Attachment 8 - TEC and Black Cockatoo Habitat Assessment Iluka and Ocean Reef Foreshore Reserves (2024)

Enclosed in this attachment are:

1. Iluka Foreshore Reserve Honeymyrtle Shrubland TEC and Black Cockatoo habitat assessment 2024
2. Ocean Reef Foreshore Reserve Honeymyrtle Shrubland TEC and Black Cockatoo habitat assessment 2024

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Iluka Foreshore Reserve Honeymyrtle Shrubland TEC and Black Cockatoo habitat assessment

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Project Name:	Iluka Foreshore Reserve Honeymyrtle Shrubland TEC and Black Cockatoo habitat assessment
Project Number:	24PER8879
Project Manager:	Glenn Harris-Maslen

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Acknowledgements

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Abbreviations

Abbreviation	Description
BC Act	*Biodiversity Conservation Act 2016*
CR	Critically Endangered
DAWE	Department of Agriculture, Water and Environment
DBCA	Department of Biodiversity, Conservation and Attractions
DBH	Diameter at breast height
DCCEEW	Department of Climate Change, Energy, the Environment and Water
DEC	Department of Environment and Conservation
DoEE	Department of the Environment and Energy
DEWHA	Department of the Environment, Water, Heritage and the Arts
DPaW	Department of Parks and Wildlife
DPIRD	Department of Primary Industries and Regional Development
DWER	Department of Water and Environmental Regulation
ELA	Eco Logical Australia Pty Ltd
EPA	Environmental Protection Authority
EN	Endangered
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
FCT	Floristic Community Type
nMDS	Non-metric Multi-Dimensional Scaling
NVIS	National Vegetation Information System
PEC	Priority Ecological Community
PMST	Protected Matters Search Tool
PRIMER	Plymouth Routines in Multivariate Ecological Research
TEC	Threatened Ecological Community
TSSC	Threatened Species Scientific Committee
VU	Vulnerable
WAH	Western Australian Herbarium
WAM	Western Australian Museum
WAOL	Western Australian Organism List
WoNS	Weed of National Significance

Executive Summary

Eco Logical Australia (ELA) were engaged by the City of Joondalup (the City) to undertake a targeted threatened ecological community and black cockatoo habitat assessment of Iluka Foreshore (the survey area). The survey area is 33.8 ha in size and located approximately 26 km north of Perth, Western Australia.

Specifically, ELA were engaged to undertake a targeted survey for the Honeymyrtle shrubland on limestone ridges of the Swan Coastal Plain threatened ecological community (herein referred to as the Honeymyrtle Shrubland TEC), listed as Critically Endangered under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and *Biodiversity Conservation Act 2016* (BC Act). ELA were previously engaged to map vegetation communities (including conservation-significant communities) within the survey area in 2020, however the Federally-listed Honeymyrtle Shrubland TEC has since been listed under the EPBC Act. As such, an assessment against the key diagnostic characteristics listed in the approved conservation advice of the TEC were not completed as part of that assessment (ELA 2021). The Honeymyrtle Shrubland TEC has previously been listed under the BC Act as the *Melaleuca huegelii – M. systena* shrublands of limestone ridges (floristic community type 26a as originally described in Gibson *et al*. 1994)'; however confirmation of its presence is defined by statistical analysis and comparison against the Gibson *et al*. (1994) floristic community types which was completed by ELA in 2020 (and found to not be present in the survey area).

In addition, ELA were engaged to undertake a targeted survey for black cockatoos listed under the EPBC Act and *Biodiversity Conservation Act 2016* (BC Act), including:

- Baudin's Cockatoo (*Zanda baudinii*; listed as Endangered [EN] under the EPBC Act and BC Act);
- Carnaby's Cockatoo (*Zanda latirostris*; listed as Endangered [EN] under the EPBC Act and BC Act); and
- Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*; listed as Vulnerable [VU] under the EPBC Act and BC Act).

A comprehensive desktop assessment was undertaken to assess the potential presence of Black Cockatoos and the Honeymyrtle Shrubland TEC in the survey area prior to the survey. Given that the survey area is located in the 'community likely to occur range' on the Species Profile and Threats Database (SPRAT) (DCCEEW 2024a).

The survey area occurs in the 'likely to occur' range of the Forest Red-tailed Black Cockatoo and Carnaby's Cockatoo, however is outside of the predicted range of the Baudin's Cockatoo. As such, the survey focussed on assessing the habitat values for Carnaby's and Forest Red-tailed Black Cockatoo in the survey area.

The Targeted Honeymyrtle Shrubland TEC assessment and Black Cockatoo habitat assessment was conducted on the 4th and 5th of September 2024 respectively in accordance with the EPA Technical Guidance for Flora and Vegetation (EPA 2016) and the Referral guideline for 3 WA threatened black cockatoo species: Carnaby's Cockatoo, Baudin's Cockatoo, and the Forest Red-tailed Black cockatoo (DAWE 2022). Three quadrats were established within the survey area to confirm the presence of the Honeymyrtle Shrubland TEC. These sample locations were established in addition to 14 quadrats completed by ELA in 2020 for the purposes of mapping vegetation communities within the survey area. Black cockatoos were surveyed by walking transects across the survey area and mapping black cockatoo habitat.

A total of 54 flora species (37 native and 17 introduced) from 29 families and 49 genera were recorded from the three quadrats established within the survey area in 2024. No Threatened flora species listed under the EPBC Act or BC Act or Priority species listed by DBCA were recorded within quadrats. A total of 17 introduced (weed) species were recorded within quadrats, representing 32% of the total species recorded. All these species are listed on the Western Australian Organism List Database as permitted (s-11) species (DPIRD 2024), indicating that no specific management of these species is required.

Vegetation within the survey area was assessed against the key diagnostic characteristics outlined in the Federally-listed Honeymyrtle Shrubland TEC approved conservation advice (DCCEEW 2023) to determine the presence of the TEC in the survey area. The primary defining features of the Honeymyrtle Shrubland TEC include location, species assemblage, patch size, and vegetation condition. Two patches of Honeymyrtle Shrubland TEC were identified within the survey area, including a 2.3 ha patch in the north of the survey area and a 0.2 ha patch in the south of the survey area. Both patches were located in the SgMhAr vegetation community (previously mapped by ELA in 2021). These patches contained sufficient coverage of key floristic indicators and occurred on skeletal soils of Tamala-limestone derived outcrops and low rises in the survey area.

To confirm the presence of the state-listed Honeymyrtle Shrubland TEC, ELA quadrats and vegetation communities were compared to FCTs defined by Gibson *et al.* (1994) using multivariate analysis. This analysis supported previous findings by ELA (2021) that vegetation in the SgMhAr community (in which areas of potential Honeymyrtle Shrubland TEC are located in the survey area) did not floristically align with FCT26a and therefore did not represent the state-listed Honeymyrtle Shrubland TEC. Quadrats were found to have a moderate floristic affiliation with FCT29a 'coastal shrublands on shallow sands' and FCT24 'Northern Spearwood shrublands and woodlands', listed as Priority 3 ecological communities by DBCA.

No primary or secondary evidence of use of the survey area by black cockatoos was recorded during the assessment. This included no direct sightings or heard calls, or evidence of foraging. Most of the survey area was mapped as 'Negligible to low' value foraging habitat for both Carnaby's and Forest Red-tailed Black Cockatoos due to a low foliar cover (<2%) of foraging species. One vegetation community, the BsArAg (ELA 2021) vegetation community was mapped as 'Low to Moderate' value foraging habitat for Carnaby's Black Cockatoo and 'Low' foraging habitat for Forest Red-tailed Black Cockatoo given the presence of *Banksia sessilis* (and to a lesser extent *B. attenuata*) in the overstorey at greater than 10% foliar cover. While *B. sessilis* and *B. attenuata* are listed as foraging species for Forest Red-tailed Black Cockatoos, they are not considered to be primary foraging species and, as such, the foraging quality of this community was mapped as lower than that for Carnaby's Black Cockatoo (for which *B. sessilis* and *B. attenuata* are considered primary foraging species). The remaining vegetation in the survey area was considered to have no foraging value given a lack of potential foraging species.

The survey area contains two potentially suitable breeding trees (>500 mm DBH), including two Tuart (*Eucalyptus gomphocephala*) trees on the northern boundary of the survey area. Given that both trees are tall and are located in proximity to water sources (<1 km), they are therefore also considered to be potential roosting habitat.

While potential roosting, nesting, and foraging habitat is present in the survey area for black cockatoos, it is considered unlikely that Carnaby's or Forest Red-tailed Black Cockatoos would utilise habitat within the survey area. Any use would be limited to sporadic and opportunistic foraging within areas and primarily located in areas where *Banksia sessilis* is present, namely the BsArAg and to a lesser extent the SgMhAr vegetation communities. While any use of habitat within the survey area would likely be sporadic or opportunistic, it is still important to protect these vegetation communities, particularly where they overlap with other significant environmental factors such as Threatened or Priority

ecological communities. The conservation of these vegetation communities should be focused primarily on areas in the best condition to ensure that condition does not worsen in future. Potential nesting trees were recorded in the survey area, given that both trees lack suitable hollows, nesting would not currently be able to occur. However, both trees may develop a nest hollow in the future and as such should be protected where possible.

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1. Introduction

1.1. Project background

Eco Logical Australia (ELA) were engaged by the City of Joondalup (the City) to undertake a Targeted Honeymyrtle Shrubland TEC assessment and Black Cockatoo habitat assessment of the Iluka Foreshore Reserve (herein referred to as the survey area). The survey area is 33.8 ha in size and located approximately 26 km north of Perth, Western Australia (Figure 1).

Specifically, the objectives of this assessment include:

- An assessment to verify if the vegetation meets the requirements specified in the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) 'Approved Conservation Advice (incorporating listing advice) for Honeymyrtle shrubland on limestone ridges of the Swan Coastal Plain ecological community', using the assessment process itemised in the Approved Conservation Advice (DCCEEW 2023);
- An assessment to verify if the vegetation meets the requirements specified in the State *Biodiversity Conservation Act 2016* (BC Act) for *Melaleuca huegelii – M. systena* shrublands of limestone ridges (floristic community type 26a as originally described in Gibson *et al.* 1994); and
- A targeted habitat assessment for Black Cockatoos, including the Carnaby's Cockatoo (*Zanda latirostris*; listed as Endangered [EN] under the EPBC Act and BC Act) and Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso;* listed as Vulnerable [VU] under the EPBC Act and BC Act).

1.2. Scope of works

The purpose of this project was to provide an assessment of the presence of Honeymyrtle Shrubland TEC and Black Cockatoo Habitat within the survey area. This technical report addresses the following items:

- Undertaking an initial desktop assessment to determine environmental values such as flora, vegetation, and ecological communities relating to the survey area;
- Undertaking a field survey to assess values pertaining to Honeymyrtle Shrubland TEC and Black Cockatoo habitat values;
- Preparation of a technical targeted Honeymyrtle Shrubland TEC and Black Cockatoo habitat survey report for the survey area; and
- Provision of all spatial/mapping data collected during the survey.

Figure 1: Survey area location

Survey area
Distributor Road
Access Road

N

0 50 100 200
Metres

Datum/Projection:
GDA 1994 MGA Zone 50

24PER8879-GM Date: 3/12/2024

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2. Environmental setting

2.1. Geology, landforms, and soils

The Perth Basin, on which the Swan Coastal Plain is located, is filled by Mesozoic to recent sediments. During the Quarternary the coastal plain was formed by deposition of sediments on an underlying eroded embayment, which reaches east to the Darling Scarp (Beard 1990). Three dune systems run parallel to the present coastline and from west to east (i.e. youngest to oldest), namely the Quindalup, Spearwood, and Bassendean systems.

Soil-landscape mapping prepared by the Department of Primary Industries and Regional Development (DPIRD) provides an inventory and condition survey of lands at a 1:250,000 scale (DPIRD 2022). The survey area is located primarily on the Spearwood Dune System, with some minor areas located on the Quindalup South Dune System (namely the area of the beach along the west coast of the survey area, and a small southern portion of the survey area). The Spearwood Dune System is comprised of sand overlaying cemented coastal limestone (i.e. Tamala Limestone) (Semeniuk & Glassford 1989). It is characterised by yellow deep sands, pale deep sands, and yellow/brown shallow sands that lay to the east of the Quindalup dune system (DPIRD 2022). The Quindalup Dune System is the youngest of the aeolian dune systems associated with the Swan Coastal Plain. It is characterised by unconsolidated white calcareous sands that form a series of dunes and beach-ridge plains (DPIRD 2022).

2.2. Regional vegetation

Vegetation type and extent have been mapped at a regional scale by Beard (1979) who categorised vegetation into broad vegetation associations. Based on this mapping at a scale of 1:250,000, DPIRD has compiled a list of vegetation extent ant types across Western Australia (DPIRD 2019; Shepherd *et al.* 2002). Two system-vegetation associations, Spearwood 949 and Spearwood 1007 occur within the survey area (DPIRD 2019). The floristic description of the 949 vegetation association is described as consisting of Acacia spp., Banksia spp., *Agonis flexuosa,* Callitris spp., Allocasuarina spp., and *Eucalyptus loxophleba* Low woodland or open low woodland (Shepherd *et al.* 2002). The 949 vegetation association has 56.45% of its total pre-European extent remaining in the SWA02 subregion (Table 1). The 1007 vegetation association is described as a mosaic of shrublands dominated by *Acacia cyclops, A. lasiocarpa, A. rostellifera,* or *Melaleuca acerosa* (Shepherd *et al.* 2002; Table 1). The 1007 vegetation association has 68.7% of its total pre-European extent remaining in the SWA02 subregion.

Table 1: Beard's (1979) vegetation associations in the survey area

Vegetation association	Vegetation description	Pre-European extent in SWA02 subregion (ha)	Current extent in SWA02 subregion (ha)	% Remaining in SWA02 subregion
949	Low woodland; banksia (*Banksia* sp.)	184,476	104,129	56.5
1007	Mosaic: Shrublands; *Acacia lasiocarpa* & *Melaleuca acerosa* heath / Shrublands; *Acacia rostellifera* & *Acacia cyclops* thicket	30,110	20,680	68.7

Source: DBCA Statewide Vegetation Statistics (DBCA 2019)

Vegetation within the Perth metropolitan area has been described by Heddle *et al.* (1980) as System 6 vegetation complexes. Two vegetation complexes occur within the survey area (Table 2). The Cottesloe – Central and South complex covers most of the survey area, with the Quindalup complex occurring in the south of the survey area.

Table 2: System 6 vegetation complexes within the survey area

Vegetation complex	System 6 code	Description	Pre-European extent in Swan Coastal Plain (ha)	Current extent in Swan Coastal Plain (ha)	% remaining
Cottesloe – Central and South	52	Mosaic of woodland of *Eucalyptus gomphocephala* (Tuart) and open forest of *Eucalyptus gomphocephala* (Tuart) – *Eucalyptus marginata* (Jarrah) – *Corymbia calophylla* (Marri); closed heath on Limestone outcrops.	44,676.1	14,724.6	33.0
Quindalup	55	Coastal dune complex consisting mainly of two alliances - the strand and fore-dune alliance and the mobile and stable dune alliance. Local variations include the low closed forest of *Melaleuca lanceolata* (Rottnest Teatree) - *Callitris preissii* (Rottnest Island Pine), the closed scrub of *Acacia rostellifera* (Summer-scented Wattle) and the low closed *Agonis flexuosa* (Peppermint) forest of Geographe Bay.	38,402.3	21,009.1	54.7

Source: Webb *et al.* 2018

2.3. Previous vegetation mapping

A total of seven vegetation communities were delineated and mapped within the Iluka Foreshore Reserve during surveys conducted by ELA in 2020 (Table 1) (ELA 2021). Vegetation within the survey area was dominated by the SgMhAr, BsArSg, and McAr vegetation communities to the east of the main walking track throughout the foreshore reserve. These three communities are coastal shrubland communities dominated by *Spyridium globulosum, Banksia sessilis,* and *Melaleuca cardiophylla* respectively.

Most of the survey area is comprised of the SgMhAr vegetation community, which was recorded primarily to the east of the walking track and to the west of Burns Beach Road. The BsArSg community was recorded along the northern and central-eastern boundaries of the survey area. The McAr vegetation community was mostly dominant in the western section of the survey area along the main walking track. Vegetation to the west of the track along the beachfront was mapped as the FpApSc community, a low open shrubland primarily comprised of *Frankenia pauciflora, Acanthocarpus preissii,* and *Scaevola crassifolia.* Three vegetation communities, namely SgSa, SgEsOa, and ArAcSg are limited to the south of the survey area (to the south of Iluka Foreshore Park).

The results of statistical analysis showed that quadrats within the BsArSg vegetation community had a close affiliation with Floristic Community Type (FCT) 24: 'Northern Spearwood shrublands and woodlands', listed by DBCA as a Priority 3 ecological community (ELA 2021). Quadrats within the remaining communities showed close affiliation with FCT29a: 'Coastal shrublands on shallow sands', listed by DBCA as a Priority 3 ecological community (ELA 2021). The Honeymyrtle Shrubland TEC was listed as a TEC under the EPBC Act in November 2023 and, as such was not mapped during the assessment completed by ELA in 2021.

Vegetation condition within the survey area was mapped as being in Excellent condition, with areas of along the central-southern part of the survey area being mapped as being in Very Good condition, while

areas along the northern and south-eastern boundary were mapped as being in Good condition (ELA 2021).

Table 3: Previously mapped vegetation communities within Iluka Foreshore Reserve (ELA 2021).

Vegetation community	Vegetation description	Area (ha)	% of the survey area
McAr	*Melaleuca cardiophylla, Acacia rostellifera* mid shrubland over *Rhagodia baccata, Threlkeldia diffusa* low sparse chenopod shrubland and **Ehrharta calycina* low sparse tussock grassland	3.3	10.5
FpApSc	*Frankenia pauciflora, Acanthocarpus preissii, Scaevola crassifolia* low open shrubland	3.6	11.5
SgMhAr	*Spyridium globulosum, Melaleuca huegelii, Acacia rostellifera* tall open shrubland over *Grevillea preissii* subsp. *preissii* mid sparse shrubland and *Rhagodia baccata, Threlkeldia diffusa* mid open chenopod shrubland over **Briza maxima, *Ehrharta calycina* low open tussock grassland and *Lomandra maritima* low sparse forbland	15.2	48.6
BsArSg	*Banksia sessilis, Acacia rostellifera, Spyridium globulosum* mid open shrubland over *Hibbertia hypericoides, Banksia dallanneyi* low open shrubland and *Lomandra maritima* low sparse forbland	4.6	14.7
SgEsOa	*Spyridium globulosum, Exocarpos sparteus, Olearia axillaris* tall sparse shrubland over *Acrotriche cordata, Scaevola crassifolia, Leucopogon parviflorus* mid sparse shrubland over *Acanthocarpus preissii* low sparse shrubland and **Trachyandra divaricata, Conostylis candicans* subsp. *calcicola low sparse shrubland*	1.2	3.8
ArAcSg	*Acacia rostellifera, Acacia cyclops, Spyridium globulosum* tall shrubland over *Rhagodia baccata, Threlkeldia diffusa* low sparse chenopod shrubland and *Acanthocarpus preissii* low sparse shrubland	0.7	2.2
SgSa	*Spyridium globulosum, Santalum acuminatum* tall sparse shrubland over *Olearia axillaris, Myoporum insulare* mid sparse shrubland and *Rhagodia baccata* mid sparse chenopod shrubland over **Tetragonia decumbens, Scaevola crassifolia* low open shrubland and *Lepidosperma gladiatum* low open sedgeland.	0.4	1.3
	Open beach / rocks	1.2	3.8
	Tracks	1.1	3.5
	Total	**31.3**	**100**

3. Methodology

3.1. Desktop review

3.1.1. Database searches

The following databases were searched for information relating to Black Cockatoos and conservation-significant ecological communities (Table 4). The applied search buffers are considered suitable based on ecological communities and fauna expected to occur within the survey area. Additionally, Commonwealth and State government spatial datasets for land-system mapping and regional vegetation mapping were reviewed, as described in Sections 2.2 and 2.3.

Table 4: Database searches undertaken for the survey area

Database	Reference	Search area
Commonwealth EPBC Act Protected Matters Search Tool (PMST) for Matters of National Environmental Significance (MNES), including any Threatened species listed under the EPBC Act.	DCCEEW 2024a	10 km buffer around the survey area
DBCA database search – Honeymyrtle Shrubland TEC (listed under the EPBC Act and BC Act)	DBCA 2024a	All known boundaries of Honeymyrtle Shrubland TEC
DBCA database search – conservation significant fauna	DBCA 2024b	10 km buffer around survey area
Birdlife roosting dataset	Birdlife 2024	12 km buffer around survey area
City of Joondalup Black Cockatoo dataset	City of Joondalup 2024	12 km buffer around survey area

3.1.2. Likelihood of occurrence assessment

An assessment of the likelihood of presence of Threatened and Priority ecological communities within the survey area was undertaken. The assessment is based on specific likelihood of occurrence criteria. The criteria include factors such as: location and recency of previous records in relation to the survey area; and suitable landforms, soils, and habitat that appear to be present based on the desktop review. Conservation codes, categories, and criteria for flora, fauna, and ecological communities protected under the EPBC Act and BC Act are provided in Appendix A. Criteria used for the likelihood of occurrence assessment are presented in Appendix B.

3.2. Field survey

3.2.1. Survey team and timing

The targeted Honeymyrtle Shrubland TEC assessment was conducted by Jeff Cargill (Principal Ecologist) on the 4th of September 2024. The targeted Black Cockatoo habitat assessment was conducted by Jeni Morris (Senior Ecologist) and Jess Tomlinson (Graduate Ecologist) on the 5th of September 2024. Field staff had valid scientific licenses to conduct flora and vegetation surveys and to take Threatened and Priority flora in WA at the time of survey. The survey timing was consistent with the Environmental Protection Authority (EPA) recommendations for undertaking flora and vegetation surveys in the South-west climatic region (i.e. Spring, September to November; EPA 2016).

Rainfall data from the nearby Wanneroo weather station (station number 9105, located approximately 10 km south-east of the survey areas) recorded a total of 13.2 millimetres (mm) during the flora survey (Bureau of Meteorology [BoM] 2024). In the three months prior to the flora field survey (June – August), a total of 458 mm of rainfall was recorded (BoM 2024). This is greater than the long-term average for

the same time period (445.2 mm). Conditions at the time of survey were considered suitable with the majority of flora species in various reproductive stages (e.g. flowering, fruiting), allowing for positive identification of individuals.

3.2.2. Targeted vegetation survey

A single season Targeted vegetation survey was undertaken across the survey area in accordance with the EPA *Technical Guidance for Flora and Vegetation* (EPA 2016). Tasks undertaken during the vegetation survey included the mapping and delineation of areas of Honeymyrtle Shrubland TEC within the survey area and the establishment of quadrats within areas mapped as potential TEC to compare against criteria in the approved conservation advice for the TEC (DCCEEW 2023).

The survey involved the use of 10 x 10 m quadrats as recommended for the Swan Coastal Plain bioregion (EPA 2016). Quadrats were not permanently marked. Photos were taken from the north-western corner of each quadrat. Where relevant, opportunistic sampling of species not recorded from within the quadrats was undertaken to supplement the existing list of species recorded from within the survey area.

A total of three quadrats were established across the survey area for the purposes of assessing patches of potential Honeymyrtle Shrubland TEC against the approved conservation advice for the TEC under the EPBC Act (DCCEEW 2023) and to complete statistical analysis to confirm its presence under the BC Act (Figure 2). These three quadrats have been added in addition to the 14 established by ELA in 2021. The following data were recorded within each quadrat:

- Vegetation structure and classes, cover of all species and dominant species list for each vegetation type (in accordance with the National Vegetation Information System [NVIS] Level V structure and floristics);
- Vegetation condition, in accordance with the scale outline in EPA (2016) adapted from Keighery (1994).
- Full species inventory (angiosperm and gymnosperm) of both native and introduced species across the subject site; and
- Relevant site data including co-ordinates, site photographs, soils, geology, drainage, slope, and any other relevant observational data.

Flora species able to be identified in the field were recorded, and voucher specimens of unfamiliar species were collected for later identification. All collections were assigned a unique collecting number.

3.2.3. Flora identification and nomenclature

Flora specimen identification following the field survey was undertaken by taxonomic specialists at the Western Australian Herbarium (WAH). Suitable material that meets WAH specimen lodgement requirements, such as flowering material and range extensions, was submitted along with Threatened and Priority Report Forms to DBCA, as required by conditions of collection licenses issued under the BC Act. Nomenclature used for the flora species within this report follows the WA Plant Census as available on FloraBase (WAH 1998-).

Figure 2: Survey effort

Survey area
Distributor Road
Access Road
Tracklogs (ELA 2024)
Quadrat (ELA 2024)
Quadrat (ELA 2021)

0 50 100 200
Metres

Datum/Projection:
GDA 1994 MGA Zone 50

24PER8879-GM Date: 3/12/2024

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3.2.3.1. Statistical analysis

Plymouth Routines in Multivariate Ecological Research v7 (PRIMER) statistical analysis software was used to analyse species-by-site data and discriminate survey sites based on their species composition (Clarke & Gorley 2015). To down-weight the relative contributions of quantitively dominant species, a fourth-root transformation was applied to the species percentage cover dataset. Specimens not identified to species level and singletons (species not recorded at a single quadrat and not forming a structural component) were excluded from the dataset prior to analysis. Computation of similarity matrices was based on the Bray-Curtis measure (Bray & Curtis 1957).

To complete floristic community type (FCT) analysis for determination of the presence of the state-listed Honeymyrtle Shrubland TEC, species within the Gibson *et al.* (1994) dataset were updated to align with current names as specified by FloraBase (WAH 1998-). Using current records, several species in the Gibson *et al.* (1994) dataset were shown to be significant range extensions from the Swan Coastal Plain; where appropriate such cases were removed. In addition, excluded and misapplied names were removed from the dataset and infra-specific names were reduced. Data from individual quadrats in the current survey were merged with the updated Gibson *et al.* (1994) dataset. Each merged dataset was analysed using a combination of pre-treatments such as the removal of taxa not identified to species level and singletons. Transformed data were analysed using a combination of multivariate analysis routines including Bray-Curtis Similarity Matrices, Cluster Analysis (single site insertion Flexible Beta) and non-metric Multi-Dimensional Scaling (nMDS).

To identify potential TECs and PECs in the survey area, ELA quadrats and vegetation communities were compared to Floristic Community Types (FCTs) defined by Gibson *et al.* (1994). To identify the presence of FCTs appropriate multivariate analyses comparing current data to that of the Gibson *et al.* (1994) species by quadrat data, and inferences based on dominant species and geomorphology were used. Given the nature of the data (e.g., spatial and temporal differences), results and subsequent extrapolations, assigned FCTs within the survey area were inferred and not absolute, i.e., a vegetation code assigned to an FCT was inferred to comprise, to varying degrees, floristic aspects of that FCT as defined by Gibson *et al.* (1994). These FCTs were subsequently compared with vegetation communities delineated by ELA (2021).

3.2.3.2. Assessment of diagnostics to determine presence of Threatened Ecological Communities

The Honeymyrtle shrubland on limestone ridges of the Swan Coastal Plain Bioregion (Honeymyrtle Shrubland TEC) was assessed as having the potential to occur within the survey area. The Honeymyrtle Shrubland TEC is listed as Critically Endangered (CR) under the EPBC Act (DCCEEW 2023). For information to assist in referral, environmental assessment, and compliance issues, it has been recommended to refer to the Listing Advice and/or Conservation Advice and Recovery Plan on the Commonwealth Species Profile and Threats Database (SPRAT; DCCEEW 2024b). The Listing Advice and/or Conservation Advice defines the national ecological community and includes key characteristics, condition thresholds, and additional considerations.

