INDIAN OCEAN DRIVE BIOLOGICAL SURVEYS - COOLIMBA-ENEABBA RD

Aquirecomm on behalf of Telstra

ecoscape

Revision	Author	QA Reviewer	Approved	Date
Draft	Lyn Atkins	JT	JT	26/02/2024
Final	Lyn Atkins	SB	SB	07/03/2024

Direct all inquiries to:
Ecoscape (Australia) Pty Ltd
Lvl 1 38 Adelaide Street Fremantle (Walyalup) WA 6160
Whadjuk Boodja
Ph: (08) 9430 8955
Prepared for Aquirecomm on behalf of Telstra

This document should be cited as 'Ecoscape (Australia) Pty Ltd (2024) *Indian Ocean Drive Biological Surveys - Coolimba-Eneabba Rd*, prepared for Aquirecomm on behalf of Telstra

TABLE OF CONTENTS

FIGURES

TABLES

MAPS

EXECUTIVE SUMMARY

Telstra is investigating potential sites to improve its mobile telecommunications coverage along Indian Ocean Drive. This report details the findings of a Reconnaissance flora and vegetation and Basic fauna survey for a 0.25 ha site near the intersection of Indian Ocean Drive and Coolimba-Eneabba Rd.

The desktop assessment identified:

- the pre-European vegetation association intersecting the survey area (association 1,026, described as *Scrub-heath / Thicket, Mosaic: Shrublands; Acacia rostellifera, A. cyclops (in the south) & Melaleuca cardiophylla (in the north) thicket / Shrublands; Acacia lasiocarpa & Melaleuca acerosa heath*) has more than 90% of its original extent remaining at all scales (state-wide to local government area)
- the Department of Biodiversity, Conservation and Attractions database searches identified:
  - one Threatened Ecological Community (TEC) from within 30 km of the survey area, but not intersecting it
  - one Priority Ecological Community (PEC) from within 30 km, but not intersecting it
  - 106 vascular flora species from within 25 km of the survey area and an additional survey area approximately 19 km to the north (subject of a separate report), none from within it or within 0.5 km
  - 31 conservation-listed terrestrial vertebrate fauna species from within 30 km of the two survey areas (as above) but none from within it or within 0.5 km. The closest conservation-listed species are shorebirds.

The field surveys (conducted during November 2023) identified:

- 49 vascular flora species recorded from three floristic quadrats and opportunistic observations including one that is conservation-listed:
  - *Grevillea olivacea* (P4) recorded as seedlings within the survey area but observed more commonly as larger shrubs in adjacent areas
- three vegetation types, none of which are representative of any TEC or PEC and all are considered to occur commonly in the local area and more regionally:
  - **CoLOW**; *Casuarina obesa* low open woodland, from the low-lying flat (0.04 ha; 17.9% of the survey area)
  - **MlMcTS**; *Melaleuca lanceolata* and *Melaleuca cardiophylla* tall shrubland, from the dune and flat area with sand over limestone (0.08 ha; 33.5% of the survey area)
  - **TsSrLSSS**; *Tecticornia* spp. and *Samolus repens* low samphire shrubland/shrubland, from the wetland fringe (0.03 ha; 12.8% of the survey area)
- the vegetation condition ranged from Degraded to Very Good with the majority in Good condition; human disturbance and weeds are the main factors affecting vegetation condition
- two fauna habitat types, both of which occur commonly in the local area and more regionally
- six fauna species, none of which are conservation-listed
- there is no habitat suitable for Black Cockatoo (Carnaby's Cockatoo) nesting, roosting, or foraging.

Overall, none of the above factors are likely to be considered as significant to environmental approvals. Furthermore, the clearing footprint is likely to be restricted to the compound and guy anchor areas which should be considered in discussions with the relevant stakeholders.

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*
BoM	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)
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*
ha	hectare/hectares
IBRA	Interim Biogeographic Regionalisation for Australia
km	kilometre/kilometres
m	metre/metres
MA	Marine species (fauna; protected under international agreements and EPBC Act)
MI	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)
S1	Schedule 1 Fauna species listed under the BC Act
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

Telstra is investigating potential sites to improve its mobile telecommunications coverage along Indian Ocean Drive. Aquirecomm, operating on Telstra's behalf, appointed Ecoscape to conduct a biological assessment of two proposed tower locations to identify and report on any potential issues that may affect the environmental approvals process.

This report is for the site known as 'Coolimba-Eneabba Rd'.

1.2 SURVEY AREA

The Aquirecomm project area, known as the 'survey area' in this report, is located within the Shire of Carnamah in the Geraldton Sandplains bioregion, approximately 240 km north of Perth (**Figure 1**). The survey area occupies 0.25 ha although only a small portion will be required for the proposed works.

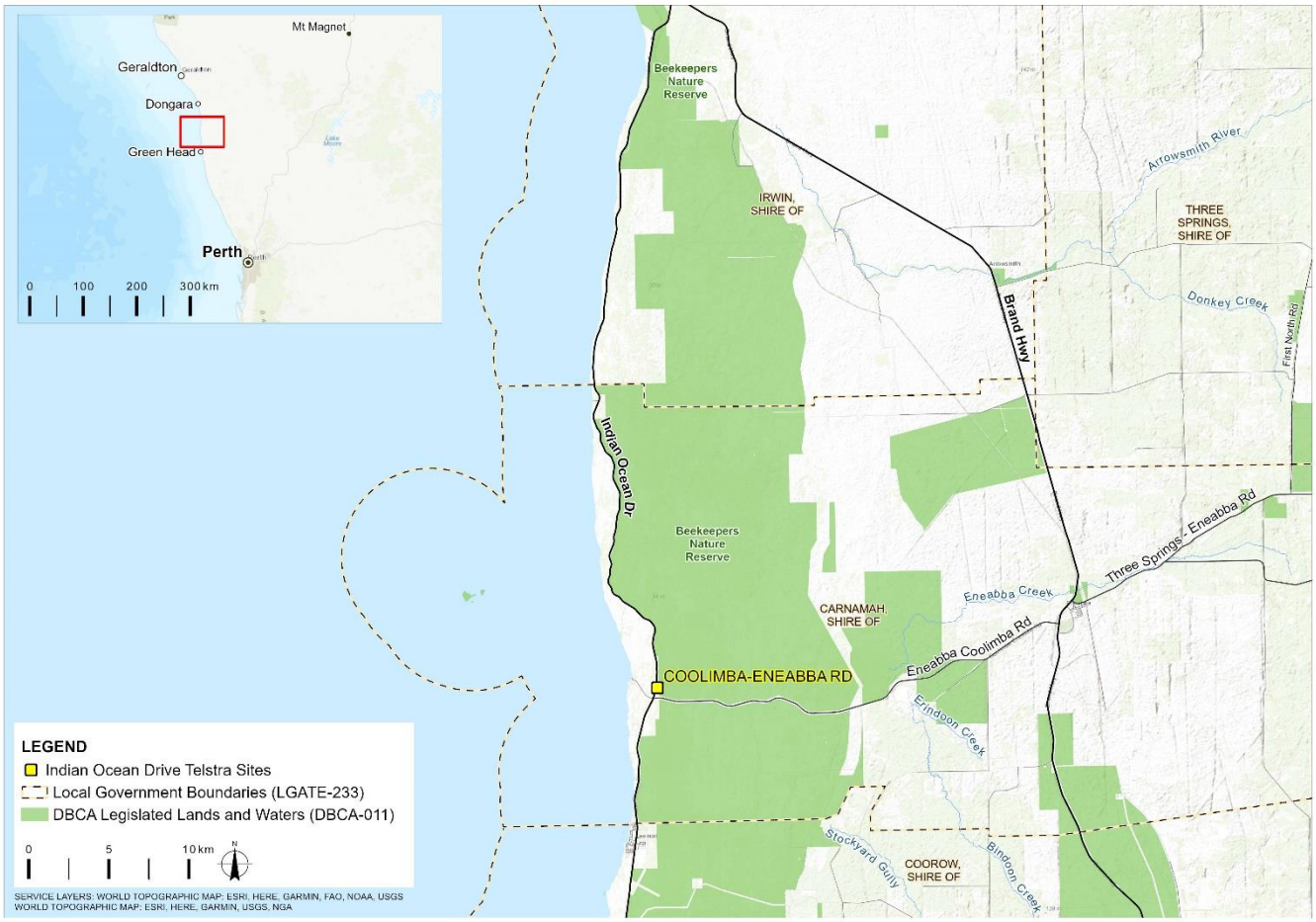


Figure 1: Survey area location

1.3 SURVEY REQUIREMENTS

The requirements of the survey were to:

- conduct a desktop assessment to identify any potentially significant aspects of the site
- undertake a field survey to ground truth the desktop findings, incorporating:
  - Reconnaissance flora and vegetation survey including searches for conservation-listed flora
  - Basic fauna survey including as assessment of habitat suitability for Carnaby's Cockatoo.

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.*

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 EPA requirements for environmental survey and reporting in Western Australia, as outlined in:

- EPA (2020) *Technical Guidance – Terrestrial vertebrate fauna surveys for environmental impact assessment*, known herein as the Fauna Technical Guidance
- EPA (2016a) *Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment*, known herein as the Flora and Vegetation Technical Guidance
- EPA (2016b) *Environmental Factor Guideline – Flora and Vegetation*
- EPA (2016c) *Environmental Factor Guideline – Terrestrial Fauna*
- 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 (Bamford 2016) *Black Cockatoo potential nest tree grading system*
- Bamford (2020) Scoring system for the assessment of foraging values of vegetation for Black Cockatoos. Revised June 2020.

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 coastal Bureau of Meteorology (BoM) station with long term rainfall records is Leeman (BOM 2024 station 9199, operating since 1983) which is located approximately 9.7 km south of the survey area. The mean annual rainfall is 513.2 mm falling predominantly during May–August (68.3% of the annual total). The rainfall during the 6-month period prior to the field survey was 61.3% of the long-term average for this period.

The closest coastal BoM station with long term temperature records is Jurien Bay (BOM 2024 station 9131, operating since 1968) which is located approximately 70 km south of the survey area. February is the hottest month with a mean maximum temperature of 30.8°C and minimum of 18°C. July is the coldest month with a mean maximum of 19.6°C and minimum of 9.5°C.

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

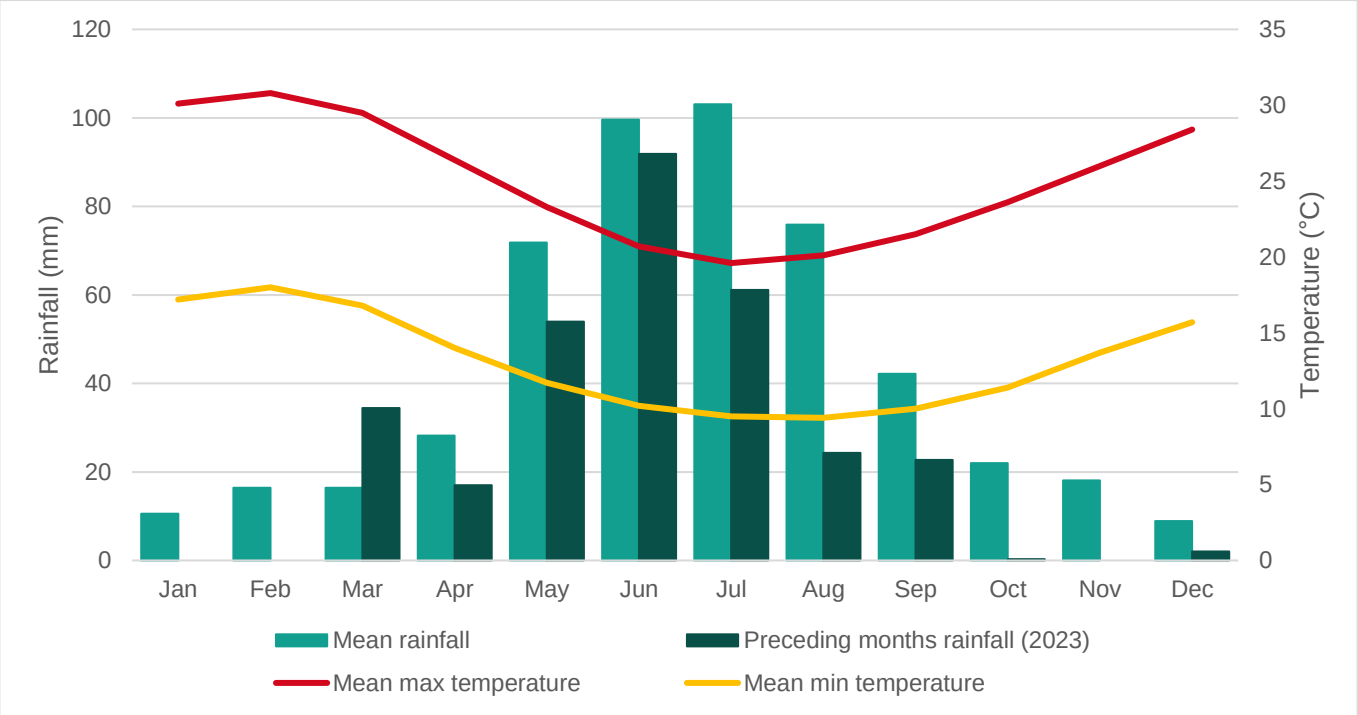


Figure 2: Rainfall and temperature data for the survey area (BoM 2024)

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**).

Table 2: Land systems (DPIRD 2020)

Mapping unit	Land system	Description	Extent (ha)	%
221Ea_2	Eatha 2 subsystem	Depositional plain surrounding Ea1 (includes small areas of Ea1)	0.19	74.63
221Qu_4	Quindalup Central 4 subsystem	Foredune complex adjacent to coast and beach and parabolic dune system with trailing arms	0.06	25.37

2.1.3 WETLANDS AND DRAINAGE

The survey area is in the Moore-Hill Rivers catchment (Department of Water and Environmental Regulation 2018). There are no drainage features (e.g. rivers) nearby.

The survey area is located adjacent to lands that are included in the Geomorphic Wetlands Cervantes Eneabba (DBCA 2017), specifically a floodplain feature.

2.1.4 ENVIRONMENTALLY SENSITIVE AREAS

The survey area does not intersect any mapped Environmentally Sensitive Areas (ESAs) (DWER 2021). The nearest ESA is located 1.8 km to the east.

2.1.5 CONSERVATION LANDS

The survey area is located approximately 50 m west of the boundary of Beekeepers Nature Reserve.

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 Geraldton Sandplains IBRA region in the Leseur Sandplain subregion (GS2), described as:

> *The Geraldton Sandplains bioregion is composed mainly of proteaceous scrub-heaths, rich in endemics, on the sandy earths of an extensive, undulating, lateritic sandplain mantling Permian to Cretaceous strata. Extensive York Gum and Jam woodlands occur on outwash plains associated drainage. The Lesueur Sandplain (GS3) comprises coastal Aeolian and limestones, Jurassic siltstones and sandstones (often heavily lateritised) of central Perth Basin. Alluvials are associated with drainage systems. There are extensive yellow sandplains in south-eastern parts, especially where the subregions overlaps the western edge of the Pilbara Craton. Shrub-heaths rich in endemics occur on a mosaic of lateritic mesas, sandplains, coastal sands and limestones. Heath on lateritised sandplains along the subregions north-eastern margins. The climate is Mediterranean and the subregional area is 1,358,915 ha* (Desmond & Chant 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 one pre-European vegetation units: vegetation association 1,026 described as *Scrub-heath / Thicket, Mosaic: Shrublands; Acacia rostellifera, A. cyclops (in the south) & Melaleuca cardiophylla (in the north) thicket / Shrublands; Acacia lasiocarpa & Melaleuca acerosa heath*. Its pre-European and current extents are listed in **Table 3** (DBCA 2019a).

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

Region	Vegetation association	Original extent (ha)	Current extent (ha)	% remaining
Western Australia	1,026	70,700.48	65,560.67	92.73
IBRA biogeographic region (Geraldton Sandplains)	1,026	11,426.90	10,729.87	93.90
IBRA biogeographic sub-region (Leseur Sandplain)	1,026	11,426.90	10,729.87	93.90
LGA (Shire of Carnamah)	1,026	5,329.93	4,964.45	93.14

2.2.3 THREATENED AND PRIORITY ECOLOGICAL COMMUNITIES

Threatened and Priority Ecological Communities intersecting the survey area and nearby were identified by a *Protected Matters Search Tool* (PMST) search (DCCEEW 2024a, using a 30 km buffer) and DBCA database search request (search reference 20-1123EC-GreenHead-Ecoscape using a 30 km buffer around the supplied shapefiles which incorporated two potential Telstra sites; this site and another approximately 19 km to the north, subject to a separate report).

The results of these searches are indicated in **Table 4** and, for the DBCA data, shown on **Map 2**. As the DBCA database search included a buffer around two survey areas, the right-side column indicates if the TEC or PEC (including the DBCA-applied buffer) is located within 30 km of the Coolimba-Eneabba Rd survey area. PMST results may refer to either the community itself occurring or habitat to support the community occurring within the search buffer.

Table 4: TECs and PECs identified by PMST and DBCA database searches

PMST	DBCA database	Ecological Community	C'wealth Status	WA status	Within 30 km?
'may buffer only		*Banksia Woodlands of the Swan Coastal Plain ecological community*	EN		No
-	X	*Coastal sands dominated by Acacia rostellifera, Eucalyptus oraria and Eucalyptus obtusiflora (Geraldton area)*		P1	Yes
-	X	*Ferricrete floristic community (Rocky Springs type)*		CR	Yes
=-	X	*Subtropical and Temperate Coastal Saltmarsh*	VU	P3	No
'may buffer only		*Tuart (Eucalyptus gomphocephala) Woodlands and Forests of the Swan Coastal Plain ecological community*	CR		No

2.2.4 THREATENED AND PRIORITY FLORA

The PMST search (as above) identified 30 EPBC-listed TF consisting of 12 that are known, or their habitat is known to occur within the 30 km search buffer area, 12 as 'species or habitat likely to occur within area' and six as 'species or species habitat may occur within area'.

