	Х							
	Eucalyptus capillosa					Х		Х	Х		Х		Х	х	х									
	Eucalyptus kondininensis						Х			Х	Х													
	Eucalyptus longicornis									х	Х													
	Eucalyptus loxophleba subsp. loxophleba																Х				Х	Х		
	Eucalyptus orthostemon				Х																			
	Eucalyptus rigidula														Х									
	Eucalyptus salmonophloia						Х	Х		Х	Х													
	<i>Eucalyptus</i> sp.	*																						х
	Eucalyptus tenera							х	х					х		х								
	Leptospermopsis erubescens			Х		Х														х				
	Leptospermum erubescens																							Х
	Melaleuca acuminata																							Х

Family	Species	Vaturalised	Cons. status	NC2301	VC2302	VC2303	NC2304	NC2305	NC2306	NC2307	VC2308	NC2309	NC2310	NC2311	NC2312	NC2313	NC2314	NC2315	NC2316	NC2317	NC2318	NC2319	NC2320	.ddC
Myrtaceae cont'	Melaleuca brophyi			X																				
	Melaleuca carrii																							х
	Melaleuca eurvstoma																							x
	Melaleuca haplantha								х					х										
	Melaleuca lateriflora																							х
	Melaleuca leptospermoides																			х				
	Melaleuca marginata							х	х				х	х										
	Melaleuca platycalyx																							х
	Melaleuca scalena				х				х				х	х										
	Melaleuca spicigera												х											
	Verticordia acerosa var. preissii																							Х
	Verticordia chrysantha																						х	
	Verticordia densiflora var. densiflora			Х																				
	Verticordia eriocephala																							х
	Verticordia picta																						Х	
Orchidaceae	Thelymitra sp.											Х			Х									
Pittosporaceae	Billardiera fusiformis																							Х
Poaceae	Amphipogon caricinus																Х							
	Amphipogon strictus																						Х	
	Amphipogon turbinatus																							Х
	Austrostipa elegantissima			Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х		Х		
	Austrostipa hemipogon			Х											Х								Х	
	Austrostipa scabra			Х		Х				Х	Х		Х	Х	Х			Х				Х	Х	
	Avena barbata	*		Х	Х			Х		Х	Х	Х		Х	Х	Х	Х		Х	Х	Х	Х	Х	
	Briza maxima	*		Х	Х	Х						Х												
	Bromus diandrus	*								Х				Х			Х	Х	Х	Х	Х	Х	Х	
	Bromus rubens	*						Х	Х			1												

		uralised	is. status	2301	2302	2303	2304	2305	2306	2307	2308	2309	2310	2311	2312	2313	2314	2315	2316	2317	2318	2319	2320	,
Family	Species	Natı	Con	WC:	Opp																			
Poaceae cont'	Chloris truncata																							Х
	Ehrharta calycina	*																Х						
	Ehrharta longiflora	*		х	Х		х	Х	х	Х	х	Х	х	Х	х	Х	х	Х	х	х	Х	Х		
	Eragrostis curvula	*																	Х	Х				
	Eragrostis dielsii				Х																			
	Hordeum vulgare	*																						Х
	Lolium perenne x rigidum	*		Х	Х		Х	Х		Х	Х		Х	Х									Х	
	Neurachne alopecuroidea					Х					Х		Х										х	
	Parapholis incurva	*			Х																			
	Pentameris airoides	*				Х																		
	Polypogon monspeliensis	*																						Х
	Rytidosperma setaceum						Х	Х	Х	Х	Х	Х	Х	Х	Х	Х	Х		Х				х	
	Schismus barbatus	*																						Х
	Spartochloa scirpoidea																							Х
	Triticum aestivum	*																						Х
	Vulpia myuros forma myuros	*				Х				Х	Х			Х	Х	Х	Х			Х		Х		
Polygalaceae	Comesperma scoparium			Х		Х						Х			Х				Х				х	
Primulaceae	Lysimachia arvensis	*																						Х
Proteaceae	Banksia fraseri var. fraseri																	Х		Х				
	Banksia purdieana											Х						Х						
	Banksia sphaerocarpa var. caesia																							Х
	Banksia sphaerocarpa var. sphaerocarpa																	Х						
	Grevillea anethifolia			Х																				
	Grevillea excelsior																							Х
	Grevillea hakeoides subsp. hakeoides				Х																			
	Grevillea hookeriana											Х												
-	Grevillea huegelii																							Х

		uralised	ns. status	:2301	:2302	:2303	2304	2305	:2306	:2307	:2308	:2309	:2310	:2311	:2312	:2313	:2314	:2315	:2316	:2317	:2318	:2319	:2320	p.
Family	Species	Nat	Col	wo	wo	wo	wo	wo	wc	wo	wo	wo	wo	wo	wo	wc	MC	wo	wc	wo	wc	wo	wo	do
Proteaceae cont'	Grevillea umbellulata																Х							
	Grevillea uncinulata																							Х
	Hakea gilbertii																							Х
	Hakea incrassata																			Х				
	Hakea prostrata																							Х
	Hakea scoparia												Х		Х		Х						Х	
	Hakea trifurcata																							Х
	Isopogon pruinosus subsp. pruinosus																							Х
	Persoonia quinquenervis																							Х
	Petrophile glauca																							Х
	Petrophile seminuda																	Х						
	Synaphea drummondii		3																					Х
	Synaphea interioris																							Х
Ranunculaceae	Clematis delicata			Х																				
Restionaceae	Desmocladus asper			Х		Х																		
	Lepidobolus preissianus			Х																Х				
Rhamnaceae	Cryptandra leucopogon																							Х
	Cryptandra myriantha												Х											
	<i>Cryptandra</i> sp.																							Х
	Stenanthemum stipulosum																						Х	
Rubiaceae	Opercularia vaginata			Х		Х						Х						Х					Х	
Rutaceae	Phebalium drummondii		3			Х																		
	Phebalium tuberculosum												Х											
Santalaceae	Santalum acuminatum				Х										Х									
	Santalum spicatum																	Х						
Sapindaceae	Dodonaea bursariifolia									Х														
	Dodonaea caespitosa																						Х	

Family	Species	Naturalised	Cons. status	WC2301	WC2302	WC2303	WC2304	WC2305	WC2306	WC2307	WC2308	WC2309	WC2310	WC2311	WC2312	WC2313	WC2314	WC2315	WC2316	WC2317	WC2318	WC2319	WC2320	Opp.
Sapindaceae cont'	Dodonaea pinifolia																					Х	Х	
	Dodonaea viscosa subsp. angustissima										Х													
Scrophulariaceae	Eremophila glabra subsp. elegans									Х														
	Eremophila lehmanniana										Х													
Solanaceae	Solanum nigrum	*																						
Stylidiaceae	Stylidium dichotomum																							Х
	Stylidium zeicolor																							Х
Thymelaeaceae	Pimelea argentea																							Х
Xanthorrhoeaceae	Xanthorrhoea nana					Х												Х						