To determine whether the Federally-listed Honeymyrtle Shrubland TEC is present in the survey area, key diagnostic characteristics must be met under Section 2.1 of the Conservation Advice (DCCEEW 2023). This includes an assessment of species assemblages, vegetation condition, patch size, and landform. This assessment was undertaken by ELA following the field survey. ELA compared field evidence from new quadrats established in 2024 and historical quadrats established in 2020 within patches of potential Honeymyrtle Shrubland TEC in the survey area to key diagnostic characteristics in the conservation advice (DCCEEW 2023).

3.2.4. Targeted Black Cockatoo habitat assessment

A Targeted black cockatoo habitat assessment was conducted in accordance with the *Referral guideline for 3 WA threatened black cockatoo species: Carnaby's Cockatoo, Baudin's Cockatoo, and the Forest Red-tailed Black Cockatoo* (DAWE 2022). Consideration was also given to the Survey guidelines for Australia's threatened birds (DEWHA 2010) when designing the survey methodology.

Three species of black cockatoo occur in the south-west of Western Australia:

- Baudin's Cockatoo (*Zanda baudinii;* listed as Endangered [EN] under the EPBC Act and BC Act);
- Carnaby's Cockatoo (*Zanda latirostris;* listed as Endangered [EN] under the EPBC Act and BC Act); and
- Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso;* listed as Vulnerable [VU] under the EPBC Act and BC Act).

Broad scale maps are available for the modelled distribution of all three species of black cockatoo (DAWE 2022). The survey area occurs within the Likely to occur range of the Forest Red-tailed Black Cockatoo and Carnaby's Cockatoo, however is outside of the predicted range of the Baudin's Cockatoo. As such, the survey focused on assessing the habitat values for the Carnaby's and Forest Red-tailed Black Cockatoo. Any individuals of Carnaby's and/or Forest Red-tailed Black Cockatoo observed in the survey area were recorded, including the number of individuals.

The Targeted survey involved personnel walking transects across the survey area and mapping black cockatoo habitat. Black Cockatoo habitat is conventionally separated into foraging, potential breeding, and potential night roosting categories, as defined in Appendix C. Foraging, potential breeding, and potential roosting habitat was assessed within the survey area. The field methodology for each of these is defined below.

3.2.4.1. Foraging habitat

Foraging habitat is defined for each species of black cockatoo in Appendix C. The foraging value (i.e. quality) of vegetation to black cockatoos is dependent on several factors including the foraging plant species present, the extent and density (including projected foliage cover) of these foraging species, and the overall structure and condition of foraging species present. In addition, connectivity, proximity to known breeding and roosting sites, and the presence of weeds and/or tree deaths (i.e. disease and drought) is also to be considered.

Vegetation communities and types delineated and mapped within the survey area previously by ELA were assigned a foraging quality (i.e. negligible to low, low to moderate, moderate, moderate to high, or high) based on the criteria outlined in Appendix D. The DAWE (2022) foraging quality scoring tool will also be used to calculate a foraging score for the survey area.

Evidence of black cockatoo foraging (i.e. branch clippings and/or chewed fruit) was also searched for to identify if the vegetation within the survey area has previously been or is currently being used by black cockatoos for feeding.

3.2.4.2. Potential breeding habitat

Potential breeding habitat is defined in Appendix C. The diameter at breast height (DBH) were recorded in the following ranges:

- Small; approximately 500-600 mm

- Medium; between 600 and 1000 mm
- Large; over 1000 mm.

All potential nesting trees encountered within the survey area were recorded with a GPS (+/- 5-10 m accuracy). Each potential nesting tree was also visually assessed from the ground (i.e., with binoculars) for the presence of suitable nest hollows (defined in Appendix C) and allocated a nesting and/or hollow rank (Table 5).

Table 5: Potential breeding tree nest and/or hollow ranking

Rank	Description of tree nest and/or hollow
1	Active nest observed (adult bird seen entering or emerging from hollow, their eggs, fledglings, or other evidence of recent nesting activity present; known active nest (as described by Birdlife 2024)
2	Hollow of suitable size and angle (i.e., near-vertical) observed with chew marks around entrance
3	Potentially suitable hollow observed but no chew marks present
4	Tree lacking suitable hollows or broken branches that might have large hollows, a tree with mainly intact branches and a spreading crown.

[1]ELA takes a precautionary approach and identifies potentially suitable hollows as those with an entrance diameter over 10 cm that could potentially accommodate black cockatoos, which require a diameter opening range of 12 – 41cm.

3.2.4.3. Potential roosting habitat

Potential night roosting habitat is defined in Appendix C. Potential night roosting habitat was delineated by mapping tall trees in proximity to water (i.e. within 12 km). A 5 m buffer was applied around each of the trees to depict projected foliage cover to estimate potential roosting habitat as hectares (where roosting habitat was not digitised from aerial imagery).

3.3. Limitations

The EPA Technical Guidance documents (EPA 2016; 2020) recommend including a discussion of the constraints and limitations of the survey methods used during ecological assessments. An assessment of potential constraints and limitations of this survey are summarised in Table 6 below. No survey constraints or limitations were identified.

Table 6: Survey limitations

Constraint	Limitations
Sources of information and availability of contextual information (i.e., pre-existing background versus new material)	Not a limitation. The Swan Coastal Plain has been very well surveyed, with increasing survey work occurring due to the ongoing urban development of the Perth metropolitan area. Several flora and fauna surveys have been undertaken in the survey area which have been utilised for the purposes of this survey. Gibson *et al.* (1994) was a primary source for determination of methods, analysis, and results for assessing FCTs. Broad-scale vegetation mapping at scales of 1:1,000,000 and 1:250,000 was available. Land-system mapping at a scale of 1:2,000,000 and soil and landform mapping was available. The information which was available was sufficient and, as such, sources of information were not considered to be a limitation.
Scope (i.e., what life forms, etc. were sampled)	Not a limitation. The survey requirement for a Targeted ecological community assessment in accordance with the EPA *Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA 2016) was adequately met. The survey requirements for Basic fauna survey in accordance with the EPA *Technical Guidance: Terrestrial vertebrate fauna surveys for environmental impact assessment* (EPA 2020) were adequately met. Further discussion on survey compliance regarding Black Cockatoos is detailed in Table 7.
Proportion of flora collected and identified (based on sampling, timing, and intensity)	Not a limitation. An adequate number of quadrats were established to inform all aspects of the diagnostic criteria for the Honeymyrtle Shrubland TEC and to ground-truth boundaries of the TEC.
Completeness and further work which might be needed (i.e. was the relevant survey area fully surveyed)	Not a limitation. The survey area was fully covered to meet requirements outlined in the scope of works. Site selection and replication was considered adequate to accurately analyse and discriminate sites based on species composition and subsequently delineate vegetation community boundaries.
Mapping reliability	Not a limitation. Coverage of the survey area was considered to be good. High quality aerial images were used for mapping for the survey and subsequent vegetation community delineation.
Timing, weather, season, cycle	Not a limitation. The survey was undertaken in the appropriate season as specified by the EPA Technical Guidance (EPA 2016; 2020).
Disturbances (fire, flood, accidental human intervention)	Not a limitation. Disturbances within the survey area included weeds, tracks, invasive animals, nearby housing, and roadsides. These disturbances did not negatively impact the ability to meet objectives outlined in the scope of works.
Intensity (in retrospect, was the intensity adequate)	Not a limitation. The survey effort was adequately met. The area was searched for sufficiently for the Honeymyrtle Shrubland TEC and evidence of foraging, breeding, or roosting habitat for Black Cockatoos. Staff undertook transects spaced adequately apart across the survey area. The number of quadrats established was sufficient to determine the presence and extent of the Honeymyrtle Shrubland TEC and Black Cockatoo habitat.
Resources (i.e., were there adequate resources to complete the survey to the required standard)	Not a limitation. The number of personnel conducting this field survey in the given time was adequate to undertake the required level of survey. Additional resources, including equipment available, additional support, and personnel were adequate.
Access problems (i.e. ability to access the survey area)	Not a limitation. All relevant areas within the survey area were able to be accessed and surveyed.
Experience levels (e.g. degree of expertise in plant identification to taxon level.	Not a limitation. All personnel conducting this field survey were suitably qualified to identify specimens, having previously undertaken flora and fauna surveys in the South-west of Western Australia.

The black cockatoo habitat assessment was undertaken in accordance with the Referral guidelines (DAWE 2022). The requirements of DAWE (2022) and detail regarding how the survey meets these requirements is summarised in Table 7. All requirements are considered to have been met.

Table 7: Summary of survey compliance with Black Cockatoo referral guidelines

Referral guideline recommendation	Compliant	Justification
Surveys should be done by a suitably qualified person with experience in vegetation or cockatoo surveys, depending on the type of survey being undertaken.	Yes	The ecologist undertaking the black cockatoo habitat assessment, Jeni Morris, has eight years' experience conducting habitat assessments for black cockatoos.
Survey should maximise the chance of detecting the species habitat and/or signs of use	Yes	The survey was undertaken in Spring which aligns with the DCCEEW recommendations for undertaking surveys for black cockatoos on the Swan Coastal Plain (i.e., foraging habitat and night-roosts – any time of the year; DAWE 2022).
Survey should determine the context of the site within the broader landscape – for example, the amount and quality of habitat nearby and in the local region (i.e., within 10 km).	Yes	The context of the habitats available within the survey area has been considered at a broader level and is discussed further below.
Survey should account for uncertainty and error (false presence and absences).	N/A	This recommendation refers to individual bird counts where presence/absence data is collected and is not applicable to this type of habitat assessment.
Survey should include collation of existing data on known locations of breeding and feeding birds and night roost locations.	Yes	Data have been obtained from Birdlife roosting and nesting database search (Birdlife 2024) and DBCA Threatened fauna database search (DBCA 2024b).
Survey should assess the extent, type, and quality of vegetation present including the presence and extent of plants known to be used by black cockatoos.	Yes	Foraging habitat was delineated and mapped in the field using vegetation communities previously delineated by ELA (2021) and a list of vegetation present has been compiled (refer to section 4.3).
In potential breeding habitat, measurements of the diameter at breast height of trees in the patch of woodland/forest must be made to determine whether the habitat meets the definition of 'breeding habitat'.	Yes	Potential breeding trees are defined as trees of a suitable species with a DBH over 50 cm. Trees were measured for DBH in the field, and where the DBH was over 50 cm, these trees were recorded, and signs of use/hollows were observed (refer to sections below).
Search for signs of use by black cockatoos (e.g., suitable nest hollows, feeding signs or feeding debris, and sighting records).	Yes	The field survey involved walking transects through areas searching for feeding signs. In addition, where hollows were observed, chew marks and other signs of use were searched for using binoculars.

4. Results

4.1. Desktop assessment

A PMST search was undertaken to identify conservation-significant ecological communities recorded within or in proximity to the survey area (DCCEEW 2024a; Appendix E). The location of known occurrences of the Honeymyrtle Shrubland TEC in proximity to the survey area was reviewed after being received from the City of Joondalup and DBCA (DBCA 2024a). In addition, the City of Joondalup Black Cockatoo database, DBCA database, and Birdlife Australia database of Black Cockatoo roosting and nesting sites was also queried to identify roosting and/or nesting sites near to the survey area (City of Joondalup 2024; DBCA 2024b; Birdlife 2024).

4.1.1. Conservation significant ecological communities

Areas of the Honeymyrtle Shrubland TEC previously recorded within and in proximity to the survey area are presented in Figure 3. The survey area is located in the 'community likely to occur' range on the SPRAT database (DCCEEW 2024a). Given the location of the survey area within the likely to occur range, the Honeymyrtle Shrubland TEC was considered Likely to occur within the survey area prior to the assessment.

4.1.2. Black cockatoo roosting and nesting records

577 records of Black Cockatoos were identified within 12 km of the survey area as part of the desktop assessment (Figure 4). This included 548 records of Carnaby's Cockatoos, eight records of Forest Red-tailed Black Cockatoos, three records of Baudin's Black Cockatoos, and 18 records of 'white-tailed black cockatoos' (i.e. not distinguishing between Baudin's and Carnaby's cockatoos). Eight confirmed white-tailed (Carnaby's and/or Baudin's) roosts, two confirmed red-tailed roosts, and three confirmed joint roosts (white-tailed and Forest Red-tailed) occur within 12 km of the survey area (Birdlife 2024). The closest known confirmed roost occurs 5.4 km to the south-east of the survey area (JOOEDGR001). An additional 20 unconfirmed roosts for Black Cockatoos occur within 12 km of the survey area (City of Joondalup 2024). The closest known unconfirmed roost occurs 0.9 km to the south-east of the survey area at Beaumaris Reserve in Ocean Reef (OJOOILUR001) (City of Joondalup 2024).

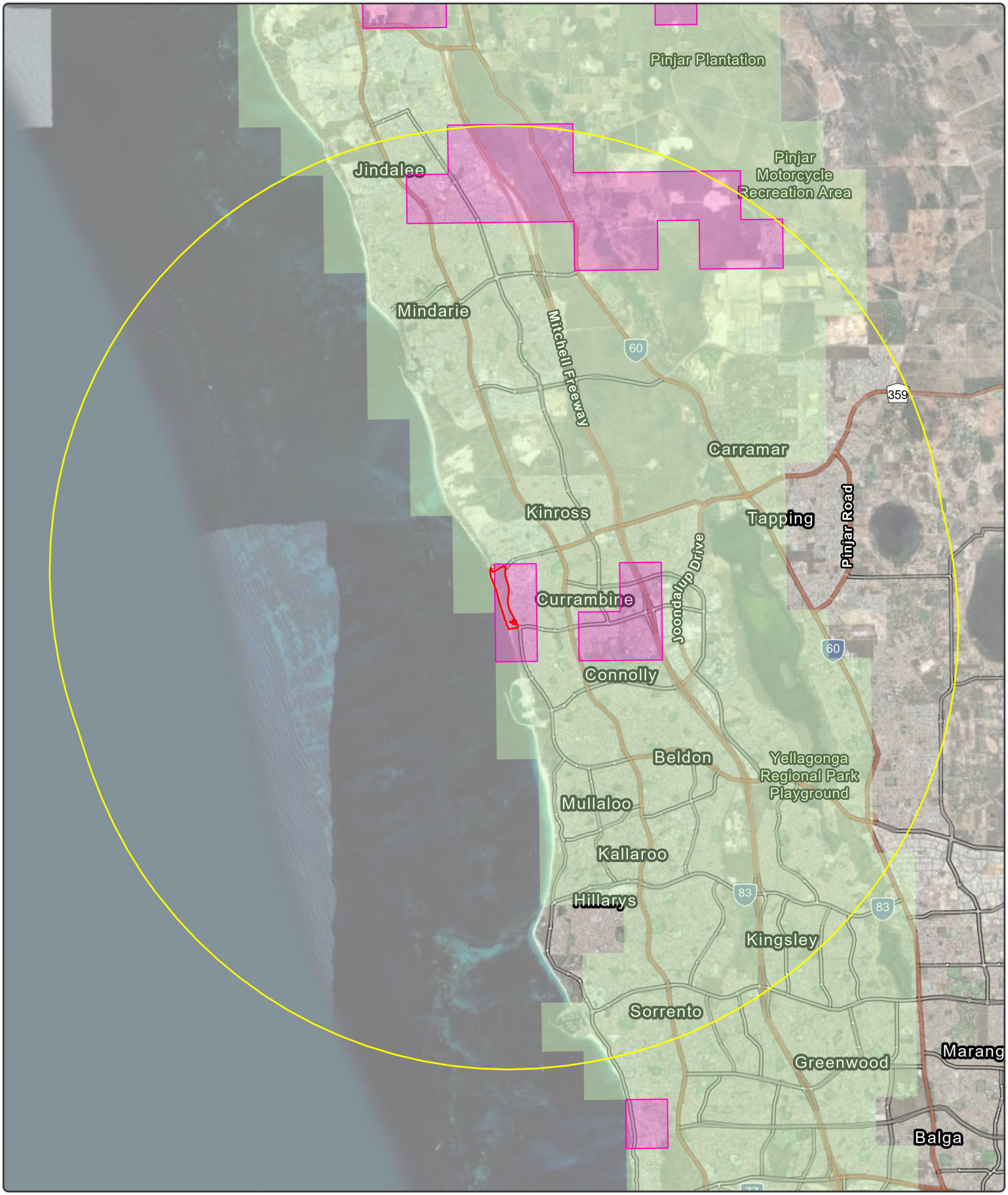

Figure 3: Previously mapped occurrences of Honeymyrtle Shrubland TEC in proximity to the survey area

Survey area

10km buffer

Honeymyrtle Shrubland TEC

Community likely to occur within area

Community may occur within area

0 1 2 4

Kilometers

Datum/Projection:
GDA 1994 MGA Zone 50

24PER8879-GM Date: 3/12/2024

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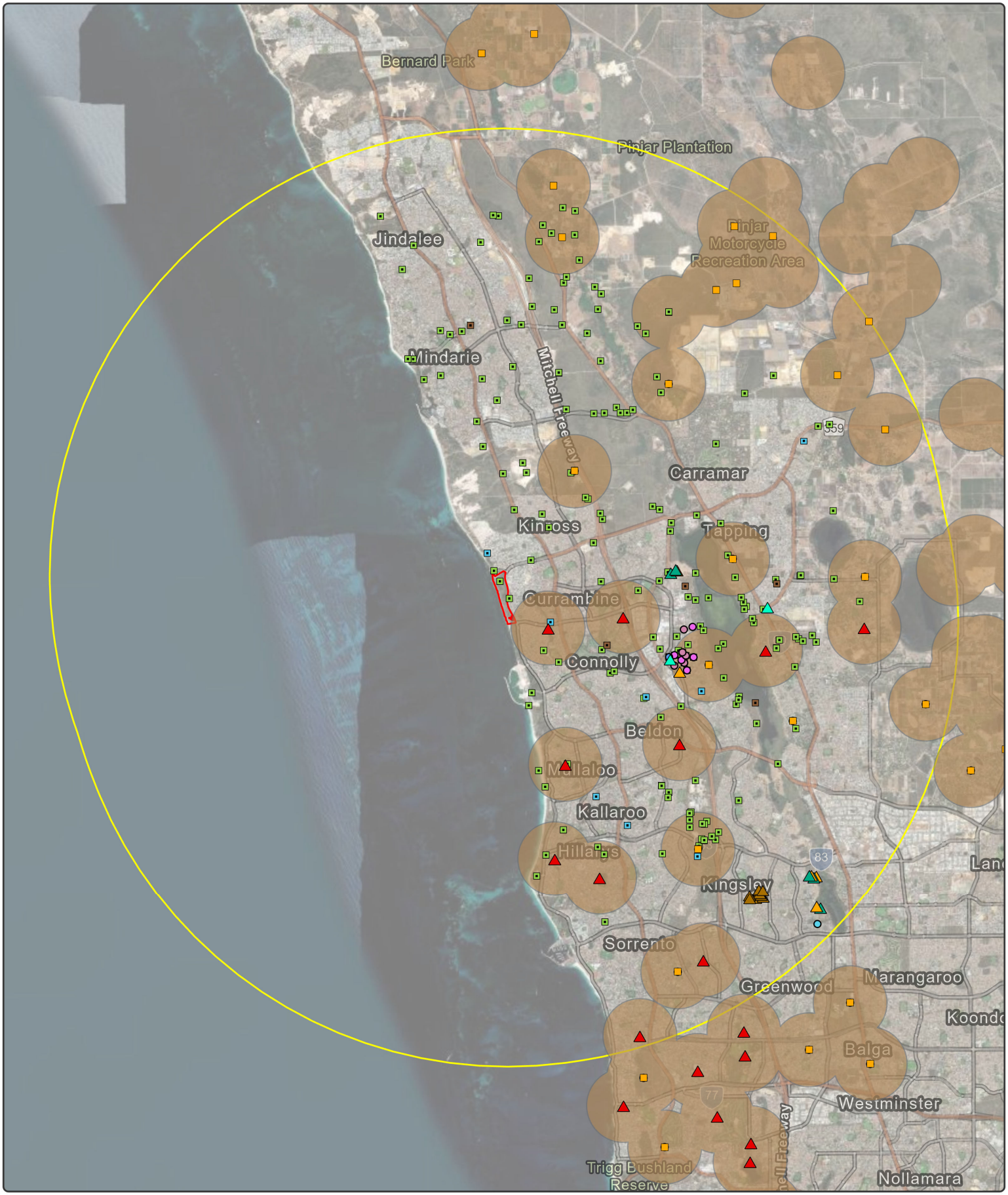

Figure 4: Black cockatoo habitat in proximity to the survey area

- Survey area
- 12km buffer

Species observations (DBCA 2024a)

- Baudin's cockatoo
- Carnaby's cockatoo
- Forest red-tailed black cockatoo
- White-tailed black cockatoo

- WA Carnaby Cockatoo roost
- Carnaby Cockatoo roosting sites 1km buffer

CoJ Carnaby Cockatoo sites

- BC Dataset May 2024 DBCA, Confirmed Roost
- Birdlife Data, Confirmed roost
- WTBC Data Set May 2024 DBCA,Confirmed artificial hollow
- BC Dataset May 2024 DBCA,Confirmed Roost (Forest Red Only)
- WTBC Data Set May 2024DBCA,Confirmed artificial hollow
- WTBC Data Set May 2024DBCA,Confirmed natural hollow
- BC Dataset May 2024 DBCA,Unconfirmed Roost
- Eco Logical Data,Unconfirmed roost
- WTBC Data Set May 2024 DBCA,Unconfirmed artificial hollow
- WTBC Data Set May 2024 DBCA,Unconfirmed natural hollow
- WTBC Data Set May 2024DBCA,Unconfirmed artificial hollow

0 1 2 4
Kilometers

Datum/Projection:
GDA 1994 MGA Zone 50

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4.2. Targeted Honeymyrtle Shrubland TEC assessment

4.2.1. Flora overview

A total of 54 flora species (37 native and 17 introduced) from 29 families and 49 genera were recorded from the three quadrats established within the survey area in 2024. Average species richness was 38, ranging from 42 species in HM1 to 33 species in HM3. The families with the highest number of species were Asteraceae and Poaceae (6 species each). Acacia, Ehrharta, and Melaleuca were the best represented genera throughout the survey, with 2 taxa recorded for each genus. A full flora list is provided in Appendix F and a species by quadrat matrix is provided in Appendix G. ELA quadrat site data is provided in Appendix H. No flora species listed as Threatened under the EPBC Act or BC Act; or flora listed as Priority by DBCA were recorded within quadrats.

4.2.2. Vegetation condition

The vegetation was recorded to be in Very Good condition within the three quadrats established during the survey (Keighery 1994). The main disturbances observed within the quadrats was the presence of introduced flora species. No Declared Pests or Weeds of National Significance (WoNS) were recorded in any quadrats during the assessment.

4.2.3. Honeymyrtle Shrubland TEC assessment

4.2.3.1. FCT analysis

To confirm the presence of the Honeymyrtle Shrubland TEC listed under the BC Act, ELA quadrats and vegetation communities were compared to FCTs defined by Gibson *et al.* (1994). Results of the analysis are shown in Table 8.

Results of the multivariate analysis of quadrats in the SgMhAr vegetation community (delineated by ELA in 2021) and the three additional quadrats established by ELA in 2024 showed that the community has moderate to strong affiliations with FCT29a and FCT24. This supports the previous findings by ELA (2021). Given that the state-listed TEC is defined based on the presence of FCT26a (*Melaleuca huegelii-M. systena* shrublands on limestone ridges), the state-listed Honeymyrtle Shrubland TEC is not considered to be present in the survey area. FCT29a 'coastal shrublands on shallow sands' and FCT24 'Northern Spearwood shrublands and woodlands' are listed as Priority 3 ecological communities by DBCA.

Table 8: Relationships between ELA vegetation communities and FCTs defined by Gibson *et al*. 1994.

Inferred FCT	ELA vegetation community	ELA quadrat numbers	Closest affiliated sites (FCT Gibson *et al.* 1994; Bray-Curtis similarity %)
29a, 24	SgMhAr	ELA23 (ELA 2021)	NAVB-2 (29a), PRES-1 (29a)
		HM1	NAVB-2 (29a, 44.4%), CHIDPT-1 (24, 41.1%), NAVB-3 (24, 34.1%)
		HM2	BURN-1 (29a, 55%), NAVB-2 (29a, 47.2%), TRIG-02 (29a, 40.6%), BURN-2 (29a, 36.9%)
		HM3	TRIG-2 (29a, 34.5%), BURN-2 (29a, 33.9%)

4.2.3.2. Assessment against DCCEEW conservation advice for Honeymyrtle Shrubland TEC

Vegetation was assessed against the key diagnostic characteristics outlined in the Federally-listed Honeymyrtle Shrubland TEC approved conservation advice (DCCEEW 2023) to determine the presence of the TEC in the survey area. The primary defining features of the Honeymyrtle Shrubland TEC include location, species assemblage, patch size, and vegetation condition.

Prior vegetation mapping completed by ELA in 2021 was used to guide the targeted assessment to identify landforms within the survey area that could potentially contain Honeymyrtle Shrubland TEC. Two patches of Honeymyrtle Shrubland TEC were identified in the field as potentially meeting the criteria for the TEC due to the presence of heathland dominated by *Melaleuca huegelii, M. systena,* and/or *Banksia sessilis* on skeletal soils on limestone outcrops. These patches include one 2.3 ha patch in the north of the survey area and one smaller 0.2 ha patch in the south of the survey area (Figure 5).

Three quadrats were established in the northern patch, with relevant TEC indicators including landform, soil type, and floristic indicators compared against the Honeymyrtle Shrubland TEC conservation advice (Table 9). One quadrat (ELA 23) from the survey completed by ELA in 2021 was also present in the larger northern patch. All four quadrats located within the potential Honeymyrtle Shrubland TEC areas were located on skeletal or shallow sandy soils on limestone crests with significant limestone outcropping. The overstorey of these four quadrats consisted primarily of the key floristic indicator of the Honeymyrtle Shrubland TEC *Melaleuca huegelii,* with some additional presence of *M. systena* and *Banksia sessilis* (also key floristic indicators of the TEC). All four quadrats also included key floristic midstorey indicators *Spyridium globulosum* and *Grevillea preissii.* Furthermore, all four quadrats contained a diverse ground layer of herbs, sedges, and grasses, with the average understorey diversity being 25 species. All other quadrats previously established by ELA within the survey area did not meet the key diagnostic characteristics outlined in the conservation advice for the Honeymyrtle Shrubland TEC.

Both mapped patches of the TEC in the survey area were considered to represent the Honeymyrtle Shrubland TEC based on assessment of values against key diagnostic characteristics defined in the conservation advice. The assessment of vegetation against the key diagnostic characteristics for this TEC is presented in Table 10.