The requested DBCA databases (search reference 28-1123FL (Ecoscape Australia)) was conducted using a 25 km buffer around the supplied shapefiles which incorporated two potential Telstra sites (this site and another approximately 19 km to the north, detailed in a separate report). 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 2** shows the locations of 106 conservation-listed flora identified by the DBCA database search.

The combined database searches identified 128 species, listed in **Table 25** and **Table 26** in **Appendix Three**, consisting of 31 TF (eight from records known to occur within the database search buffer and 30 from the PMST that may have been identified due to habitat likelihood of occurring rather than species likelihood), seven P1, 19 P2, 49 P3 and 22 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 includes the following sources: ecology as listed on *FloraBase* (WAH 1998-2023, 2023) or in more detailed documents e.g. formal taxonomic descriptions of the species.

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 5**, for each specific survey area) 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 5**.

Table 5: Categories for likelihood of occurrence of TF and PF

Likelihood 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**

* close proximity = 6.25 km (¼ of the distance of the database search buffer)
** proximity = 12.5 km (½ of the distance of the database search buffer)

The likelihood assessment is available in **Table 25** and **Table 26** in **Appendix Three**. None have been previously recorded from within the survey area. No TF, P1 or P2, three P3 and two P4 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

Combined database search results are incorporated into **Table 27** in **Appendix Three**.

Species identified by these database searches that are excluded from the field survey and further assessments (including likelihood assessments) are listed in **Table 28** along with the reason for their exclusion (marine species whose habitat does not occur within the survey area, e.g. whales and turtles and invertebrates that are not within the scope of the survey). Such excluded species are not further referenced in this document.

2.2.5.1 EPBC-listed Threatened Fauna

The *Protected Matters Search Tool* (PMST) search (DCCEEW 2024a, using a 30 km buffer) identified the following as having been recorded or having potential to occur within the search area buffer i.e. 'species or species habitat known to occur within the area' (or buffer) or 'species or species habitat likely to (or may) occur within area' (or buffer):

- four mammals
- 25 birds
- one reptile.

2.2.5.2 DBCA Database Search

A search of the DBCA databases was conducted (search reference: 8054 - FaunaSearch_Ecoscape_Bateman8054) using a 30 km buffer around the supplied shapefiles which incorporated two potential Telstra sites (this site and another approximately 19 km to the north, subject of a separate report).

Thirty-one conservation-listed terrestrial vertebrates were identified as having previously been recorded from within the search area buffer, consisting of two mammals, 27 birds (noting that '*Zanda* sp. White-tailed Black Cockatoo' has been combined with *Zanda latirostris* as this is the only such species known to occur in the survey area) and two reptiles.

2.2.5.3 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 6**.

Table 6: Categories for likelihood of occurrence of conservation-listed fauna

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**

* close proximity = 7.5 km (¼ of the distance of the database search buffer)
** proximity = 15 km (½ of the distance of the database search buffer)

The likelihood of species occurring within the survey area are indicated in **Table 27** in **Appendix Three**.. One species were assessed as being Likely to occur within the survey area:

- *Pluvialis squatarola* (Grey Plover), which is a listed Migratory species.

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 5.4.3.1**, including providing an indication of dependence of species on the habitat and resources available within the survey area.

2.2.5.4 Black Cockatoos

According to DBCA mapping the survey area is located approximately:

- 48 km northwest of confirmed Carnaby's Cockatoo breeding areas (DBCA 2018a)
- 29 km northwest of buffer edges of Black Cockatoo breeding sites (DBCA 2019b)
- 36 km northwest of buffer edges of Black Cockatoo roost sites (DBCA 2019c)
- 26 km north of areas under investigation as Carnaby's Cockatoo feeding habitat (DBCA 2018b).

Figure 2 in EPA (2019) indicates the survey area is located 10-20 km to the west of an 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 the survey area or sufficiently close to provide contextual information.

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 2023) was searched for recent environmental surveys in the vicinity of the survey area.

The search, conducted on 16 February 2024, identified one (duplicated) environmental survey conducted within 20 km of the survey area, with only metadata available from the IBSA portal site. However, Ecoscape has this reference within its library (GHD Pty Ltd 2015) and inspection of this document identified that the GHD survey area was more coastal than the current survey area and the report has little relevance.

2.3.3 OTHER LITERATURE

No other documents have been located that provide local contextual information for this assessment. More distant survey reports pertaining to similar landforms were reviewed for contextual information:

- Ecoscape (2021) *Arrowsmith Wind and Solar Farm Environmental Survey*. This report details the results of a Reconnaissance flora and vegetation and Basic fauna survey at a site proposed for a wind and solar farm, located approximately 35 km north of the current survey area. The Arrowsmith survey area had similar landforms to the current survey area. The significant findings included 191 vascular flora species (three conservation-listed), eight broad vegetation types (Groundwater Dependent Ecosystems were considered as significant), 57 vertebrate fauna species (one Threatened species, one Migratory and one Marine species).
- Ecoscape (2023a) *Arrowsmith Hydrogen Detailed Flora and Vegetation Survey*. This survey was an extension of the previous survey above. The Detailed flora and vegetation survey resulted in the identification of 234 vascular flora species including five that are conservation-listed and 10 vegetation types including one that is likely to be representative of the *Coastal sands dominated by Acacia rostellifera, Eucalyptus oraria and Eucalyptus obtusiflora (Geraldton area)* PEC. Two of these vegetation types were considered to represent Carnaby's Cockatoo foraging habitat.
- Ecoscape (2023b) *Arrowsmith Wind Farm Project – Fauna Risk Assessment*. This desktop risk assessment identified the potential risk of rotor strike to raptor species and Carnaby's Cockatoo was high due to site location, presence of seasonal freshwater and foraging habitat.
- Mattiske Consulting (2021) *Flora and Vegetation Assessment Arrowsmith North Survey Area*. The Mattiske survey area is located approximately 2.8 km to the east of the IGE survey area (so approximately 40 km north of the current survey area). A total of 113 survey sites were established, resulting in the recording of 221 vascular plant taxa (no TF; nine PF) and eight vegetation communities, none of which were considered as significant. Overall, the vegetation was low heath and shrubland on sandplain, and mostly not floristically similar to the sandplain vegetation of the IGE site.
- Woodman Environmental Consulting (2012) *Summary report of flora and vegetation studies 2001-2011*. This report summarises flora and vegetation survey findings from a number of surveys conducted in areas of interest for future mining by Iluka Resources. In total 425 floristic quadrats were assessed, identifying 1,012 vascular plant taxa including 11 TF and 79 PF. Floristic analysis identified 42 floristic community types, most of which within the Iluka study area were considered to have high conservation significance due to high species richness and endemism.
- Hart, Simpson and Associates Pty Ltd (2003) *Proposed EP 413 Denison 3D Seismic Survey Flora & Fauna Investigation Report*. This report details a survey for Origin Energy, with the study located approximately 2.5 km north of the IGE survey area. The survey identified a shrub mallee vegetation type as being significant (dominated by *Eucalyptus obtusifolia* subsp. *dongarraensis*); this is now recognised as a P1 PEC, three conservation-listed flora (*Anthocercis intricata*, P3; *Haloragis foliosa*; P3, and *Eucalyptus zopherophloia*; P4) and three conservation-listed fauna species (Carnaby's Cockatoo, Malleefowl, Peregrine Falcon).

3 METHODS

3.1 SURVEY AIMS

The aims of the flora, vegetation and fauna surveys were to identify any potentially significant biological attributes of the site.

3.2 GUIDING PRINCIPLES

The flora and vegetation survey was conducted as a Reconnaissance survey according to the Flora and Vegetation Technical Guidance (EPA 2016a). The EPA recommends a Reconnaissance survey should:

- provide context and gather broad information
- verify the findings of the desktop assessment
- include low intensity sampling of the flora and vegetation to describe the general vegetation characteristics and condition
- clarify if the area may support any significant flora and vegetation
- identify if a Detailed survey is required.

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, particularly their 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 Reconnaissance survey.

Conservation criteria used in this assessment are outlined in **Table 16**, **Table 17** and **Table 18** 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, 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. 100 m^2.

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.

Quadrat locations are displayed on **Map 4**.

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. The entire survey area was extensively searched.

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 19** and **Table 20** 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, with the upper case letters at the end referring to the stratum structure e.g. **MlMcTS** refers to ***M****elaleuca* ***l****anceolata* and ***M****elaleuca* ***c****ardiophylla* tall shrubland.

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 21** 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 November 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 taxonomist Stephen Kern using relevant literature, taxonomic keys and reference specimens held at the WA Herbarium, including seeking assistance from specialist taxonomists where necessary.

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 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. However, for a Reconnaissance survey with low intensity sampling, the species inventory is not anticipated to be comprehensive.

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 16** and **Table 17** 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. 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:

- vegetation type and condition mapping
- aerial imagery
- landforms
- soil characteristic.

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 non-breeding range of Carnaby's Cockatoo (DAWE 2022) and estimated distribution of this species in EPA (2019).

Where present, potential and active (actual) Black Cockatoo breeding trees were assessed as per Commonwealth guidance (DAWE 2022) and Bamford (2016) methods.

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
- 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 22** in **Appendix Two**)
- photographs, showing hollows if possible
- known nesting trees as per DBCA data.

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 23** 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 24** 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.

3.4.2.2 Other Species of Conservation Significance

Other conservation-listed species, including migratory birds, with the potential to occur were targeted using active searches (incorporating avian surveys) during the field survey.

4 FIELD SURVEY RESULTS

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 2223-0089), assisted by Natasha Whitfield, during 27 November 2023.

4.1.1 FLORA

4.1.1.1 Flora Inventory

Three floristic quadrats were recorded from within the survey area.

Forty-nine vascular flora were recorded from 39 genera and 25 families from the quadrats, relevés, opportunistic observations and searches for conservation-listed flora. Of these, 13 were introduced (26.5%) and 10 (20.4%) could not be identified to species level due to insufficient diagnostic reproductive material including five species of Samphires (*Tecticornia* and *Sarcocornia* spp.), none of which had seeds that are required for identification. None of the unidentified species are similar to conservation-listed flora known from the area.

The most commonly represented families were Poaceae (10 taxa), Cehnopodiaceae (six) and Asteraceae (four). The most commonly represented genera were *Tecticornia* with four taxa and *Melaleuca* (three).

The number of species per quadrat ranged from nine in quadrat CE2302 to 21 in quadrat CE2303, with an average species diversity per quadrat of 13.3. The most commonly recorded species were Melaleuca lanceolata recorded from three quadrats, and *Acanthocarpus preissii*, *Austrostipa* sp. and *Melaleuca huegelii* (two quadrats each).

The combined flora inventory is presented in **Table 29** in **Appendix Four**. Quadrat data is presented in **Appendix Five**.

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 that was not identified with certainty resembled any currently described TF.

Priority Flora

One PF was recorded during the field survey:

- *Grevillea olivacea* (P4).

Its location is indicated on **Map 4** and described in more detail in **Table 7**.

Table 7: PF recorded during the field survey

***Grevillea olivacea* (P4)**	
Description: According to *FloraBase* (WAH 2024, 1998b-2024), Grevillea olivacea is an erect shrub 1–4.5 m high growing on white or grey sand on coastal dunes and limestone rock. Within the survey area this species was observed as three small seedlings within quadrat CE2303. However, there were mature plants, as pictured below, just outside the survey area. 	**Habitat:** Limestone pavement; shallow white sand with shell fragments **Location:** Quadrat CE2303 and along access track from Indian Ocean Drive (outside the survey area) **Survey results**: 3 plants (seedlings) in survey area **Populations:** 1 population **Known records and distribution**: According to Atlas of Living Australia (ALA 2024) there are 82 records of this species from the Geraldton Sandplains and Swan Coastal Plain bioregions (excluding outlier records that are potentially planted) with an overall distribution of approximately 400 km (north-south) by 40 km (inland; east-west), with the survey area located within the largest concentration of records.

4.1.1.3 Other Significant Flora

No 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.

Although a number of collected specimens could not be identified with certainty due to lack of diagnostic reproductive material there is no reason to consider that they are of taxonomic interest.

4.1.1.5 Introduced Flora

Thirteen introduced flora species (weeds) were recorded during the field survey, representing 26.5% of the overall flora inventory.

All were recorded at low densities within the survey area and no single taxon was considered as a major contributor to vegetation condition assessment.

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

Three vegetation types were recorded from within the survey area (**Table 8**, **Map 4**) based on a combination of structural vegetation type as identified in the field.

The vegetation types within the survey area, grouped broadly based on landform types, were:

- flat (low, lying and disturbed): **CoLOW**; *Casuarina obesa* low open woodland

- dune (sand, sand over limestone): **MlMcTS**; *Melaleuca lanceolata* and *Melaleuca cardiophylla* tall shrubland
- wetland fringe: **TsSrLSSS**; *Tecticornia* spp. and *Samolus repens* low samphire shrubland/shrubland.

Table 8: Vegetation types

Landform	Mapping unit	Vegetation type	Floristic quadrats	Representative photograph	Other species	Area (ha) and extent (%)
Flat	**CoLOW**	*Casuarina obesa* low open woodland over *Melaleuca lanceolata* and *Melaleuca huegelii* tall open shrubland over **Vulpia myuros* forma myuros, **Ehrharta longiflora* and *Hyalosperma cotula* low open grassland/forbland **NVIS**: U ^*Casuarina obesa*\^tree\6\r;M+ ^*Melaleuca lanceolata*,^*Melaleuca huegelii*\^shrub\4\i;G ^^*Vulpia myuros* forma *myuros*,*Ehrharta longiflora*,*Hyalosperma cotula*\^other grass,forb\1\i	CE2303		*Acacia xanthina* *Acanthocarpus preissii* *Austrostipa* sp. **Avellinia michelii* *Blennospora drummondii* **Bromus rubens* **Carpobrotus edulis* **Cuscuta planiflora* *Grevillea olivacea* (P4) *Lobelia* sp. **Lysimachia arvensis* *Rhodanthe laevis* *Rytidosperma* sp. *Templetonia retusa* **Urospermum picroides*	0.04 ha 17.88%
Dunes, sand over limestone	**MIMcTS**	*Melaleuca lanceolata* and *Melaleuca cardiophylla* tall shrubland over **Bromus hordeaceus* and *Spergularia marina* low sparse grassland/forbland **NVIS**: M+ ^*Melaleuca lanceolata*,^*Melaleuca cardiophylla*\^shrub\4\c;G ^*Bromus hordeaceus*,^*Spergularia marina*\^other grass,forb\1\r	CE2301		*Acanthocarpus preissii* *Austrostipa* sp. *Crassula* sp. *Melaleuca huegelii* *Rhagodia preissii* subsp. *obovata* *Roepera fruticulosa*	0.08 ha 33.47%

Landform	Mapping unit	Vegetation type	Floristic quadrats	Representative photograph	Other species	Area (ha) and extent (%)
Wetland fringe	**TsSrLSSS**	*Tecticornia* spp. and *Samolus repens* low samphire shrubland/shrubland **NVIS**: G+ ^^*Tecticornia* sp. 1,*Samolus repens*,*Tecticornia* sp. 3\^samphire shrub,shrub\2\c	CE2302		*Frankenia pauciflora* **Juncus bufonius* **Lagurus ovatus* *Melaleuca lanceolata* *Tecticornia* sp. 2 *Tecticornia* sp. 4	0.03 ha 12.8%
		Not native vegetation (cleared, salt pan)				0.09 ha 35.8%
		TOTAL EXTENT				**0.25 ha**

4.1.3 VEGETATION SIGNIFICANCE

4.1.3.1 TECs and PECs

The DBCA ecological communities database search (**Section 2.2.3**) identified two TECs as occurring within 30 km of the survey area:

- BC Act-listed critically endangered *Ferricrete floristic community (Rocky Springs type)* TEC
- EPBC Act-listed vulnerable *Subtropical and Temperate Coastal Saltmarsh* TEC that is listed as a P3 PEC by the DBCA.

No vegetation likely to represent the *Ferricrete floristic community (Rocky Springs type)* TEC was recorded from the survey area (DBCA 2023).

The survey area is not on the coast therefore, despite salt marsh being present within the survey area (vegetation type **TsSrLSSS**), by definition it is not representative of the *Subtropical and Temperate Coastal Saltmarsh* TEC. The saltmarsh within the survey area is associated with an inland salt lake.

This search also identified the *Coastal sands dominated by Acacia rostellifera, Eucalyptus oraria and Eucalyptus obtusiflora (Geraldton area)* PEC within the 30 km search buffer. However, the buffer was applied to two potential Telstra sites and this PEC has not been mapped from within 30 km of this survey area. No vegetation recorded from the survey area was assessed as being representative of this PEC.

Therefore, no TECs or PECs are considered to occur within the survey area.

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 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. However, it should not be expected that a Reconnaissance flora and vegetation survey would record a complete flora inventory.

A species accumulation curve was generated using quadrat data (**Figure 3**). Opportunistic observations, which increase the number of species recorded, are not included in the analysis.

The species accumulation curve suggests that additional survey would be required to record the species richness of the survey area. However, the Bootstrap estimate of species richness is 41.79 which, when taking opportunistic records into account, is lower than the recorded number of species (49) suggesting that the survey was adequate to describe the flora of the survey area.