Table 9: Honeymyrtle Shrubland assessment of quadrats established in Iluka Foreshore Reserve by ELA in 2021 and 2024

	HM1	HM2	HM3	ELA23	ELA15	ELA16	ELA17	ELA18	ELA19	ELA20	ELA21	ELA22	ELA24	ELA25	ELA26	ELA27	ELA28
Vegetation type (ELA 2021)	SgMhAr	SgMhAr	SgMhAr	SgMhAr	FpApSc	FpApSc	FpApSc	BsArSg	BsArSg	McAr	McAr	McAr	SgMhAr	SgMhAr	SgMhAr	BsArSg	SgMhAr
Soil type	Skeletal sand	Skeletal sand	Skeletal sand	Shallow sand	Skeletal sand	Skeletal sand	Shallow sand	Sand	Sand	Skeletal sand	Skeletal sand	Skeletal sand	Skeletal sand	Shallow sand	Shallow sand	Sand	Sand
Soil colour	Brown	Grey-brown	Grey-brown	Brown	Grey-white	Grey-white	Grey	Grey-brown	Grey-brown	Grey	Grey-brown	Grey-brown	Grey-brown	Grey-brown	Grey-brown	Grey	Grey
Limestone outcropping	20-50%	20-50%	20-50%	10-20%	>50%	>50%	<2%	<2%	-	>50%	20-50%	>50%	20-50%	10-20%	10-20%	-	2-10%
Landform	Crest	Crest	Crest	Rise	Cliff	Cliff	Cliff	Swale	Rise	Hill	Rise	Rise	Slope	Rise	Slope	Swale	Swale
Key overstorey species cover																	
Melaleuca huegelii	30	45	40	15	10	0.5	0.5	-	-	-	-	-	5	-	2	-	10
Melaleuca systena	-	-	0.5	-	-	-	-	0.1	-	-	-	-	-	1.5	-	-	-
Banksia sessilis	-	0.5	1	-	-	-	-	8	15	-	-	-	-	0.2	-	0.5	-
Key midstorey species cover																	
Acacia lasiocarpa	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Spyridium globulosum	2	5	0.5	15	-	0.3	0.4	2	1.5	-	-	-	30	30	25	5	8
Grevillea preissii	1	2.5	0.5	0.1	-	-	-	-	-	-	-	-	0.2	0.2	-	-	-
Understorey diversity																	
Ground layer species	30	25	18	26	17	18	14	20	27	13	14	18	33	22	23	25	18

Table 10: Honeymyrtle Shrubland TEC assessment against DCCEEW guidance

Key diagnostic characteristics (DCCEEW 2023)	Outcome
Occurs in the Perth subregion of the Swan Coastal Plain IBRA Bioregion in WA	The survey area is located within the Perth subregion of the Swan Coastal Plain IBRA bioregion in WA and therefore meets this criterion.
Occurs on shallow to skeletal soils on the ridge slopes and tops of limestone ridges and outcrops associated with Tamala Limestone	Parts of the survey area mapped as potential Honeymyrtle Shrubland TEC occur on limestone hilltops. Soils are skeletal with limestone outcropping observed to be between 20 and 50% (based on evidence from quadrats HM1, HM2, and HM3). The survey area occurs primarily on the Spearwood Dune land system (i.e. Tamala Limestone). As such, parts of the survey area mapped as potential Honeymyrtle Shrubland TEC are considered to meet this criterion.
Occurs as shrubland, heath, or thickets and has less than 10% canopy cover of *Eucalyptus* species or other tall trees.	The vegetation within the survey area mapped as potential Honeymyrtle Shrubland TEC occurs as a closed shrubland/heathland with no canopy coverage of *Eucalyptus* spp. or other tall trees. As such, these areas are considered to meet this criterion.
The shrub layer is dominated by *Melaleuca huegelii* and/or *M. systena* and/or *Banksia sessilis* – commonly over *Acacia lasiocarpa, Grevillea preissii,* and *Spyridium globulosum.*	The shrub layer within the parts of the survey area mapped as potential Honeymyrtle Shrubland TEC consists primarily of *Melaleuca huegelii* (average foliar cover of 33% based on quadrats HM1, HM2, HM3, and ELA23). In addition, *M. systena* is present at HM3 and *Banksia sessilis* is present at HM2 and HM3 at foliar covers of less than 1%. Furthermore, *Grevillea preissii* and *Spyridium globulosum* were observed in quadrats HM1, HM2, and HM3 present in the middle-upper stratum. Given the presence of key floristic indicators in areas mapped as potential Honeymyrtle Shrubland TEC, it is considered that these areas meet this criterion.
The ground layer is typically rich with numerous herbs (including grasses) and smaller shrubs may develop a mossy ground cover.	The ground layer within the four quadrats located in potential Honeymyrtle Shrubland TEC areas in the survey area consisted of a diverse understorey including grasses, with an average of 25 understorey species being recorded. Given the presence of this diverse understorey, it is considered that these areas meet this criterion.
Structure and diversity of Honeymyrtle shrubland may be altered by recent disturbances and cause a shift to a regenerative state. Under these circumstances the loss is likely to be a temporary phenomenon if natural regeneration is not disrupted. Recovering/regenerating areas are still included in the protected ecological community.	Vegetation within the survey area has not been altered by recent disturbances and as such this criterion is not applicable for this assessment.
Patch size – the minimum patch size for the community is considered to be 0.01 ha.	Vegetation within the survey area mapped as potential Honeymyrtle Shrubland TEC is greater than 0.01 ha in patch size and therefore meets this criterion.

Figure 5: Honeymyrtle Shrubland TEC recorded in the survey area

- Survey area
- Distributor Road
- Access Road
- Honeymyrtle shrubland on limestone ridges of the Swan Coastal Plain Bioregion (CR)
- Track/Building
- Open Beach/ Rocks

Vegetation Community (ELA 2021)

- ArAcSg
- BsArSg
- FpApSc
- McAr
- SgEsOa
- SgMhAr
- SgSa

0 50 100 200
Meters

Datum/Projection:
GDA 1994 MGA Zone 50

24PER8879-GM Date: 3/12/2024

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4.3. Black cockatoo habitat assessment

A targeted assessment of potential foraging, breeding, and roosting habitat for Forest Red-tailed Black Cockatoos (*Calyptorhynchus banksii naso*) or Carnaby's Black Cockatoos (*Zanda latirostris*) was undertaken in the survey area. No primary (i.e. direct sighting) or secondary (i.e. foraging evidence) evidence was recorded in the survey area from the assessment. Potential foraging, breeding, and roosting habitat within the survey area is described in the sections below.

4.3.1. Foraging habitat

Most of the survey area was mapped as 'Negligible to low' value foraging habitat for Carnaby's Cockatoo (15.2 ha, 48.6% of the survey area) due to the presence of suitable foraging plant species at a low density (i.e., less than 2% PFC; Table 11; Figure 6). One vegetation community – BsArAg – was mapped as 'Low to moderate' value foraging habitat for Carnaby's Cockatoos (4.6 ha, 14.7% of the survey area) given the presence of primary foraging species of between 10-20% PFC. Primary foraging species for Carnaby's Cockatoo recorded in the survey area included *Banksia sessilis, B. attenuata,* and *Eucalyptus gomphocephala,* while secondary foraging species included *Acacia saligna, Banksia dallanneyi, Callistemon* spp., and *Grevillea preissii.*

Table 11: Quality of foraging habitat recorded in the survey area for Carnaby's cockatoo

Quality	Criteria summary	Associated vegetation communities	Extent (ha) within the survey area	% of survey area
Low to moderate	Suitable foraging species present but at a lower density (i.e., primary food sources present at 10-20% PFC, secondary food sources present at 20-40% PFC). Lower quality foraging habitat but with evidence of use (i.e., chewed nuts, cones, seeds, or flowers).	BsArAg	4.8	14.7
Negligible to low	Presence of some scattered foraging species but <2% PFC.	SgMhAr	15.2	48.6
No foraging value	No foraging value. No Proteaceae, eucalyptus, or other potential sources of food.	ArAcSg, FpApSc, McAr, SgEsOa, SgSa	13.8	36.6
Total			33.8	100

Most of the survey area was mapped as 'Negligible to low' value foraging habitat for Carnaby's Cockatoo (15.2 ha, 48.6% of the survey area) due to the presence of suitable foraging plant species at a low density (i.e., less than 2% PFC; Table 12; Figure 6). One vegetation community – BsArAg – was mapped as 'Low' foraging value for Forest Red-tailed Black Cockatoos (4.6 ha, 14.7% of the survey area) given the presence of food sources between 1-5% PFC. No Primary foraging species for Forest Red-tailed Black Cockatoos were recorded in the survey area, while secondary foraging species included *B. sessilis, B. attenuata, B. sessilis, Eucalyptus gomphocephala,* and *Grevillea preissii.*

Table 12: Quality of foraging habitat recorded in the survey area for Forest Red-tailed Black Cockatoo

Quality	Criteria summary	Associated vegetation communities	Extent (ha) within the survey area	% of survey area
Low	Suitable foraging species present at a low density (i.e. food sources present at 1-5% PFC); and/or	BsArAg	4.8	14.7

Quality	Criteria summary	Associated vegetation communities	Extent (ha) within the survey area	% of survey area
	Scattered foraging species or paddocks with known food sources such as melons or weeds that represent a short-term food source.			
Negligible to low	Presence of some scattered foraging species but <2% PFC.	SgMhAr	15.2	48.6
No foraging value	No foraging value. No Proteaceae, eucalyptus, or other potential sources of food.	ArAcSg, FpApSc, McAr, SgEsOa, SgSa	13.8	36.6
Total			33.8	100

In addition, the DCCEEW (2022) scoring tool was used for each species (Appendix I). This outlines that the Carnaby's Cockatoo foraging quality is High (score of 8). Given no areas of the survey area are dominated by Jarrah or Marri woodland and/or forest, the DCCEEW scoring tool was not undertaken for Forest Red-tailed Black Cockatoos.

4.3.2. Potential breeding and roosting habitat

Two potentially suitable breeding trees were recorded within the survey area (Figure 6). This included two Tuart (*Eucalyptus gomphocephala*) trees on the northern boundary the survey area. One tree was 500-600 mm DBH while the other was >1000 mm DBH. Both trees had a nest/hollow rank of four (i.e., tree lacking suitable hollows or broken branches that might have large hollows, i.e. a tree with mainly intact branches and a spreading crown). Both potential breeding trees could be considered as potentially suitable roosting habitat given proximity to water sources. Such as Sir James McCusker Park. (1 km south-east).

Table 13: Potential breeding trees in the survey area

Tree ID: IF_1	**Tree ID: IF_2**
	
DBH: 500-600 mm	**DBH**: >1000 mm
Hollow Rank: 4	**Hollow Rank**: 4
Hollows: Nil	**Hollows**: Nil
Easting: 377821 **Northing:** 6488640	**Easting:** 378824 **Northing:** 6488642

Figure 6: Potential habitat for Carnaby's and Forest Red-tailed Black Cockatoos in the survey area

Survey area

Distributor Road

Access Road

Foraging habitat

Low to moderate (Carnaby's), Low (Forest Red-tailed)

Negligible to low (Carnaby's and Forest Red-tailed)

No foraging value

Potential breeding trees

Tuart (*Eucalyptus gomphocephala*), 500-600mm DBH, no hollows

Tuart (*Eucalyptus gomphocephala*), >1000mm DBH, no hollows

0 50 100 200

Meters

Datum/Projection:
GDA 1994 MGA Zone 50

24PER8879-GM Date: 5/12/2024

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5. Discussion

5.1. Targeted Honeymyrtle Shrubland TEC Assessment

Vegetation within the survey area was mapped and analysed to identify the presence of any conservation-significant ecological communities (i.e. TECs and/or PECs) by ELA in 2020 (ELA 2021). Given the new listing of the Honeymyrtle shrubland on limestone ridges of the Swan Coastal Plain bioregion TEC (Honeymyrtle Shrubland TEC) as Critically Endangered under the EPBC Act on the 15th of November 2023, the City of Joondalup commissioned ELA in 2024 to undertake a targeted assessment for Honeymyrtle Shrubland TEC within the survey area.

The Honeymyrtle Shrubland TEC has previously been listed under the BC Act as the (*Melaleuca huegelii-M. systena* shrublands of limestone ridges (floristic community type 26a as originally described in Gibson *et al.* 1994); however confirmation of its presence is defined by statistical analysis and comparison against the Gibson *et al.* (1994) floristic community types which was completed by ELA in 2023 (and found to not be present in the survey area). Statistical analysis was re-run with the addition of new quadrats by ELA in 2020.

Vegetation mapping completed by ELA in 2020 was used to guide targeted assessment of the vegetation within the survey area to identify areas of Honeymyrtle Shrubland TEC. Two patches of Honeymyrtle Shrubland TEC were identified within the survey area in the field, based on the presence of key floristic indicators such as *Melaleuca huegelii, M. systena,* and *B. sessilis* forming a shrubland or heathland on skeletal soils on Tamala limestone-derived outcrops or low rises. These patches included a 2.3 ha patch in the north of the survey area, and a smaller 0.2 ha patch in the south of the survey area. Both patches were located within the SgMhAr vegetation community. ELA established three new quadrats in September 2024 (in addition to the 14 previously established in 2020) to confirm the presence of the TEC in the survey area using diagnostic criteria in the approved conservation guidance for the Honeymyrtle Shrubland TEC (DCCEEW 2023).

Flora species recorded in the three new quadrats were typical of the Swan Coastal Plain IBRA bioregion (WAH 1998-). No flora species listed under the EPBC Act or BC Act, or as Priority by DBCA were recorded within quadrats. Approximately 32% of the total species recorded in the quadrats were introduced species, reflective of the location of the survey area in proximity to urban development, which acts as a vector for the spread of weeds. All introduced species are listed on the Western Australian Organism List Database as permitted (s-11) species, indicating that no specific management of these species is required.

ELA quadrats within defined areas of Honeymyrtle Shrubland TEC (located within the SgMhAr vegetation community) were compared to FCTs defined by Gibson *et al.* (1994). Results of the multivariate analysis showed the same result as that completed by ELA (2021), which found a moderate affiliation with FCT29a 'coastal shrublands on shallow sands' and FCT24 'Northern Spearwood shrublands and woodlands', both listed as a Priority 3 ecological community. The multivariate analysis did not find an affiliation with FCT26a used to confirm the presence of the State-listed Honeymyrtle Shrubland TEC, and as such this TEC is not considered to be present in the survey area.

Vegetation was assessed against the key diagnostic characteristics outlined in the Federally-listed Honeymyrtle Shrubland TEC approved conservation advice (DCCEEW 2023) to determine the presence of the TEC in the survey area. The primary defining features of the Honeymyrtle Shrubland TEC include location, species assemblage, patch size, and vegetation condition. Prior to the assessment, the Honeymyrtle Shrubland TEC was considered Likely to occur within the survey area given that the survey area is located in the 'community likely to occur' range on the SPRAT database. All quadrats within

mapped patches of the Honeymyrtle Shrubland TEC met the EPBC Act diagnostic criteria in the approved conservation advice, confirming the presence of the Federally-listed TEC in the survey area. No other vegetation within the survey area was found to represent the Federally-listed Honeymyrtle Shrubland TEC in the survey area.

While other communities in the survey area contained sufficient areas of foliar cover of key indicator species (i.e. the coverage of *Banksia sessilis* in the BsArSg vegetation community), they lacked the key landform characteristics to be considered the Honeymyrtle Shrubland TEC, occurring on deep sands or in dune swales with no limestone outcropping. In addition, some vegetation communities occurring on limestone outcropping rises lacked sufficient or dominant foliar cover of the key indicator species of the TEC and therefore were not considered to represent the TEC.

5.2. Targeted Black Cockatoo Assessment

Several previous records of Carnaby's Cockatoo and Forest Red-tailed Black Cockatoo occur within 20 km of the survey area (DBCA 2024b). The survey area occurs in the Carnaby's Cockatoo breeding range and the 'likely to occur' range of the Forest Red-tailed Black Cockatoo (DCCEEW 2022). Habitat critical to the survival of Carnaby's Cockatoo includes *Eucalyptus* woodlands that provide nest hollows used for breeding, together with nearby vegetation that provides feeding, roosting, and watering habitat that supports successful breeding (Department of Parks and Wildlife 2013). Habitat critical to the survival of Forest Red-tailed Black Cockatoos includes all Marri (*Corymbia calophylla*) and Jarrah (*Eucalyptus marginata*) forests, woodlands, and remnants in the south-west of Western Australia receiving more than 600 mm of annual average rainfall (Chapman 2008). Aspects of the aforementioned habitats critical to the survival of both species of black cockatoo occur, to varying extents, throughout the survey area and are discussed in further detail below.

No primary or secondary evidence of foraging, breeding, or roosting by black cockatoos was recorded in the survey area during the assessment. This included no direct sightings or heard calls, or evidence of foraging. Most of the survey area was mapped as 'Negligible to low' value foraging habitat for both Carnaby's and Forest Red-tailed Black Cockatoos. This mainly comprised of the SgMhAr vegetation community which contained some scattered foraging species such as *Banksia sessilis* and *Grevillea preissii,* but primarily below 2% PFC. The BsArAg vegetation community was mapped as 'Low to Moderate' value foraging habitat for Carnaby's Black Cockatoo and 'Low' foraging habitat for Forest Red-tailed Black Cockatoo given the presence of *Banksia sessilis* (and to a lesser extent *B. attenuata)* in the overstorey at greater than 10% foliar cover. While *B. sessilis* and *B. attenuata* are listed as foraging species for Forest Red-tailed Black Cockatoos, they are not considered to be primary foraging species and, as such, the foraging quality of this community was mapped as lower than that for Carnaby's Black Cockatoo (for which *B. sessilis* and *B. attenuata* are considered primary foraging species).

The survey area contains two potentially suitable breeding trees (>500 mm DBH), including two Tuart (*Eucalyptus gomphocephala*) trees on the northern boundary of the survey area. Tuart trees are considered potential breeding species for all three species of black cockatoo in Western Australia (DCCEEW 2022). Given that both trees are tall and are located in proximity to water sources (<1 km), they are therefore also considered to be potential roosting habitat.

While potential roosting, nesting, and foraging habitat is present in the survey area for black cockatoos, it is considered unlikely that Carnaby's or Forest Red-tailed Black Cockatoos would utilise habitat within the survey area. Any use would be limited to sporadic and opportunistic foraging within areas and primarily located in areas where *Banksia sessilis* is present, namely the BsArAg and to a lesser extent the SgMhAr vegetation communities. While any use of habitat within the survey area would likely be sporadic or opportunistic, it is still important to protect these vegetation communities, particularly

where they overlap with other significant environmental factors such as Threatened or Priority ecological communities. The conservation of these vegetation communities should be focused primarily on areas in the best condition to ensure that condition does not worsen in future through the introduction of weeds or from uncontrolled fires. While potential nesting trees were recorded in the survey area, given that both trees lack suitable hollows, nesting would not currently be able to occur. However, both trees may develop a nest hollow in the future and as such should be protected where possible.

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Appendix A: Framework for conservation significant flora and fauna ranking

CATEGORIES OF THREATENED SPECIES UNDER THE ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999 (EPBC ACT)

Threatened fauna and flora may be listed in any one of the following categories as defined in Section 179 of the EPBC Act. Species listed as 'conservation dependent' and 'extinct' are not Matters of National Environmental Significance and therefore do not trigger the EPBC Act.

Category	Definition
Extinct (EX)	There is no reasonable doubt that the last member of the species has died.
Extinct in the Wild (EW)	Taxa known to survive only in captivity or as a naturalised population well outside its past range; or taxa has not been recorded in its known and/or expected habitat at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.
Critically Endangered (CR)	Taxa considered to be facing an extremely high risk of extinction in the wild.
Endangered (EN)	Taxa considered to be facing a very high risk of extinction in the wild.
Vulnerable (VU)	Taxa considered to be facing a high risk of extinction in the wild.
Near Threatened (NT)	Taxa has been evaluated against the criteria but does not qualify for Critically Endangered, Endangered, or Vulnerable now, but is close to qualifying or is likely to qualify for a threatened category in the future.
Least Concern (LC)	Taxa has been evaluated against the criteria and does not qualify for Critically Endangered, Endangered, Vulnerable, or Near Threatened. Widespread and abundant taxa are included in this category.
Data Deficient (DD)	There is inadequate information to make a direct or indirect assessment of taxa's risk of extinction based on its distribution and/or population status.
Not Evaluated (NE)	Taxa has not yet been evaluated against the criteria.
Migratory (MI)	Not an IUCN category. Species are defined as migratory if they are listed in an international agreement approved by the Commonwealth Environment Minister, including: • the Bonn Convention (convention of the Conservation of Migratory Species of Wild Animal) for which Australia is a range state; • the agreement between the Government of Australia and the Government of the People's Republic of China for the Protection of Migratory Birds and their environment (CAMBA); • The agreement between the Government of Japan and the Government of Australia for the Protection of Migratory Birds and Birds in Danger of Extinction and their Environment (JAMBA); or • The agreement between Australia and the Republic of Korea to develop a bilateral migratory bird agreement similar to the JAMBA and CAMBA in respect to migratory bird conservation and provides a basis for collaboration on the protection of migratory shorebirds and their habitat (ROKAMBA)

CONSERVATION CODES FOR WESTERN AUSTRALIAN FLORA AND FAUNA

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.*

Specially protected fauna or flora are species 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.

Threatened species (T)

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).

The assessment of the conservation status of these species is based on their national extent and ranked according to their level of threat under IUCN Red List categories and criteria as detailed below.

Category	Code	Description
Critically Endangered	CR	Threatened species considered to be "facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with criteria set out in the ministerial guidelines". Listed as critically endangered under section 19(1)(a) of the BC Act in accordance with the criteria set out in section 20 and the ministerial guidelines. Published under Schedule 1 Division 1 of the Biodiversity Conservation (Listing of Native Species) (Flora) Order 2024 or Schedule 2 Division 1 of the Biodiversity Conservation (Listing of Native Species) (Fauna) Order 2024.
Endangered	EN	Threatened species considered to be "facing a very high risk of extinction in the wild in the near future, as determined in accordance with criteria set out in the ministerial guidelines". Listed as endangered under section 19(1)(b) of the BC Act in accordance with the criteria set out in section 21 and the ministerial guidelines. Published under Schedule 1 Division 2 of the Biodiversity Conservation (Listing of Native Species) (Flora) Order 2024 or Schedule 2 Division 2 of the Biodiversity Conservation (Listing of Native Species) (Fauna) Order 2024.
Vulnerable	VU	Threatened species considered to be "facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with criteria set out in the ministerial guidelines". Listed as vulnerable under section 19(1)(c) of the BC Act in accordance with the criteria set out in section 22 and the ministerial guidelines. Published under Schedule 1 Division 3 of the Biodiversity Conservation (Listing of Native Species) (Flora) Order 2024 or Schedule 2 Division 3 of the Biodiversity Conservation (Listing of Native Species) (Fauna) Order 2024.

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, as follows:

Category	Code	Description
Extinct species	EX	Species which have been adequately searched for and there is no reasonable doubt that the last individual has died. Published under Schedule 2 of the Biodiversity Conservation (Listing of Native Species) (Flora) Order 2024 or Schedule 3 of the Biodiversity Conservation (Listing of Native Species) (Fauna) Order 2024.
Extinct in the wild species	EW	Species that is "known only to survive in cultivation, in captivity, or as a naturalised population well outside its past range, and it has not been recorded in its known habitat or expected habitat, at appropriate seasons anywhere in its past range despite surveys over a time frame appropriate to its life cycle and form", and listing is otherwise in accordance with the ministerial guidelines (section 25 of the BC Act). Currently there are no threatened flora or fauna species listed as extinct in the wild. If listing of a species as extinct in the wild occurs, then a schedule will be added to the applicable notice.

Specially protected species

Listed by order of the Minister as specially protected under Section 13 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.

Categories are detailed below.

Category	Code	Description
Migratory species	MI	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 15 of the BC Act). Includes birds that are subject to an agreement between the government of Australia and the government of Japan (JAMBA), People's Republic of 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. Listed as Migratory under Section 13(1)(a)(ii) of the BC Act. Published under Schedule 1 Division 2 of the Biodiversity Conservation (listing of Native Species) (Fauna) Order 2024.
Species of special conservation interest (conservation dependent fauna)	CD	Fauna of special conservation need being species 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). Listed as species of special conservation interest (conservation dependent fauna) under Section 13(1)(a)(i) of the BC Act. Published under Schedule 1 Division 1 of the Biodiversity Conservation (listing of Native Species) (Fauna) Order 2024.
Other specially protected species	OS	Fauna otherwise in need of special protection to ensure their conservation, and listing is otherwise in accordance with the ministerial guidelines (section 18 of the BC Act). Listed as Other specially protected species under Section 13(1)(b) of the BC Act. Published under Schedule 1 Division 3 of the Biodiversity Conservation (listing of Native Species) (Fauna) Order 2024.

Priority species (P)

Possibly threatened species that do not meet survey criteria, or are otherwise data deficient, are added to the Priority Fauna or Priority Flora Lists under Priorities 1, 2, or 3. These three categories are ranked in order of priority for survey and evaluation of conservation status so that consideration can be given to their declaration as threatened flora or fauna.

Species that are adequately known, are rare but not threatened, meet criteria for near threatened, or that have been recently removed from the threatened species or other specially protected fauna lists for other than taxonomic reasons, are placed in Priority 4. These species require regular monitoring.

Assessment of Priority codes is based on 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.

Category	Code	Definition
Priority 1	P1	Poorly known species Species that are known from one or a few locations (generally five or less) which are potentially at risk. All occurrences are either: very small; or on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, road and rail reserves, gravel reserves, and active mineral leases; or otherwise under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes. Such species are in urgent need of further survey.
Priority 2	P2	Poorly known species Species that are known from one or a few locations (generally five or less), some of which are on lands managed primarily for nature conservation (e.g., national parks, conservation parks, nature reserves, and other lands with secure tenure being managed for conservation. Species may not be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes. Such species are in urgent need of further survey.
Priority 3	P3	Poorly known species. Species that are known from several locations, and the species does not appear to be under imminent threat, or from few but widespread locations with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several locations but do not meet adequacy of survey requirements and known threatening processes exist that could affect them. Such species need further survey.
Priority 4	P4	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.

Appendix B: Likelihood of occurrence assessment criteria

Likelihood rating	Criteria
Recorded	The species has been previously recorded within the survey area from DBCA database search results and/or from previous surveys of the survey area, and/or the species has been confirmed through a current vouchered specimen at the WA Herbarium.
Likely	The species has not previously been recorded from within the survey area. However, to qualify requires one or more of the following criteria to be met: • The species has been recorded in close proximity to the survey area, and occurs in similar habitat to that which occurs within the survey area • Core habitat and suitable landforms for the species occurs within the survey area either year-round or seasonally. In relation to fauna species, this could be that a host plant is seasonally present on site, or habitat features such as caves are present that may be used during particular times during its life cycle e.g. for breeding. In relation to both flora and fauna species, it may be there are seasonal wetlands present • There is a medium to high probability that a species uses the survey area
Potential	The species has not previously been recorded from within the survey area. However, to qualify requires one or more of the following criteria to be met: • Targeted surveys may locate the species based on records occurring in proximity to the survey area and suitable habitat occurring in the survey area • The survey area has been assessed as having potentially suitable habitat through habitat modelling • The species is known to be cryptic and may not have been detected despite extensive surveys • The species is highly mobile and has an extensive foraging range so may not have been detected during previous surveys The species has been recorded in the survey area by a previous survey or there is historic evidence of species occurrence within the survey area. However, one or more of the following criteria is met: • Doubt remains over taxonomic identification or the majority of habitat does not appear suitable (although presence cannot be ruled out due to factors such as species ecology or distribution) • Location co-ordinates for the record are doubtful
Unlikely	The species has been recorded locally through DBCA database searches. However it has not been recorded within the survey area and: • It is unlikely to occur due to the site lacking critical habitat, having at best marginally suitable habitat, and/or being severely degraded • It is unlikely to occur due to few historic record/s and no other current collections in the local area The species has been recorded within the bioregion based on literature review but has not been recorded locally or within the survey area through DBCA database searches. The species has not been recorded in the survey area despite adequate survey efforts, such as a standardised methodology of targeted searching within potentially suitable habitat.
Does not occur (one or more criteria requires to be met)	The species is not known to occur within the IBRA bioregion based on current literature and distribution. The conspicuous species has not been recorded in the survey area despite adequate survey efforts at an appropriate time of year to detect the species within potentially suitable habitat. The survey area lacks important habitat for a species that has highly selective habitat requirements. The species has been historically recorded within the survey area or locally, however it is considered locally extinct due to significant habitat changes such as land clearing and/or introduced predators.

Appendix C: Black Cockatoo habitat definitions

Habitat	Definition
Foraging habitat	Foraging habitat is defined as plant species known to support foraging within the range of each species. The specific foraging requirements differ slightly between the three species as described in DAWE 2022: • **Carnaby's Cockatoo** – mainly feeds in native shrubland, kwongkan heathland, and woodland. Food items include seeds, flowers, and nectar of native proteaceous plant species (i.e. *Banksia* spp., *Hakea* spp., *Grevillea* spp.), as well as *Callistemon* spp., and Marri (*Corymbia calophylla*). Also feeds on the seeds of introduced species including *Pinus* spp., *Erodium* spp., wild radish, canola, almonds, macadamia, and pecan nuts; insects and insect larvae; occasionally flesh and juice of apples and persimmons; and liquidambar. • **Baudin's Cockatoo** – mainly feeds in eucalypt woodlands and forest and proteaceous woodlands and heath. Food items primarily include seeds of Marri, rarely Jarrah (*Eucalyptus marginata*), and seeds of native proteaceous plant species (e.g. *Banksia* spp. and *Hakea* spp.). Also feeds on insects and insect larvae; pith of kangaroo paw (*Anigozanthos flavidus*); tips of *Pinus* spp.; *Macadamia* spp.; almonds and pecans; seeds of apples, pears, and persimmons. • **Forest Red-tailed Black Cockatoo** – mainly feeds in Jarrah and Marri woodlands and forest and edges of Karri (*Eucalyptus diversicolor*) forests including Wandoo (*E. wandoo*) and Blackbutt (*E. patens*). Food items primarily include seeds of Marri and Jarrah. Also feeds on *Allocasuarina* cones, fruits of Snottygobble (*Persoonia longifolia*) and Mountain Marri (*Corymbia haematoxylon*). Other less important foods include: Blackbutt, Bullich (*Eucalyptus megacarpa*), *Allocasuarina fraseriana, Hakea* spp., Tuart (*Eucalyptus gomphocephala*), Redheart Moit (*Eucalyptus decipiens*), and Bushy Yate (*Eucalyptus lehmanii*). Also some introduced eucalypts such as river red gum (*E. camaldulensis*) and flooded gum (*E. rudis*).
Night roosting habitat	Habitat that contains one, or a group of potential roosting trees: • **Known roosting tree** – a tree (generally the tallest), native or introduced known to be used for night roosting or which demonstrates evidence of roosting. Usually close to an important water source and within an area of high-quality foraging habitat. During the breeding season, male black cockatoos roost in the vicinity of the nesting trees, therefore a breeding area may also be considered to be night roosting habitat. • **Potential roosting tree** – A tall tree of any species in close proximity to water.
Breeding habitat	Habitat that contains known, suitable, or potential nesting trees: • **Known nesting tree** – Trees (live or dead but still standing) which contain a hollow where black cockatoo breeding has been recorded or which demonstrates evidence of breeding (i.e. showing evidence of use through scratches, chew marks, or feathers). • **Suitable nesting tree –** Trees with suitable nesting hollows present, although no evidence of use. Note that any species of tree may develop suitable hollows for breeding. • **Suitable nesting hollow –** Any hollow with dimensions suitable for use for nesting by black cockatoos (Carnaby's Cockatoo 23-30 cm [EPA 2019], Baudin's Cockatoo 30-40 cm [Chapman 2008]. Forest Red-tailed Black Cockatoo 12-41cm [Chapman 2008]). Suitable nest hollows are only found in live trees with a diameter at breast height (DBH) of at least 500 mm. Usually this will be a natural hollow, but artificial hollows may also be suitable in some circumstances (for example, where the artificial hollow has been specifically designed for use by black cockatoos). Note that artificial hollows have only been shown to have value for Carnaby's Cockatoos to date. • **Potential nesting trees –** Trees that have a suitable DBH to develop a nest hollow but do not currently have hollows. For most species of trees, suitable nest hollows are only found in live trees with a DBH of at least 500 mm. Trees suitable to develop a nest hollow in the future are 300-500 mm DBH. Note that many species of eucalypt may develop suitable hollows for breeding.

References

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Appendix D: Black cockatoo foraging habitat quality criteria

Foraging habitat quality	Carnaby's Cockatoo	Forest Black Cockatoo (Baudin's Cockatoo and Forest Red-tailed Black Cockatoo)
High	• Presence of suitable foraging plant species[1] at a high density (i.e. primary food sources[2] present at >60% PFC[3], secondary food sources[2] present at >70% PFC) and presence of preferred food sources at several strata; • Low weed invasion and/or low tree deaths (indicating it is robust and unlikely to decline in the medium term); and/or • Lower quality foraging habitat based on vegetation characteristics, but with evidence of use (i.e. chewed nuts, cones, seeds or flowers). • Example: Banksia forest >60% PFC and Good or higher vegetation condition with low weed invasion and/or low tree deaths.	• Presence of suitable foraging plant species[1] at a high density (i.e. food sources present at >60% PFC[3]) and presence of preferred food sources at several strata; • Low weed invasion and/or low tree deaths (indicating it is robust and unlikely to decline in the medium term); and/or • Lower quality foraging habitat based on vegetation characteristics, but with evidence of use (i.e. chewed nuts, cones, seeds or flowers). • Example: Marri-Jarrah Forest >60% PFC and Good or higher vegetation condition with low weed invasion and/or low tree deaths.
Moderate to high	• Presence of suitable foraging plant species at a high density (i.e. primary food sources present at 40-60% PFC, secondary food sources at >60% PFC) and presence of preferred food sources at several strata; • Foraging species with >60% PFC but foraging habitat viability reduced due to high weed invasion and/or tree deaths indicating that the vegetation could potentially decline in the medium term due to suppressed regrowth or disease; and/or • Lower quality foraging habitat but with evidence of use (i.e. chewed nuts, cones, seeds or flowers).	• Presence of suitable foraging plant species at a high density (i.e. food sources present at 40-60% PFC) and presence of preferred food sources at several strata; • Foraging species with >60% PFC but foraging habitat viability reduced due to high weed invasion and/or tree deaths indicating that the vegetation could potentially decline in the medium term due to suppressed regrowth or disease; and/or • Lower quality foraging habitat but with evidence of use (i.e. chewed nuts, cones, seeds or flowers).
Moderate	• Presence of suitable foraging plant species at a low to moderate density (i.e. primary food sources present at 20-40% PFC, secondary food sources at 40-60% PFC); • Foraging species with 40-60% PFC but foraging habitat viability reduced due to high weed invasion and/or tree deaths indicating that the vegetation could potentially decline in the medium term due to suppressed regrowth or disease; and/or • Lower quality foraging habitat but with evidence of use (i.e. chewed nuts, cones, seeds or flowers).	• Presence of suitable foraging plant species at a low to moderate density (i.e. food sources present at 20-40% PFC); • Foraging species with 40-60% PFC but foraging habitat viability reduced due to high weed invasion and/or tree deaths indicating that the vegetation could potentially decline in the medium term due to suppressed regrowth or disease; and/or • Lower quality foraging habitat but with evidence of use (i.e. chewed nuts, cones, seeds or flowers).
Low to moderate	• Suitable foraging species present but at a lower density (i.e. primary food sources present at 10-20% PFC, secondary food sources present at 20-40% PFC);	• Suitable foraging species present but at a lower density (i.e. primary food sources present at 10-20% PFC, secondary food sources present at 20-40% PFC);

Foraging habitat quality	Carnaby's Cockatoo	Forest Black Cockatoo (Baudin's Cockatoo and Forest Red-tailed Black Cockatoo)
	• Foraging species with 20-40% projected foliage cover but foraging habitat viability reduced due to high weed invasion and/or tree deaths indicating that the vegetation could potentially decline in the medium term due to suppressed regrowth or disease; and/or • Lower quality foraging habitat but with evidence of use (i.e. chewed nuts, cones, seeds or flowers).	• Foraging species with 20-40% projected foliage cover but foraging habitat viability reduced due to high weed invasion and/or tree deaths indicating that the vegetation could potentially decline in the medium term due to suppressed regrowth or disease; and/or • Lower quality foraging habitat but with evidence of use (i.e. chewed nuts, cones, seeds or flowers).
Low	• Suitable foraging species present at a low density (i.e. primary food sources present at <10% PFC, secondary food sources present at 10-20% PFC); and/or • Scattered foraging species or paddocks with known food sources such as melons or weeds that represent a short-term food source.	• Suitable foraging species present at a low density (i.e. food sources present at 1-5% PFC); and/or • Scattered foraging species or paddocks with known food sources such as melons or weeds that represent a short-term food source.
Negligible to low	• Presence of some scattered foraging species but <2% PFC.	• Presence of some scattered foraging species but <1% PFC.
No foraging value	• No foraging value. No Proteaceae, eucalypts or other potential sources of food. Examples: water bodies, bare ground, developed sites, mown grass.	• No foraging value. No eucalypts or other potential sources of food. Examples: water bodies, bare ground, developed sites.

[1] Based on the list of suitable foraging plants collated forom the following soureces: DAWE (2022), Groom (2011), Johnstone *et al.* (2010), Heydenrych (2012), and Lee *et al.* (2013).

[2] Primary food sources for Carnaby's Cockatoo are defined as those species which are known to provide a regular foraging resource and have been designated as being 'high' priority for planting by the Department of Environment and Conservation (now known as DBCA), where as secondary food items are defined as those species that are only occasionally foraged upon, and which have been assigned as being moderate to low priority for planting by DBCA (Groom 2011).

[3] PFC = projected foliage cover

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Lee, J., Finn, H., and Calver, M. 2013. Ecology of Black Cockatoos at a Mine site in the Eastern Jarrah-Marri Forest, Western Australia. *Pacific Conservation Biology* 19: 76–90.

Appendix E: Protected Matters Search Tool (PMST) results

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Please see the caveat for interpretation of information provided here.

Report created: 29-Oct-2024

Summary

Matters of National Environment Significance

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

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance (Ramsar	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	1
Listed Threatened Ecological Communities:	4
Listed Threatened Species:	59
Listed Migratory Species:	49

Other Matters Protected by the EPBC Act

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

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

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

Commonwealth Lands:	46
Commonwealth Heritage Places:	None
Listed Marine Species:	74
Whales and Other Cetaceans:	12
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	2
Habitat Critical to the Survival of Marine Turtles:	None

Extra Information

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

State and Territory Reserves:	7
Regional Forest Agreements:	None
Nationally Important Wetlands:	1
EPBC Act Referrals:	55
Key Ecological Features (Marine):	2
Biologically Important Areas:	10
Bioregional Assessments:	None
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

Commonwealth Marine Area [Resource Information]

Approval is required for a proposed activity that is located within the Commonwealth Marine Area which has, will have, or is likely to have a significant impact on the environment. Approval may be required for a proposed action taken outside a Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area.

Feature Name	Buffer Status
Commonwealth Marine Areas (EPBC Act)	In buffer area only

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.
Status of Vulnerable, Disallowed and Ineligible are not MNES under the EPBC Act.

Community Name	Threatened Category	Presence Text	Buffer Status
Banksia Woodlands of the Swan Coastal Plain ecological community	Endangered	Community likely to occur within area	In feature area
Empodisma peatlands of southwestern Australia	Endangered	Community may occur within area	In buffer area only
Honeymyrtle shrubland on limestone ridges of the Swan Coastal Plain Bioregion	Critically Endangered	Community likely to occur within area	In feature area
Tuart (Eucalyptus gomphocephala) Woodlands and Forests of the Swan Coastal Plain ecological community	Critically Endangered	Community likely to occur within area	In feature area

Listed Threatened Species [Resource Information]

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.
Number is the current name ID.

Scientific Name	Threatened Category	Presence Text	Buffer Status
BIRD			
Anous tenuirostris melanops			
Australian Lesser Noddy [26000]	Vulnerable	Species or species habitat may occur within area	In feature area
Ardenna grisea			
Sooty Shearwater [82651]	Vulnerable	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat may occur within area	In buffer area only
Calidris acuminata Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat known to occur within area	In feature area
Calidris canutus Red Knot, Knot [855]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Calyptorhynchus banksii naso Forest Red-tailed Black-Cockatoo, Karrak [67034]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Diomedea amsterdamensis Amsterdam Albatross [64405]	Endangered	Species or species habitat may occur within area	In feature area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Species or species habitat may occur within area	In feature area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Leipoa ocellata Malleefowl [934]	Vulnerable	Species or species habitat likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Limosa lapponica menzbieri Northern Siberian Bar-tailed Godwit, Russkoye Bar-tailed Godwit [86432]	Endangered	Species or species habitat likely to occur within area	In feature area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area	In feature area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area	In feature area
Pachyptila turtur subantarctica Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Phaethon rubricauda westralis Red-tailed Tropicbird (Indian Ocean), Indian Ocean Red-tailed Tropicbird [91824]	Endangered	Species or species habitat may occur within area	In feature area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area	In feature area
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area	In feature area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Thalassarche cauta			
Shy Albatross [89224]	Endangered	Species or species habitat may occur within area	In feature area
Thalassarche impavida			
Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area	In feature area
Thalassarche melanophris			
Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Thalassarche steadi			
White-capped Albatross [64462]	Vulnerable	Species or species habitat may occur within area	In feature area
Tringa nebularia			
Common Greenshank, Greenshank [832]	Endangered	Species or species habitat known to occur within area	In buffer area only
Zanda latirostris listed as Calyptorhynchus latirostris			
Carnaby's Black Cockatoo, Short-billed Black-cockatoo [87737]	Endangered	Breeding known to occur within area	In feature area
INSECT			
Hesperocolletes douglasi			
Douglas' Broad-headed Bee, Rottnest Bee [66734]	Critically Endangered	Species or species habitat may occur within area	In feature area
MAMMAL			
Balaenoptera musculus			
Blue Whale [36]	Endangered	Species or species habitat likely to occur within area	In feature area
Dasyurus geoffroii			
Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Eubalaena australis			
Southern Right Whale [40]	Endangered	Breeding known to occur within area	In feature area
Macroderma gigas			
Ghost Bat [174]	Vulnerable	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Neophoca cinerea](#) Australian Sea-lion, Australian Sea Lion [22]	Endangered	Species or species habitat likely to occur within area	In feature area
PLANT			
[Andersonia gracilis](#) Slender Andersonia [14470]	Endangered	Species or species habitat likely to occur within area	In feature area
[Anigozanthos viridis subsp. terraspectans](#) Dwarf Green Kangaroo Paw [3435]	Vulnerable	Species or species habitat may occur within area	In buffer area only
[Banksia mimica](#) Summer Honeypot [82765]	Endangered	Species or species habitat may occur within area	In buffer area only
[Caladenia huegelii](#) King Spider-orchid, Grand Spider-orchid, Rusty Spider-orchid [7309]	Endangered	Species or species habitat may occur within area	In buffer area only
[Caleana dixonii listed as Paracaleana dixonii](#) Sandplain Duck Orchid [87944]	Endangered	Species or species habitat may occur within area	In buffer area only
[Diuris micrantha](#) Dwarf Bee-orchid [55082]	Vulnerable	Species or species habitat likely to occur within area	In feature area
[Diuris purdiei](#) Purdie's Donkey-orchid [12950]	Endangered	Species or species habitat may occur within area	In buffer area only
[Drakaea elastica](#) Glossy-leafed Hammer Orchid, Glossy-leaved Hammer Orchid, Warty Hammer Orchid [16753]	Endangered	Species or species habitat likely to occur within area	In feature area
[Drakaea micrantha](#) Dwarf Hammer-orchid [56755]	Vulnerable	Species or species habitat may occur within area	In buffer area only
[Eleocharis keigheryi](#) Keighery's Eleocharis [64893]	Vulnerable	Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Eucalyptus argutifolia			
Yanchep Mallee, Wabling Hill Mallee [24263]	Vulnerable	Species or species habitat known to occur within area	In feature area
Macarthuria keigheryi			
Keighery's Macarthuria [64930]	Endangered	Species or species habitat may occur within area	In buffer area only
Marianthus paralius			
[83925]	Endangered	Species or species habitat known to occur within area	In feature area
Melaleuca sp. Wanneroo (G.J. Keighery 16705)			
[89456]	Endangered	Species or species habitat known to occur within area	In buffer area only
REPTILE			
Caretta caretta			
Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area	In feature area
Chelonia mydas			
Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
Dermochelys coriacea			
Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area	In feature area
Natator depressus			
Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
SHARK			
Carcharias taurus (west coast population)			
Grey Nurse Shark (west coast population) [68752]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Carcharodon carcharias			
White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Pristis pristis Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756]	Vulnerable	Species or species habitat may occur within area	In feature area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area	In feature area
Sphyrna lewini Scalloped Hammerhead [85267]	Conservation Dependent	Species or species habitat likely to occur within area	In feature area

Listed Migratory Species [Resource Information]

Scientific Name	Threatened Category	Presence Text	Buffer Status
Migratory Marine Birds			
Anous stolidus Common Noddy [825]		Species or species habitat likely to occur within area	In feature area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area	In feature area
Ardenna carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Foraging, feeding or related behaviour likely to occur within area	In feature area
Ardenna grisea Sooty Shearwater [82651]	Vulnerable	Species or species habitat may occur within area	In feature area
Diomedea amsterdamensis Amsterdam Albatross [64405]	Endangered	Species or species habitat may occur within area	In feature area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Species or species habitat may occur within area	In feature area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Hydroprogne caspia Caspian Tern [808]		Foraging, feeding or related behaviour known to occur within area	In feature area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area	In feature area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Onychoprion anaethetus Bridled Tern [82845]		Breeding known to occur within area	In feature area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area	In feature area
Sterna dougallii Roseate Tern [817]		Foraging, feeding or related behaviour likely to occur within area	In feature area
Sternula albifrons Little Tern [82849]		Species or species habitat may occur within area	In feature area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Thalassarche cauta Shy Albatross [89224]	Endangered	Species or species habitat may occur within area	In feature area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area	In feature area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Thalassarche steadi](#) White-capped Albatross [64462]	Vulnerable	Species or species habitat may occur within area	In feature area
Migratory Marine Species			
[Balaenoptera edeni](#) Bryde's Whale [35]		Species or species habitat may occur within area	In feature area
[Balaenoptera musculus](#) Blue Whale [36]	Endangered	Species or species habitat likely to occur within area	In feature area
[Caperea marginata](#) Pygmy Right Whale [39]		Species or species habitat may occur within area	In feature area
[Carcharhinus longimanus](#) Oceanic Whitetip Shark [84108]		Species or species habitat may occur within area	In feature area
[Carcharias taurus](#) Grey Nurse Shark [64469]		Species or species habitat likely to occur within area	In feature area
[Carcharodon carcharias](#) White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area	In feature area
[Caretta caretta](#) Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area	In feature area
[Chelonia mydas](#) Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
[Dermochelys coriacea](#) Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area	In feature area
[Eubalaena australis as Balaena glacialis australis](#) Southern Right Whale [40]	Endangered	Breeding known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Lamna nasus](#) Porbeagle, Mackerel Shark [83288]		Species or species habitat may occur within area	In feature area
[Megaptera novaeangliae](#) Humpback Whale [38]		Species or species habitat known to occur within area	In feature area
[Mobula alfredi as Manta alfredi](#) Reef Manta Ray, Coastal Manta Ray [90033]		Species or species habitat may occur within area	In feature area
[Mobula birostris as Manta birostris](#) Giant Manta Ray [90034]		Species or species habitat may occur within area	In feature area
[Natator depressus](#) Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
[Orcinus orca](#) Killer Whale, Orca [46]		Species or species habitat may occur within area	In feature area
[Pristis pristis](#) Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756]	Vulnerable	Species or species habitat may occur within area	In feature area
[Rhincodon typus](#) Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area	In feature area
Migratory Terrestrial Species			
[Motacilla cinerea](#) Grey Wagtail [642]		Species or species habitat may occur within area	In feature area
Migratory Wetlands Species			
[Actitis hypoleucos](#) Common Sandpiper [59309]		Species or species habitat known to occur within area	In feature area
[Calidris acuminata](#) Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Calidris canutus](#) Red Knot, Knot [855]	Vulnerable	Species or species habitat likely to occur within area	In feature area
[Calidris ferruginea](#) Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area	In feature area
[Calidris melanotos](#) Pectoral Sandpiper [858]		Species or species habitat may occur within area	In feature area
[Calidris ruficollis](#) Red-necked Stint [860]		Species or species habitat known to occur within area	In buffer area only
[Charadrius leschenaultii](#) Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat likely to occur within area	In feature area
[Limosa lapponica](#) Bar-tailed Godwit [844]		Species or species habitat likely to occur within area	In feature area
[Numenius madagascariensis](#) Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area	In feature area
[Pandion haliaetus](#) Osprey [952]		Species or species habitat known to occur within area	In feature area
[Tringa nebularia](#) Common Greenshank, Greenshank [832]	Endangered	Species or species habitat known to occur within area	In buffer area only

Other Matters Protected by the EPBC Act

Commonwealth Lands [Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Commonwealth Land Name	State	Buffer Status
Unknown		

Commonwealth Land Name	State	Buffer Status
Commonwealth Land - [50574]	WA	In buffer area only
Commonwealth Land - [50575]	WA	In buffer area only
Commonwealth Land - [50587]	WA	In buffer area only
Commonwealth Land - [50586]	WA	In buffer area only
Commonwealth Land - [50585]	WA	In buffer area only
Commonwealth Land - [50584]	WA	In buffer area only
Commonwealth Land - [50582]	WA	In buffer area only
Commonwealth Land - [50583]	WA	In buffer area only
Commonwealth Land - [50588]	WA	In buffer area only
Commonwealth Land - [50489]	WA	In buffer area only
Commonwealth Land - [51491]	WA	In buffer area only
Commonwealth Land - [50553]	WA	In buffer area only
Commonwealth Land - [50711]	WA	In buffer area only
Commonwealth Land - [50668]	WA	In buffer area only
Commonwealth Land - [50559]	WA	In buffer area only
Commonwealth Land - [50667]	WA	In buffer area only
Commonwealth Land - [50576]	WA	In buffer area only
Commonwealth Land - [50436]	WA	In buffer area only
Commonwealth Land - [50626]	WA	In buffer area only
Commonwealth Land - [50439]	WA	In buffer area only
Commonwealth Land - [51978]	WA	In buffer area only
Commonwealth Land - [51118]	WA	In buffer area only
Commonwealth Land - [50430]	WA	In buffer area only
Commonwealth Land - [50625]	WA	In buffer area only
Commonwealth Land - [50413]	WA	In buffer area only
Commonwealth Land - [50606]	WA	In buffer area only
Commonwealth Land - [50594]	WA	In buffer area only

Commonwealth Land Name	State	Buffer Status
Commonwealth Land - [50410]	WA	In buffer area only
Commonwealth Land - [50592]	WA	In buffer area only
Commonwealth Land - [50494]	WA	In buffer area only
Commonwealth Land - [50562]	WA	In buffer area only
Commonwealth Land - [50563]	WA	In buffer area only
Commonwealth Land - [50682]	WA	In buffer area only
Commonwealth Land - [50316]	WA	In buffer area only
Commonwealth Land - [50593]	WA	In buffer area only
Commonwealth Land - [50598]	WA	In buffer area only
Commonwealth Land - [50440]	WA	In buffer area only
Commonwealth Land - [50271]	WA	In buffer area only
Commonwealth Land - [50448]	WA	In buffer area only
Commonwealth Land - [51120]	WA	In buffer area only
Commonwealth Land - [50502]	WA	In buffer area only
Commonwealth Land - [50508]	WA	In buffer area only
Commonwealth Land - [50630]	WA	In buffer area only
Commonwealth Land - [50560]	WA	In buffer area only
Commonwealth Land - [51111]	WA	In buffer area only
Commonwealth Land - [50561]	WA	In buffer area only

Listed Marine Species			[Resource Information]
Scientific Name	Threatened Category	Presence Text	Buffer Status
Bird			
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area	In feature area
Anous stolidus Common Noddy [825]		Species or species habitat likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Anous tenuirostris melanops Australian Lesser Noddy [26000]	Vulnerable	Species or species habitat may occur within area	In feature area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area	In feature area
Ardenna carneipes as Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Foraging, feeding or related behaviour likely to occur within area	In feature area
Ardenna grisea as Puffinus griseus Sooty Shearwater [82651]	Vulnerable	Species or species habitat may occur within area	In feature area
Bubulcus ibis as Ardea ibis Cattle Egret [66521]		Species or species habitat may occur within area overfly marine area	In feature area
Calidris acuminata Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat known to occur within area	In feature area
Calidris canutus Red Knot, Knot [855]	Vulnerable	Species or species habitat likely to occur within area overfly marine area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area overfly marine area	In feature area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area overfly marine area	In feature area
Calidris ruficollis Red-necked Stint [860]		Species or species habitat known to occur within area overfly marine area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Charadrius leschenaultii](#) Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat likely to occur within area	In feature area
[Diomedea amsterdamensis](#) Amsterdam Albatross [64405]	Endangered	Species or species habitat may occur within area	In feature area
[Diomedea epomophora](#) Southern Royal Albatross [89221]	Vulnerable	Species or species habitat may occur within area	In feature area
[Diomedea exulans](#) Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
[Haliaeetus leucogaster](#) White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area	In feature area
[Halobaena caerulea](#) Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area	In buffer area only
[Himantopus himantopus](#) Pied Stilt, Black-winged Stilt [870]		Species or species habitat known to occur within area overfly marine area	In buffer area only
[Hydroprogne caspia as Sterna caspia](#) Caspian Tern [808]		Foraging, feeding or related behaviour known to occur within area	In feature area
[Larus pacificus](#) Pacific Gull [811]		Foraging, feeding or related behaviour may occur within area	In feature area
[Limosa lapponica](#) Bar-tailed Godwit [844]		Species or species habitat likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area	In feature area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area	In feature area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area overfly marine area	In feature area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area	In feature area
Onychoprion anaethetus as Sterna anaethetus Bridled Tern [82845]		Breeding known to occur within area	In feature area
Pachyptila turtur Fairy Prion [1066]		Species or species habitat likely to occur within area	In feature area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area	In feature area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area	In feature area
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Puffinus assimilis Little Shearwater [59363]		Foraging, feeding or related behaviour known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Recurvirostra novaehollandiae](#) Red-necked Avocet [871]		Species or species habitat known to occur within area overfly marine area	In buffer area only
[Rostratula australis as Rostratula benghalensis (sensu lato)](#) Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area overfly marine area	In feature area
[Stercorarius antarcticus as Catharacta skua](#) Brown Skua [85039]		Species or species habitat may occur within area	In buffer area only
[Sterna dougallii](#) Roseate Tern [817]		Foraging, feeding or related behaviour likely to occur within area	In feature area
[Sternula albifrons as Sterna albifrons](#) Little Tern [82849]		Species or species habitat may occur within area	In feature area
[Thalassarche carteri](#) Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat likely to occur within area	In feature area
[Thalassarche cauta](#) Shy Albatross [89224]	Endangered	Species or species habitat may occur within area	In feature area
[Thalassarche impavida](#) Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area	In feature area
[Thalassarche melanophris](#) Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
[Thalassarche steadi](#) White-capped Albatross [64462]	Vulnerable	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Thinornis cucullatus as Thinornis rubricollis](#) Hooded Plover, Hooded Dotterel [87735]		Species or species habitat may occur within area overfly marine area	In feature area
[Tringa nebularia](#) Common Greenshank, Greenshank [832]	Endangered	Species or species habitat known to occur within area overfly marine area	In buffer area only
Fish			
[Acentronura australe](#) Southern Pygmy Pipehorse [66185]		Species or species habitat may occur within area	In feature area
[Campichthys galei](#) Gale's Pipefish [66191]		Species or species habitat may occur within area	In feature area
[Choeroichthys suillus](#) Pig-snouted Pipefish [66198]		Species or species habitat may occur within area	In feature area
[Halicampus brocki](#) Brock's Pipefish [66219]		Species or species habitat may occur within area	In feature area
[Hippocampus angustus](#) Western Spiny Seahorse, Narrow-bellied Seahorse [66234]		Species or species habitat may occur within area	In feature area
[Hippocampus breviceps](#) Short-head Seahorse, Short-snouted Seahorse [66235]		Species or species habitat may occur within area	In feature area
[Hippocampus subelongatus](#) West Australian Seahorse [66722]		Species or species habitat may occur within area	In feature area
[Lissocampus fatiloquus](#) Prophet's Pipefish [66250]		Species or species habitat may occur within area	In feature area
[Maroubra perserrata](#) Sawtooth Pipefish [66252]		Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Mitotichthys meraculus Western Crested Pipefish [66259]		Species or species habitat may occur within area	In feature area
Nannocampus subosseus Bonyhead Pipefish, Bony-headed Pipefish [66264]		Species or species habitat may occur within area	In feature area
Phycodurus eques Leafy Seadragon [66267]		Species or species habitat may occur within area	In feature area
Phyllopteryx taeniolatus Common Seadragon, Weedy Seadragon [66268]		Species or species habitat may occur within area	In feature area
Pugnaso curtirostris Pugnose Pipefish, Pug-nosed Pipefish [66269]		Species or species habitat may occur within area	In feature area
Solegnathus lettiensis Gunther's Pipehorse, Indonesian Pipefish [66273]		Species or species habitat may occur within area	In feature area
Stigmatopora argus Spotted Pipefish, Gulf Pipefish, Peacock Pipefish [66276]		Species or species habitat may occur within area	In feature area
Stigmatopora nigra Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277]		Species or species habitat may occur within area	In feature area
Syngnathoides biaculeatus Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area	In feature area
Urocampus carinirostris Hairy Pipefish [66282]		Species or species habitat may occur within area	In feature area
Vanacampus margaritifer Mother-of-pearl Pipefish [66283]		Species or species habitat may occur within area	In feature area
Mammal			