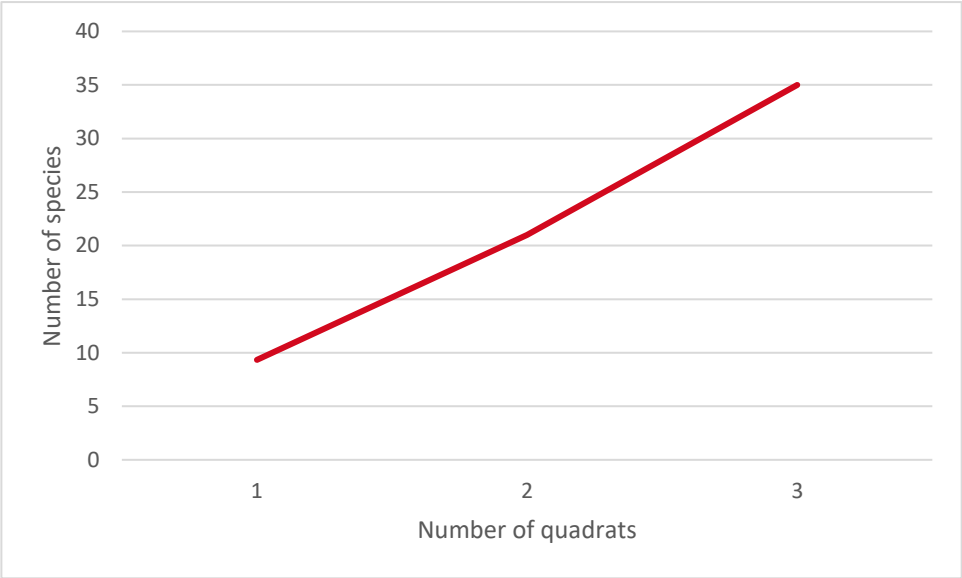


Figure 3: Species accumulation curve

4.1.5 VEGETATION CONDITION

The vegetation condition within the survey area ranged from Degraded to Very Good condition, with the majority of the vegetated portion in Good condition (**Table 9**, **Map 5**). The main factor affecting vegetation condition was human disturbance as part of the survey area is likely to be used as a camp site on occasion, being sheltered from onshore winds and not visible from the road.

The vegetation condition of vegetation type **TsSrLSSS** was considered to be Very Good based on the assumption that the salinity is naturally occurring and not anthropogenic in origin, due to the lack of wide-scale clearing in the vicinity.

Table 9: Vegetation condition

Vegetation condition	Extent (ha)	Proportion (%)
Pristine	-	
Excellent	-	-
Very Good	0.03	12.82
Good	0.11	45.76
Degraded	0.01	5.59
Completely Degraded	-	-
Not vegetated (cleared, bare salt pan)	0.09	35.84

4.1.6 BOTANICAL LIMITATIONS

Survey design and type: Single phase, quadrat-based flora and vegetation survey with conservation-listed flora searches.

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 10**.

Table 10: Botanical limitations

Possible limitations	Constraints (yes/no): Significant, moderate or negligible	Comment
Availability of contextual information at a regional and local scale	Negligible	Despite there being a lack of local contextual information, the landforms of the survey area are widespread. Therefore, this is considered a negligible constraint with sufficient information available to adequately describe the survey area and form informed opinions regarding its significance.
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 30 years' experience undertaking flora and vegetation surveys over much of was including in the bioregion.
Proportion of the flora recorded and/or collected, and any identification issues	No constraints	Forty-nine vascular flora taxa were recorded during the field survey of which 25.6% 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 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 entirely accessible and surveyed at sufficient intensity to describe the flora and vegetation within.
Access restrictions within the survey area	No constraints	The survey area was entirely accessible.
Survey timing, rainfall, season of survey	No constraints	The field survey was conducted during November which is within the optimal survey period for the bioregion. The rainfall in the 6 months prior to the field survey was well below the mean for this period (**Section 2.1.1, Figure 4** below), also indicated by the rainfall deciles (see below). This represents [what constraint; consider annual and ephemeral species]
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.

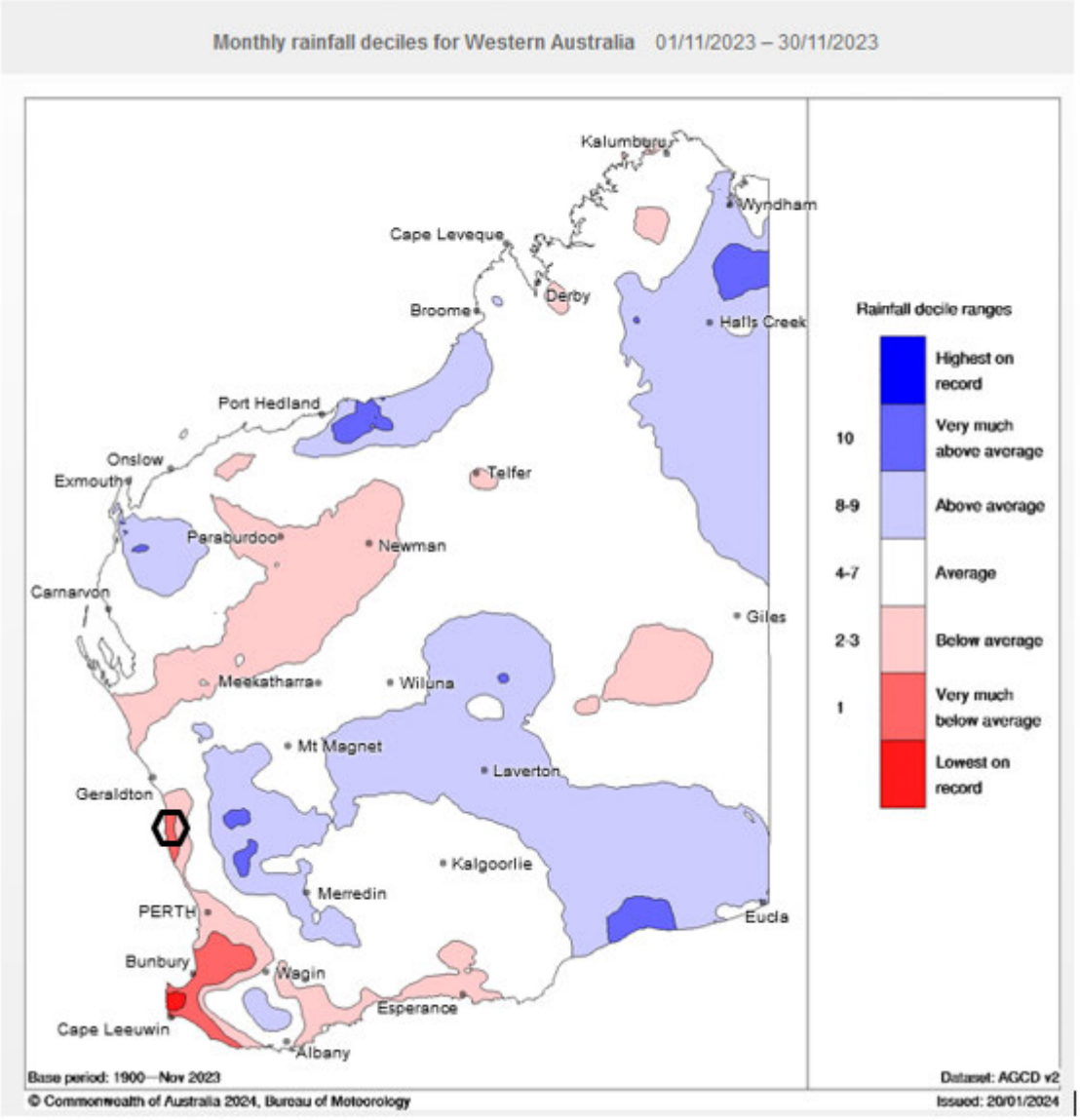


Figure 4: Rainfall deciles for the 6 months prior to the field survey (BoM 2024)

The shape in **Figure 4** indicates the approximate location of the field survey.

4.2 VERTEBRATE FAUNA SURVEY

The fauna survey was conducted by Lyn Atkins (Principal Ecologist), assisted by Natasha Whitfield during 27 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 entire site was traversed on foot and all habitats were assessed for quality and capability of supporting both locally common and significant fauna species.

4.2.1 FAUNA HABITAT

(Number in words) fauna habitat types were recorded within the survey area (**Table 11**):

- Shrubland
- Samphire.

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 11: Fauna habitat types

Habitat type	Description	Photograph
Shrubland	The Shrubland habitat was on the sand dune (upper image) and shallow sand over limestone (lower image) and was characterised by *Melaleuca* (Honeymyrtle) and *Acacia* (Wattle) species. There were occasional emergent *Casuarina* (Sheoak) trees on lower-lying parts. The Shrubland is suited to nesting and foraging of smaller bird species. Reptiles are likely to be present (although none were observed) as the sand is suited to burrowing and there was much fallen timber suited to lizards. Mammals, particularly rodent-sized species, may occur as there is sufficient cover as shelter and the sandy soil is suited to burrowing. Rabbits are likely although not recorded, as are feral predators including cats and foxes. Kangaroos are likely to occur more frequently in the more-open sections of Shrubland on the flatter areas due to the density of the dunal vegetation. **Extent**: 0.13 ha; 51.3%	 

Habitat type	Description	Photograph
Samphire	The Samphire habitat (upper image) occurred on the edge of a small saline wetland formed on the leeward edge of a sand dune and is likely part of the larger floodplain of Leeman Lagoon. A small pool of hypersaline water was present in the adjacent salt pan during the field survey, on the edge of the adjacent dune. The pool size is likely to be larger during wetter years although only seasonal (winter-early summer). The soil is clayey sand with shell fragments (lower image) and was saline. Kangaroo tracks were observed in the soft mud on the edge of the salt pan. No bird tracks were observed suggesting that the hypersaline water was of little interest for aquatic invertebrate foraging. The Samphire habitat is poor quality for virtually all fauna suites due to the lack of shelter due to the paucity of shrubs as shelter and for foraging. However, this open nature is likely to represent a part of the landscape that is easy to traverse (e.g. kangaroos) thus be a preferred pathway during larger traverse. **Extent**: 0.03 ha; 12.8%	 

4.2.2 FAUNA INVENTORY

Six vertebrate fauna species were recorded during the survey (**Table 12**). None are conservation-listed.

Table 12: Recorded fauna species

Species	Common name
Mammals	
Macropus fuliginosus	Western Grey Kangaroo
Birds	
Acanthiza inornata	Western Thornbill
Corvus coronoides	Australian Raven
Elanus caeruleus	Black-shouldered Kite
Malurus lamberti	Variegated Fairy-wren
Pachycephala rufiventris	Rufous Whistler

4.2.3 BLACK COCKATOO HABITAT ASSESSMENT

The survey area is within the mapped non-breeding distribution of Carnaby's Cockatoo (DAWE 2022). No Carnaby's Cockatoo were recorded during the field survey.

4.2.3.1 Breeding Habitat

There were no trees suitable as Black Cockatoo habitat trees in the survey area.

4.2.3.2 Roosting Habitat

There were no trees within the survey area that were of sufficient size to be used as roost trees.

4.2.3.3 Foraging Habitat

The suitability of the survey area as foraging habitat for Carnaby's Cockatoo was assessed and mapped as per the Commonwealth (DAWE 2022) scoring tool (**Table 23** in **Appendix Two**). The survey area was not considered to represent foraging habitat as it was not a shrubland or woodland characterised by proteaceous or other foraging species.

The Bamford (2020) scoring system (**Table 24** 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.

Application of the Bamford (2020) foraging value tool (**Table 24** in **Appendix Two**), the survey area scores 1 of a possible total of 10 (**Table 13**). This identifies the survey area as having negligible to low foraging value.

Table 13: Black Cockatoo foraging value (Bamford 2020)

Score	Carnaby's Cockatoo	Comment
Site condition	1	Low density of proteaceous species, and has no eucalypts or other potential foraging species.
Site context	0	No local breeding known; no breeding habitat present in close vicinity
Species density/stocking rate	0	Species not recorded and no evidence of foraging
TOTAL SCORE	**1**	

4.2.4 FAUNA SURVEY LIMITATIONS

Table 14: Fauna survey limitations

Possible limitations	Constraints (yes/no): Significant, moderate or negligible	Comment
Availability of data and information	No constraint	Although there is little local information available the habitats present are regionally widespread and well understood.
Competency/experience of the survey team, including bioregion experience	No constraint	The surveyor has been undertaking Basic fauna surveys for over 15 years in the southwest of Western Australia.
Scope of survey e.g. excluded fauna groups	No constraint	The survey was confined to terrestrial vertebrate species.
Timing, weather, season	Negligible constraint	The survey was undertaken during late spring with fine and clear weather which was optimal as most fauna suites would be active during this period. However, the seasonal conditions were drier than average which may have had a minor impact on some fauna suites that may have had less presence in the survey area as the more mobile species may have moved to the more mesic lake fringe 0.5-1 km to the east.
Disturbances that may have affected results	No constraint	There were no recent disturbances that would have affected the survey results.
Proportion of fauna identified, recorded, or collected	No constraint	All observed fauna could be identified. No collections were made.
Adequacy of survey intensity and proportion of survey achieved	No constraint	The survey was of sufficient intensity to adequately describe the habitats and gain an understanding of fauna likely to be present (or observed).
Access	No constraint	The survey area was fully accessible.
Data and analysis issues including sampling biases	No constraint	Data analysis is not required for a Basic survey.

5 DISCUSSION

The survey area occupied 0.25 ha in total although only a portion of this extent will be required for the proposed works.

5.1 FLORA SIGNIFICANCE

A total of 49 vascular flora species were recorded from three floristic quadrats and opportunistic observations, including during searches for conservation-listed flora. Approximately one quarter of the total flora inventory (13 species; 26.5%) were introduced species reflecting the high level of disturbance in the survey area.

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

One Priority-listed Flora species was recorded: *Grevillea olivacea* (P4) that was recorded as seedlings within the survey area and observed as larger shrubs just outside the survey area.

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, grazing and other disturbances, actual habitat availability and search effort, is included in **Table 25** in **Appendix Three**.

No conservation-listed flora had previously been recorded from within close proximity (<500 m) of the survey area, however, *Grevillea olivacea* (P4; recorded in the survey area) has been recorded within 1 km of the site.

Four additional taxa were identified at desktop assessment stage as being Likely to occur; discussed below.

***Haloragis foliosa* (P3)**

Haloragis foliosa is a perennial herb or shrub to 0.5 m high growing in sand over limestone (WAH 1998-2024).

Suitable habitat is likely to be present, however, available photographs (Hart Simpson and Associates Pty Ltd 2003; WAH 1998-2023) of this species indicate it is unlikely to have been overlooked had it been present, noting that the western edge of the vegetation type **TsSrLSSS** was not accessible due to standing water in the wetland. Consequently it has been re-evaluated as it 'May occur', but only in this vegetation type and portion of the survey area.

***Spergularia nesophila* (P3)**

WAH collection data (WAH 2024) indicates *Spergularia nesophila* is a spreading herb to 30 cm high that has been recorded from sand over limestone and in a saline pan, including from several islands. *FloraBase* (WAH 1998-2024) indicates its distribution to be between Dirk Hartog Island and south of Cervantes, approximately 540 km north-south, mostly coastal but with an outlier 100 km inland. ALA (2024) indicates a record for this species almost 400 km from the coast.

Given that suitable habitat occurs and a similar species was recorded (*Spergularia marina*), it is possible that *Spergularia nesophila* also occurs, therefore the likelihood of *Spergularia nesophila* occurring in the survey area has been re-evaluated to 'May occur'.

***Stylidium maritimum* (P3)**

Stylidium maritimum is a perennial herb to 0.7 m high with pinkish flowers between September and November, growing in sand over limestone soils in various near-coastal vegetation types. Its usual distribution is from Illawong Beach south to North Fremantle, approximately 275 km north-south, and to approximately 10 km inland (WAH 1998-2024).

Whilst the survey was conducted near the end of its flowering period, if it occurred it should have been observed. However, due to the drier than average year flowering is likely to have concluded early and the plant would therefore be less visible. The likelihood of *Stylidium maritimum* occurring has been re-evaluated to 'May occur' as it may be present, but only in vegetation type **MlMcTS**.

***Eucalyptus zopherophloia* (P4)**

Eucalyptus zopherophloia is a rough-barked mallee known from coastal and near coastal areas, growing in sand over limestone and limestone soils (WAH 1998-2024). Its usual distribution is from Shark Bay south to near Jurien Bay, approximately 490 km north-south and up to 60 km inland (ALA 2024).

The survey area did not have any *Eucalyptus* spp. within it, therefore the likelihood of *Eucalyptus zopherophloia* occurring has been re-evaluated as being Very unlikely to occur.

5.1.1.3 Other Significant Flora

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

Although the Samphires (*Tecticornia* and *Sarcocornia* spp.) could not be named due to the lack of reproductive material available (i.e. no seeds were present in the collected representatives) they are unlikely to be of taxonomic interest, and are likely to be well represented nearby at Leeman Lagoon.

5.1.1.4 Introduced Flora

Thirteen introduced species were recorded during the field survey representing approximately one quarter of the flora inventory. The ground stratum of two of the **Vulpia myuros* forma *myuros*, **Ehrharta longiflora* and **Bromus hordeaceus* were characteristic of two of the vegetation types, however, are commonly occurring species within the bioregion and beyond and are not considered to be significant.

None are considered to be significant weeds i.e. none are Declared Pest plants or WoNS species.

5.1.1.5 Local and Regional Significance of Flora

Aside from conservation-listed species (*Grevillea olivacea*), none of the flora are considered to have any particular local or regional significance. All species occur widely in the near coastal areas of the Geraldton Sandplains bioregion, and at times beyond.