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Arctocephalus forsteri](#) Long-nosed Fur-seal, New Zealand Fur-seal [20]		Species or species habitat may occur within area	In feature area
[Neophoca cinerea](#) Australian Sea-lion, Australian Sea Lion [22]	Endangered	Species or species habitat likely to occur within area	In feature area
Reptile			
[Aipysurus pooleorum](#) Shark Bay Sea Snake [66061]		Species or species habitat may occur within area	In feature area
[Caretta caretta](#) Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area	In feature area
[Chelonia mydas](#) Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
[Dermochelys coriacea](#) Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area	In feature area
[Hydrophis kingii as Disteira kingii](#) Spectacled Sea Snake [93511]		Species or species habitat may occur within area	In feature area
[Hydrophis platura as Pelamis platurus](#) Yellow-bellied Sea Snake [93746]		Species or species habitat may occur within area	In feature area
[Natator depressus](#) Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area

Whales and Other Cetaceans			[Resource Information]
Current Scientific Name	Status	Type of Presence	Buffer Status
Mammal			

Current Scientific Name	Status	Type of Presence	Buffer Status
[Balaenoptera acutorostrata](#) Minke Whale [33]		Species or species habitat may occur within area	In feature area
[Balaenoptera edeni](#) Bryde's Whale [35]		Species or species habitat may occur within area	In feature area
[Balaenoptera musculus](#) Blue Whale [36]	Endangered	Species or species habitat likely to occur within area	In feature area
[Caperea marginata](#) Pygmy Right Whale [39]		Species or species habitat may occur within area	In feature area
[Delphinus delphis](#) Common Dolphin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area	In feature area
[Eubalaena australis](#) Southern Right Whale [40]	Endangered	Breeding known to occur within area	In feature area
[Grampus griseus](#) Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area	In feature area
[Megaptera novaeangliae](#) Humpback Whale [38]		Species or species habitat known to occur within area	In feature area
[Orcinus orca](#) Killer Whale, Orca [46]		Species or species habitat may occur within area	In feature area
[Stenella attenuata](#) Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area	In feature area
[Tursiops aduncus](#) Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area	In feature area

Current Scientific Name	Status	Type of Presence	Buffer Status
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area	In feature area

Australian Marine Parks [Resource Information]

Park Name	Zone & IUCN Categories	Buffer Status
Two Rocks	Multiple Use Zone (IUCN VI)	In buffer area only
Two Rocks	National Park Zone (IUCN II)	In buffer area only

Extra Information

State and Territory Reserves [Resource Information]

Protected Area Name	Reserve Type	State	Buffer Status
Lake Joondalup	Nature Reserve	WA	In buffer area only
Marmion	Marine Park	WA	In feature area
Neerabup	National Park	WA	In buffer area only
Neerabup	Nature Reserve	WA	In buffer area only
Unnamed WA21176	5(1)(h) Reserve	WA	In buffer area only
Unnamed WA43290	Conservation Park	WA	In buffer area only
Woodvale	5(1)(h) Reserve	WA	In buffer area only

Nationally Important Wetlands [Resource Information]

Wetland Name	State	Buffer Status
Joondalup Lake	WA	In buffer area only

EPBC Act Referrals [Resource Information]

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Alkimos Seawater Desalination	2019/8453		Completed	In buffer area only
Expansion of Limestone Extraction	2022/09324		Post-Approval	In buffer area only
Land clearing for timber storage	2022/09367		Completed	In buffer area only
Land Development, James Street and Well Street, East Wanneroo, Elberton Property	2021/9106		Assessment	In buffer area only

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Marine Route Survey for Subsea Fibre Optic Data Cable System - Australia West	2024/09826		Completed	In buffer area only
Upgrade of Flynn Drive to dual carriageway between Tranquil Vista to Old Yanchep Road, CARRAMAR, BANKSIA GROVE and NEERABUP.	2024/09948		Referral Decision	In buffer area only
Wattle Avenue East Quarry	2022/09326		Referral Decision	In buffer area only
Controlled action				
Butler North District Open Space playing fields development, Wanneroo, WA	2017/8053	Controlled Action	Post-Approval	In buffer area only
Catalina Residential Development	2010/5785	Controlled Action	Post-Approval	In buffer area only
Excavate sand and limestone resources	2010/5621	Controlled Action	Completed	In buffer area only
Jindee Residential Development	2012/6631	Controlled Action	Post-Approval	In buffer area only
Limestone extraction on Lot 8 Wattle Avenue, Nowergup	2013/6767	Controlled Action	Post-Approval	In buffer area only
Lot 1665 Wanneroo Road, Sinagra.	2017/7921	Controlled Action	Post-Approval	In buffer area only
Lot 9000 Wanneroo Road Sinagra Mixed Use Development, Western Australia	2020/8798	Controlled Action	Proposed Decision	In buffer area only
Meridian Business Park Industrial Development	2007/3479	Controlled Action	Post-Approval	In buffer area only
Mitchell Freeway Extension and Wanneroo Road Upgrade, WA	2018/8367	Controlled Action	Post-Approval	In buffer area only
Mitchell Freeway Extension between Burns Beach Rd and Hester Av, Neerabup, WA	2013/7091	Controlled Action	Post-Approval	In buffer area only
Mitchell Freeway Principal Shared Path Gaps Project Ocean Reef Road to Hepburn Avenue	2020/8833	Controlled Action	Post-Approval	In buffer area only
National Lifestyle Villages Development	2011/6020	Controlled Action	Post-Approval	In buffer area only
Nava-1 Cable System	2001/510	Controlled Action	Completed	In buffer area only

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Controlled action				
Neerabup Industrial Area, WA	2021/8917	Controlled Action	Assessment Approach	In buffer area only
Neerabup Industrial Estate, Lot 701 Flynn Drive Neerabup WA	2012/6424	Controlled Action	Post-Approval	In buffer area only
Ocean Reef Marina Development	2009/4937	Controlled Action	Completed	In buffer area only
Residential development Lot 1004 Alkimos WA	2011/5902	Controlled Action	Post-Approval	In buffer area only
Shark Hazard Mitigation Drum Line Program, WA	2014/7174	Controlled Action	Completed	In buffer area only
Subdivision of Lot 902 Flynn Drive Neerabup for Industrial Development	2021/8977	Controlled Action	Assessment Approach	In buffer area only
Urban and Residential Development at Lot 9 Brighton	2011/6137	Controlled Action	Post-Approval	In buffer area only
Urban development in accordance with the Local Structure Plan	2008/4601	Controlled Action	Post-Approval	In buffer area only
Urban Residential Development at Lot 9049 Marmoin Avenue	2009/5155	Controlled Action	Post-Approval	In buffer area only
Vegetation Clearing, Wannaroo Rd and Nowergup Rd	2011/5955	Controlled Action	Completed	In buffer area only
Not controlled action				
APX-West Fibre-optic telecommunications cable system, WA to Singapore	2013/7102	Not Controlled Action	Completed	In buffer area only
Butler Railway Extension Project - Nowergup Depot Eastern Alignment	2011/5989	Not Controlled Action	Completed	In buffer area only
Commercial development of Lot 9004 Hodges Drive, Joondalup, WA	2016/7844	Not Controlled Action	Completed	In buffer area only
Connect Joondalup - Lot 9000 McLarty Ave and Lot 999 Piccadilly Circus, Joondalup, WA	2016/7758	Not Controlled Action	Completed	In buffer area only
Container Deposit Scheme Project	2019/8517	Not Controlled Action	Completed	In buffer area only
Development of ECU Engineering Annex, Joondalup Campus, WA	2017/7995	Not Controlled Action	Completed	In buffer area only
Eradication of the European House Borer, Perth metropolitan area, WA	2009/5027	Not Controlled Action	Completed	In buffer area only

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Not controlled action				
Extension of 7.5km of the Joondalup Line electrified passenger railway from Cla	2010/5632	Not Controlled Action	Completed	In buffer area only
Flynn Drive / Pinjar Road Intersection Works, Lot 9000 Flynn Drive, Neerabup, WA	2017/7983	Not Controlled Action	Completed	In buffer area only
Groundwater Replenishment Scheme (GWRS) Stage 2	2016/7786	Not Controlled Action	Completed	In buffer area only
Improving rabbit biocontrol: releasing another strain of RHDV, sthrn two thirds of Australia	2015/7522	Not Controlled Action	Completed	In feature area
INDIGO West Submarine Telecommunications Cable, WA	2017/8126	Not Controlled Action	Completed	In buffer area only
Ocean Reef Marina Development, City of Joondalup, WA	2014/7237	Not Controlled Action	Completed	In buffer area only
Pinjar Motorcycle Park Raceway Development	2012/6419	Not Controlled Action	Completed	In buffer area only
Quinns Main sewer extension, Clarkson - Neerabup, WA	2018/8215	Not Controlled Action	Completed	In buffer area only
Realignment of Flynn Drive	2011/6170	Not Controlled Action	Completed	In buffer area only
Residential Development, Lots 10 Dundebar Road and 28 and 29 Belgrade Road, East Wanneroo, WA	2019/8521	Not Controlled Action	Completed	In buffer area only
Residential Subdivision - Lots 12, 36 & 38 Capron St, Wanneroo	2012/6409	Not Controlled Action	Completed	In buffer area only
Seismic Survey, Bremer Basin, Mentelle Basin and Zeewyck Sub-basin	2004/1700	Not Controlled Action	Completed	In buffer area only
Wanneroo Road/Ocean Reef Road Grade Separation, Pearsall, WA	2017/8110	Not Controlled Action	Completed	In buffer area only
Wanneroo Road Duplication, WA	2015/7632	Not Controlled Action	Completed	In buffer area only
Not controlled action (particular manner)				
Australia to Singapore Fibre Optic Submarine Cable System	2011/6127	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only
Laying a submarine optical fibre telecommunications cable, Perth to Singapore and Jakarta	2014/7332	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Not controlled action (particular manner)				
Road realignment and widening	2009/4926	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only
Subdivision Lot 4 Flynn Drive and earthworks for industrial development, 240 Fl	2009/5028	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only

Key Ecological Features [Resource Information]

Key Ecological Features are the parts of the marine ecosystem that are considered to be important for the biodiversity or ecosystem functioning and integrity of the Commonwealth Marine Area.

Name	Region	Buffer Status
Commonwealth marine environment within and adjacent to the west coast inshore lagoons	South-west	In buffer area only
Western rock lobster	South-west	In buffer area only

Biologically Important Areas [Resource Information]

Scientific Name	Behaviour	Presence	Buffer Status
Seabirds			
Ardenna pacifica			
Wedge-tailed Shearwater [84292]	Foraging (in high numbers)	Known to occur	In feature area
Hydroprogne caspia			
Caspian Tern [808]	Foraging (provisioning young)	Known to occur	In feature area
Larus pacificus			
Pacific Gull [811]	Foraging (in high numbers)	Former Range	In feature area
Onychoprion anaethetus			
Bridled Tern [82845]	Foraging (in high numbers)	Known to occur	In feature area
Puffinus assimilis tunneyi			
Little Shearwater [59363]	Foraging (in high numbers)	Known to occur	In feature area
Sterna dougallii			
Roseate Tern [817]	Foraging	Known to occur	In feature area

Scientific Name	Behaviour	Presence	Buffer Status
[Sternula nereis](#) Fairy Tern [82949]	Foraging (in high numbers)	Known to occur	In feature area
Seals			
[Neophoca cinerea](#) Australian Sea Lion [22]	Foraging (male)	Likely to occur	In feature area
Whales			
[Megaptera novaeangliae](#) Humpback Whale [38]	Migration (north)	Known to occur	In buffer area only
[Megaptera novaeangliae](#) Humpback Whale [38]	Migration (north and south)	Known to occur	In feature area

Caveat

1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data is available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance on the contents of this report.

3 DATA SOURCES

Threatened ecological communities

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

Threatened, migratory and marine species

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

Where little information is available for a species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc.).

In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More detailed distribution mapping methods are used to update these distributions when time permits.

4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

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

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded breeding sites; and
- seals which have only been mapped for breeding sites near the Australian continent

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

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

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

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

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

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Appendix F: Flora species list

Family	Species	Status
Apiaceae	*Daucus glochidiatus*	
Asparagaceae	*Acanthocarpus preissii*	
	Lomandra maritima	
Asteraceae	**Lactuca serriola*	Permitted – s11
	**Sonchus asper*	Permitted – s11
	**Sonchus oleraceus*	Permitted – s11
	**Urospermum picroides*	Permitted – s11
	Olearia axillaris	
	Rhodanthe corymbosa	
Caryophyllaceae	**Cerastium glomeratum*	Permitted – s11
	**Stellaria media*	Permitted – s11
Chenopodiaceae	*Rhagodia baccata*	
	Threlkeldia diffusa	
Crassulaceae	**Crassula glomerata*	Permitted – s11
	Crassula colorata	
Cyperaceae	*Lepidosperma ?calcicola*	
Ericaceae	*Leucopogon parviflorus*	
Fabaceae	**Melilotus indicus*	Permitted – s11
	Acacia cyclops	
	Acacia truncata	
	Hardenbergia comptoniana	
	Templetonia retusa	
Goodeniaceae	*Scaevola nitida*	
Haemodoraceae	*Conostylis setigera*	
Hemerocallidaceae	*Dianella revoluta*	
	Tricoryne elatior	
Iridaceae	**Gladiolus caryophyllaceus*	Permitted – s11
	**Romulea rosea*	Permitted – s11
Lauraceae	*Cassytha flava*	
Malvaceae	*Thomasia triphylla*	
Montiaceae	*Calandrinia tholiformis*	
Myrtaceae	*Melaleuca huegelii*	
	Melaleuca systena	
Orchidaceae	*Caladenia latifolia*	
Oxalidaceae	**Oxalis pes-caprae*	Permitted – s11
Phyllanthaceae	*Lysiandra calycina*	
Poaceae	**Briza maxima*	Permitted – s11
	**Catapodium rigidum*	Permitted – s11
	**Ehrharta calycina*	Permitted – s11
	**Ehrharta longiflora*	Permitted – s11
	Austrostipa flavescens	
	Poa poiformis	

Family	Species	Status
Primulaceae	**Lysimachia arvensis*	Permitted – s11
Proteaceae	*Banksia dallanneyi*	
	Banksia sessilis	
	Grevillea preissii	
Ranunculaceae	*Clematis linearifolia*	
Rhamnaceae	*Spyridium globulosum*	
	Trymalium ledifolium	
Rubiaceae	**Galium murale*	Permitted – s11
	Opercularia vaginata	
Santalaceae	*Exocarpos sparteus*	
Scrophulariaceae	*Eremophila glabra*	

Appendix G: Species by site matrix

Species Name	HM1	HM2	HM3	ELA23
**Briza maxima*	x	x		x
**Briza minor*				x
**Bromus diandrus*				x
**Carpobrodus edulis*				x
**Catapodium rigidum*	x	x	x	x
**Cerastium glomeratum*	x	x	x	
**Crassula glomerata*	x	x		x
**Ehrharta calycina*	x			x
**Ehrharta longiflora*	x	x	x	x
**Galium murale*	x	x		x
**Gladiolus caryophyllaceus*	x			x
**Lactuca serriola*	x		x	
**Lysimachia arvensis*	x	x	x	x
**Melilotus indicus*	x	x	x	x
**Oxalis pes-caprae*	x			x
**Romulea rosea*	x	x		
**Sonchus asper*	x	x		
**Sonchus oleraceus*	x	x	x	x
**Stellaria media*	x	x	x	x
**Urospermum picroides*	x			
Acacia cyclops	x		x	x
Acacia rostellifera				x
Acacia truncata	x		x	x
Acanthocarpus preissii	x	x		
Austrostipa flavescens	x	x	x	
Banksia dallanneyi		x	x	
Banksia sessilis		x	x	
Caladenia latifolia		x	x	
Calandrinia tholiformis	x			x
Cassytha flava	x	x	x	x
Clematis linearifolia		x		
Conostylis setigera	x			x
Crassula colorata		x		x
Daucus glochidiatus	x	x	x	x
Dianella revoluta	x	x		x
Eremophila glabra	x	x	x	x
Exocarpos sparteus			x	
Grevillea preissii	x	x	x	x
Hardenbergia comptoniana	x	x	x	x
Lepidosperma ?calcicola	x		x	
Leucopogon parviflorus	x	x	x	x
Lomandra maritima	x	x	x	x

Species Name	HM1	HM2	HM3	ELA23
Lysiandra calycina	x	x		
Melaleuca huegelii	x	x	x	x
Melaleuca systena			x	
Olearia axillaris	x	x	x	x
Opercularia vaginata		x		
Parietaria cardiostegia	x			x
Poa poiformis	x	x	x	
Rhagodia baccata	x	x	x	x
Rhodanthe corymbosa	x	x		x
Scaevola nitida			x	
Spyridium globulosum	x	x	x	x
Templetonia retusa	x	x	x	x
Thomasia triphylla		x		
Threlkeldia diffusa	x	x		x
Tricoryne elatior		x	x	
Trymalium ledifolium		x	x	

Appendix H: Quadrat data

Site name	Date	Site type	Observer
HM1	4/9/2024	Quadrat 10 x 10m	JC
Vegetation condition	**Disturbance**	**Age since fire (years)**	**Vegetation community**
Very Good	Weeds	Old (>20)	SgMhAr
Habitat description	**Landform unit**	**Aspect**	**Slope (%)**
Melaleuca huegelii heath	Crest, Hill	W	5
Soil colour	**Soil type**	**Rock type**	**Outcropping (%)**
Brown	Fine skeletal sand	Limestone	20 – 50%
Easting		**Northing**	
378773		6488501	

Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Eremophila glabra	5	U	Shrubs 1-2m
Melaleuca huegelii	30	M	Shrubs <1m
Templetonia retusa	5	M	Shrubs <1m
Rhagodia baccata	2.5	M	Shrubs <1m
Lysiandra calycina	2	M	Shrubs <1m
Spyridium globulosum	2	M	Shrubs <1m
Grevillea preissii	1	M	Shrubs <1m
Acacia truncata	0.5	M	Shrubs <1m

Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Threlkeldia diffusa	0.5	M	Shrubs <1m
Acacia cyclops	0.2	M	Shrubs <1m
Leucopogon parviflorus	0.2	M	Shrubs <1m
Olearia axillaris	0.2	M	Shrubs <1m
**Ehrharta longiflora*	3	M	Grasses
**Briza maxima*	0.5	M	Grasses
**Catapodium rigidum*	0.1	G	Grasses
**Ehrharta calycina*	0.1	G	Grasses
Austrostipa flavescens	0.1	G	Grasses
Poa poiformis	0.1	G	Grasses
Lepidosperma ?calcicola	0.1	G	Sedges
Hardenbergia comptoniana	0.5	G	Climber
Cassytha flava	0.1	G	Climber
**Melilotus indicus*	5	G	Herbs
**Cerastium glomeratum*	0.5	G	Herbs
**Lysimachia arvensis*	0.5	G	Herbs
**Galium murale*	0.2	G	Herbs
**Sonchus oleraceus*	0.2	G	Herbs
Acanthocarpus preissii	0.2	G	Herbs
**Crassula glomerata*	0.1	G	Herbs
**Gladiolus caryophyllaceus*	0.1	G	Herbs
**Lactuca serriola*	0.1	G	Herbs
**Oxalis pes-caprae*	0.1	G	Herbs
**Romulea rosea*	0.1	G	Herbs
**Sonchus asper*	0.1	G	Herbs
**Stellaria media*	0.1	G	Herbs
**Urospermum picroides*	0.1	G	Herbs
Calandrinia tholiformis	0.1	G	Herbs
Conostylis setigera	0.1	G	Herbs
Daucus glochidiatus	0.1	G	Herbs
Dianella revoluta	0.1	G	Herbs
Lomandra maritima	0.1	G	Herbs
Parietaria cardiostegia	0.1	G	Herbs
Rhodanthe corymbosa	0.1	G	Herbs

Site name	Date	Site type	Observer
HM2	4/9/2024	Quadrat 10 x 10m	JC
Vegetation condition	**Disturbance**	**Age since fire (years)**	**Vegetation community**
Very Good	Weeds	Old (>20)	SgMhAr
Habitat description	**Landform unit**	**Aspect**	**Slope (%)**
Melaleuca huegelii heath	Crest, Hill	W	5
Soil colour	**Soil type**	**Rock type**	**Outcropping (%)**
Grey-brown	Fine skeletal sand	Limestone	20 – 50%
Easting		**Northing**	
378887		6488348	

Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Opercularia vaginata	1.5	U	Shrubs 1-2m
Eremophila glabra	1	U	Shrubs 1-2m
Melaleuca huegelii	45	U	Shrubs <1m
Spyridium globulosum	5	U	Shrubs <1m
Grevillea preissii	2.5	M	Shrubs <1m
Rhagodia baccata	2	M	Shrubs <1m
Banksia sessilis	0.5	M	Shrubs <1m
Leucopogon parviflorus	0.5	M	Shrubs <1m
Lysiandra calycina	0.5	M	Shrubs <1m
Banksia dallanneyi	0.2	M	Shrubs <1m

Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Olearia axillaris	0.2	M	Shrubs <1m
Templetonia retusa	0.2	M	Shrubs <1m
Threlkeldia diffusa	0.2	M	Shrubs <1m
Thomasia triphylla	0.1	M	Shrubs <1m
Trymalium ledifolium	0.1	M	Shrubs <1m
**Ehrharta longiflora*	4	M	Grasses
**Briza maxima*	0.5	M	Grasses
Poa poiformis	0.2	G	Grasses
**Catapodium rigidum*	0.1	G	Grasses
Austrostipa flavescens	0.1	G	Grasses
Hardenbergia comptoniana	0.2	G	Climber
Cassytha flava	0.1	G	Climber
Clematis linearifolia	0.1	G	Climber
**Melilotus indicus*	5	G	Herbs
Lomandra maritima	0.5	G	Herbs
**Cerastium glomeratum*	0.2	G	Herbs
**Galium murale*	0.2	G	Herbs
**Lysimachia arvensis*	0.2	G	Herbs
**Sonchus oleraceus*	0.2	G	Herbs
Daucus glochidiatus	0.2	G	Herbs
**Crassula glomerata*	0.1	G	Herbs
**Romulea rosea*	0.1	G	Herbs
**Sonchus asper*	0.1	G	Herbs
**Stellaria media*	0.1	G	Herbs
Acanthocarpus preissii	0.1	G	Herbs
Caladenia latifolia	0.1	G	Herbs
Crassula colorata	0.1	G	Herbs
Dianella revoluta	0.1	G	Herbs
Rhodanthe corymbosa	0.1	G	Herbs
Tricoryne elatior	0.1	G	Herbs

Site name	Date	Site type	Observer
HM3	4/9/2024	Quadrat 10 x 10m	JC
Vegetation condition	**Disturbance**	**Age since fire (years)**	**Vegetation community**
Very Good	Weeds	Old (>20)	SgMhAr
Habitat description	**Landform unit**	**Aspect**	**Slope (%)**
Melaleuca huegelii heath	Crest, Hill	W	5
Soil colour	**Soil type**	**Rock type**	**Outcropping (%)**
Grey-brown	Fine skeletal sand	Limestone	20 – 50%
Easting		**Northing**	
378916		6488245	

Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Eremophila glabra	2.5	U	Shrubs 1-2m
Exocarpos sparteus	0.5	U	Shrubs 1-2m
Spyridium globulosum	0.5	U	Shrubs 1-2m
Melaleuca huegelii	40	U	Shrubs <1m
Rhagodia baccata	5	U	Shrubs <1m
Templetonia retusa	2	U	Shrubs <1m
Acacia truncata	1	U	Shrubs <1m
Banksia sessilis	1	U	Shrubs <1m
Olearia axillaris	1	M	Shrubs <1m
Grevillea preissii	0.5	M	Shrubs <1m

Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Melaleuca systena	0.5	M	Shrubs <1m
Trymalium ledifolium	0.5	M	Shrubs <1m
Acacia cyclops	0.2	M	Shrubs <1m
Leucopogon parviflorus	0.2	M	Shrubs <1m
Banksia dallanneyi	0.1	M	Shrubs <1m
**Ehrharta longiflora*	2	G	Grasses
Poa poiformis	0.2	G	Grasses
**Catapodium rigidum*	0.1	G	Grasses
Austrostipa flavescens	0.1	G	Grasses
Lepidosperma ?calcicola	0.1	G	Sedges
**Melilotus indicus*	5	G	Herbs
**Sonchus oleraceus*	0.5	G	Herbs
**Lactuca serriola*	0.2	G	Herbs
**Lysimachia arvensis*	0.2	G	Herbs
Daucus glochidiatus	0.2	G	Herbs
Lomandra maritima	0.2	G	Herbs
**Cerastium glomeratum*	0.1	G	Herbs
**Stellaria media*	0.1	G	Herbs
Caladenia latifolia	0.1	G	Herbs
Scaevola nitida	0.1	G	Herbs
Tricoryne elatior	0.1	G	Herbs
Hardenbergia comptoniana	0.5	G	Climber
Cassytha flava	0.1	G	Climber

Site name	Date	Site type	Observer
ELA23 (ELA 2021)	30/9/2020	Quadrat 10 x 10m	JC
Vegetation condition	**Disturbance**	**Age since fire (years)**	**Vegetation community**
Excellent	Weeds	Old (>20)	SgMhAr
Habitat description	**Landform unit**	**Aspect**	**Slope (%)**
Limestone heath	Rise	W	1
Soil colour	**Soil type**	**Rock type**	**Outcropping (%)**
Brown	Fine	Limestone	10 – 20%
Easting		**Northing**	
378806		6488840	

Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Melaleuca huegelii	15	M	Shrub <5m
Spyridium globulosum	15	M	Shrub <5m
Acacia cyclops	2	M	Shrub <5m
Acacia truncata	0.5	M	Shrub <5m
Acacia rostellifera	0.1	M	Shrub <5m
Leucopogon parviflorus	0.05	M	Shrub <5m
Templetonia retusa	0.05	M	Shrub <5m
Olearia axillaris	0.5	M	Shrub <3m
Eremophila glabra	0.2	M	Shrub <2m
Rhagodia baccata	0.2	M	Shrub <2m

Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Grevillea preissii	0.1	M	Shrub <2m
**Ehrharta calycina*	1	G	Grass
**Briza maxima*	0.5	G	Grass
**Ehrharta longiflora*	0.2	G	Grass
**Bromus diandrus*	0.1	G	Grass
**Briza minor*	0.05	G	Grass
**Catapodium rigidum*	0.05	G	Grass
**Galium murale*	0.03	G	Grass
**Lysimachia arvensis*	0.2	G	Herb
**Melilotus indicus*	0.2	G	Herb
Lomandra maritima	0.2	G	Herb
Parietaria cardiostegia	0.2	G	Herb
**Carpobrotus edulis*	0.1	G	Herb
Cassytha flava	0.1	G	Herb
Conostylis setigera	0.1	G	Herb
Dianella revoluta	0.1	G	Herb
Poaceae sp.	0.1	G	Herb
Threlkeldia diffusa	0.1	G	Herb
**Gladiolus caryophyllaceus*	0.05	G	Herb
**Stellaria media*	0.05	G	Herb
Daucus glochidiatus	0.05	G	Herb
Rhodanthe corymbosa	0.05	G	Herb
**Crassula glomerata*	0.02	G	Herb
Crassula colorata	0.02	G	Herb
**Sonchus oleraceus*	0.01	G	Herb
Calandrinia tholiformis	0.01	G	Herb
Hardenbergia comptoniana	0.1	G	Climber

Appendix I: DAWE (2022) scoring tool

Starting score	Carnaby's Cockatoo		
10	**Start at a score of 10** if your site is native shrubland, kwongkan 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.**		
Attribute	**Subtractions**	**Context adjustor (attributes reducing functionality of foraging habitat)**	**Evidence from field survey**
Foraging potential	-2	Subtract 2 from your score if there is no evidence of feeding debris on your site.	No evidence observed.
Connectivity	0	Subtract 2 from your score if you have evidence to conclude that there is no other foraging habitat within 12 km of your site.	There are multiple patches of potential foraging habitat within 12 km of the survey area.
Proximity to breeding	0	Subtract 2 if you have evidence to conclude that your site is more than 12 km from breeding habitat.	The survey area is located 4 km north-west of confirmed natural and artificial hollows at ECU Joondalup campus.
Proximity to roosting	0	Subtract if you have evidence to conclude that your site is more than 20 km from a known night roosting habitat.	Seven confirmed white-tailed (Carnaby's and/or Baudin's) roosts within 12 km of the survey area. The closest known confirmed roost occurs 3.4 km north-east of the survey area (WANTAMR001).
Impact from significant plant disease	0	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.	Disease was not observed during the field survey.
Total score	**8**		
Appraisal	A total of 4.6 ha is considered to be High quality for Carnaby's Cockatoo		

Ocean Reef Foreshore Reserve Honeymyrtle Shrubland TEC and Black Cockatoo habitat assessment

City of Joondalup

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Document Tracking

Project Name:	Ocean Reef Foreshore Reserve Honeymyrtle Shrubland TEC and Black Cockatoo habitat assessment
Project Number:	24PER8879
Project Manager:	Glenn Harris-Maslen

Version	Prepared by	Reviewed by	Approved by	Status	Date
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Acknowledgements

This document has been prepared by Eco Logical Australia Pty Ltd with support from City of Joondalup.

Abbreviations

Abbreviation	Description
BC Act	*Biodiversity Conservation Act 2016*
CR	Critically Endangered
DAWE	Department of Agriculture, Water and Environment
DBCA	Department of Biodiversity, Conservation and Attractions
DBH	Diameter at breast height
DCCEEW	Department of Climate Change, Energy, the Environment and Water
DEC	Department of Environment and Conservation
DoEE	Department of the Environment and Energy
DEWHA	Department of the Environment, Water, Heritage and the Arts
DPaW	Department of Parks and Wildlife
DPIRD	Department of Primary Industries and Regional Development
DWER	Department of Water and Environmental Regulation
ELA	Eco Logical Australia Pty Ltd
EPA	Environmental Protection Authority
EN	Endangered
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
FCT	Floristic Community Type
nMDS	Non-metric Multi-Dimensional Scaling
NVIS	National Vegetation Information System
PEC	Priority Ecological Community
PMST	Protected Matters Search Tool
PRIMER	Plymouth Routines in Multivariate Ecological Research
TEC	Threatened Ecological Community
TSSC	Threatened Species Scientific Committee
VU	Vulnerable
WAH	Western Australian Herbarium
WAM	Western Australian Museum
WAOL	Western Australian Organism List
WoNS	Weed of National Significance

Executive Summary

Eco Logical Australia (ELA) were engaged by the City of Joondalup (the City) to undertake a targeted threatened ecological community and black cockatoo habitat assessment of Ocean Reef Foreshore (the survey area). The survey area is 15.9 ha in size and located approximately 26 km north of Perth, Western Australia.

Specifically, ELA were engaged to undertake a targeted survey for the Honeymyrtle shrubland on limestone ridges of the Swan Coastal Plain threatened ecological community (herein referred to as the Honeymyrtle Shrubland TEC), listed as Critically Endangered under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and *Biodiversity Conservation Act 2016* (BC Act). ELA were previously engaged to map vegetation communities (including conservation-significant communities) within the survey area in 2023, however the Federally-listed Honeymyrtle Shrubland TEC was listed under the EPBC Act after the field survey had been undertaken and, as such, an assessment against the key diagnostic characteristics listed in the approved conservation advice of the TEC was not completed as part of that assessment (ELA 2024). The Honeymyrtle Shrubland TEC has previously been listed under the BC Act as the '*Melaleuca huegelii – M. systena* shrublands of limestone ridges (floristic community type 26a as originally described in Gibson *et al.* 1994)'; however confirmation of its presence is defined by statistical analysis and comparison against the Gibson *et al.* (1994) floristic community types which was completed by ELA in 2023 (and found to not be present in the survey area).

In addition, ELA were engaged to undertake a targeted survey for black cockatoos listed under the EPBC Act and *Biodiversity Conservation Act 2016* (BC Act), including:

- Baudin's Cockatoo (*Zanda baudinii*; listed as Endangered [EN] under the EPBC Act and BC Act);
- Carnaby's Cockatoo (*Zanda latirostris*; listed as Endangered [EN] under the EPBC Act and BC Act); and
- Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*; listed as Vulnerable [VU] under the EPBC Act and BC Act).

A comprehensive desktop assessment was undertaken to assess the potential presence of Black Cockatoos and the Honeymyrtle Shrubland TEC in the survey area prior to the survey. Given that the survey area is located in the 'community likely to occur range' on the Species Profile and Threats Database (SPRAT) (DCCEEW 2024a).

The survey area occurs in the 'likely to occur' range of the Forest Red-tailed Black Cockatoo and Carnaby's Cockatoo however is outside of the predicted range of the Baudin's Cockatoo. As such, the survey focussed on assessing the habitat values for Carnaby's and Forest Red-tailed Black Cockatoo in the survey area.

The Targeted Honeymyrtle Shrubland TEC assessment and Black Cockatoo habitat assessment was conducted on the 6th and 5th of September 2024 respectively in accordance with the EPA Technical Guidance for Flora and Vegetation (EPA 2016) and the Referral guideline for 3 WA threatened black cockatoo species: Carnaby's Cockatoo, Baudin's Cockatoo, and the Forest Red-tailed Black cockatoo (DAWE 2022). Two quadrats were established within the survey area to confirm the presence of the Honeymyrtle Shrubland TEC. These sample locations were established in addition to five quadrats completed by ELA in 2023 for the purposes of mapping vegetation communities within the survey area (ELA 2024). The black cockatoo habitat assessment was undertaken by walking transects across the survey area and mapping black cockatoo habitat.

A total of 60 flora species (41 native and 19 introduced) from 32 families and 50 genera were recorded from the two quadrats established within the survey area in 2024. No Threatened flora species listed

under the EPBC Act or BC Act or Priority species listed by DBCA were recorded within the quadrats. A total of 19 introduced (weed) species were recorded within quadrats, representing 32% of the total species recorded. All these species are listed on the Western Australian Organism List Database as permitted (s-11) species (DPIRD 2024), indicating that no specific management of these species is required.

Vegetation within the survey area was assessed against the key diagnostic characteristics outlined in the Honeymyrtle Shrubland TEC approved conservation advice (DCCEEW 2023) to determine the presence of the TEC in the survey area. The primary defining features of the Honeymyrtle Shrubland TEC include location, species assemblage, patch size, and vegetation condition. Two patches of Honeymyrtle Shrubland TEC were identified within the survey area totalling 0.8 ha in size. Both patches were located in the north of the survey area within the '*Melaleuca cardiophylla* Closed Heath' vegetation community (previously mapped by ELA in 2023). These patches contained sufficient coverage of key floristic indicators and occurred on skeletal soils of Tamala-limestone derived outcrops and low rises in the survey area.

To confirm the presence of the state-listed Honeymyrtle Shrubland TEC listed under the BC Act, ELA quadrats and vegetation communities were compared to FCTs defined by Gibson *et al.* (1994) using multivariate analysis. This analysis supported previous findings by ELA (2021) that vegetation in the '*Melaleuca cardiophylla* Closed Heath' community (in which areas of potential Honeymyrtle Shrubland TEC are located in the survey area) did not floristically align with FCT26a and therefore did not represent the state-listed Honeymyrtle Shrubland TEC. Quadrats were found to have a moderate to strong floristic affiliation with FCT29a 'coastal shrublands on shallow sands' and FCT24 'Northern Spearwood shrublands and woodlands', listed as Priority 3 ecological communities by DBCA.

No primary or secondary evidence of use of the survey area by black cockatoos was recorded during the assessment. This included no direct sightings or heard calls, or evidence of foraging. No breeding or roosting habitat was recorded within the survey area during the assessment. One vegetation community, the '*Melaleuca cardiophylla* Closed Heath' community was mapped as Negligible to Low foraging quality for Carnaby's Cockatoos due to the scattered presence of *Banksia sessilis*. The rest of the vegetation in the survey area was found to have no foraging value for Carnaby's Cockatoos. No foraging vegetation was recorded for Forest Red-tailed Black Cockatoos.

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1. Introduction

1.1. Project background

Eco Logical Australia (ELA) were engaged by the City of Joondalup (the City) to undertake a Targeted Honeymyrtle Shrubland TEC assessment and Black Cockatoo habitat assessment of the Ocean Reef Foreshore Reserve (herein referred to as the survey area). The survey area is 15.9 ha in size and located approximately 24 km north of Perth, Western Australia (Error! Reference source not found.).

Specifically, the objectives of this assessment include:

- An assessment to verify if the vegetation meets the requirements specified in the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) 'Approved Conservation Advice (incorporating listing advice) for Honeymyrtle shrubland on limestone ridges of the Swan Coastal Plain ecological community', using the assessment process itemised in the Approved Conservation Advice (DCCEEW 2023);
- An assessment to verify if the vegetation meets the requirements specified in the State *Biodiversity Conservation Act 2016* (BC Act) for *Melaleuca huegelii – M. systena* shrublands of limestone ridges (floristic community type 26a as originally described in Gibson *et al.* 1994);and
- A targeted habitat assessment for Black Cockatoos, including the Carnaby's Cockatoo (*Zanda latirostris*; listed as Endangered [EN] under the EPBC Act and BC Act) and Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso;* listed as Vulnerable [VU] under the EPBC Act and BC Act).

1.2. Scope of works

The purpose of this project was to provide an assessment of the presence of Honeymyrtle Shrubland TEC and Black Cockatoo Habitat within the survey area. This technical report addresses the following items:

- Undertaking an initial desktop assessment to determine environmental values such as flora, vegetation, and ecological communities relating to the survey area;
- Undertaking a field survey to assess values pertaining to Honeymyrtle Shrubland TEC and Black Cockatoo habitat values;
- Preparation of a technical targeted Honeymyrtle Shrubland TEC and Black Cockatoo habitat survey report; and
- Provision of all spatial/mapping data collected during the survey.

Figure 1: Survey area location

Survey area
Distributor Road
Access Road

N

0 25 50 100
Metres

Datum/Projection:
GDA 1994 MGA Zone 50

24PER8879-GM Date: 4/12/2024

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2. Environmental setting

2.1. Geology, landforms, and soils

The Perth Basin, on which the Swan Coastal Plain is located, is filled by Mesozoic to recent sediments. During the Quarternary the coastal plain was formed by deposition of sediments on an underlying eroded embayment, which reaches east to the Darling Scarp (Beard 1990). Three dune systems run parallel to the present coastline and from west to east (i.e. youngest to oldest), namely the Quindalup, Spearwood, and Bassendean systems.

Soil-landscape mapping prepared by the Department of Primary Industries and Regional Development (DPIRD) provides an inventory and condition survey of lands at a 1:250,000 scale (DPIRD 2022). The survey area is located primarily on the Quindalup South Dune System, with some minor areas located on the Spearwood Dune System (namely some areas in the southern part of the survey area). The Quindalup Dune System is the youngest of the aeolian dune systems associated with the Swan Coastal Plain. It is characterised by unconsolidated white calcareous sands that form a series of dunes and beach-ridge plains (DPIRD 2022). The Spearwood Dune System is comprised of sand overlaying cemented coastal limestone (i.e. Tamala Limestone) (Semeniuk & Glassford 1989). It is characterised by yellow deep sands, pale deep sands, and yellow/brown shallow sands that lay to the east of the Quindalup dune system (DPIRD 2022).

2.2. Regional vegetation

Vegetation type and extent have been mapped at a regional scale by Beard (1979) who categorised vegetation into broad vegetation associations. Based on this mapping at a scale of 1:250,000, DPIRD has compiled a list of vegetation extent ant types across Western Australia (DPIRD 2019; Shepherd *et al.* 2002). Two system-vegetation associations, Spearwood 949 and Spearwood 1007 occur within the survey area (DPIRD 2019). The floristic description of the 949 vegetation association is described as consisting of Acacia spp., Banksia spp., *Agonis flexuosa,* Callitris spp., Allocasuarina spp., and *Eucalyptus loxophleba* Low woodland or open low woodland (Shepherd *et al.* 2002). The 949 vegetation association has 56.45% of its total pre-European extent remaining in the SWA02 subregion (Error! Reference source not found.). The 1007 vegetation association is described as a mosaic of shrublands dominated by *Acacia cyclops, A. lasiocarpa, A. rostellifera,* or *Melaleuca acerosa* (Shepherd *et al.* 2002; Error! Reference source not found.).

Table 1: Beard's (1979) vegetation associations in the survey area

Vegetation association	Vegetation description	Pre-European extent in SWA02 subregion (ha)	Current extent in SWA02 subregion (ha)	% Remaining in SWA02 subregion
949	Low woodland; banksia (*Banksia* sp.)	184,476	104,129	56.5
1007	Mosaic: Shrublands; *Acacia lasiocarpa* & *Melaleuca acerosa* heath / Shrublands; *Acacia rostellifera* & *Acacia cyclops* thicket	30,110	20,680	68.7

Vegetation within the Perth metropolitan area has been described by Heddle *et al.* (1980) as System 6 vegetation complexes. The survey area occurs within the Quindalup complex (Table 2).

Table 2: System 6 vegetation complexes within the survey area

Vegetation complex	System 6 code	Description	Pre-European extent in Swan Coastal Plain (ha)	Current extent in Swan Coastal Plain (ha)	% remaining
Quindalup	55	Coastal dune complex consisting mainly of two alliances - the strand and fore-dune alliance and the mobile and stable dune alliance. Local variations include the low closed forest of *Melaleuca lanceolata* (Rottnest Teatree) - *Callitris preissii* (Rottnest Island Pine), the closed scrub of *Acacia rostellifera* (Summer-scented Wattle) and the low closed *Agonis flexuosa* (Peppermint) forest of Geographe Bay.	38,402.3	21,009.1	54.7

Source: Webb *et al.* 2018

2.3. Previous vegetation mapping

A total of four vegetation communities were delineated and mapped within the survey area during surveys conducted by ELA in 2023 (Table 3) (ELA 2024). Vegetation within the survey area was dominated by the 'Mixed Open Shrubland' vegetation community, while smaller areas of other vegetation communities occurred throughout. This included the '*Acacia rostellifera* Shrubland' community which occurred primarily along Ocean Reef Road (on the eastern boundary of the survey area), the '*Melaleuca cardiophylla* Closed Heath' community which occurred in two main patches in the north and south of the survey area, and one small patch of the '*Spinifex hirsutus* and **Thinopyrum distichum* Grassland' community in the north of the survey area. In addition to remnant vegetation, the western boundary of the survey area is comprised of Open Beach/Rocks, while there are cleared areas and walking trails throughout the survey area.

The results of statistical analysis of vegetation communities completed by ELA in 2023 found that the 'Mixed Open Shrubland' vegetation community had a moderate affiliation with FCT29a, listed as a Priority 3 ecological community by DBCA (ELA 2024). One quadrat within a patch of the '*Melaleuca cardiophylla'* Closed Heath community was found to have a moderate affiliation with FCT24, described as 'Northern Spearwood shrublands and woodland' and listed as a Priority 3 ecological community by DBCA. It was noted by ELA (2024) that the Honeymyrtle Shrubland TEC was listed under the EPBC Act from 15 November 2023 (post-field survey) and an assessment against the key diagnostic characteristics listed in the approved conservation advice for the TEC was not completed.

Vegetation condition within the survey area ranged from Excellent to Completely Degraded condition based on the Keighery (1994) vegetation condition scale, with most of the survey area being assessed by ELA in 2023 as being in Excellent condition (ELA 2024).

Table 3: Previously mapped vegetation communities within Ocean Reef Foreshore Reserve (ELA 2024).

Vegetation community	Vegetation description	Area (ha)	% of the survey area
Acacia rostellifera Shrubland	*Acacia rostellifera* Shrubland over mixed shrubland; *Scaevola crassifolia, Rhagodia baccata* and *Spyridium globulosum* and an understorey of weedy grasses and herbs such as **Bromus diandrus, *Ehrharta longiflora,* and **Euphorbia terracina.* This vegetation type occurs on the tertiary dunes at the eastern edge of the site.	2.3	14.5
Melaleuca cardiophylla Closed Heath	Mixed Open Shrubland of *Olearia axillaris, Rhagodia baccata,* and *Scaevola crassifolia* and other mixed shrubs over an understorey of weedy grasses and mixed herbs. This vegetation type occurs on the secondary and tertiary dunes along the length of the entire site.	2.1	13.3
Mixed Open Shrubland	Closed heath of *Melaleuca cardiophylla* over *Styphelia insularis* and mixed shrubs and an understorey of mixed herbs and weedy grasses. This vegetation type is situated on shallow sand over limestone.	9.4	59.2
Spinifex hirsutus and **Thinopyrum distichum* Grassland	*Spinifex hirsutus* and **Thinopyrum distichum* Grassland with sparse *Olearia axillaris* shrubs. This vegetation type occurs along the foredunes on the western edge of the site.	0.1	0.8
	Open Beach/Rocks	1.5	9.2
	Tracks/Cleared Areas	0.5	3.2
	Total	15.9	100

3. Methodology

3.1. Desktop review

3.1.1. Database searches

The following databases were searched for information relating to Black Cockatoos and conservation-significant ecological communities (Table 4). The applied search buffers are considered suitable based on ecological communities and fauna expected to occur within the survey area. Additionally, Commonwealth and State government spatial datasets for land-system mapping and regional vegetation mapping were reviewed, as described in Sections 2.2 and 2.3.

Table 4: Database searches undertaken for the survey area

Database	Reference	Search area
Commonwealth EPBC Act Protected Matters Search Tool (PMST) for Matters of National Environmental Significance (MNES), including any Threatened species listed under the EPBC Act.	DCCEEW 2024a	10 km buffer around the survey area
DBCA database search – Honeymyrtle Shrubland TEC (listed under EPBC Act and BC Act)	DBCA 2024a	All known boundaries of Honeymyrtle Shrubland TEC
DBCA database search – conservation significant fauna	DBCA 2024b	10 km buffer around survey area
Birdlife roosting dataset	Birdlife 2024	12 km buffer around survey area
City of Joondalup Black Cockatoo dataset	City of Joondalup 2024	12 km buffer around survey area

3.1.2. Likelihood of occurrence assessment

An assessment of the likelihood of presence of Threatened and Priority ecological communities within the survey area was undertaken. The assessment is based on specific likelihood of occurrence criteria. The criteria include factors such as: location and recency of previous records in relation to the survey area; and suitable landforms, soils, and habitat that appear to be present based on the desktop review. Conservation codes, categories, and criteria for flora, fauna, and ecological communities protected under the EPBC Act and BC Act are provided in Appendix A. Criteria used for the likelihood of occurrence assessment are presented in Appendix B.

3.2. Field survey

3.2.1. Survey team and timing

The targeted Honeymyrtle Shrubland TEC assessment was conducted by Jeff Cargill (Principal Ecologist) on the 6th of September 2024. The targeted Black Cockatoo habitat assessment was conducted by Jeni Morris (Senior Ecologist) and Jess Tomlinson (Graduate Ecologist) on the 5th of September 2024. Field staff had valid scientific licenses to conduct flora and vegetation surveys and to take Threatened and Priority flora in WA at the time of survey. The survey timing was consistent with the Environmental Protection Authority (EPA) recommendations for undertaking flora and vegetation surveys in the South-west climatic region (i.e. Spring, September to November; EPA 2016).

Rainfall data from the nearby Wanneroo weather station (station number 9105, located approximately 10 km south-east of the survey areas) recorded a total of 13.2 millimetres (mm) during the flora survey (Bureau of Meteorology [BoM] 2024). In the three months prior to the flora field survey (June – August), a total of 458 mm of rainfall was recorded (BoM 2024). This is greater than the long-term average for

the same time period (445.2 mm). Conditions at the time of survey were considered suitable with the majority of flora species in various reproductive stages (e.g. flowering, fruiting), allowing for positive identification of individuals.

3.2.2. Targeted vegetation survey

A single season Targeted vegetation survey was undertaken across the survey area in accordance with the EPA *Technical Guidance for Flora and Vegetation* (EPA 2016). Tasks undertaken during the vegetation survey included the mapping and delineation of areas of Honeymyrtle Shrubland TEC within the survey area and the establishment of quadrats within areas mapped as potential TEC to compare against criteria in the approved conservation advice for the TEC (DCCEEW 2023).

The survey involved the use of 10 x 10 m quadrats as recommended for the Swan Coastal Plain bioregion (EPA 2016). Quadrats were not permanently marked. Photos were taken from the north-western corner of each quadrat. Where relevant, opportunistic sampling of species not recorded from within the quadrats was undertaken to supplement the existing list of species recorded from within the survey area.

Two quadrats were established across the survey area in 2024 for the purposes of assessing patches of potential Honeymyrtle Shrubland TEC against the approved conservation advice for the TEC under the EPBC Act (DCCEEW 2023) and to complete statistical analysis to confirm its presence under the BC Act (Figure 2). These two quadrats have been added in addition to the five established by ELA in 2023. The following data were recorded within each quadrat:

- Vegetation structure and classes, cover of all species and dominant species list for each vegetation type (in accordance with the National Vegetation Information System [NVIS] Level V structure and floristics);
- Vegetation condition, in accordance with the scale outline in EPA (2016) adapted from Keighery (1994).
- Full species inventory (angiosperm and gymnosperm) of both native and introduced species across the subject site; and
- Relevant site data including co-ordinates, site photographs, soils, geology, drainage, slope, and any other relevant observational data.

Flora species able to be identified in the field were recorded, and voucher specimens of unfamiliar species were collected for later identification. All collections were assigned a unique collecting number.

3.2.3. Flora identification and nomenclature

Flora specimen identification following the field survey was undertaken by taxonomic specialists at the Western Australian Herbarium (WAH). Suitable material that meets WAH specimen lodgement requirements, such as flowering material and range extensions, was submitted along with Threatened and Priority Report Forms to DBCA, as required by conditions of collection licenses issued under the BC Act. Nomenclature used for the flora species within this report follows the WA Plant Census as available on FloraBase (WAH 1998-).

Figure 2: Survey effort

Survey area
Distributor Road
Access Road
Tracklogs (ELA 2024)
Quadrat (ELA 2024)
Quadrat (ELA 2023)

0 25 50 100
Metres

Datum/Projection:
GDA 1994 MGA Zone 50

24PER8879-GM Date: 4/12/2024

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3.2.3.1. Statistical analysis

Plymouth Routines in Multivariate Ecological Research v7 (PRIMER) statistical analysis software was used to analyse species-by-site data and discriminate survey sites based on their species composition (Clarke & Gorley 2015). To down-weight the relative contributions of quantitively dominant species, a fourth-root transformation was applied to the species percentage cover dataset. Specimens not identified to species level and singletons (species not recorded at a single quadrat and not forming a structural component) were excluded from the dataset prior to analysis. Computation of similarity matrices was based on the Bray-Curtis measure (Bray & Curtis 1957).

To complete floristic community type (FCT) analysis for determination of the presence of the state-listed Honeymyrtle Shrubland TEC, species within the Gibson *et al.* (1994) dataset were updated to align with current names as specified by FloraBase (WAH 1998-). Using current records, several species in the Gibson *et al.* (1994) dataset were shown to be significant range extensions from the Swan Coastal Plain; where appropriate such cases were removed. In addition, excluded and misapplied names were removed from the dataset and infra-specific names were reduced. Data from individual quadrats in the current survey were merged with the updated Gibson *et al.* (1994) dataset. Each merged dataset was analysed using a combination of pre-treatments such as the removal of taxa not identified to species level and singletons. Transformed data were analysed using a combination of multivariate analysis routines including Bray-Curtis Similarity Matrices, Cluster Analysis (single site insertion Flexible Beta) and non-metric Multi-Dimensional Scaling (nMDS).

To identify potential TECs and PECs in the survey area, ELA quadrats and vegetation communities were compared to Floristic Community Types (FCTs) defined by Gibson *et al.* (1994). To identify the presence of FCTs appropriate multivariate analyses comparing current data to that of the Gibson *et al.* (1994) species by quadrat data, and inferences based on dominant species and geomorphology were used. Given the nature of the data (e.g., spatial and temporal differences), results and subsequent extrapolations, assigned FCTs within the survey area were inferred and not absolute, i.e., a vegetation code assigned to an FCT was inferred to comprise, to varying degrees, floristic aspects of that FCT as defined by Gibson *et al.* (1994). These FCTs were subsequently compared with vegetation communities delineated by ELA (2023).

3.2.3.2. Assessment of diagnostics to determine presence of Threatened Ecological Communities

The Honeymyrtle shrubland on limestone ridges of the Swan Coastal Plain Bioregion (Honeymyrtle Shrubland TEC) was assessed as having the potential to occur within the survey area. The Honeymyrtle Shrubland TEC is listed as Critically Endangered (CR) under the EPBC Act (DCCEEW 2023). For information to assist in referral, environmental assessment, and compliance issues, it has been recommended to refer to the Listing Advice and/or Conservation Advice and Recovery Plan on the Commonwealth Species Profile and Threats Database (SPRAT; DCCEEW 2024b). The Listing Advice and/or Conservation Advice defines the national ecological community and includes key characteristics, condition thresholds, and additional considerations.

To determine whether the Federally-listed Honeymyrtle Shrubland TEC is present in the survey area, key diagnostic characteristics must be met under Section 2.1 of the Conservation Advice (DCCEEW 2023). This includes an assessment of species assemblages, vegetation condition, patch size, and landform. This assessment was undertaken by ELA following the field survey. ELA compared field evidence from new quadrats established in 2024 and historical quadrats established in 2023 within patches of potential Honeymyrtle Shrubland TEC in the survey area to key diagnostic characteristics in the conservation advice (DCCEEW 2023).

3.2.4. Targeted Black Cockatoo habitat assessment

A Targeted black cockatoo habitat assessment was conducted in accordance with the *Referral guideline for 3 WA threatened black cockatoo species: Carnaby's Cockatoo, Baudin's Cockatoo, and the Forest Red-tailed Black Cockatoo* (DAWE 2022). Consideration was also given to the Survey guidelines for Australia's threatened birds (DEWHA 2010) when designing the survey methodology.

Three species of black cockatoo occur in the south-west of Western Australia:

- Baudin's Cockatoo (*Zanda baudinii;* listed as Endangered [EN] under the EPBC Act and BC Act);
- Carnaby's Cockatoo (*Zanda latirostris;* listed as Endangered [EN] under the EPBC Act and BC Act); and
- Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso;* listed as Vulnerable [VU] under the EPBC Act and BC Act).