5.2 VEGETATION SIGNIFICANCE

Three vegetation types were recorded from the survey area:

- **CoLOW**; *Casuarina obesa* low open woodland, from the low-lying flat (0.04 ha; 17.9% of the survey area)
- **MlMcTS**; *Melaleuca lanceolata* and *Melaleuca cardiophylla* tall shrubland, from the dune and flat area with sand over limestone (0.08 ha; 33.5% of the survey area)
- **TsSrLSSS**; *Tecticornia* spp. and *Samolus repens* low samphire shrubland/shrubland, from the wetland fringe (0.03 ha; 12.8% of the survey area).

5.2.1 THREATENED ECOLOGICAL COMMUNITIES

The survey area does not intersect any known TECs. None of the vegetation within the survey area resembles any currently described TEC.

5.2.2 PRIORITY ECOLOGICAL COMMUNITIES

The survey area does not intersect any known PECs. None of the vegetation within the survey area resembles any currently described PEC.

5.2.3 LOCAL AND REGIONAL SIGNIFICANCE OF VEGETATION

None of the vegetation recorded from within the survey area is likely to have any specific local or regional significance. Similar vegetation occurs widely in the near-coastal areas and, for vegetation type **TsSrLSSS**, around salt lakes (including Leeman Lagoon that is immediately to the east of the survey area), in the Geraldton Sandplains bioregion and beyond.

5.2.4 VEGETATION CONDITION

The vegetation condition ranged from Degraded to Very Good condition, with the majority in Good condition. Introduced species (weeds) and human ground disturbance from tracks and likely camping are the main reasons for the lower condition ratings and absence of higher (Pristine and Excellent) ratings.

5.3 WETLANDS AND RIPARIAN AREAS

The survey area does not include any drainage features (rivers, creeks), nor are any nearby.

The survey area is located adjacent to lands that are included in a floodplain feature of the Geomorphic Wetlands Cervantes Eneabba (DBCA 2017). The adjacent wetland is known as Leeman Lagoon. The survey area includes a small salt pan (unvegetated and mostly dry at the time of survey), which in times of higher rainfall would likely form part of the Lagoon.

5.4 FAUNA SIGNIFICANCE

5.4.1 FAUNA HABITAT TYPES

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

- Shrubland (0.13 ha)
- Wetland (0.03 ha).

The Shrubland habitat is likely to be utilised by most fauna species present in the local area. The shrubs provide shelter and foraging for birds, small mammals, and reptiles although there are no tall trees that would suit raptors or larger birds and the density of the vegetation, including fallen stems, would hinder clear traverses by larger mammals i.e. kangaroos.

The Samphire habitat has only limited shelter, consisting of only small shrubs, most Samphires. They, and the soil, are hypersaline and potentially flooded during wetter winters thus restricting any burrowing animals. The lack of available shelter and foraging also restricts fauna usage of this habitat.

Both habitat types are common at local and regional scales, although the Samphire habitat generally occupies only small extents due to the restricted landform upon which it occurs (around salt lakes and coastal).

5.4.2 FAUNA ASSEMBLAGE

Six vertebrate fauna species were recorded during the field survey (**Section 4.2.2**). None are conservation-listed nor considered significant in other ways.

5.4.3 RECORDED CONSERVATION-LISTED SPECIES

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

The survey area is considered to represent ‘negligible to low’ foraging value for Carnaby's Cockatoo. There are no trees that are suitable for breeding or roosting.

5.4.3.1 Post-survey Likelihood Assessment

The post-survey likelihood assessment is incorporated into **Table 27** in **Appendix Three**.

The conservation-listed fauna species identified during the desktop assessment as being 'Likely' to occur and not recorded during the field survey is discussed below with respect to its habitat requirements, taking into consideration the findings of the field survey and survey effort.

'Likely to occur'

***Pluvialis squatarola* (Grey Pover) – EPBC/BC status MI**

The Grey Plover is a migratory species that breeds in the Arctic tundra and migrates south during the austral summer where they congregate on near coastal areas, particular for foraging on tidal flats and salt marshes (DCCEEW 2024b).

Given that its foraging habitat includes salt marshes, a small portion within the survey area may be considered as suitable. However, due to the small extent of habitat present within and adjacent to the survey area, the large amounts of contiguous habitat 0.5–1 km to the east associated with the Leeman Lagoon and coastal areas 1.8 km to the west, and the lack of bird footprints in the mud surrounding the standing water and in other muddy areas, it is unlikely that this or any other shorebird occurs, or will occur, within the survey area. Therefore, the Grey Plover has been re-evaluated as Unlikely to occur except perhaps as an overfly.

6 CONCLUSIONS AND DWER'S 10 CLEARING PRINCIPLES

6.1 CONCLUSIONS

The desktop assessment and Reconnaissance flora and vegetation and Basic fauna survey identified the following:

- the pre-European vegetation association intersecting the survey area (association 1,026) has more than 90% of its original extent remaining at all scales (state-wide to local government area)
- 49 vascular flora species recorded from three floristic quadrats and opportunistic observations including one that is conservation-listed:
  - *Grevillea olivacea* (P4) recorded as seedlings within the survey area but observed more commonly as larger shrubs in adjacent areas
- three vegetation types, none of which are representative of any TEC or PEC and all are considered to occur commonly in the local area and more regionally:
  - **CoLOW**; *Casuarina obesa* low open woodland, from the low-lying flat (0.04 ha; 17.9% of the survey area)
  - **MlMcTS**; *Melaleuca lanceolata* and *Melaleuca cardiophylla* tall shrubland, from the dune and flat area with sand over limestone (0.08 ha; 33.5% of the survey area)
  - **TsSrLSSS**; *Tecticornia* spp. and *Samolus repens* low samphire shrubland/shrubland, from the wetland fringe (0.03 ha; 12.8% of the survey area)
- the vegetation condition ranged from Degraded to Very Good with the majority in Good condition; human disturbance and weeds are the main factors affecting vegetation condition
- two fauna habitat types, both of which occur commonly in the local area and more regionally
- six fauna species, none of which are conservation-listed
- there is no habitat suitable for Black Cockatoo (Carnaby's Cockatoo) nesting, roosting, or foraging.

Overall, none of the above factors are likely to be considered as significant to environmental approvals.

6.2 DWER'S 10 CLEARING PRINCIPLES

The following table is provided to summarise the likely significant findings of the survey and how they are likely to be assessed, based on DWER's 10 clearing principles (Department of Environment Regulation 2014). Of note, the clearing footprint is likely to be restricted to the compound and guy anchor areas which should be considered in discussions with the relevant stakeholders.

Table 15: Assessment against DWER's 10 clearing principles

Principle	Assessment	Outcome
Principle (a) Native vegetation should not be cleared if it comprises a high level of biological diversity.	The survey area did not have a significant number of flora or fauna species and is not considered to have a high level of biological diversity.	Unlikely to be at variance
Principle (b) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia.	No conservation-listed fauna species was recorded, nor does the survey area have habitat suitable to support conservation-listed species.	Unlikely to be at variance
Principle (c) Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, rare flora.	No rare (TF) flora species were recorded nor are any considered likely to occur. One P4 species was recorded – *Grevillea olivacea*. Three seedlings were observed in the survey area, however, mature shrubs were observed	Unlikely to be at variance

Principle	Assessment	Outcome
	outside the survey area in the immediate vicinity. It is unlikely that works within the survey area will significantly affect the population of this species either at a local or wider scale.	
Principle (d) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of a threatened ecological community.	The survey area is not representative of any currently listed TEC or PEC. The vegetation types recorded within it are well represented locally and more regionally.	Unlikely to be at variance
Principle (e) Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared.	The pre-European vegetation association intersecting the survey area has more than 90% of its original extent remaining at all scales (state-wide to local government area). Therefore, the survey area is not within an area that has been extensively cleared.	Unlikely to be at variance
Principle (f) Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland.	The survey area does not intersect any mapped watercourses or wetlands. However, it is close to a geomorphic wetland known as Leeman Lagoon. Ground disturbance works may affect the nearby wetland if conducted during times of significant rainfall, although such works conducted during drier times or drier seasons are unlikely to impact on the wetland.	May be at variance
Principle (g) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.	The proposed works are of only a very small scale (a mobile phone tower) and are (with appropriate management) unlikely to cause appreciable land degradation. Ground disturbance (clearing) on the dune may lead to wind erosion as a result of the strong winds experienced in the area and sandy soil. Surface stabilisation during and after construction should be considered as part of the construction environment management plan.	May be at variance
Principle (h) Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area.	Although the survey area is in close vicinity to a conservation area (Beekeepers Nature Reserve, approximately 50 m from the survey area), the small extent requiring clearing is unlikely to impact on the values of this reserve.	Unlikely to be at variance
Principle (i) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water.	The small extent of clearing required is unlikely to cause any deterioration in the quality of surface or groundwater.	Unlikely to be at variance
Principle (j) Native vegetation should not be cleared if clearing the vegetation is likely to cause, or exacerbate, the incidence or intensity of flooding.	The small extent of clearing required is unlikely to cause or exacerbate any flooding.	Unlikely to be at variance

REFERENCES

Atlas of Living Australia 2024, *Atlas of Living Australia*. .

Bamford Consulting Ecologists 2016, *Black Cockatoo potential nest tree grading system*. Available from: https://ecologists.bamford.id.au/ecological-consulting/black-cockatoos. [17 March 2022].

Bamford Consulting Ecologists 2020, *Scoring system for the assessment of foraging values of vegetation for Black Cockatoos. Revised June 2020*. Available from: https://ecologists.bamford.id.au/ecological-consulting/black-cockatoos.

Beard, JS 1990, *Plant Life of Western Australia* , Kangaroo Press, Kenthurst, NSW.

Bureau of Meteorology 2024, *Climate statistics for Australian locations*. Available from: http://www.bom.gov.au/climate/averages/tables/cw_009240.shtml.

Commonwealth of Australia (1999), *Environment Protection and Biodiversity Conservation Act 1999*.

Department of Agriculture Water and the Environment 2020, *Australia's bioregions (IBRA)*. Available from: http://www.environment.gov.au/land/nrs/science/ibra.

Department of Agriculture Water and the Environment 2022, *Referral guideline for 3 WA threatened black cockatoo species: Carnaby's Cockatoo, Baudin's Cockatoo and the Forest Red-tailed Black-cockatoo*.

Department of Biodiversity Conservation and Attractions 2017, *Geomorphic Wetlands Cervantes Eneabba (DBCA-015)*. Available from: https://catalogue.data.wa.gov.au/dataset/geomorphic-wetlands-cervantes-eneabba.

Department of Biodiversity Conservation and Attractions 2018a, *Carnabys Cockatoo Confirmed Breeding Areas within the Swan Coastal Plain and Jarrah Forest IBRA Regions (DBCA-054)*.

Department of Biodiversity Conservation and Attractions 2018b, *Carnabys Cockatoo Areas requring investigation as feeding habitat in the Swan Coastal Plain (SCP) IBRA Region (DBCA-057)*. Available from: https://catalogue.data.wa.gov.au/dataset/carnabys-cockatoo-unconfirm-feeding-areas-scp.

Department of Biodiversity Conservation and Attractions 2018c, *List of Threatened Ecological Communities (TECs) endorsed by the Western Australian Minister for Environment (28 June 2018)*. Available from: https://www.dpaw.wa.gov.au/images/plants-animals/threatened-species/threatened_ecological_communities_endorsed_by_the_minister_for_the_environment_june_2018.pdf.

Department of Biodiversity Conservation and Attractions 2019a, *DBCA Statewide Vegetation Statistics*. Available from: https://catalogue.data.wa.gov.au/dataset/dbca-statewide-vegetation-statistics.

Department of Biodiversity Conservation and Attractions 2019b, *Black Cockatoo Breeding Sites - Buffered (DBCA-063)*. Available from: https://catalogue.data.wa.gov.au/dataset/black-cockatoo-breeding-sites-buffered.

Department of Biodiversity Conservation and Attractions 2019c, *Black Cockatoo Roosting Sites - Buffered (DBCA-064)*.

Department of Biodiversity Conservation and Attractions 2020, *Conservation Codes for Western Australian Fauna and Flora (10 December 2020)*. Available from: https://www.dpaw.wa.gov.au/images/Conservation codes for Western Australian Flora and Fauna 179KB.pdf.

Department of Biodiversity Conservation and Attractions 2023, *Threatened Ecological Community Fact Sheet: Ferricrete floristic community (Rocky Springs type)*. Available from: file:///C:/Users/latkins/Downloads/ferricrete_tec_fact_sheet_0-1.pdf.

Department of Climate Change Energy the Environment and Water 2023, *SPRAT EPBC Migratory List in Species Profile and Threats Database*. Available from: http://www.environment.gov.au/cgi-bin/sprat/public/publicshowmigratory.pl.

Department of Climate Change Energy the Environment and Water 2024a, *Protected Matters Search Tool (PMST)*. Available from: https://pmst.awe.gov.au/#/map?lng=131.50634765625003&lat=-28.671310915880834&zoom=5&baseLayers=Imagery,ImageryLabels.

Department of Climate Change Energy the Environment and Water 2024b, *Conservation Advice for Pluvialis squatarola (grey plover)*. Available from:

http://www.environment.gov.au/biodiversity/threatened/species/pubs/865-conservation-advice-05012024.pdf.

Department of Environment and Conservation 2013, *Definitions, categories and criteria for Threatened and Priority Ecological Communities*. Available from: https://www.dpaw.wa.gov.au/images/plants-animals/threatened-species/definitions_categories_and_criteria_for_threatened_and_priority_ecological_communities.pdf.

Department of Environment Regulation 2014, *A guide to the assessment of applications to clear native vegetation under Part V Division 2 of the Environmental Protection Act 1986*. Available from: https://www.der.wa.gov.au/images/documents/your-environment/native-vegetation/Guidelines/Guide2_assessment_native_veg.pdf.

Department of Primary Industries and Regional Development 2019, *Pre-European Vegetation (DPIRD-006)*. Available from: https://catalogue.data.wa.gov.au/dataset/pre-european-dpird-006.

Department of Primary Industries and Regional Development 2020, *Soil Landscape Mapping - Rangelands (DPIRD-063)*. Available from: https://catalogue.data.wa.gov.au/dataset/soil-landscape-mapping-rangelands.

Department of Sustainability Environment Water Population and Communities 2011a, *Survey guidelines for Australia's threatened mammals: Guidelines for detecting mammals listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999*. Available from: http://www.environment.gov.au/system/files/resources/b1c6b237-12d9-4071-a26e-ee816caa2b39/files/survey-guidelines-mammals.pdf.

Department of Sustainability Environment Water Population and Communities 2011b, *Survey guidelines for Australia's threatened reptiles: Guidelines for detecting reptiles listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999*. Available from: http://www.environment.gov.au/system/files/resources/eba674a5-b220-4ef1-9f3a-b9ff3f08a959/files/survey-guidelines-reptiles.pdf.

Department of the Environment Water Heritage and the Arts; Commonwealth of Australia 2009, *Matters of National Environmental Significance. Significant impact guidelines 1.1 - Environment Protection and Biodiversity Conservation Act 1999*.

Department of the Environment Water Heritage and the Arts; Commonwealth of Australia 2010a, *Survey Guidelines for Australia's Threatened Bats: Guidelines for detecting bats listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999*. Available from: http://www.environment.gov.au/epbc/publications/threatened-bats.html.

Department of the Environment Water Heritage and the Arts; Commonwealth of Australia 2010b, *Survey Guidelines for Australia's Threatened Birds: Guidelines for detecting birds listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999*. Available from: http://www.environment.gov.au/epbc/publications/threatened-birds.html.

Department of Water and Environmental Regulation 2018, *Hydrographic Catchments - Catchments (DWER-028)*. Available from: https://catalogue.data.wa.gov.au/dataset/hydrographic-catchments-catchments.

Department of Water and Environmental Regulation 2021, *Clearing Regulations - Environmentally Sensitive Areas (DWER-046)*. Available from: https://catalogue.data.wa.gov.au/dataset/clearing-regulations-environmentally-sensitive-areas-dwer-046.

Department of Water and Environmental Regulation 2023, *Index of Biodiversity Surveys for Assessments (IBSA)*. Available from: https://biocollect.ala.org.au/ibsa#max%3D20%26sort%3DdateCreatedSort.

Desmond, A & Chant, A 2002, ''Geraldton Sandplain 3 (GS3 - Lesueur Sandplain subregion)'' in *Bioregional Summary of the 2002 Biodiversity Audit for Western Australia* , eds.N McKenzie, J May, & S McKenna, Department of Conservation and Land Management, Department of Conservation and Land Management.

Ecoscape (Australia) Pty Ltd 2021, *Arrowsmith Wind and Solar Farm Environmental Survey* , Prepared for Infinite Blue Energy.

Ecoscape (Australia) Pty Ltd 2023a, *Arrowsmith Hydrogen Detailed Flora and Vegetation Survey* , Prepared for Infinite Green Energy.

Ecoscape (Australia) Pty Ltd 2023b, *Arrowsmith Wind Farm Project - Fauna risk Assessment* , Prepared for Infinite Green Energy.

Environmental Protection Authority 2016a, *Technical Guidance - Flora and Vegetation Surveys for Environmental Impact Assessment*, EPA, Western Australia. Available from: http://www.epa.wa.gov.au/policies-guidance/technical-guidance-flora-and-vegetation-surveys-environmental-impact-assessment.

Environmental Protection Authority 2016b, *Environmental Factor Guideline - Flora and Vegetation*.

Environmental Protection Authority 2016c, *Environmental Factor Guideline - Terrestrial Fauna*.

Environmental Protection Authority 2016d, *Environmental Factor Guideline - Terrestrial Environmental Quality*.