Broad scale maps are available for the modelled distribution of all three species of black cockatoo (DAWE 2022). The survey area occurs within the Likely to occur range of the Forest Red-tailed Black Cockatoo and Carnaby's Cockatoo, however is outside of the predicted range of the Baudin's Cockatoo. As such, the survey focused on assessing the habitat values for the Carnaby's and Forest Red-tailed Black Cockatoo. Any individuals of Carnaby's and/or Forest Red-tailed Black Cockatoo observed in the survey area were recorded, including the number of individuals.

The Targeted survey involved personnel walking transects across the survey area and mapping black cockatoo habitat. Black Cockatoo habitat is conventionally separated into foraging, potential breeding, and potential night roosting categories, as defined in Appendix C. Foraging, potential breeding, and potential roosting habitat was assessed within the survey area. The field methodology for each of these is defined below.

3.2.4.1. Foraging habitat

Foraging habitat is defined for each species of black cockatoo in Appendix C. The foraging value (i.e. quality) of vegetation to black cockatoos is dependent on several factors including the foraging plant species present, the extent and density (including projected foliage cover) of these foraging species, and the overall structure and condition of foraging species present. In addition, connectivity, proximity to known breeding and roosting sites, and the presence of weeds and/or tree deaths (i.e. disease and drought) is also to be considered.

Vegetation communities and types delineated and mapped within the survey area previously by ELA were assigned a foraging quality (i.e. negligible to low, low to moderate, moderate, moderate to high, or high) based on the criteria outlined in Appendix D. The DAWE (2022) foraging quality scoring tool will also be used to calculate a foraging score for the survey area.

Evidence of black cockatoo foraging (i.e. branch clippings and/or chewed fruit) was also searched for to identify if the vegetation within the survey area has previously been or is currently being used by black cockatoos for feeding.

3.2.4.2. Potential breeding habitat

Potential breeding habitat is defined in Appendix C. The diameter at breast height (DBH) were recorded in the following ranges:

- Small; approximately 500-600 mm
- Medium; between 600 and 1000 mm

- Large; over 1000 mm.

All potential nesting trees encountered within the survey area were recorded with a GPS (+/- 5-10 m accuracy). Each potential nesting tree was also visually assessed from the ground (i.e., with binoculars) for the presence of suitable nest hollows (defined in Appendix C) and allocated a nesting and/or hollow rank (Table 5).

Table 5: Potential breeding tree nest and/or hollow ranking

Rank	Description of tree nest and/or hollow
1	Active nest observed (adult bird seen entering or emerging from hollow, their eggs, fledglings, or other evidence of recent nesting activity present; known active nest (as described by Birdlife 2024)
2	Hollow of suitable size and angle (i.e., near-vertical) observed with chew marks around entrance
3	Potentially suitable hollow observed but no chew marks present
4	Tree lacking suitable hollows or broken branches that might have large hollows, a tree with mainly intact branches and a spreading crown.

[1]ELA takes a precautionary approach and identifies potentially suitable hollows as those with an entrance diameter over 10 cm that could potentially accommodate black cockatoos, which require a diameter opening range of 12 – 41 cm.

3.2.4.3. Potential roosting habitat

Potential night roosting habitat is defined in Appendix C. Potential night roosting habitat was delineated by mapping tall trees in proximity to water (i.e. within 12 km). A 5 m buffer was applied around each of the trees to depict projected foliage cover to estimate potential roosting habitat as hectares (where roosting habitat was not digitised from aerial imagery).

3.3. Limitations

The EPA Technical Guidance documents (EPA 2016; 2020) recommend including a discussion of the constraints and limitations of the survey methods used during ecological assessments. An assessment of potential constraints and limitations of this survey are summarised in Table 6 below. No survey constraints or limitations were identified.

Table 6: Survey limitations

Constraint	Limitations
Sources of information and availability of contextual information (i.e., pre-existing background versus new material)	Not a limitation. The Swan Coastal Plain has been very well surveyed, with increasing survey work occurring due to the ongoing urban development of the Perth metropolitan area. Several flora and fauna surveys have been undertaken in the survey area which have been utilised for the purposes of this survey. Gibson *et al.* (1994) was a primary source for determination of methods, analysis, and results for assessing FCTs. Broad-scale vegetation mapping at scales of 1:1,000,000 and 1:250,000 was available. Land-system mapping at a scale of 1:2,000,000 and soil and landform mapping was available. The information which was available was sufficient and, as such, sources of information were not considered to be a limitation.
Scope (i.e., what life forms, etc. were sampled)	Not a limitation. The survey requirement for a Targeted ecological community assessment in accordance with the EPA *Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA 2016) was adequately met. The survey requirements for Basic fauna survey in accordance with the EPA *Technical Guidance: Terrestrial vertebrate fauna surveys for environmental impact assessment* (EPA 2020) were adequately met. Further discussion on survey compliance regarding Black Cockatoos is detailed in Table 7.
Proportion of flora collected and identified (based on sampling, timing, and intensity)	Not a limitation. An adequate number of quadrats were established to inform all aspects of the diagnostic criteria for the Honeymyrtle Shrubland TEC and to ground-truth boundaries of the TEC.
Completeness and further work which might be needed (i.e. was the relevant survey area fully surveyed)	Not a limitation. The survey area was fully covered to meet requirements outlined in the scope of works. Site selection and replication was considered adequate to accurately analyse and discriminate sites based on species composition and subsequently delineate vegetation community boundaries.
Mapping reliability	Not a limitation. Coverage of the survey area was considered to be good. High quality aerial images were used for mapping for the survey and subsequent vegetation community delineation.
Timing, weather, season, cycle	Not a limitation. The survey was undertaken in the appropriate season as specified by the EPA Technical Guidance (EPA 2016; 2020).
Disturbances (fire, flood, accidental human intervention)	Not a limitation. Disturbances within the survey area included weeds, tracks, invasive animals, nearby housing, and roadsides. These disturbances did not negatively impact the ability to meet objectives outlined in the scope of works.
Intensity (in retrospect, was the intensity adequate)	Not a limitation. The survey effort was adequately met. The area was searched for sufficiently for the Honeymyrtle Shrubland TEC and evidence of foraging, breeding, or roosting habitat for Black Cockatoos. Staff undertook transects spaced adequately apart across the survey area. The number of quadrats established was sufficient to determine the presence and extent of the Honeymyrtle Shrubland TEC and Black Cockatoo habitat.
Resources (i.e., were there adequate resources to complete the survey to the required standard)	Not a limitation. The number of personnel conducting this field survey in the given time was adequate to undertake the required level of survey. Additional resources, including equipment available, additional support, and personnel were adequate.
Access problems (i.e. ability to access the survey area)	Not a limitation. All relevant areas within the survey area were able to be accessed and surveyed.
Experience levels (e.g. degree of expertise in plant identification to taxon level.	Not a limitation. All personnel conducting this field survey were suitably qualified to identify specimens, having previously undertaken flora and fauna surveys in the South-west of Western Australia.

The black cockatoo habitat assessment was undertaken in accordance with the Referral guidelines (DAWE 2022). The requirements of DAWE (2022) and detail regarding how the survey meets these requirements is summarised in Table 7. All requirements are considered to have been met.

Table 7: Summary of survey compliance with Black Cockatoo referral guidelines

Referral guideline recommendation	Compliant	Justification
Surveys should be done by a suitably qualified person with experience in vegetation or cockatoo surveys, depending on the type of survey being undertaken.	Yes	The ecologist undertaking the black cockatoo habitat assessment, Jeni Morris, has eight years' experience conducting habitat assessments for black cockatoos.
Survey should maximise the chance of detecting the species habitat and/or signs of use	Yes	The survey was undertaken in Spring which aligns with the DCCEEW recommendations for undertaking surveys for black cockatoos on the Swan Coastal Plain (i.e., foraging habitat and night-roosts – any time of the year; DAWE 2022).
Survey should determine the context of the site within the broader landscape – for example, the amount and quality of habitat nearby and in the local region (i.e., within 10 km).	Yes	The context of the habitats available within the survey area has been considered at a broader level and is discussed further below.
Survey should account for uncertainty and error (false presence and absences).	N/A	This recommendation refers to individual bird counts where presence/absence data is collected and is not applicable to this type of habitat assessment.
Survey should include collation of existing data on known locations of breeding and feeding birds and night roost locations.	Yes	Data have been obtained from Birdlife roosting and nesting database search (Birdlife 2024) and DBCA Threatened fauna database search (DBCA 2024b).
Survey should assess the extent, type, and quality of vegetation present including the presence and extent of plants known to be used by black cockatoos.	Yes	Foraging habitat was delineated and mapped in the field using vegetation communities previously delineated by ELA (2021) and a list of vegetation present has been compiled (refer to section 4.3).
In potential breeding habitat, measurements of the diameter at breast height of trees in the patch of woodland/forest must be made to determine whether the habitat meets the definition of 'breeding habitat'.	Yes	Potential breeding trees are defined as trees of a suitable species with a DBH over 50 cm. Trees were measured for DBH in the field, and where the DBH was over 50 cm, these trees were recorded, and signs of use/hollows were observed (refer to sections below).
Search for signs of use by black cockatoos (e.g., suitable nest hollows, feeding signs or feeding debris, and sighting records).	Yes	The field survey involved walking transects through areas searching for feeding signs. In addition, where hollows were observed, chew marks and other signs of use were searched for using binoculars.

4. Results

4.1. Desktop assessment

A PMST search was undertaken to identify conservation-significant ecological communities recorded within or in proximity to the survey area (DCCEEW 2024a; Appendix E). The location of known occurrences of the Honeymyrtle Shrubland TEC in proximity to the survey area was reviewed after being received from the City of Joondalup and DBCA (DBCA 2024a). In addition, the City of Joondalup Black Cockatoo database, DBCA database, and Birdlife Australia database of Black Cockatoo roosting and nesting sites was also queried to identify roosting and/or nesting sites near to the survey area (City of Joondalup 2024; DBCA 2024b; Birdlife 2024).

4.1.1. Conservation significant ecological communities

Areas of the Honeymyrtle Shrubland TEC previously recorded within and in proximity to the survey area are presented in Figure 3. The survey area is located in the 'community likely to occur' range on the SPRAT database (DCCEEW 2024a). Given the location of the survey area within the likely to occur range, the Honeymyrtle Shrubland TEC was considered Likely to occur within the survey area prior to the assessment.

4.1.2. Black cockatoo roosting and nesting records

577 records of Black Cockatoos were identified within 12 km of the survey area as part of the desktop assessment (Figure 4). This included 548 records of Carnaby's Cockatoos, 18 records of Forest Red-tailed Black Cockatoos, three records of Baudin's Black Cockatoos, and 18 records of 'white-tailed black cockatoos' (i.e. not distinguishing between Baudin's and Carnaby's Cockatoos). 11 confirmed white-tailed (Carnaby's and/or Baudin's) roosts, two confirmed red-tailed roosts, and three confirmed joint roosts (white-tailed and Forest Red-tailed) occur within 12 km of the survey area (Birdlife 2024). The closest known confirmed roost occurs 4.4 km to the north-east of the survey area (JOOEDGR001). An additional 20 unconfirmed roosts for Black Cockatoos occur within 12 km of the survey area (City of Joondalup 2024). The closest known unconfirmed roost occurs 0.8 km to the east of the survey area at Beaumaris Reserve in Ocean Reef (OJOOILUR001) (City of Joondalup 2024)

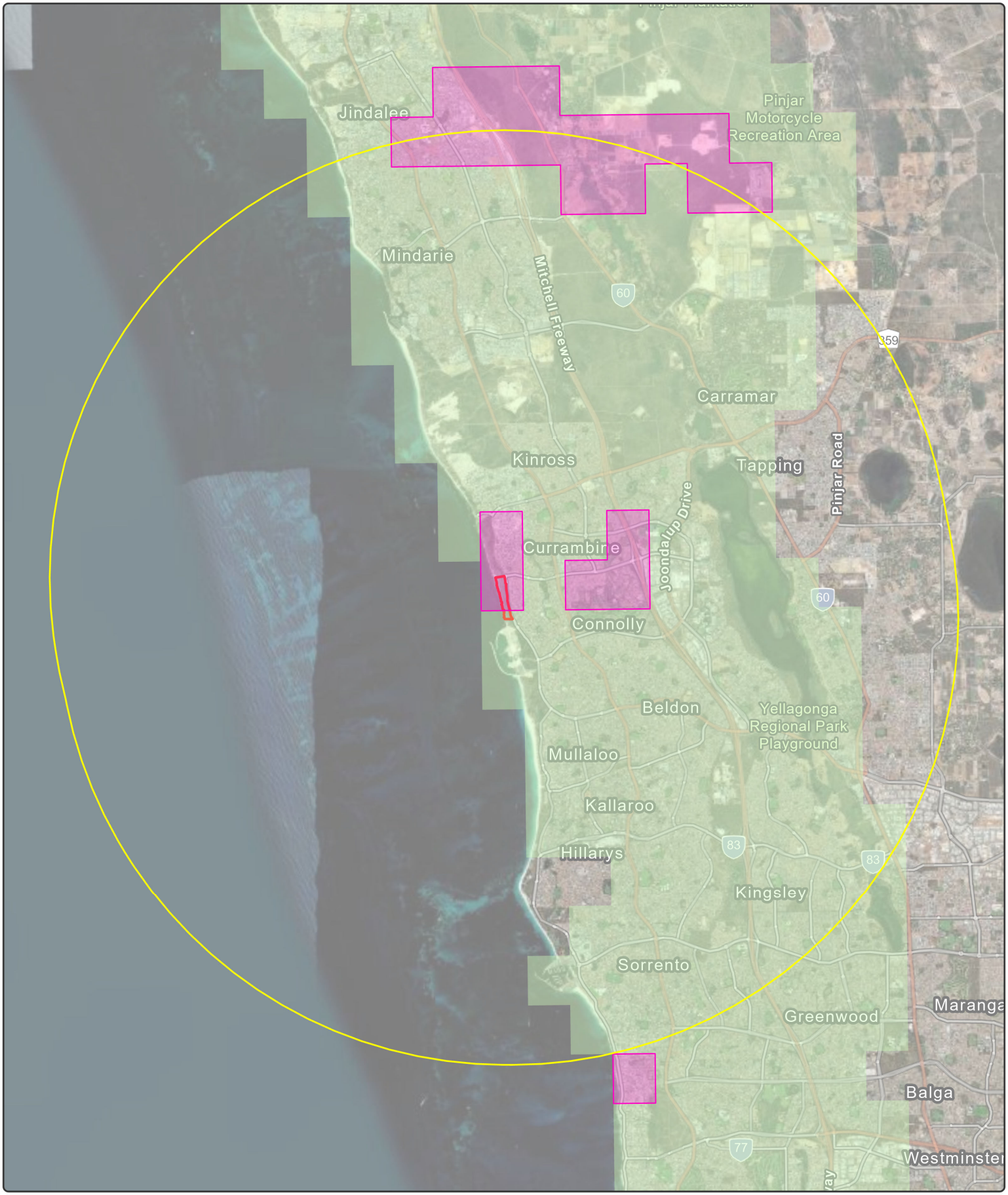

Figure 3: Previously mapped occurrences of Honeymyrtle Shrubland TEC in proximity to the survey area

Survey area

10km buffer

Honeymyrtle Shrubland TEC (DCCEEW 2024)

Community likely to occur within area

Community may occur within area

0 1 2 4

Kilometers

Datum/Projection:
GDA 1994 MGA Zone 50

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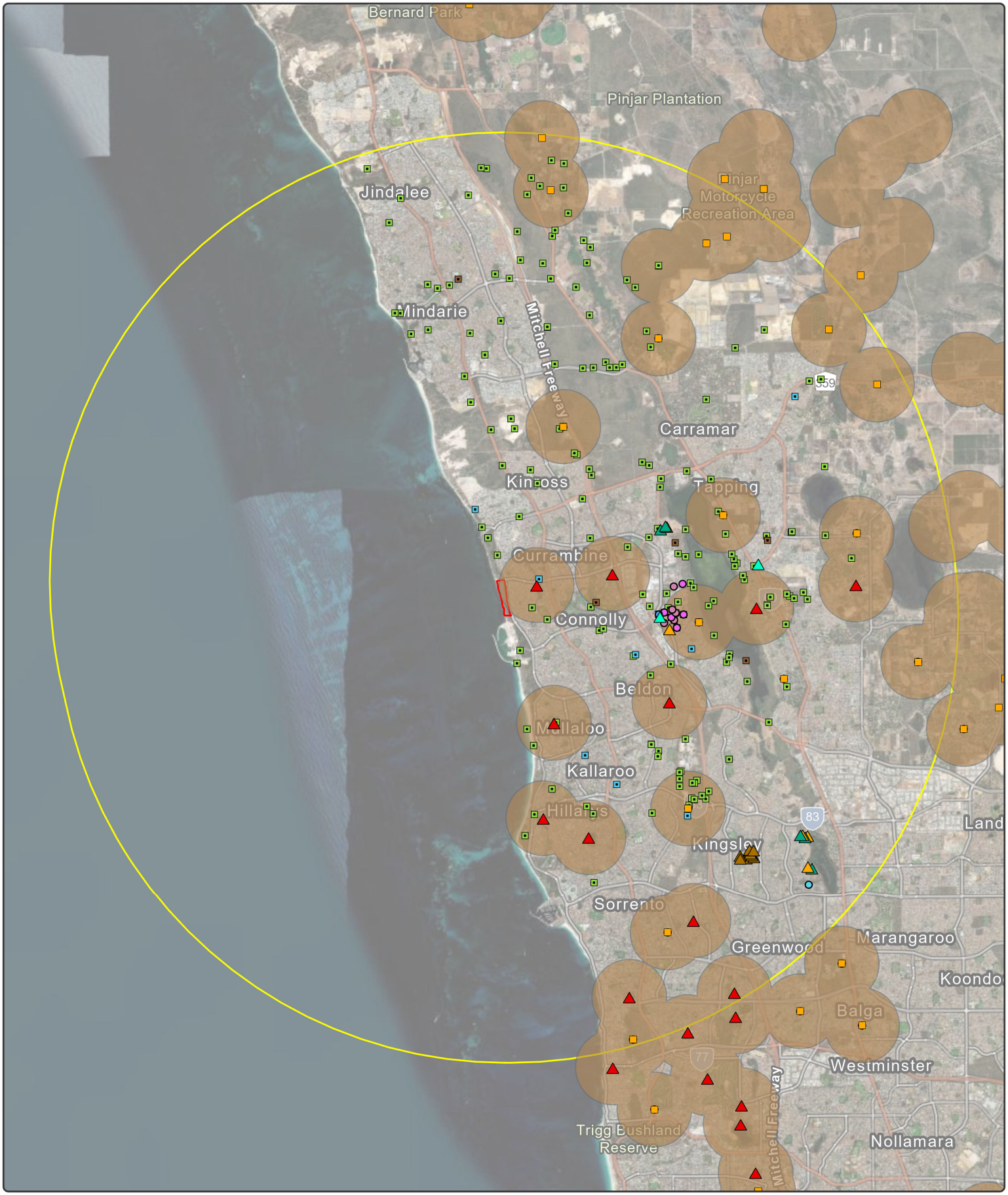

Figure 4: Black cockatoo habitat in proximity to the survey area

- Survey area
- 12km buffer

Species observations (DBCA 2024a)

- Baudin's cockatoo
- Carnaby's cockatoo
- Forest red-tailed black cockatoo
- White-tailed black cockatoo

- WA Carnaby Cockatoo roost
- Carnaby Cockatoo roosting sites 1km buffer

CoJ Carnaby Cockatoo sites

- BC Dataset May 2024 DBCA, Confirmed Roost
- Birdlife Data, Confirmed roost
- WTBC Data Set May 2024 DBCA,Confirmed artificial hollow
- BC Dataset May 2024 DBCA,Confirmed Roost (Forest Red Only)
- WTBC Data Set May 2024DBCA,Confirmed artificial hollow
- WTBC Data Set May 2024DBCA,Confirmed natural hollow
- BC Dataset May 2024 DBCA,Unconfirmed Roost
- Eco Logical Data,Unconfirmed roost
- WTBC Data Set May 2024 DBCA,Unconfirmed artificial hollow
- WTBC Data Set May 2024 DBCA,Unconfirmed natural hollow
- WTBC Data Set May 2024DBCA,Unconfirmed artificial hollow

0 1 2 4
Kilometers

Datum/Projection:
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4.2. Targeted Honeymyrtle Shrubland TEC assessment

4.2.1. Flora overview

A total of 60 flora species (41 native and 19 introduced) from 32 families and 50 genera were recorded from two quadrats established within the survey area in 2024. Average species richness was 50 species, ranging from 49 species in MOR1 to 51 species in MOR2. The family with the highest number of species was Fabaceae with 10 species. Acacia was the best represented genus, with four taxa recorded. A full flora list is provided in Appendix F and a species by quadrat matrix is provided in Appendix G. ELA quadrat site data is provided in Appendix H. No flora species listed as Threatened under the EPBC Act or BC Act; or flora listed as Priority by DBCA were recorded within quadrats.

4.2.2. Vegetation condition

The vegetation was recorded to be in Very Good condition within the two quadrats established during the survey (Keighery 1994). The main disturbances observed within the quadrats was the presence of introduced flora species. No Declared Pests or Weeds of National Significance (WoNS) were recorded in any quadrats during the assessment.

4.2.3. Honeymyrtle Shrubland TEC assessment

4.2.3.1. FCT analysis

To confirm the presence of the Honeymyrtle Shrubland TEC listed under the BC Act, ELA quadrats and vegetation communities were compared to FCTs defined by Gibson *et al.* (1994). Results of the analysis are shown in Table 8.

Results of the multivariate analysis of quadrats in the *Melaleuca cardiophylla* Closed Heath vegetation community (delineated by ELA in 2023) and the two additional quadrats established by ELA in 2024 showed that the community has a strong affiliation with FCT 29a and a moderate affiliation with FCT 24. This supports the previous findings by ELA (2024). Given that the state-listed TEC is defined based on the presence of FCT26a (*Melaleuca huegelii – M. systena* shrublands on limestone ridges), the state-listed Honeymyrtle Shrubland TEC is not considered to be present within the survey area. FCT29a 'coastal shrublands on shallow sands' and FCT 24 'Northern Spearwood shrublands and woodlands' are listed as Priority 3 ecological communities by DBCA.

Table 8: Relationships between ELA vegetation communties and FCTs defined by Gibson *et al*. (1994).

Inferred FCT	ELA vegetation community	ELA quadrat numbers	Closest affiliated sites (FCT Gibson *et al.* 1994; Bray-Curtis similarity %)
29a, 24	*Melaleuca cardiophylla* Closed Heath (ELA 2024)	ELA10 (ELA 2024)	BURN-1 (29a, 63.2%), TRIG-2 (29a, 43.3%), NAVB-2 (29a, 40%), PRES-1 (29a, 30.5%)
		ELA13 (ELA 2024)	BURN-1 (29a, 55.5%), NAVB-2 (29a, 38.4%), COOL-02 (24, 37.5%), MTB-2 (24, 36.8%), MTB-3 (24, 33.3%), COOL-08 (24, 33.3%), COOL-03 (24, 29.3%), NAVB-4 (24, 24.7%)
		MOR-01	NAVB-3 (24, 38.5%), CHIDPT-1 (24, 37.8%), NAVB-2 (29a, 37.4%)
		MOR-02	N/A (own branch)

4.2.3.2. Assessment against DCCEEW conservation advice for Honeymyrtle Shrubland TEC

Vegetation was assessed against the key diagnostic characteristics outlined in the Federally-listed Honeymyrtle Shrubland TEC approved conservation advice (DCCEEW 2023) to determine the presence of the TEC in the survey area. The primary defining features of the Honeymyrtle Shrubland TEC include location, species assemblage, patch size, and vegetation condition.

Prior vegetation mapping completed by ELA in 2023 was used to guide the targeted assessment to identify landforms within the survey area that could potentially contain Honeymyrtle Shrubland TEC. Two patches of Honeymyrtle Shrubland TEC were identified in the field as potentially meeting the criteria for the TEC due to the presence of heathland dominated by *Melaleuca huegelii, M. systena,* and/or *Banksia sessilis* on skeletal soils on limestone outcrops. Both patches are located in the north of the survey area within the '*Melaleuca cardiophylla* Closed Heath' vegetation community. One patch is 0.6 ha in size while the other is 0.2 ha (Figure 5).

Two quadrats were established (one in each patch), with relevant TEC indicators including landform, soil type, and floristic indicators compared against the Honeymyrtle Shrubland TEC conservation advice (Table 9). One quadrat (Q13) from the survey completed by ELA in 2023 was also present in a patch of the Honeymyrtle Shrubland TEC. All three quadrats located within the potential Honeymyrtle Shrubland TEC patches were located on skeletal or shallow sandy soils on limestone hills with significant limestone outcropping. The overstorey of all three quadrats consisted primarily of the key floristic indicator of the TEC *Melaleuca huegelii,* while *M. systena* was also present to a lesser extent in each quadrat, and *Banksia sessilis* was present in Q13. All three quadrats contained key midstorey indicators *Grevillea preissii* and *Spyridium globulosum,* while *Acacia lasiocarpa* was also present in quadrats MOR1 and Q13. Furthermore, all three quadrats contained a diverse ground layer of herbs, sedges, and grasses, with the average understorey being 30 species. All other quadrats previously established by ELA within the survey area did not meet the key diagnostic characteristics outlined in the conservation advice for the Honeymyrtle Shrubland TEC.

Both mapped patches of the TEC in the survey area were considered to represent the Honeymyrtle Shrubland TEC based on the assessment of values against key diagnostic characteristics defined in the conservation advice (DCCEEW 2023). The assessment of vegetation against the key diagnostic characteristics for the TEC is presented in Table 10.

Table 9: Honeymyrtle Shrubland assessment of quadrats established in Ocean Reef Foreshore Reserve by ELA in 2023 and 2024

	MOR1	MOR2	Q13	Q9	Q10	Q11	Q12
Vegetation type (ELA 2024)	*Melaleuca cardiophylla* Closed Heath	*Melaleuca cardiophylla* Closed Heath	*Melaleuca cardiophylla* Closed Heath	**Spinifex hirsutus* and **Thinopyrum distichum* Grassland	*Melaleuca cardiophylla* Closed Heath	*Acacia rostellifera* Shrubland	Mixed Open Shrubland
Soil type	Skeletal sand	Skeletal sand	Skeletal sand	Sand	Sand	Sand	Sand
Soil colour	Dark brown	Dark brown	Grey	White	Grey	Grey	Grey
Limestone outcropping	10 – 20%	10 – 20%	10 – 20%	-	15%	-	-
Landform	Hill	Hill	Hill	Dune	Rise	Dune	Dune
Key overstorey species cover							
Melaleuca huegelii	60	50	30	-	0.5	-	-
Melaleuca systena	0.5	2.5	0.5	-	-	-	-
Banksia sessilis	-	-	0.5	-	-	-	-
Key midstorey species cover							
Acacia lasiocarpa	0.2	-	1.5	-	-	-	-
Spyridium globulosum	0.2	0.5	1.5	-	0.5	-	20
Grevillea preissii	0.5	0.5	0.5	-	-	-	-
Key understorey species cover							
Ground layer species	28	30	32	10	25	10	12

Table 10: Honeymyrtle Shrubland TEC assessment against DCCEEW guidance

Key diagnostic characteristics (DCCEEW 2023)	Outcome
Occurs in the Perth subregion of the Swan Coastal Plain IBRA Bioregion in WA	The survey area is located within the Perth subregion of the Swan Coastal Plain IBRA bioregion in WA and therefore meets this criterion.
Occurs on shallow to skeletal soils on the ridge slopes and tops of limestone ridges and outcrops associated with Tamala Limestone	Parts of the survey area mapped as potential Honeymyrtle Shrubland TEC occur on limestone hilltops. Soils are skeletal with limestone outcropping observed to be between 10 and 20% (based on evidence from quadrats MOR1, MOR2, and Q13). The survey area occurs primarily on the Quindalup land system. While Tamala limestone typically underlays the Spearwood land system, the scale of land-system mapping within Western Australia is broad (1:250,000) and the distance between mapped patches of potential Honeymyrtle Shrubland TEC is minimal (100 m between patch and closest polygon of Spearwood land system). As such, it is considered that the limestone in patches of potential Honeymyrtle Shrubland TEC within the survey area are considered to be associated with Tamala Limestone and as such meets this criterion.
Occurs as shrubland, heath, or thickets and has less than 10% canopy cover of *Eucalyptus* species or other tall trees.	The vegetation within the survey area mapped as potential Honeymyrtle Shrubland TEC occurs as a closed shrubland/heathland with no canopy coverage of *Eucalyptus* spp. or other tall trees. As such, these areas are considered to meet this criterion.
The shrub layer is dominated by *Melaleuca huegelii* and/or *M. systena* and/or *Banksia sessilis* – commonly over *Acacia lasiocarpa, Grevillea preissii,* and *Spyridium globulosum.*	The shrub layer within parts of the survey area mapped as potential Honeymyrtle Shrubland TEC consists primarily of *Melaleuca huegelii* (average foliar cover of 47% based on quadrats MOR1, MOR2, and Q13). In addition, *M. systena* is also present in all three quadrats and *Banksia sessilis* is present in quadrat Q13. Furthermore, key midstorey indicators, *Grevillea preissii* and *Spyridium globulosum* were observed in all three quadrats, while *Acacia lasiocarpa* was present in quadrats MOR1 and Q13. Given the presence of key floristic indicators in areas mapped as potential Honeymyrtle Shrubland TEC, it is considered that these areas meet this criterion.
The ground layer is typically rich with numerous herbs (including grasses) and smaller shrubs may develop a mossy ground cover.	The ground layer within the four quadrats located in potential Honeymyrtle Shrubland TEC areas in the survey area consisted of a diverse understorey including grasses, with an average of 30 understorey species being recorded. Given the presence of this diverse understorey, it is considered that these areas meet this criterion.
Structure and diversity of Honeymyrtle shrubland may be altered by recent disturbances and cause a shift to a regenerative state. Under these circumstances the loss is likely to be a temporary phenomenon if natural regeneration is not disrupted. Recovering/regenerating areas are still included in the protected ecological community.	Vegetation within the survey area has not been altered by recent disturbances and as such this criterion is not applicable for this assessment.
Patch size – the minimum patch size for the community is considered to be 0.01 ha.	Vegetation within the survey area mapped as potential Honeymyrtle Shrubland TEC is greater than 0.01 ha in patch size and therefore meets this criterion.