Environmental Protection Authority 2019, *EPA Advice: Carnaby's Cockatoo in Environmental Impact Assessment in the Perth and Peel Region*. Available from: https://www.epa.wa.gov.au/sites/default/files/Policies_and_Guidance/Carnaby%27s cockatoo_new FINAL.pdf.

Environmental Protection Authority 2020, *Technical Guidance - Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment*, EPA, Perth, Western Australia. Available from: https://www.epa.wa.gov.au/sites/default/files/Policies_and_Guidance/EPA-Technical-Guidance-Vertebrate-Fauna-Surveys.pdf.

Environmental Protection Authority 2021, *Statement of environmental principles, factors, objectives and aims of EIA*.

GHD Pty Ltd 2015, *Mid West Coastal Nodes Biological Survey Report* , Report for Shire of Irwin.

Government of Western Australia (1986), *Environmental Protection Act 1986*.

Government of Western Australia (2007), *Biosecurity and Agriculture Management Act 2007*.

Government of Western Australia (2016), *Biodiversity Conservation Act 2016*.

Government of Western Australia (2018), *Biodiversity Conservation Regulations 2018*.

Government of Western Australia 2018, *Conservation and Parks Commission*. Available from: https://www.conservation.wa.gov.au/.

Hart Simpson and Associates Pty Ltd 2003, *Proposed EP 413 Denison 3D Seismic Survey Flora & Fauna Investigation Report* , Prepared for Origin Energy Resources Ltd.

Invasive Plants and Animals Committee 2016, *Australian Weeds Strategy 2017 to 2027* , Australian Government; Department of Agriculture and Water Resources Canberra.

Mattiske Consulting Pty Ltd 2021, *Flora and Vegetation Assessment Arrowsmith North Survey Area* , Prepared for VRX Silica Limited.

NVIS Technical Working Group & Department of the Environment and Energy 2017, *Australian Vegetation Attribute Manual: National Vegetation Information System, Version 7.0* , eds.M Bolton, C DeLacey, & K Bossard , Canberra.

Peel, MC, Finlayson, BL & McMahon, TA 2007, 'Updated world map of the Köppen-Geiger climate classification'., *Hydrology and Earth System Sciences*, vol. 11, pp.1633–1644.

Pisces Conservation Ltd 2010, *Species Diversity and Richness IV*.

Shepherd, DP, Beeston, GR & Hopkins, AJM 2002, 'Native Vegetation in Western Australia: Extent, Type and Status'., *Resource Management Technical Report 249*.

Species and Communities Program & Department of Biodiversity Conservation and Attractions 2022, *Priority Ecological Communities for Western Australia Version 34 (21 December 2022)*. Available from: https://www.dpaw.wa.gov.au/images/images/documents/plants-animals/threatened-species/Listings/Priority Ecological Communities list.pdf.

Walker, J & Hopkins, M 1990, ''Vegetation'' in *Australian Soil and Land Survey. Field Handbook.* , eds.R McDonald, R Isbell, J Speight, J Walker, & M Hopkins, Inkata Press, Inkata Press, Melbourne.

Weeds Australia & Centre for Invasive Species Solutions 2021, *Weeds of National Environmental Significance (WoNS)*. Available from: https://weeds.org.au/weeds-profiles/.

Western Australian Government 2023a, *Government Gazette 6 October 2023. No. 135*. Available from: https://www.legislation.wa.gov.au/legislation/prod/gazettestore.nsf/FileURL/gg2023_135.pdf/$FILE/Gg2023_135.pdf?OpenElement. [27 October 2023].

Western Australian Government 2023b, 'Biodiversity Conservation (Threatened Ecological Communities) Order 2023'., *Government Gazette*, vol. No. 62.

Western Australian Herbarium 1998, *FloraBase - the Western Australian Flora. Department of Biodiversity, Conservation and Attractions*. Available from: https://florabase.dbca.wa.gov.au/search/advanced. [16 October 2023].

Western Australian Herbarium 2023, *FloraBase: Search the Herbarium Specimens*. Available from: https://florabase.dbca.wa.gov.au/search/specimen/. [4 December 2023].

Western Australian Herbarium 2024, *FloraBase: Search the Herbarium Specimens*. Available from: https://florabase.dbca.wa.gov.au/search/advanced. [9 January 2024].

Woodman Environmental Consulting 2012, *Summary report of flora and vegetation studies 2001-2011* , Prepared for Iluka Resources Limited Eneabba.

MAPS

306580 306600 306620 306640 306660 306680 306700 306720 306740

6695140 6695120 6695100 6695080 6695060 6695040 6695020 6695000 6694980

221Qu14

221Qu_4

221Ea_2

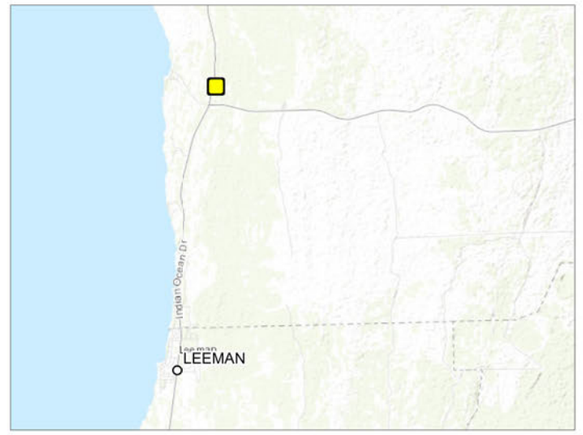
LEGEND

Survey Area

Soil Land Systems

- 221Ea_2: Depositional plain surrounding Ea1 (includes small areas of Ea1)
- 221Qu14: Limestone outcrop ; shallow calcareous sand
- 221Qu_4: Foredune complex adjacent to coast and beach and parabolic dune system with trailing arms

DATA SOURCES:
SOURCE DATA: ROAD NETWORK (MRWA 2023). SOIL-LANDSCAPE MAPPING WESTERN AUSTRALIA – BEST AVAILABLE SOILS (DPIRD-027) (DPIRD 2022). SURFACE HYDROLOGY LINES (NATIONAL) (GEOSCIENCE AUSTRALIA 2015).
BASEMAP: ESRI TOPOGRAPHIC (2024)
SERVICE LAYERS: WORLD IMAGERY: SOURCE: ESRI, MAXAR, EARTHSTAR GEOGRAPHICS, AND THE GIS USER COMMUNITY
WORLD TOPOGRAPHIC MAP: ESRI, HERE, GARMIN, USGS, NGA



ecoscape

SOIL LAND SYSTEMS

COOLIMBA-ENEABBA ROAD
TELSTRA SITE BIOLOGICAL SURVEYS

Acquirecomm

COORDINATE SYSTEM: GDA 1994 MGA ZONE 50
PROJECTION: TRANSVERSE MERCATOR
DATUM: GDA 1994
UNITS: METER

N

SCALE: 1:650 @ A3

0 10 20 m

PROJECT NO: 4879-23

REV	AUTHOR	APPROVED	DATE
0	TD	SB	21/02/2024

MAP 01

285000 290000 295000 300000 305000 310000 315000 320000 325000 330000

6715000 6710000 6705000 6700000 6695000 6690000 6685000 6680000 6675000

Beagle Islands Nature Reserve

Beekeepers Nature Reserve

Lake Logue Nature Reserve

Stockyard Gully Reserve

Lipfert, Milligan, Etc Islands Nature Reserve

Beekeepers Nature Reserve

Lesueur National Park

South Eneabba Nature Reserve

Brand Hwy

Indian Ocean Dr

Eneabba Creek

Erindoon Creek

Stockyard Gully

Bindoon Creek

Coolimba-Eneabba Rd

LEEMAN

Green Head

Code	Taxon	Status	Code	Taxon	Status
Afl	*Acacia flabellifolia*	3	Hsp	*Hemiandra* sp. Eneabba (H. Demarz 3687)	3
Ala	*Acacia lasiocarpa* var. *lasiocarpa* Cockleshell Gully variant	2	Hpr	*Hibbertia propinqua*	4
All	*Acacia latipes* subsp. *licina*	3	Han	*Hopkinsia anoectocolea*	3
Ate	*Acacia telmica*	3	Hle	*Hydrocotyle lemnoides*	4
Avi	*Acacia vittata*	2	Hga	*Hypocalymma gardneri*	3
Bcy	*Banksia cypholoba*	3	Jru	*Jacksonia rubra*	2
Bel	*Banksia elegans*	4	Kar	*Korthalsella arthroclada*	1
Bbi	*Beaufortia bicolor*	3	Lde	*Lepidobolus densus*	4
Bci	*Beyeria cinerea* subsp. *cinerea*	3	Lqu	*Lepidobolus quadratus*	3
Bnu	*Blackallia nudiflora*	3	Lco	*Liparophyllum congestiflorum*	4
Cde	*Caladenia denticulata* subsp. *albicans*	1	Mst	*Mesomelaena stygia* subsp. *deflexa*	3
Cor	*Calandrinia oraria*	3	Pdi	*Paracaleana dixonii*	T
Cpa	*Calectasia palustris*	2	Par	*Patersonia argyrea*	3
Cch	*Calytrix chrysantha*	4	Pfi	*Persoonia filiformis*	3
Cen	*Calytrix eneabbensis*	4	Pru	*Persoonia rudis*	3
Cpu	*Calytrix purpurea*	2	Ppi	*Phlebocarya pilosissima* subsp. *teretifolia*	2
Csu	*Calytrix superba*	4	Pra	*Platysace ramosissima*	3
Cmi	*Centrolepis milleri*	3	Pas	*Poranthera asybosca*	1
Cre	*Chordifex reseminans*	2	Sen	*Scaevola eneabba*	2
Crh	*Comesperma rhadinocarpum*	3	Sgr	*Schoenus griffinianus*	4
Cbi	*Cristonia bilobata* subsp. *pubescens*	2	Ssp	*Schoenus* sp. Eneabba	2
Dte	*Dampiera tephrea*	3	Sca	*Scholtzia calcicola*	2
Dde	*Daviesia debilior* subsp. *debilior*	2	Sne	*Spergularia nesophila*	3
Dpt	*Daviesia pteroclada*	3	Sdi	*Stawellia dimorphantha*	4
Dbi	*Desmocladus biformis*	3	Scn	*Stylidium carnosum* subsp. Narrow leaves	1
Del	*Desmocladus elongatus*	4	Sdr	*Stylidium drummondianum*	3
Dco	*Drakaea concolor*	T	Sin	*Stylidium inversiflorum*	4
Eke	*Eleocharis keigheryi*	T	Slo	*Stylidium longitubum*	4
Egl	*Eremophila glabra* subsp. *chlorella*	T	Sma	*Stylidium maritimum*	3
Emi	*Eremophila microtheca*	4	Sto	*Stylidium torticarpum*	3
Esu	*Eremophila subangustifolia*	T	Sfi	*Styphelia filamentosa*	3
Epi	*Eryngium pinnatifidum* subsp. *Umbraphilum*	2	Sfi	*Styphelia filifolia*	3
Efo	*Eucalyptus foecunda* subsp. *aeolica*	2	Sob	*Styphelia obtecta*	T
Ema	*Eucalyptus macrocarpa* subsp. *elachantha*	4	Tpu	*Thelymitra pulcherrima*	2
Erh	*Eucalyptus rhodantha* var. *rhodantha*	T	Tsl	*Thryptomene* sp. Lancelin (M.E. Trudgen 14000)	3
Ezo	*Eucalyptus zopherophloia*	4	Tsp	*Thryptomene spicata*	2
Fha	*Fabronia hampeana*	2	Tve	*Thysanotus vernalis*	3
Fgl	*Frankenia glomerata*	4	Tpr	*Triglochin protuberans*	3
Gaa	*Grevillea althoferorum* subsp. *althoferorum*	T	Vam	*Verticordia amphigia*	3
Gbi	*Grevillea biformis* subsp. *cymbiformis*	3	Var	*Verticordia argentea*	2
Gco	*Grevillea cooljarloo*	1	Vau	*Verticordia aurea*	4
Ger	*Grevillea erinacea*	3	Vde	*Verticordia densiflora* var. *roseostella*	3
Gol	*Grevillea olivacea*	4	Vfr	*Verticordia fragrans*	3
Gru	*Grevillea rudis*	4	Vlu	*Verticordia luteola* var. *rosea*	1
Gun	*Grevillea uniformis*	3	Vmu	*Verticordia muelleriana* subsp. *muelleriana*	3
Gal	*Guichenotia alba*	3	Wer	*Walteranthus erectus*	2
Hlo	*Haemodorum loratum*	3	Xto	*Xanthosia tomentosa*	4
Hfo	*Haloragis foliosa*	3			

LEGEND

- Coolimba-Eneabba Rd

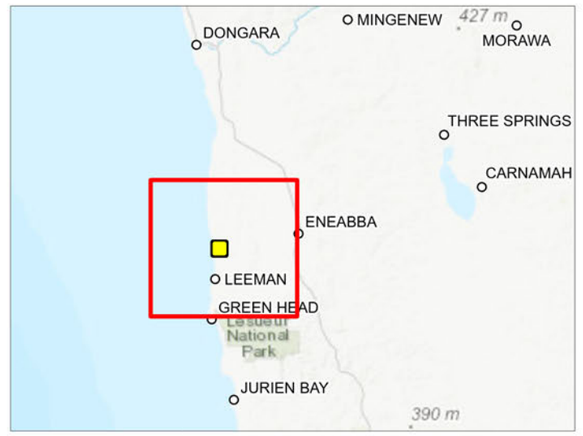
DBCA Conservation-listed Flora

- Threatened
- Priority 1
- Priority 2
- Priority 3
- Priority 4
- Town
- State Road
- Drainage Lines
- DBCA Legislated Lands and Waters (DBCA-011)
- DBCA Important Wetlands (DBCA-045)
- Environmentally Sensitive Areas (DWER-046)

TEC/PEC (DBCA 2023)

- Ferricrete floristic community (Rocky Springs type)

DATA SOURCES:
SOURCE DATA: DBCA CONSERVATION LISTED FLORA AND COMMUNITIES (DBCA 2023) CLEARING REGULATIONS - ENVIRONMENTALLY SENSITIVE AREAS (DWER-046) (DWER 2021). DBCA - LEGISLATED LANDS AND WATERS (DBCA-011) (DBCA 2022). ROAD NETWORK (MRWA 2023). SURFACE HYDROLOGY LINES (NATIONAL) (GEOSCIENCE AUSTRALIA 2015).
BASEMAP: ESRI TOPOGRAPHIC (2024)
SERVICE LAYERS: WORLD TOPOGRAPHIC MAP: ESRI, HERE, GARMIN, FAO, USGS
WORLD TOPOGRAPHIC MAP: ESRI, HERE, GARMIN, USGS, NGA



ecoscape

DBCA DATABASE SEARCH RESULTS FLORA AND COMMUNITIES

COOLIMBA-ENEABBA ROAD TELSTRA SITE BIOLOGICAL SURVEYS

Acquirecomm

COORDINATE SYSTEM: GDA 1994 MGA ZONE 50
PROJECTION: TRANSVERSE MERCATOR
DATUM: GDA 1994
UNITS: METER

N

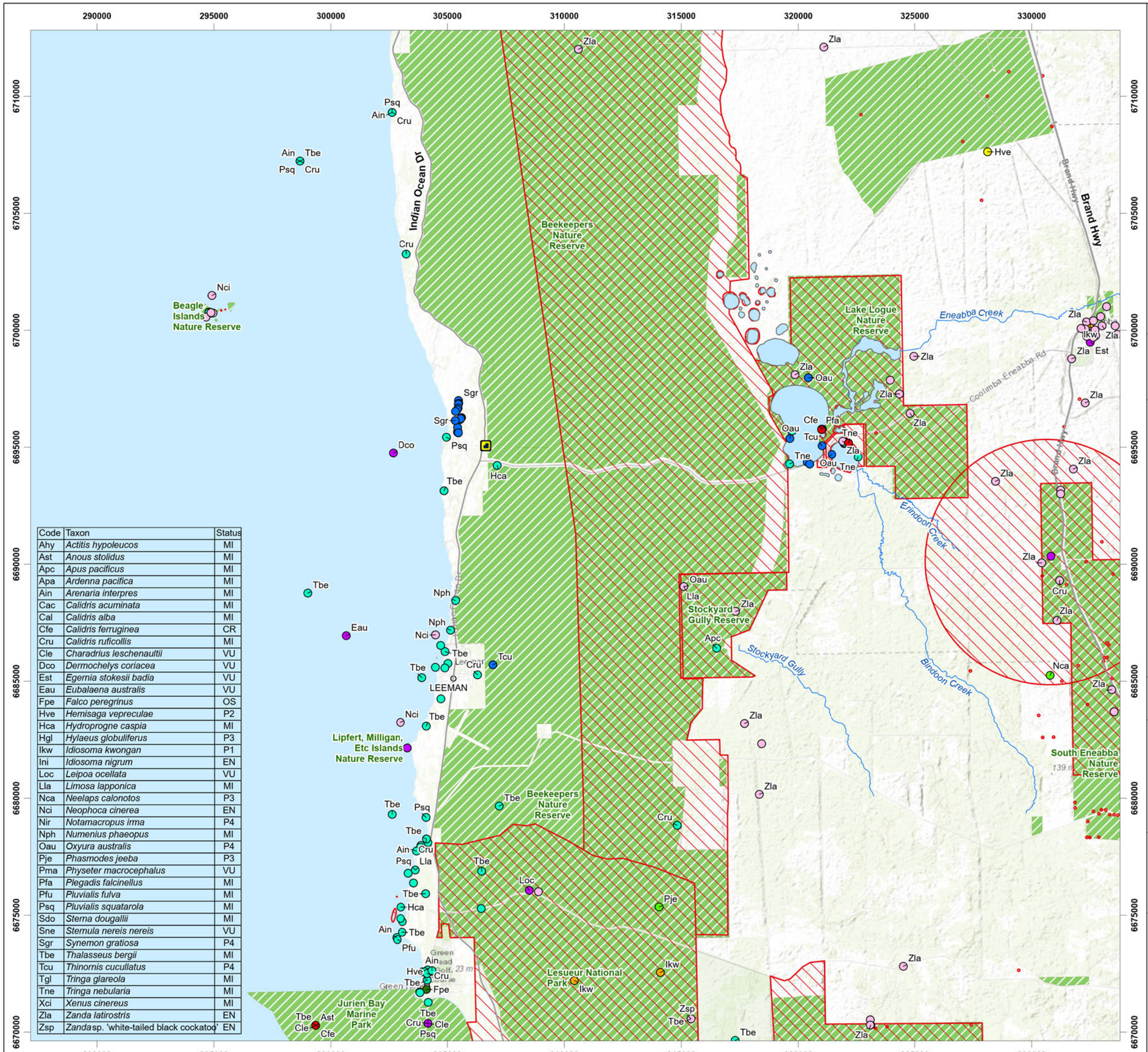
SCALE: 1:165,000 @ A3

0 2.5 5 km

PROJECT NO: 4879-23

REV	AUTHOR	APPROVED	DATE
0	TD	SB	21/02/2024

MAP 02



Code	Taxon	Status
Ahy	*Actitis hypoleucos*	MI
Ast	*Anous stolidus*	MI
Apc	*Apus pacificus*	MI
Apa	*Ardenna pacifica*	MI
Ain	*Arenaria interpres*	MI
Cac	*Calidris acuminata*	MI
Cal	*Calidris alba*	MI
Cfe	*Calidris ferruginea*	CR
Cru	*Calidris ruficollis*	MI
Cle	*Charadrius leschenaultii*	VU
Dco	*Dermochelys coriacea*	VU
Est	*Egernia stokesii badia*	VU
Eau	*Eubalaena australis*	VU
Fpe	*Falco peregrinus*	OS
Hve	*Hemisaga vepreculae*	P2
Hca	*Hydroprogne caspia*	MI
Hgl	*Hylaeus globuliferus*	P3
Ikw	*Idiosoma kwongan*	P1
Ini	*Idiosoma nigrum*	EN
Loc	*Leipoa ocellata*	VU
Lla	*Limosa lapponica*	MI
Nca	*Neelaps calonotos*	P3
Nci	*Neophoca cinerea*	EN
Nir	*Notamacropus irma*	P4
Nph	*Numenius phaeopus*	MI
Oau	*Oxyura australis*	P4
Pje	*Phasmodes jeeba*	P3
Pma	*Physeter macrocephalus*	VU
Pfa	*Plegadis falcinellus*	MI
Pfu	*Pluvialis fulva*	MI
Psq	*Pluvialis squatarola*	MI
Sdo	*Sterna dougallii*	MI
Sne	*Sternula nereis nereis*	VU
Sgr	*Synemon gratiosa*	P4
Tbe	*Thalasseus bergii*	MI
Tcu	*Thinornis cucullatus*	P4
Tgl	*Tringa glareola*	MI
Tne	*Tringa nebularia*	MI
Xci	*Xenus cinereus*	MI
Zla	*Zanda latirostris*	EN
Zsp	*Zanda* sp. 'white-tailed black cockatoo'	EN

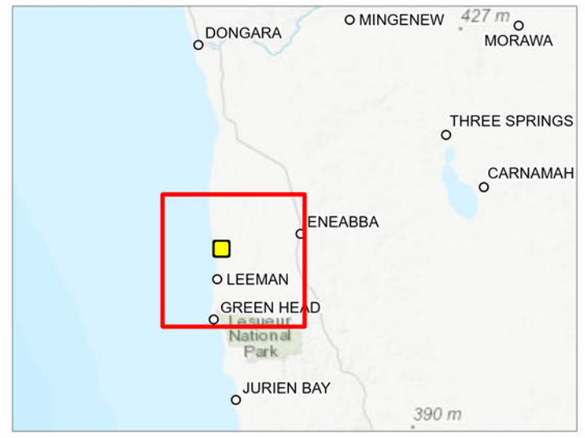
LEGEND

- Survey Area
- Coolimba-Eneabba Rd

DBCA Conservation-listed Fauna

- Critically Endangered
- Endangered
- Vulnerable
- Migratory Species
- Other Specially Protected
- Priority 1
- Priority 2
- Priority 3
- Priority 4
- Town
- State Road
- Drainage Lines
- Environmentally Sensitive Areas (DWER-046)
- DBCA Legislated Lands and Waters (DBCA-011)
- DBCA Important Wetlands (DBCA-045)

DATA SOURCES:
SOURCE DATA: DBCA CONSERVATION-LISTED FAUNA (DBCA 2023) CLEARING REGULATIONS - ENVIRONMENTALLY SENSITIVE AREAS (DWER-046) (DWER 2021). DBCA - LEGISLATED LANDS AND WATERS (DBCA-011) (DBCA 2022). ROAD NETWORK (MRWA 2023). SURFACE HYDROLOGY LINES (NATIONAL) (GEOSCIENCE AUSTRALIA 2015).
BASEMAP: ESRI TOPOGRAPHIC (2024)
SERVICE LAYERS: WORLD TOPOGRAPHIC MAP: ESRI, HERE, GARMIN, FAO, USGS
WORLD TOPOGRAPHIC MAP: ESRI, HERE, GARMIN, USGS, NGA



ecoscape

DBCA DATABASE SEARCH RESULTS - FAUNA

COOLIMBA-ENEABBA ROAD TELSTRA SITE BIOLOGICAL SURVEYS

Acquirecomm

COORDINATE SYSTEM: GDA 1994 MGA ZONE 50
PROJECTION: TRANSVERSE MERCATOR
DATUM: GDA 1994
UNITS: METER

SCALE: 1:160,000 @ A3

0 2.5 5 km

PROJECT NO: 4879-23

REV	AUTHOR	APPROVED	DATE
0	TD	SB	21/02/2024

MAP 03

Path: X:\01_Projects\4879-23 Indian Ocean Drive Telstra Surveys\Maps\APRXs\Report_Maps_CE_4879.aprx

306600 306620 306640 306660 306680 306700 306720

6695120 6695100 6695080 6695060 6695040 6695020 6695000

Grevillea olivacea

CE2301

CE2302

Grevillea olivacea CE2303

LEGEND

Survey Area

Quadrat

Vegetation Type

- **CoLow:** *Casuarina obesa* low open woodland
- **MiMcTs:** *Melaleuca lanceolata* and *Melaleuca cardiophylla* tall shrubland
- **TsSrLSSS:** *Tecticornia* spp. and *Samdus repens* low samphire shrubland/shrubland
- Cleared / Not native vegetation

Conservation-listed Flora

- Priority 4

DATA SOURCES:
SOURCE DATA: VEGETATION DATA (ECOSCAPE 2023)
IMAGERY: GOOGLE (2023)
BASEMAP: ESRI TOPOGRAPHIC
SERVICE LAYERS: WORLD IMAGERY: SOURCE: ESRI, MAXAR, EARTHSTAR GEOGRAPHICS, AND THE GIS USER COMMUNITY
WORLD TOPOGRAPHIC MAP: ESRI, HERE, GARMIN, USGS, NGA

ecoscape

VEGETATION TYPES, QUADRATS & CONSERVATION-LISTED FLORA

COOLIMBA-ENEABBA ROAD
TELSTRA SITE BIOLOGICAL SURVEYS

Acquirecomm

COORDINATE SYSTEM: GDA 1994 MGA ZONE 50
PROJECTION: TRANSVERSE MERCATOR
DATUM: GDA 1994
UNITS: METER

N

SCALE: 1:500 @ A3

0 10 20 m

PROJECT NO: 4879-23

REV	AUTHOR	APPROVED	DATE
0	TD	SB	21/02/2024

MAP 04

306600 306620 306640 306660 306680 306700 306720

6695120 6695100 6695080 6695060 6695040 6695020 6695000

LEGEND

Survey Area

Vegetation Condition

- Very Good
- Good
- Degraded
- Cleared / Not native vege

DATA SOURCES:
SOURCE DATA: VEGETATION DATA (ECOSCAPE 2023)
IMAGERY: GOOGLE (2023)
BASEMAP: ESRI TOPOGRAPHIC
SERVICE LAYERS: WORLD IMAGERY: SOURCE: ESRI, MAXAR, EARTHSTAR GEOGRAPHICS, AND THE GIS USER COMMUNITY
WORLD TOPOGRAPHIC MAP: ESRI, HERE, GARMIN, USGS, NGA

ecoscape

VEGETATION CONDITION

COOLIMBA-ENEABBA ROAD
TELSTRA SITE BIOLOGICAL SURVEYS

Acquirecomm

COORDINATE SYSTEM: GDA 1994 MGA ZONE 50
PROJECTION: TRANSVERSE MERCATOR
DATUM: GDA 1994
UNITS: METER

N

SCALE: 1:500 @ A3

0 10 20 m

PROJECT NO: 4879-23

REV	AUTHOR	APPROVED	DATE
0	TD	SB	21/02/2024

MAP 05

306600 306620 306640 306660 306680 306700 306720

6695120 6695100 6695080 6695060 6695040 6695020 6695000

LEGEND

Survey Area

Fauna Habitat

- Samphire
- Shrubland
- Cleared / Not native vegetation

DATA SOURCES:
SOURCE DATA: HABITAT DATA (ECOSCAPE 2023)
IMAGERY: GOOGLE (2023)
BASEMAP: ESRI TOPOGRAPHIC
SERVICE LAYERS: WORLD IMAGERY: SOURCE: ESRI, MAXAR, EARTHSTAR GEOGRAPHICS, AND THE GIS USER COMMUNITY
WORLD TOPOGRAPHIC MAP: ESRI, HERE, GARMIN, USGS, NGA

ecoscape

FAUNA HABITAT

COOLIMBA-ENEABBA ROAD
TELSTRA SITE BIOLOGICAL SURVEYS

Acquirecomm

COORDINATE SYSTEM: GDA 1994 MGA ZONE 50
PROJECTION: TRANSVERSE MERCATOR
DATUM: GDA 1994
UNITS: METER

N

SCALE: 1:500 @ A3

0 10 20 m

PROJECT NO: 4879-23

REV	AUTHOR	APPROVED	DATE
0	TD	SB	21/02/2024

MAP 06

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 16**.

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).

Table 16: EPBC Act categories for flora, fauna and ecological communities

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 *critically endangered* category at a particular time if, at that time, it is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria.	An ecological community is eligible to be included in the *critically endangered* category at a particular time if, at that time, it is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria
Endangered (EN)	A native species is eligible to be included in the *endangered* category at a particular time if, at that time: (a) it is not critically endangered; and (b) it is facing a very high risk of extinction in the wild in the near future, as determined in accordance with the prescribed criteria.	An ecological community is eligible to be included in the *endangered* category at a particular time if, at that time: (a) it is not critically endangered; and (b) it is facing a very high risk of extinction in the wild in the near future, as determined in accordance with the prescribed criteria.

Category	Threatened species	Threatened Ecological Communities
Vulnerable (VU)	A native species is eligible to be included in the *vulnerable* category at a particular time if, at that time: (a) it is not critically endangered or endangered; and (b) it is facing a high risk of extinction in the wild in the medium term future, as determined in accordance with the prescribed criteria.	An ecological community is eligible to be included in the *vulnerable* category at a particular time if, at that time: (a) it is not critically endangered or endangered; and (b) it is facing a high risk of extinction in the wild in the medium term future, as determined in accordance with the prescribed criteria.
Conservation Dependent	A native species is eligible to be included in the conservation dependent category at a particular time if, at that time: (a) the species is the focus of a specific conservation program the cessation of which would result in the species becoming vulnerable, endangered or critically endangered; or (b) the following subparagraphs are satisfied: (i) the species is a species of fish; (ii) the species is the focus of a plan of management that provides for management actions necessary to stop the decline of, and support the recovery of, the species so that its chances of long-term survival in nature are maximised; (iii) the plan of management is in force under a law of the Commonwealth or of a State or Territory; (iv) cessation of the plan of management would adversely affect the conservation status of the species.	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 17**; 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 16** for conservation status category descriptions).

The most recent Western Australian flora and fauna listings were published in the Government Gazette on 6 October 2023 (Western Australian Government 2023a) and ecological communities listings on 26 May 2023 (Western Australian Government 2023b).

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 17**. 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 17**.

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 17: 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 Threatened, Extinct and Specially Protected fauna and flora are:**	
T	**Threatened species** Listed by order of the Minister as Threatened in the category of critically endangered, endangered or vulnerable under section 19(1), or is a rediscovered species to be regarded as threatened species under section 26(2) of the *Biodiversity Conservation Act 2016* (BC Act). **Threatened fauna** is 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

Conservation Codes for Western Australian Flora and Fauna	
CR	**Critically endangered species** 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.
EN	**Endangered species** 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.
VU	**Vulnerable species** 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 species **Listed by order of the Minister as extinct under section 23(1) of the BC Act as extinct or extinct in the wild.**	
EX	**Extinct species** 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).
EW	**Extinct in the wild species** Species that "*is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; and it has not been recorded in its known habitat or expected habitat, at appropriate seasons, anywhere in its past range, despite surveys over a time frame appropriate to its life cycle and form*", and listing is otherwise in accordance with the ministerial guidelines (section 25of the BC Act).
Specially protected species Listed by order of the Minister as specially protected under section 13(1) of the BC Act. Meeting one or more of the following categories: species of special conservation interest; migratory species; cetaceans; species subject to international agreement; or species otherwise in need of special protection. Species that are listed as threatened species (critically endangered, endangered or vulnerable) or extinct species under the BC Act cannot also be listed as Specially Protected species.	
MI	**Migratory species** Fauna that periodically or occasionally visit Australia or an external Territory or the exclusive economic zone; or the species is subject of an international agreement that relates to the protection of migratory species and that binds the Commonwealth; 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 *Convention on the Conservation of Migratory Species of Wild Animals* (Bonn Convention), an environmental treaty under the United Nations Environment Program. Migratory species listed under the BC Act are a subset of the migratory animals that are known to visit Western Australia, protected under the international agreements or treaties, excluding species that are listed as Threatened species.
CD	**Species of special conservation interest (conservation dependent)** 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)
OS	**Other specially protected species** 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).
P	**Priority species** Priority is not a listing category under the BC Act. 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	
1	**Priority 1: Poorly-known species – known from few locations, none on conservation lands** 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. subspecies 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 18**.

Currently described TECs are listed on the DBCA website, with the most recent list endorsed by the Minister for Environment in June 2018 (DBCA 2018d).

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 21 December 2022 (Species and Communities Program, DBCA 2022). Definitions and criteria for PECs are shown in **Table 18**.

Table 18: DBCA definitions and criteria for TECs and PECs (DEC 2013)

Criteria	Definition
Threatened Ecological Communities	
Presumed Totally Destroyed (PD)	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. 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): A. Records within the last 50 years have not been confirmed despite thorough searches of known or likely habitats or B. 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): i. 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); ii. 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): 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 immediate future (within approximately 10 years); ii. there are very few occurrences, each of which is small and/or isolated and 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 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); ii. there are few occurrences, each of which is small and/or isolated and all or most occurrences are very vulnerable to known threatening processes; iii. there may be many occurrences but total area is small and all or most occurrences are small and/or isolated and very vulnerable to known threatening processes. The ecological community exists only as very modified occurrences that may be capable of being substantially restored or rehabilitated if such work begins in the short-term future (within approximately 20 years).

Criteria	Definition
Vulnerable (VU)	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. 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	
Priority One	*Poorly known ecological communities* 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.
Priority Two	*Poorly known ecological communities* 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.
Priority Three	*Poorly known ecological communities* 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.
Priority Four	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. 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.
Priority Five	*Conservation Dependent Ecological Communities* 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 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 19: 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	c	i	r	bi	bc	unknown
Growth Form	**Height Ranges (m)**	**Structural Formation Classes**						
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

Table 20: NVIS height classes (NVIS Technical Working Group & DotEE 2017)

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: (based on Walker & Hopkins 1990)						

Table 21: Vegetation condition scale for the South West and Interzone Botanical Provinces (EPA 2016a)

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

Table 22: 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 23: Black Cockatoo foraging quality scoring tool (DAWE 2022)

Foraging quality scoring tool template				
Starting Score		**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 (attributes reducing functionality 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*
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 24: Black Cockatoo foraging value scoring system (Bamford 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. *Erodium* 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.
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. *Erodium* 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, *Eucalyptus caesia* and *E. erythrocorys*.

Site condition: vegetation composition, condition and structure scoring			
Site Score	**Carnaby's Cockatoo**	**Baudin's Cockatoo**	**Forest Red-tailed Black Cockatoo**
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).
4	Moderate foraging value. Examples: ▪ Woodland/low forest with tree banksias (of key species *B. attenuata* and *B. menziesii*) 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 *B. attenuata* and *B. menziesii*) with 40-60% projected foliage cover ▪ Banksia Low Forest (of key species *B. attenuata* and *B. menziesii*) 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 *B. attenuata* and *B. menziesii*) 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 condition: vegetation composition, condition and structure scoring		
Site Score	**Carnaby's Cockatoo** **Baudin's Cockatoo** **Forest Red-tailed Black Cockatoo**	
Site context	Percentage of the 'local' (i.e. within 15 km) area native vegetation that the survey area represents	
Score	**'Local' breeding known/likely**	**'Local' breeding unlikely**
3	>5%	>10%
2	1-5%	5-10%
1	0.1-1%	1-5%
0	<0.1%	<1%
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 infrequently reported and little or no foraging evidence is present.	

APPENDIX THREE DESKTOP ASSESSMENT RESULTS AND LIKELIHOOD ASSESSMENTS

Table 25: Flora database search results, habitat and likelihood assessment (Threatened Flora)

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

Database		Species	Cons. status***		Habitat	Likelihood of occurring	
PMST*	DBCA**		EPBC Act	BC Act		Desktop	Post-survey
Known		*Acacia forrestiana*	VU	VU	Lateritic gravelly soils, clay loam over sandstone. Gullies, hills, breakaways.	Very unlikely	Very unlikely
Likely		*Andersonia gracilis*	VU	EN	White/grey sand, sandy clay, gravelly loam. Winter-wet areas, near swamps.	Very unlikely	Very unlikely
May		*Banksia catoglypta*	VU	VU	Lateritic breakaways.	Very unlikely	Very unlikely
May		*Caladenia hoffmanii*	EN	EN	Clay, loam, laterite, granite. Rocky outcrops and hillsides, ridges, swamps and gullies.	Very unlikely	Very unlikely
Likely		*Conostylis dielsii* subsp. *teres*	VU	EN	White, grey or yellow sand, gravel. Low open woodland.	Very unlikely	Very unlikely
May		*Conostylis micrantha*	VU	EN	White or grey sand. Sandplains.	Very unlikely	Very unlikely
Likely		*Daviesia speciosa*	EN	EN	Gravelly lateritic soils. Undulating plains, rises.	Very unlikely	Very unlikely
	TPFL	*Drakaea concolor*	EN	VU	Sand.	Very unlikely	Very unlikely
May		*Drakaea elastica*	EN	EN	White or grey sand. Low-lying situations adjoining winter-wet swamps.	Very unlikely	Very unlikely
Known	TPFL	*Eleocharis keigheryi*	VU	VU	Clay, sandy loam. Emergent in freshwater: creeks, claypans.	Very unlikely	Very unlikely
Known	WAH, TPFL	*Eremophila glabra* subsp. *chlorella*	EN	EN	Sandy clay. Winter-wet depressions.	Unlikely	Unlikely
Known	WAH, TPFL	*Eremophila subangustifolia*	CR	CR	Slightly saline, pale brown sandy clay on the margins of seasonally wet flats and lakes. Associated species include Acacia saligna, Casuarina obesa and Melaleuca rhaphiophylla.	May	May
Likely		*Eucalyptus crispata*	EN	VU	Sand, loam with lateritic gravel. Lateritic breakaways.	Very unlikely	Very unlikely
Known		*Eucalyptus impensa / Eucalyptus ×impensa*	CR	EN	Yellow sand. Lateritic hills.	Very unlikely	Very unlikely
Known		*Eucalyptus johnsoniana*	VU	VU	White/grey sand with lateritic gravel. Sandplains, lateritic breakaways.	Very unlikely	Very unlikely
Likely		*Eucalyptus lateritica / Eucalyptus ×lateritica*	EN	VU	White or grey sand with gravel. Lateritic breakaways & mesas.	Very unlikely	Very unlikely
Likely		*Eucalyptus leprophloia*	EN	EN	White or grey sand over laterite. Valley slopes.	Very unlikely	Very unlikely
May	WAH	*Eucalyptus rhodantha* var. *rhodantha*	VU	VU	Grey/yellow/red sand over laterite. Undulating country, hillslopes.	Very unlikely	Very unlikely
Known		*Eucalyptus suberea*	VU	VU	Grey sand. Near or on lateritic breakaways.	Very unlikely	Very unlikely
Likely	WAH, TPFL	*Grevillea althoferorum* subsp. *althoferorum*	CR	EN	Grey sand with gravel.	Very unlikely	Very unlikely
Likely		*Grevillea batrachioides*	CR	EN	Sandy loam. Sandstone outcrops.	Very unlikely	Very unlikely
Likely		*Grevillea curviloba / Grevillea curviloba* subsp. *incurva*	EN	EN	Grey sand, sandy loam. Winter-wet heath.	Very unlikely	Very unlikely
Likely	WAH	*Grevillea humifusa*	CR	EN	Gravelly loam over laterite.	Very unlikely	Very unlikely
Likely		*Hakea megalosperma*	VU	VU	Grey sand, loam. Lateritic hills & rocks.	Very unlikely	Very unlikely

Database		Species	Cons. status***		Habitat	Likelihood of occurring	
PMST*	DBCA**		EPBC Act	BC Act		Desktop	Post-survey
Known		*Hemiandra gardneri*	CR	EN	Grey or yellow sand, clayey sand. Sandplains.	Very unlikely	Very unlikely
Known	WAH, TPFL	*Paracaleana dixonii*	VU	EN	Grey sand over granite.	Very unlikely	Very unlikely
Known	WAH, TPFL	*Styphelia obtecta / Leucopogon obtectus*	EN	EN	Grey-white or yellow sand. Gently undulating slope or plain.	Very unlikely	Very unlikely
Known		*Tetratheca nephelioides*	EN	CR	White-grey sand, yellow-brown clayey sand, gravel laterite. Outcrops, undulating hills, ridges.	Very unlikely	Very unlikely
Known		*Thelymitra stellata*	EN	EN	Sand, gravel, lateritic loam.	Very unlikely	Very unlikely
Likely		*Verticordia albida*	CR	EN	Grey-yellow sand. Road verges.	Very unlikely	Very unlikely
May		*Wurmbea tubulosa*	VU	EN	Clay, loam. River-banks, seasonally-wet places.	Very unlikely	Very unlikely

* PMST likelihood of occurrence or likelihood of habitat occurring

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

*** Commonwealth EPBC Act and Western Australian BC Act conservation status

Table 26: Flora database search results, habitat and likelihood assessment (Priority Flora)

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

DBCA Database*	Taxon	Cons. Code**	Habitat	Likelihood of occurring	
				Desktop	Post-survey
WAH, TPFL	*Caladenia denticulata* subsp*. albicans*	P1	Riverbanks, wet flats, depressions. Clay or sandy soil.	Very unlikely	Very unlikely
WAH	*Grevillea cooljarloo*	P1	Sand, clayey sand, seasonally wet wetlands,	Very unlikely	Very unlikely
WAH, TPFL	*Korthalsella arthroclada*	P1	White, sandy clay around lake edges.	May	May
WAH	*Poranthera asybosca*	P1	Open kwongan shrubland on white sand over laterite.	Very unlikely	Very unlikely
WAH	*Stylidium carnosum* subsp. Narrow leaves (J.A. Wege 490)	P1	Slopes on low hills, low plains. White/grey sand with laterite.	Very unlikely	Very unlikely
WAH	*Verticordia dasystylis* subsp*. oestopoia*	P1	Gritty soils over granite. Outcrops.	Very unlikely	Very unlikely
WAH, TPFL	*Verticordia luteola* var. *rosea*	P1	White sand. Flats.	Very unlikely	Very unlikely
WAH	*Acacia lasiocarpa* var. *lasiocarpa* Cockleshell Gully variant (E.A. Griffin 2039)	P2	Grey-yellow sand with laterite. Low open heath.	Very unlikely	Very unlikely
WAH, TPFL	*Acacia vittata*	P2	Grey sand, sandy clay. Margins of seasonal lakes.	May	May
WAH	*Calytrix purpurea*	P2	White, grey or yellow sand, often over laterite. Sandplains, sand dunes.	Very unlikely	Very unlikely
WAH	*Chordifex reseminans*	P2	Dry sand. Heath.	Very unlikely	Very unlikely
WAH	*Cristonia biloba* subsp. *pubescens*	P2	Sand, sand over laterite.	Very unlikely	Very unlikely
WAH, TPFL	*Daviesia debilior* subsp*. debilior*	P2	Sand over lateritic gravel.	Very unlikely	Very unlikely
WAH	*Eryngium pinnatifidum* subsp. Umbraphilum (G.J. Keighery 13967)	P2	Winter-wet areas, sometimes slightly saline	Unlikely	Unlikely
WAH	*Eucalyptus foecunda* subsp*. aeolica*	P2	Limestone.	May	Very unlikely
WAH, TPFL	*Guichenotia quasicalva*	P2	Drainage lines. Sandy clay over laterite.	Very unlikely	Very unlikely
WAH	*Jacksonia rubra*	P2	Clayey sand.	Very unlikely	Very unlikely
WAH	*Phlebocarya pilosissima* subsp. *teretifolia*	P2	White or grey sand.	May	May

DBCA Database*	Taxon	Cons. Code**	Habitat	Likelihood of occurring	
				Desktop	Post-survey
WAH, TPFL	*Scaevola eneabba*	P2	Sandplain.	Very unlikely	Very unlikely
WAH	*Schoenus* sp. Eneabba (F. Obbens & C. Godden I154)	P2	Grey, yellow or white sand. Undulating sandplains, mid slopes, tops of rises.	Unlikely	Unlikely
WAH	*Scholtzia calcicola*	P2	Yellow/grey sand, over limestone. Slopes.	May	May
WAH	*Stylidium pseudocaespitosum*	P2	White, grey or yellow sand over laterite. Breakaways and hillslopes.	Very unlikely	Very unlikely
WAH, TPFL	*Thelymitra pulcherrima*	P2	Gravel.	Very unlikely	Very unlikely
WAH	*Thryptomene spicata*	P2	Sand over laterite in open shrubland. Scattered Eucalyptus todtiana trees or mallees.	Very unlikely	Very unlikely
WAH	*Verticordia argentea*	P2	White, grey or yellow sand. Sand ridges, undulating plains.	Unlikely	Unlikely
WAH	*Walteranthus erectus*	P2	Sand over limestone. Coastal limestone ridges.	May	May
WAH	*Acacia flabellifolia*	P3	Rocky loam, lateritic gravelly soils. Low hills & ridges.	Very unlikely	Very unlikely
WAH	*Acacia latipes* subsp. *licina*	P3	White sand, granitic soils. Limestone hills, sandplains.	May	May
WAH	*Acacia telmica*	P3	Sand, loam or loamy clay. Low-lying seasonally moist areas.	Very unlikely	Very unlikely
WAH	*Anthocercis intricata*	P3	Sand or loam over limestone. Consolidated sand dunes.	May	May
WAH	*Banksia cypholoba*	P3	Sand & gravelly loam.	Unlikely	Unlikely
WAH, TPFL	*Beaufortia bicolor*	P3	White sand over laterite. Sandplains.	Very unlikely	Very unlikely
WAH, TPFL	*Beyeria cinerea* subsp. *cinerea*	P3	Depressions, limestone ridges, hill tops. Brown or grey sand, sand over limestone.	May	Unlikely
WAH	*Beyeria gardneri*	P3	Yellow sand.	Unlikely	Unlikely
WAH	*Blackallia nudiflora*	P3	Clay or sandy clay with granite. On hills or breakaways, plains.	Very unlikely	Very unlikely
WAH, TPFL	*Calandrinia oraria*	P3	Small white sand dunes immediately adjacent to the beach and up to 100–150 m inland in lightly larger dunes with grey or grey-brown sands.	Unlikely	Unlikely
WAH	*Centrolepis milleri*	P3	Sandplains.	Unlikely	Unlikely
WAH	*Comesperma rhadinocarpum*	P3	Sandy soils, sand over laterite. Hill slopes, undulating plains.	Very unlikely	Very unlikely
WAH, TPFL	*Dampiera tephrea*	P3	Sand, gravelly loam.	May	May
WAH	*Daviesia pteroclada*	P3	Sandy or clay gravelly soils over laterite. Hills.	Very unlikely	Very unlikely
WAH	*Desmocladus biformis*	P3	Sand, sandy clay, lateritic soils. Dry sites.	Very unlikely	Very unlikely
WAH	*Eucalyptus macrocarpa x pyriformis*	P3	Sand, lateritic sandy soils. Hills, rocky ironstone ridges, sandplains.	Very unlikely	Very unlikely
WAH, TPFL	*Grevillea biformis* subsp. *cymbiformis*	P3	White sand.	May	May
WAH	*Grevillea erinacea*	P3	White, grey or yellow sand, often with lateritic gravel.	Unlikely	Unlikely
WAH	*Grevillea uniformis*	P3	Sand or sandy loam on sandstone, lateritic gravel. Sandstone outcrops, creeklines.	Very unlikely	Very unlikely
WAH	*Guichenotia alba*	P3	Sandy & gravelly soils. Low-lying flats, depressions.	Very unlikely	Very unlikely
WAH	*Haemodorum loratum*	P3	Grey or yellow sand, gravel.	Very unlikely	Very unlikely
WAH	*Haloragis foliosa*	P3	White/grey sand over limestone.	Likely	May
WAH	*Hemiandra* sp. Eneabba (H. Demarz 3687)	P3	Sand over laterite, sandplains. Disturbed sites.	Very unlikely	Very unlikely
WAH	*Hemigenia saligna*	P3	Lateritic and sandy soils.	Very unlikely	Very unlikely

DBCA Database*	Taxon	Cons. Code**	Habitat	Likelihood of occurring	
				Desktop	Post-survey
WAH	*Hopkinsia anoectocolea*	P3	White or grey sand, often saline. Winter-wet depressions, floodplains, salt lakes.	Very unlikely	Very unlikely
WAH, TPFL	*Hypocalymma gardneri*	P3	Grey-brown sand, laterite. Sandplains, upper slopes, heathland.	Very unlikely	Very unlikely
WAH	*Hypocalymma tetrapterum*	P3	Grey sand, loam, lateritic gravel. Riverbanks, breakaways.	Very unlikely	Very unlikely
WAH	*Lepidobolus quadratus*	P3	Lateritic gravel, grey/white sand. Dry kwongan.	Very unlikely	Very unlikely
WAH	*Mesomelaena stygia* subsp. *deflexa*	P3	White, grey or lateritic sand, clay, gravel.	Very unlikely	Very unlikely
WAH	*Patersonia argyrea*	P3	Grey sand and lateritic gravel.	Very unlikely	Very unlikely
WAH	*Persoonia filiformis*	P3	Yellow or white sand over laterite.	Very unlikely	Very unlikely
WAH	*Persoonia rudis*	P3	White, grey or yellow sand, often over laterite.	Very unlikely	Very unlikely
WAH, TPFL	*Pithocarpa corymbulosa*	P3	Gravelly or sandy loam. Amongst granite outcrops.	Very unlikely	Very unlikely
WAH	*Platysace ramosissima*	P3	Sandy soils.	Unlikely	Unlikely
WAH	*Spergularia nesophila*	P3	Sand over limestone; saline pan.	Likely	May
WAH	*Stylidium drummondianum*	P3	Sand or clayey sand over laterite. Upper hillslopes, breakaways. Low heath, mallee shrubland.	Very unlikely	Very unlikely
WAH, TPFL	*Stylidium maritimum*	P3	Sand over limestone. Dune slopes and flats. Coastal heath and shrubland, open Banksia woodland.	Likely	May
WAH	*Stylidium torticarpum*	P3	Sandy clay and clay loam over laterite. Adjacent to creek lines, depressions and beneath breakaways.	Very unlikely	Very unlikely
WAH	*Styphelia filamentosa*	P3	Deep, white sand or sand over laterite, in the understorey of species-rich heath.	Very unlikely	Very unlikely
WAH	*Styphelia filifolia*	P3	Yellow/brown sand. Flats or slopes.	Very unlikely	Very unlikely
WAH	*Synaphea oulopha*	P3	Lateritic breakaways and rises. Grey sand, gravelly loam, clay.	Very unlikely	Very unlikely
WAH	*Thryptomene* sp. Lancelin (M.E. Trudgen 14000)	P3	Calcareous sand.	May	May
WAH	*Thysanotus vernalis*	P3	Sandy loam.	Unlikely	Unlikely
WAH	*Triglochin protuberans*	P3	Red loam, grey mud over clay. Winter-wet sites, claypans, near salt lakes, margins of pools.	Very unlikely	Very unlikely
WAH, TPFL	*Verticordia amphigia*	P3	Sandy loam, clay & rocky loam. Winter-wet depressions.	Unlikely	Unlikely
WAH	*Verticordia densiflora* var. *roseostella*	P3	Sandy gravelly soils.	Very unlikely	Very unlikely
WAH, TPFL	*Verticordia fragrans*	P3	White, grey or yellow sand, clay loam. Low-lying areas, sandplains.	Very unlikely	Very unlikely
WAH	*Verticordia luteola* var. *luteola*	P3	Grey sand over gravel. Flats.	Very unlikely	Very unlikely
TPFL	*Verticordia muelleriana* subsp. *muelleriana*	P3	White/grey or yellow sand. Sandplains.	Unlikely	Unlikely
WAH	*Banksia elegans*	P4	Yellow, white or red sand. Sandplains, low consolidated dunes.	May	May
WAH, TPFL	*Calytrix chrysantha*	P4	White, grey or yellow/brown sand. Flats.	May	May
WAH, TPFL	*Calytrix eneabbensis*	P4	White, grey or yellow sand over laterite. Sandplains.	Unlikely	Unlikely
WAH, TPFL	*Calytrix superba*	P4	Sand over laterite. Flats.	Very unlikely	Very unlikely
WAH	*Desmocladus elongatus*	P4	White or grey sand. Dry kwongan.	Very unlikely	Very unlikely
WAH	*Eremophila microtheca*	P4	Sandy clay. Winter wet flats, saline flats, sandplains.	May	May
WAH, TPFL	*Eucalyptus macrocarpa* subsp. *elachantha*	P4	White or grey sand over laterite. Hillslopes, ridges, sandplains.	Very unlikely	Very unlikely

DBCA Database*	Taxon	Cons. Code**	Habitat	Likelihood of occurring	
				Desktop	Post-survey
TPFL	*Eucalyptus pendens*	P4	White or grey sand with lateritic gravel. Hillsides, breakaways, sandplains.	Very unlikely	Very unlikely
WAH, TPFL	*Eucalyptus zopherophloia*	P4	Grey/white sand with limestone rubble. Coastal areas.	Likely	Very unlikely
WAH	*Frankenia glomerata*	P4	White sand.	May	May
WAH	*Grevillea olivacea*	P4	Coastal dunes, limestone rocks.	Likely	Known
WAH	*Grevillea rudis*	P4	White, grey, yellow or red sand, often with gravel & over laterite.	May	May
WAH	*Hibbertia propinqua*	P4	Eucalyptus and Banksia woodlands and heath (kwongan). Pale grey to yellow sand and sandy loams, usually over laterite or close to laterite breakaways.	Very unlikely	Very unlikely
WAH	*Hydrocotyle lemnoides*	P4	Swamps.	May	May
WAH, TPFL	*Lepidobolus densus*	P4	Yellow lateritic sand, lateritic gravel. Dry kwongan.	Very unlikely	Very unlikely
WAH	*Liparophyllum congestiflorum*	P4	Grey sand/loam over laterite. Flats, seasonally wet areas.	Unlikely	Unlikely
WAH	*Schoenus griffinianus*	P4	White sand.	Very unlikely	Very unlikely
WAH, TPFL	*Stawellia dimorphantha*	P4	White, grey, yellow sand.	Very unlikely	Very unlikely
WAH	*Stylidium inversiflorum*	P4	White or grey sand over laterite. Sandplains, hillslopes and gullies. Heath, open woodland.	Very unlikely	Very unlikely
WAH	*Stylidium longitubum*	P4	Sandy clay, clay. Seasonal wetlands.	Very unlikely	Very unlikely
WAH, TPFL	*Verticordia aurea*	P4	Deep sand. Sandplains.	Very unlikely	Very unlikely
WAH	*Xanthosia tomentosa*	P4	Lateritic gravelly soils.	Very unlikely	Very unlikely
WAH	*Fabronia hampeana*	P2	Not vascular plant - excluded	Not in project scope	

Table 27: Fauna database results and likelihood assessments

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

Database		Species	Common name	Conservation status		Likelihood of occurring	
PMST*	DBCA			EPBC status	WA status	Desktop	Post-survey
		Mammals					
May		*Dasyurus geoffroii*	Chuditch, Western Quoll	VU	VU	Very unlikely	Very unlikely
Known		*Macroderma gigas*	Ghost Bat	VU	VU	Very unlikely	Very unlikely
Known	X	*Neophoca cinerea***	Australian Sea Lion	EN	EN	Very unlikely	Very unlikely
	X	*Notamacropus irma*	Western Brush Wallaby		P4	Very unlikely	Very unlikely
May		*Parantechinus apicalis*	Dibbler	EN	EN	Very unlikely	Very unlikely
		Birds					
	X	*Actitis hypoleucos*	Common Sandpiper	MI	MI	Unlikely	Very unlikely
	X	*Anous stolidus*	Common Noddy	MI	MI	Unlikely	Very unlikely
Likely		*Anous tenuirostris melanops*	Australian Lesser Noddy	VU	EN	Unlikely	Very unlikely
Likely		*Aphelocephala leucopsis*	Southern Whiteface	VU		Unlikely	Very unlikely

Database		Species	Common name	Conservation status		Likelihood of occurring	
PMST*	DBCA			EPBC status	WA status	Desktop	Post-survey
	X	*Apus pacificus*	Fork-tailed Swift	MI	MI	Unlikely	Very unlikely
	X	*Ardenna pacifica*	Wedge-tailed Shearwater	MI	MI	Unlikely	Very unlikely
	X	*Arenaria interpres*	Ruddy Turnstone	MI	MI	Unlikely	Very unlikely
Known	X	*Calidris acuminata*	Sharp-tailed Sandpiper	MI (VU)	MI	Unlikely	Very unlikely
	X	*Calidris alba*	Sanderling	MI	MI	Unlikely	Very unlikely
Known		*Calidris canutus*	Red Knot, Knot	VU	EN	Unlikely	Very unlikely
	X	*Calidris ferruginea*	Curlew Sandpiper	CR & MI	CR	Unlikely	Very unlikely
	X	*Calidris ruficollis*	Red-necked Stint	MI	MI	Unlikely	Very unlikely
May	X	*Charadrius leschenaultii*	Greater Sand Plover, Large Sand Plover	VU & MI	VU	Unlikely	Very unlikely
May		*Diomedea amsterdamensis*	Amsterdam Albatross	EN	CR	Very unlikely	Very unlikely
May		*Diomedea epomophora*	Southern Royal Albatross	VU	VU	Very unlikely	Very unlikely
Likely		*Diomedea exulans*	Wandering Albatross	VU	VU	Very unlikely	Very unlikely
Likely		*Falco hypoleucos*	Grey Falcon	VU	VU	Unlikely	Very unlikely
	X	*Falco peregrinus*	Peregrine Falcon		OS	Unlikely	Very unlikely
	X	*Hydroprogne caspia*	Caspian Tern	MI	MI	Likely	Very unlikely
Likely	X	*Leipoa ocellata*	Malleefowl	VU	VU	Very unlikely	Very unlikely
	X	*Limosa lapponica*	Bar-tailed Godwit	MI	MI	Unlikely	Very unlikely
Known		*Limosa lapponica menzbieri*	Northern Siberian Bar-tailed Godwit, Russkoye Bar-tailed Godwit	EN	CR	Unlikely	Very unlikely
May		*Macronectes giganteus*	Southern Giant-Petrel, Southern Giant Petrel	EN	MI	Very unlikely	Very unlikely
Likely		*Macronectes halli*	Northern Giant Petrel	VU	MI	Very unlikely	Very unlikely
	X	*Numenius phaeopus*	Whimbrel	MI	MI	Unlikely	Very unlikely
	X	*Oxyura australis*	Blue-billed Duck		P4	Unlikely	Very unlikely
May		*Phaethon rubricauda westralis*	Red-tailed Tropicbird (Indian Ocean), Indian Ocean Red-tailed Tropicbird	EN	P4	Very unlikely	Very unlikely
May		*Phoebetria fusca*	Sooty Albatross	VU	EN	Very unlikely	Very unlikely
	X	*Plegadis falcinellus*	Glossy Ibis	MI	MI	May	Very unlikely
	X	*Pluvialis fulva*	Pacific Golden Plover	MI	MI	Unlikely	Very unlikely
	X	*Pluvialis squatarola*	Grey Plover	MI	MI	Likely	Unlikely
May		*Pterodroma mollis*	Soft-plumaged Petrel	VU		Very unlikely	Very unlikely
Likely		*Rostratula australis*	Australian Painted Snipe	EN	EN	Unlikely	Very unlikely
	X	*Sterna dougallii*	Roseate Tern	MI	MI	May	Very unlikely
Known	X	*Sternula nereis nereis*	Fairy Tern, Australian Fairy Tern	VU	VU	May	Very unlikely

Database		Species	Common name	Conservation status		Likelihood of occurring	
PMST*	DBCA			EPBC status	WA status	Desktop	Post-survey
Likely		*Thalassarche carteri*	Indian Yellow-nosed Albatross	VU	EN	Very unlikely	Very unlikely
May		*Thalassarche cauta*	Shy Albatross	EN	VU	Very unlikely	Very unlikely
May		*Thalassarche impavida*	Campbell Albatross, Campbell Black-browed Albatross	VU	VU	Very unlikely	Very unlikely
Likely		*Thalassarche melanophris*	Black-browed Albatross	VU	EN	Very unlikely	Very unlikely
May		*Thalassarche steadi*	White-capped Albatross	VU		Very unlikely	Very unlikely
	X	*Thalasseus bergii*	Crested Tern	MI	MI	May (overfly)	Very unlikely
	X	*Thinornis cucullatus*	Hooded Plover, Hooded Dotterel		P4	Unlikely	Very unlikely
	X	*Tringa glareola*	Wood Sandpiper	MI	MI	Unlikely	Very unlikely
Likely	X	*Tringa nebularia*	Common Greenshank	MI (EN)	MI	Unlikely	Very unlikely
	X	*Xenus cinereus*	Terek Sandpiper	MI	MI	Unlikely	Very unlikely
Known	X	*Zanda latirostris*	Carnaby's Cockatoo	EN	EN	Very unlikely	Very unlikely
		Reptiles					
Known	X	*Egernia stokesii badia*	Western Spiny-tailed Skink	EN	VU	Unlikely	Unlikely
	X	*Neelaps calonotos*	Black-striped Snake, Black-striped Burrowing Snake		P3	Unlikely	Unlikely

* PMST likelihood of occurrence or likelihood of habitat occurring

** *Neophoca cinerea* (Australian Sea Lion) has been retained as they have been reported as traversing across land for moderate distances

Table 28: Excluded species and reason for exclusion

Note: the excluded species list does not include fish or invertebrates identified only from the PMST search

Species	Common name	Conservation status		Reason excluded from assessment
		EPBC Act	WA	
Balaenoptera borealis	Sei Whale	VU	EN	Marine; habitat does not occur
Balaenoptera musculus	Blue Whale	EN	EN	Marine; habitat does not occur
Balaenoptera physalus	Fin Whale	VU	EN	Marine; habitat does not occur
Eubalaena australis	Southern Right Whale	EN	VU	Marine; habitat does not occur
Physeter macrocephalus	Sperm Whale	MI	VU	Marine; habitat does not occur
Caretta caretta	Loggerhead Turtle	EN	EN	Marine; habitat does not occur
Chelonia mydas	Green Turtle	VU	VU	Marine; habitat does not occur
Dermochelys coriacea	Leatherback Turtle, Leathery Turtle	EN	VU	Marine; habitat does not occur
Natator depressus	Flatback Turtle	VU	VU	Marine; habitat does not occur

Species	Common name	Conservation status		Reason excluded from assessment
		EPBC Act	WA	
Hemisaga vepreculae	Thorny Bush Katydid (Moora)		P2	Invertebrate; not within the scope of the project
Hylaeus globuliferus	Woolybush Bee		P3	Invertebrate; not within the scope of the project
Idiosoma kwongan	Kwongan Heath Shield-backed Trapdoor Spider		P1	Invertebrate; not within the scope of the project
Idiosoma nigrum	Shield-backed Trapdoor Spider	VU	EN	Invertebrate; not within the scope of the project
Phasmodes jeeba	Springtime Corroboree Stick Katydid (Eneabba)		P3	Invertebrate; not within the scope of the project
Synemon gratiosa	Graceful Sunmoth		P4	Invertebrate; not within the scope of the project

APPENDIX FOUR FIELD SURVEY RESULTS

Table 29: Flora inventory (site x species matrix)

Family	Species	Naturalised	Cons. code	CE2301	CE2302	CE2303	Opportunistic
Aizoaceae	*Carpobrotus edulis*	*				1	
Apocynaceae	*Alyxia buxifolia*						1
Asparagaceae	*Acanthocarpus preissii*			1		1	
Asteraceae	*Blennospora drummondii*					1	
	Hyalosperma cotula					1	
	Rhodanthe laevis					1	
	Urospermum picroides	*				1	
Campanulaceae	*Lobelia* sp.					1	
Caryophyllaceae	*Spergularia marina*			1			
Casuarinaceae	*Casuarina obesa*					1	
Chenopodiaceae	*Rhagodia preissii subsp. obovata*			1			
	Salicornia sp.						1
	Tecticornia sp. 1				1		
	Tecticornia sp. 2				1		
	Tecticornia sp. 3				1		
	Tecticornia sp. 4				1		
Convolvulaceae	*Cuscuta planiflora*	*				1	
Crassulaceae	*Crassula glomerata*	*					1
	Crassula sp.			1			
Fabaceae	*Acacia rostellifera*						1
	Acacia xanthina					1	
	Templetonia retusa					1	
	Templetonia sulcata						1
Frankeniaceae	*Frankenia pauciflora*				1		
Haemodoraceae	*Conostylis prolifera*						1
Hemerocallidaceae	*Dianella revoluta*						1
Juncaceae	*Juncus bufonius*	*			1		
Lauraceae	*Cassytha* sp.						1
Malvaceae	*Seringia hermanniifolia*						1
Myrtaceae	*Melaleuca cardiophylla*			1			
	Melaleuca huegelii			1		1	
	Melaleuca lanceolata			1	1	1	
Pittosporaceae	*Pittosporum ligustrifolium*						1
Poaceae	*Austrostipa elegantissima*						1
	Austrostipa sp.			1		1	
	Avellinia michelii	*				1	
	Avena barbata	*					1
	Bromus hordeaceus	*		1			
	Bromus rubens	*				1	
	Ehrharta longiflora	*				1	
	Lagurus ovatus	*			1		
	Rytidosperma sp.					1	

Family	Species	Naturalised	Cons. code	CE2301	CE2302	CE2303	Opportunistic
	Vulpia myuros forma *myuros*	*				1	
Primulaceae	*Lysimachia arvensis*	*				1	
	Samolus repens				1		1
Proteaceae	*Grevillea olivacea*		4			1	
Rhamnaceae	*Spyridium globulosum*						1
Sapindaceae	*Dodonaea aptera*						1
Zygophyllaceae	*Roepera fruticulosa*			1			

APPENDIX FIVE FLORISTIC QUADRAT DATA

CE2301

Staff LJA **Date** 27/11/2023 **Season** P

Revisit

Type Q 10 m x 10 m

Location Coolimba-Eneabba

MGA Zone 50 306637 **mE** 6695079 **mN** **Lat.** -29.8597 **Long.** 114.9982

Habitat Dunes

Aspect E **Slope** Gentle

Soil Type Grey sand

Rock Type Limestone

Loose Rock <2 % cover **Litter** 60 % cover ; <1 cm in depth

Bare ground 35 % cover **Weeds** 15 % cover

Vegetation M+ ^*Melaleuca lanceolata*,^*Melaleuca cardiophylla*\^shrub\4\c;G ^*Bromus hordeaceus*, ^*Spergularia marina*\^other grass,forb\1\r

Veg. Condition Good

Disturbance Possible previous grazing

Fire Age >10 years

Notes

Species	WA Cons.	Height (m)	Cover (%)	Count
Acanthocarpus preissii		0.3	<1	
Austrostipa sp.		0.6	<1	
**Bromus hordeaceus*		0.3	3	

Crassula sp.	0.1	<1
Melaleuca cardiophylla	2	15
Melaleuca huegelii	2	1
Melaleuca lanceolata	3	35
Rhagodia preissii subsp. *obovata*	1.5	1
Roepera fruticulosa	0.3	<1
Spergularia marina	0.2	2

CE2302

Staff LJA **Date** 27/11/2023 **Season** P

Revisit

Type Q 10 m x 10 m

Location Coolimba-Eneabba

MGA Zone 50 306651 **mE** 6695064 **mN** **Lat.** -29.8598 **Long.** 114.9983

Habitat Lake fringe

Aspect N/A **Slope** N/A

Soil Type Saline grey sand

Rock Type Limestone and shell

Loose Rock 2-10 % cover **Litter** 2 % cover ; <1 cm in depth

Bare ground 70 % cover **Weeds** 5 % cover

Vegetation G+ ^^*Tecticornia* sp. 1,*Samolus repens*,*Tecticornia* sp. 3\^samphire shrub,shrub\2\c

Veg. Condition Very Good

Disturbance None obvious

Fire Age

Notes Likely naturally saline dune swale

Species	WA Cons.	Height (m)	Cover (%)	Count
Frankenia pauciflora		0.4	<1	
**Juncus bufonius*		0.02	<1	
**Lagurus ovatus*		0.2	2	

Melaleuca lanceolata	0.5	<1
Samolus repens	0.5	5
Tecticornia sp. 1	0.6	20
Tecticornia sp. 2	0.2	2
Tecticornia sp. 3	0.1	4
Tecticornia sp. 4	0.2	2

CE2303

Staff LJA **Date** 27/11/2023 **Season** P

Revisit

Type Q 10 m x 10 m

Location Coolimba-Eneabba

MGA Zone 50 306671 **mE** 6695066 **mN** **Lat.** -29.8598 **Long.** 114.9985

Habitat Lake fringe

Aspect SW **Slope** Very Gentle

Soil Type Shell fragments

Rock Type Limestone

Loose Rock <2 % cover **Litter** 60 % cover ; 1-2 cm in depth

Bare ground 20 % cover **Weeds** 15 % cover

Vegetation U ^*Casuarina obesa*\^tree\6\r;M+ ^*Melaleuca lanceolata*,^*Melaleuca huegelii*\^shrub\4\i;G ^^*Vulpia myuros* forma *myuros*,*Ehrharta longiflora*,*Hyalosperma cotula*\^other grass,forb\1\i

Veg. Condition Good

Disturbance Possibly cleared previously; lime investigations?

Fire Age

Notes Soil is shell fragments

Species	WA Cons.	Height (m)	Cover (%)	Count
Acacia xanthina		0.5	<1	
Acanthocarpus preissii		0.2	<1	
Austrostipa sp.		0.6	<1	

*Avellinia michelii		0.1	<1
Blennospora drummondii		0.05	<1
*Bromus rubens		0.2	<1
Carpobrotus edulis		0.1	<1
Casuarina obesa		5	5
*Cuscuta planiflora		0.1	<1
*Ehrharta longiflora		0.2	3
Grevillea olivacea	P 4	0.1	<1
Hyalosperma cotula		0.1	2
Lobelia sp.		0.2	<1
*Lysimachia arvensis		0.2	1
Melaleuca huegelii		2.2	10
Melaleuca lanceolata		2.5	10
Rhodanthe laevis		0.05	<1
Rytidosperma sp.		0.3	1
Templetonia retusa		0.5	<1
*Urospermum picroides		0.3	<1
Vulpia myuros forma *myuros*		0.2	20

APPENDIX SIX DBCA REPORT FORM