Figure 5: Honeymyrtle Shrubland TEC recorded in the survey area

- Survey area
- Distributor Road
- Access Road
- Honeymyrtle shrubland on limestone ridges of the Swan Coastal Plain Bioregion (CR)
- Tracks/Cleared Areas
- Open Beach/Rocks

Vegetation communities (ELA 2024)

- *Acacia rostellifera* Shrubland
- *Melaleuca cardiophylla* Closed Heath
- Mixed Open Shrubland
- *Spinifex hirsutus* and **Thinopyrum distichum* Grassland

0 25 50 100
Metres

Datum/Projection:
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4.3. Black cockatoo habitat assessment

A targeted assessment of potential foraging, breeding, and roosting habitat for Forest Red-tailed Black Cockatoos (*Calyptorhynchus banksii naso*) or Carnaby's Cockatoos (*Zanda latirostris*) was undertaken in the survey area. No primary (i.e. direct sighting) or secondary (i.e. foraging) evidence of black cockatoos was recorded in the survey area during the assessment.

Most of the survey area was found to have no foraging value for Carnaby's Cockatoos (13.8 ha, 86.7% of the survey area) due to a lack of suitable foraging species (Table 11). One vegetation community – '*Melaleuca cardiophylla* Closed Heath' was mapped as 'Negligible to low' value foraging habitat for Carnaby's Cockatoos (2.1 ha, 13.3% of the survey area) given the presence of suitable foraging species (namely *Banksia sessilis*) at a low density (i.e., less than 2% PFC) (Figure 6). Vegetation within the survey area was assessed to have no foraging value for Forest Red-tailed Black Cockatoos given a lack of suitable foraging species.

Given that no parts of the survey area would be considered dominated by proteaceous heathland or Jarrah/Marri woodland and/or forest, the DCCEEW scoring tool was not undertaken for Carnaby's Cockatoos or Forest Red-tailed Black Cockatoos.

No potentially suitable breeding trees or roosting trees were recorded in the survey area during the assessment.

Table 11: Quality of foraging habitat recorded in the survey area for Carnaby's Cockatoo

Quality	Criteria summary	Associated vegetation communities	Extent (ha) within the survey area	% of survey area
Negligible to low	Presence of some scattered foraging species but <2% PFC.	*Melaleuca cardiophylla* Closed Heath	2.1	13.3
No foraging value	No foraging value. No Proteaceae, eucalyptus, or other potential sources of food.	*Acacia rostellifera* Shrubland, Mixed Open Shrubland, *Spinifex hirsutus* and **Thinopyrum distichum* Grassland, Tracks/Cleared Areas, Open Beach/Rocks	13.8	86.7
Total			15.9	100

Figure 6: Carnaby's Black Cockatoo foraging habitat within the survey area

Survey area
Distributor Road
Access Road

Carnaby's Cockatoo foraging quality

Negligible to Low
No foraging value

0 25 50 100
Metres

Datum/Projection:
GDA 1994 MGA Zone 50

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5. Discussion

5.1. Targeted Honeymyrtle Shrubland TEC Assessment

Vegetation within the survey area was mapped and analysed to identify the presence of any conservation-significant ecological communities (i.e. TECs and/or PECs) by ELA in 2023 (ELA 2024). Given the new listing of the Honeymyrtle shrubland on limestone ridges of the Swan Coastal Plain bioregion TEC (Honeymyrtle Shrubland TEC) as Critically Endangered under the EPBC Act on the 15th of November 2023 (i.e. post-field survey), an assessment of the presence of the federally-listed TEC was not undertaken by ELA in 2023. The City of Joondalup subsequently commissioned ELA in 2024 to undertake a targeted assessment for Honeymyrtle Shrubland TEC within the survey area.

The Honeymyrtle Shrubland TEC has previously been listed under the BC Act as the '*Melaleuca huegelii-M. systena* shrublands of limestone ridges (floristic community type 26a as originally described in Gibson *et al.* 1994)'; however confirmation of its presence is defined by statistical analysis and comparison against the Gibson *et al.* (1994) floristic community types which was completed by ELA in 2023 (and found to not be present in the survey area). Statistical analysis was re-run with the addition of new quadrats by ELA in 2024.

Vegetation mapping completed by ELA in 2023 was used to guide targeted assessment of the vegetation within the survey area to identify areas of Honeymyrtle Shrubland TEC. Two patches of potential Honeymyrtle Shrubland TEC were recorded in the field due to the presence of vegetation containing key floristic indicators *Melaleuca huegelii, M. systena,* and *B. sessilis* forming a shrubland or heathland on skeletal soils of Tamala limestone-derived outcrops. These patches included a 0.6 ha patch and a 0.2 ha patch of vegetation within the *'Melaleuca cardiophylla* Closed Heath' vegetation community. ELA established two new quadrats in September 2024 (in addition to the five previously established in 2023) to confirm the presence of the TEC in the survey area using diagnostic criteria in the approved conservation advice for the Honeymyrtle Shrubland TEC (DCCEEW 2023).

Flora species recorded in the two new quadrats were typical of the Swan Coastal Plain IBRA bioregion (WAH 1998-). No flora species listed under the EPBC Act or BC Act, or as Priority by DBCA were recorded within quadrats. Approximately 32% of the total species recorded in the quadrats were introduced species, reflective of the location of the survey area in proximity to urban development, which acts as a vector for the spread of weeds. All introduced species are listed on the Western Australian Organism List Database as permitted (s-11) species, indicating that no specific management of these species is required.

ELA quadrats within defined areas of Honeymyrtle Shrubland TEC (located within the '*Melaleuca cardiophylla* Closed Heath' vegetation community were compared to FCTs defined by Gibson *et al.* (1994). Results of the multivariate analysis showed the same result as that completed by ELA (2024) which found a moderate to strong affiliation with FCT29a 'coastal shrublands on shallow sands' and FCT24 'Northern Spearwood shrublands and woodlands', both listed as a Priority 3 ecological community. The multivariate analysis did not find an affiliation with FCT26a used to confirm the presence of the State-listed Honeymyrtle Shrubland TEC, and as such this TEC is not considered to be present in the survey area.

Vegetation was assessed against the key diagnostic characteristics outlined in the Federally-listed Honeymyrtle Shrubland TEC approved conservation advice (DCCEEW 2023) to determine the presence of the TEC in the survey area. The primary defining features of the Honeymyrtle Shrubland TEC include location, species assemblage, patch size, and vegetation condition. Prior to the assessment, the Honeymyrtle Shrubland TEC was considered Likely to occur within the survey area given that the survey

area is located in the 'community likely to occur' range on the SPRAT database. All quadrats within mapped patches of the Honeymyrtle Shrubland TEC met the EPBC Act diagnostic criteria in the approved conservation advice, confirming the presence of the Federally-listed TEC in the survey area. No other vegetation within the survey area was found to represent the Federally-listed Honeymyrtle Shrubland TEC in the survey area.

The patches of Federally-listed Honeymyrtle Shrubland TEC in the survey area occur as small sections of the '*Melaleuca cardiophylla* Closed Heath' vegetation community in areas where limestone outcropping was greatest, on the crests of hills. This increase in limestone outcropping coincided with a decrease in the cover of the *M. cardiophylla* and a subsequent increase in the cover of key floristic indicators of the TEC such as *M. huegelii, M. systena,* and *Banksia sessilis.* While the entire '*Melaleuca cardiophylla* Closed Heath' vegetation community was found to have floristic affinities to FCT24 'Northern Spearwood shrublands and woodland' (listed as a Priority 3 ecological community by DBCA), the areas outside of the mapped patches of Honeymyrtle Shrubland TEC within the community are not considered to be the TEC given the significant coverage of *M. cardiophylla* and lack of significant limestone outcropping.

The Honeymyrtle Shrubland TEC is considered to occur on limestone ridges and outcrops associated with Tamala Limestone. While Tamala Limestone typically underlays the Spearwood Land System, the patches of Federally-listed Honeymyrtle Shrubland TEC in the survey area are located on the Quindalup land system. ELA has taken a precautionary approach to mapping of the TEC and considers the TEC to be present in the mapped patches given field evidence and consideration of scale. For example, evidence from surveyed quadrats within mapped patches of the Honeymyrtle Shrubland TEC in the survey area clearly shows cemented Tamala limestone and skeletal soils. In addition, the scale of land-system mapping within Western Australia is broad (i.e., 1:250,000) and the distance between mapped patches of potential Honeymyrtle Shrubland TEC is minimal (100 m between the patch and closest polygon of Spearwood land system).

5.2. Targeted Black Cockatoo habitat assessment

No breeding or roosting habitat was recorded within the survey area during the assessment. One vegetation community, the '*Melaleuca cardiophylla* Closed Heath' was mapped as Negligible to Low foraging quality for Carnaby's Cockatoos due to the scattered presence of *Banksia sessilis.* The rest of the vegetation in the survey area was found to have no foraging value for Carnaby's Cockatoos. No foraging vegetation was recorded for Forest Red-tailed Black Cockatoos. Given the lack of suitable roosting and nesting habitat within the survey area and the poor quality of foraging habitat within the survey area, it is considered unlikely for Carnaby's Cockatoos to utilise habitat within the survey area. Any use by Carnaby's Cockatoos would be limited sporadic and opportunistic foraging within areas mapped as Negligible to Low foraging quality. Given a lack of any suitable habitat for Forest Red-tailed Black Cockatoos in the survey area, it is considered unlikely that they would utilise any habitat in the survey area.

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Appendix A Framework for conservation significant flora and fauna ranking

CATEGORIES OF THREATENED SPECIES UNDER THE ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999 (EPBC ACT)

Threatened fauna and flora may be listed in any one of the following categories as defined in Section 179 of the EPBC Act. Species listed as 'conservation dependent' and 'extinct' are not Matters of National Environmental Significance and therefore do not trigger the EPBC Act.

Category	Definition
Extinct (EX)	There is no reasonable doubt that the last member of the species has died.
Extinct in the Wild (EW)	Taxa known to survive only in captivity or as a naturalised population well outside its past range; or taxa has not been recorded in its known and/or expected habitat at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.
Critically Endangered (CR)	Taxa considered to be facing an extremely high risk of extinction in the wild.
Endangered (EN)	Taxa considered to be facing a very high risk of extinction in the wild.
Vulnerable (VU)	Taxa considered to be facing a high risk of extinction in the wild.
Near Threatened (NT)	Taxa has been evaluated against the criteria but does not qualify for Critically Endangered, Endangered, or Vulnerable now, but is close to qualifying or is likely to qualify for a threatened category in the future.
Least Concern (LC)	Taxa has been evaluated against the criteria and does not qualify for Critically Endangered, Endangered, Vulnerable, or Near Threatened. Widespread and abundant taxa are included in this category.
Data Deficient (DD)	There is inadequate information to make a direct or indirect assessment of taxa's risk of extinction based on its distribution and/or population status.
Not Evaluated (NE)	Taxa has not yet been evaluated against the criteria.
Migratory (MI)	Not an IUCN category. Species are defined as migratory if they are listed in an international agreement approved by the Commonwealth Environment Minister, including: • the Bonn Convention (convention of the Conservation of Migratory Species of Wild Animal) for which Australia is a range state; • the agreement between the Government of Australia and the Government of the People's Republic of China for the Protection of Migratory Birds and their environment (CAMBA); • The agreement between the Government of Japan and the Government of Australia for the Protection of Migratory Birds and Birds in Danger of Extinction and their Environment (JAMBA); or • The agreement between Australia and the Republic of Korea to develop a bilateral migratory bird agreement similar to the JAMBA and CAMBA in respect to migratory bird conservation and provides a basis for collaboration on the protection of migratory shorebirds and their habitat (ROKAMBA)

CONSERVATION CODES FOR WESTERN AUSTRALIAN FLORA AND FAUNA

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.*

Specially protected fauna or flora are species 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.

Threatened species (T)

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).

The assessment of the conservation status of these species is based on their national extent and ranked according to their level of threat under IUCN Red List categories and criteria as detailed below.

Category	Code	Description
Critically Endangered	CR	Threatened species considered to be "facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with criteria set out in the ministerial guidelines". Listed as critically endangered under section 19(1)(a) of the BC Act in accordance with the criteria set out in section 20 and the ministerial guidelines. Published under Schedule 1 Division 1 of the Biodiversity Conservation (Listing of Native Species) (Flora) Order 2024 or Schedule 2 Division 1 of the Biodiversity Conservation (Listing of Native Species) (Fauna) Order 2024.
Endangered	EN	Threatened species considered to be "facing a very high risk of extinction in the wild in the near future, as determined in accordance with criteria set out in the ministerial guidelines". Listed as endangered under section 19(1)(b) of the BC Act in accordance with the criteria set out in section 21 and the ministerial guidelines. Published under Schedule 1 Division 2 of the Biodiversity Conservation (Listing of Native Species) (Flora) Order 2024 or Schedule 2 Division 2 of the Biodiversity Conservation (Listing of Native Species) (Fauna) Order 2024.
Vulnerable	VU	Threatened species considered to be "facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with criteria set out in the ministerial guidelines". Listed as vulnerable under section 19(1)(c) of the BC Act in accordance with the criteria set out in section 22 and the ministerial guidelines. Published under Schedule 1 Division 3 of the Biodiversity Conservation (Listing of Native Species) (Flora) Order 2024 or Schedule 2 Division 3 of the Biodiversity Conservation (Listing of Native Species) (Fauna) Order 2024.

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, as follows:

Category	Code	Description
Extinct species	EX	Species which have been adequately searched for and there is no reasonable doubt that the last individual has died. Published under Schedule 2 of the Biodiversity Conservation (Listing of Native Species) (Flora) Order 2024 or Schedule 3 of the Biodiversity Conservation (Listing of Native Species) (Fauna) Order 2024.
Extinct in the wild species	EW	Species that is "known only to survive in cultivation, in captivity, or as a naturalised population well outside its past range, and it has not been recorded in its known habitat or expected habitat, at appropriate seasons anywhere in its past range despite surveys over a time frame appropriate to its life cycle and form", and listing is otherwise in accordance with the ministerial guidelines (section 25 of the BC Act). Currently there are no threatened flora or fauna species listed as extinct in the wild. If listing of a species as extinct in the wild occurs, then a schedule will be added to the applicable notice.

Specially protected species

Listed by order of the Minister as specially protected under Section 13 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.

Categories are detailed below.

Category	Code	Description
Migratory species	MI	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 15 of the BC Act). Includes birds that are subject to an agreement between the government of Australia and the government of Japan (JAMBA), People's Republic of 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. Listed as Migratory under Section 13(1)(a)(ii) of the BC Act. Published under Schedule 1 Division 2 of the Biodiversity Conservation (listing of Native Species) (Fauna) Order 2024.
Species of special conservation interest (conservation dependent fauna)	CD	Fauna of special conservation need being species 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). Listed as species of special conservation interest (conservation dependent fauna) under Section 13(1)(a)(i) of the BC Act. Published under Schedule 1 Division 1 of the Biodiversity Conservation (listing of Native Species) (Fauna) Order 2024.
Other specially protected species	OS	Fauna otherwise in need of special protection to ensure their conservation, and listing is otherwise in accordance with the ministerial guidelines (section 18 of the BC Act). Listed as Other specially protected species under Section 13(1)(b) of the BC Act. Published under Schedule 1 Division 3 of the Biodiversity Conservation (listing of Native Species) (Fauna) Order 2024.

Priority species (P)

Possibly threatened species that do not meet survey criteria, or are otherwise data deficient, are added to the Priority Fauna or Priority Flora Lists under Priorities 1, 2, or 3. These three categories are ranked in order of priority for survey and evaluation of conservation status so that consideration can be given to their declaration as threatened flora or fauna.

Species that are adequately known, are rare but not threatened, meet criteria for near threatened, or that have been recently removed from the threatened species or other specially protected fauna lists for other than taxonomic reasons, are placed in Priority 4. These species require regular monitoring.

Assessment of Priority codes is based on 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.

Category	Code	Definition
Priority 1	P1	Poorly known species Species that are known from one or a few locations (generally five or less) which are potentially at risk. All occurrences are either: very small; or on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, road and rail reserves, gravel reserves, and active mineral leases; or otherwise under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes. Such species are in urgent need of further survey.
Priority 2	P2	Poorly known species Species that are known from one or a few locations (generally five or less), some of which are on lands managed primarily for nature conservation (e.g., national parks, conservation parks, nature reserves, and other lands with secure tenure being managed for conservation. Species may not be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes. Such species are in urgent need of further survey.
Priority 3	P3	Poorly known species. Species that are known from several locations, and the species does not appear to be under imminent threat, or from few but widespread locations with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several locations but do not meet adequacy of survey requirements and known threatening processes exist that could affect them. Such species need further survey.
Priority 4	P4	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.

Appendix B Likelihood of occurrence assessment criteria

Likelihood rating	Criteria
Recorded	The species has been previously recorded within the survey area from DBCA database search results and/or from previous surveys of the survey area, and/or the species has been confirmed through a current vouchered specimen at the WA Herbarium.
Likely	The species has not previously been recorded from within the survey area. However, to qualify requires one or more of the following criteria to be met: • The species has been recorded in close proximity to the survey area, and occurs in similar habitat to that which occurs within the survey area • Core habitat and suitable landforms for the species occurs within the survey area either year-round or seasonally. In relation to fauna species, this could be that a host plant is seasonally present on site, or habitat features such as caves are present that may be used during particular times during its life cycle e.g. for breeding. In relation to both flora and fauna species, it may be there are seasonal wetlands present • There is a medium to high probability that a species uses the survey area
Potential	The species has not previously been recorded from within the survey area. However, to qualify requires one or more of the following criteria to be met: • Targeted surveys may locate the species based on records occurring in proximity to the survey area and suitable habitat occurring in the survey area • The survey area has been assessed as having potentially suitable habitat through habitat modelling • The species is known to be cryptic and may not have been detected despite extensive surveys • The species is highly mobile and has an extensive foraging range so may not have been detected during previous surveys The species has been recorded in the survey area by a previous survey or there is historic evidence of species occurrence within the survey area. However, one or more of the following criteria is met: • Doubt remains over taxonomic identification or the majority of habitat does not appear suitable (although presence cannot be ruled out due to factors such as species ecology or distribution) • Location co-ordinates for the record are doubtful
Unlikely	The species has been recorded locally through DBCA database searches. However it has not been recorded within the survey area and: • It is unlikely to occur due to the site lacking critical habitat, having at best marginally suitable habitat, and/or being severely degraded • It is unlikely to occur due to few historic record/s and no other current collections in the local area The species has been recorded within the bioregion based on literature review but has not been recorded locally or within the survey area through DBCA database searches. The species has not been recorded in the survey area despite adequate survey efforts, such as a standardised methodology of targeted searching within potentially suitable habitat.
Does not occur (one or more criteria requires to be met)	The species is not known to occur within the IBRA bioregion based on current literature and distribution. The conspicuous species has not been recorded in the survey area despite adequate survey efforts at an appropriate time of year to detect the species within potentially suitable habitat. The survey area lacks important habitat for a species that has highly selective habitat requirements. The species has been historically recorded within the survey area or locally, however it is considered locally extinct due to significant habitat changes such as land clearing and/or introduced predators.

Appendix C Black Cockatoo habitat definitions

Habitat	Definition
Foraging habitat	Foraging habitat is defined as plant species known to support foraging within the range of each species. The specific foraging requirements differ slightly between the three species as described in DAWE 2022: • **Carnaby's Cockatoo** – mainly feeds in native shrubland, kwongkan heathland, and woodland. Food items include seeds, flowers, and nectar of native proteaceous plant species (i.e. *Banksia* spp., *Hakea* spp., *Grevillea* spp.), as well as *Callistemon* spp., and Marri (*Corymbia calophylla*). Also feeds on the seeds of introduced species including *Pinus* spp., *Erodium* spp., wild radish, canola, almonds, macadamia, and pecan nuts; insects and insect larvae; occasionally flesh and juice of apples and persimmons; and liquidambar. • **Baudin's Cockatoo** – mainly feeds in eucalypt woodlands and forest and proteaceous woodlands and heath. Food items primarily include seeds of Marri, rarely Jarrah (*Eucalyptus marginata*), and seeds of native proteaceous plant species (e.g. *Banksia* spp. and *Hakea* spp.). Also feeds on insects and insect larvae; pith of kangaroo paw (*Anigozanthos flavidus*); tips of *Pinus* spp.; *Macadamia* spp.; almonds and pecans; seeds of apples, pears, and persimmons. • **Forest Red-tailed Black Cockatoo** – mainly feeds in Jarrah and Marri woodlands and forest and edges of Karri (*Eucalyptus diversicolor*) forests including Wandoo (*E. wandoo*) and Blackbutt (*E. patens*). Food items primarily include seeds of Marri and Jarrah. Also feeds on *Allocasuarina* cones, fruits of Snottygobble (*Persoonia longifolia*) and Mountain Marri (*Corymbia haematoxylon*). Other less important foods include: Blackbutt, Bullich (*Eucalyptus megacarpa*), *Allocasuarina fraseriana, Hakea* spp., Tuart (*Eucalyptus gomphocephala*), Redheart Moit (*Eucalyptus decipiens*), and Bushy Yate (*Eucalyptus lehmanii*). Also some introduced eucalypts such as river red gum (*E. camaldulensis*) and flooded gum (*E. rudis*).
Night roosting habitat	Habitat that contains one, or a group of potential roosting trees: • **Known roosting tree** – a tree (generally the tallest), native or introduced known to be used for night roosting or which demonstrates evidence of roosting. Usually close to an important water source and within an area of high-quality foraging habitat. During the breeding season, male black cockatoos roost in the vicinity of the nesting trees, therefore a breeding area may also be considered to be night roosting habitat. • **Potential roosting tree** – A tall tree of any species in close proximity to water.
Breeding habitat	Habitat that contains known, suitable, or potential nesting trees: • **Known nesting tree** – Trees (live or dead but still standing) which contain a hollow where black cockatoo breeding has been recorded or which demonstrates evidence of breeding (i.e. showing evidence of use through scratches, chew marks, or feathers). • **Suitable nesting tree –** Trees with suitable nesting hollows present, although no evidence of use. Note that any species of tree may develop suitable hollows for breeding. • **Suitable nesting hollow –** Any hollow with dimensions suitable for use for nesting by black cockatoos (Carnaby's Cockatoo 23-30 cm [EPA 2019], Baudin's Cockatoo 30-40 cm [Chapman 2008]. Forest Red-tailed Black Cockatoo 12-41cm [Chapman 2008]). Suitable nest hollows are only found in live trees with a diameter at breast height (DBH) of at least 500 mm. Usually this will be a natural hollow, but artificial hollows may also be suitable in some circumstances (for example, where the artificial hollow has been specifically designed for use by black cockatoos). Note that artificial hollows have only been shown to have value for Carnaby's Cockatoos to date. • **Potential nesting trees –** Trees that have a suitable DBH to develop a nest hollow but do not currently have hollows. For most species of trees, suitable nest hollows are only found in live trees with a DBH of at least 500 mm. Trees suitable to develop a nest hollow in the future are 300-500 mm DBH. Note that many species of eucalypt may develop suitable hollows for breeding.

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Appendix D Black Cockatoo foraging habitat quality criteria

Foraging habitat quality	Carnaby's Cockatoo	Forest Black Cockatoo (Baudin's Cockatoo and Forest Red-tailed Black Cockatoo)
High	• Presence of suitable foraging plant species[1] at a high density (i.e. primary food sources[2] present at >60% PFC[3], secondary food sources[2] present at >70% PFC) and presence of preferred food sources at several strata; • Low weed invasion and/or low tree deaths (indicating it is robust and unlikely to decline in the medium term); and/or • Lower quality foraging habitat based on vegetation characteristics, but with evidence of use (i.e. chewed nuts, cones, seeds or flowers). • Example: Banksia forest >60% PFC and Good or higher vegetation condition with low weed invasion and/or low tree deaths.	• Presence of suitable foraging plant species[1] at a high density (i.e. food sources present at >60% PFC[3]) and presence of preferred food sources at several strata; • Low weed invasion and/or low tree deaths (indicating it is robust and unlikely to decline in the medium term); and/or • Lower quality foraging habitat based on vegetation characteristics, but with evidence of use (i.e. chewed nuts, cones, seeds or flowers). • Example: Marri-Jarrah Forest >60% PFC and Good or higher vegetation condition with low weed invasion and/or low tree deaths.
Moderate to high	• Presence of suitable foraging plant species at a high density (i.e. primary food sources present at 40-60% PFC, secondary food sources at >60% PFC) and presence of preferred food sources at several strata; • Foraging species with >60% PFC but foraging habitat viability reduced due to high weed invasion and/or tree deaths indicating that the vegetation could potentially decline in the medium term due to suppressed regrowth or disease; and/or • Lower quality foraging habitat but with evidence of use (i.e. chewed nuts, cones, seeds or flowers).	• Presence of suitable foraging plant species at a high density (i.e. food sources present at 40-60% PFC) and presence of preferred food sources at several strata; • Foraging species with >60% PFC but foraging habitat viability reduced due to high weed invasion and/or tree deaths indicating that the vegetation could potentially decline in the medium term due to suppressed regrowth or disease; and/or • Lower quality foraging habitat but with evidence of use (i.e. chewed nuts, cones, seeds or flowers).
Moderate	• Presence of suitable foraging plant species at a low to moderate density (i.e. primary food sources present at 20-40% PFC, secondary food sources at 40-60% PFC); • Foraging species with 40-60% PFC but foraging habitat viability reduced due to high weed invasion and/or tree deaths indicating that the vegetation could potentially decline in the medium term due to suppressed regrowth or disease; and/or • Lower quality foraging habitat but with evidence of use (i.e. chewed nuts, cones, seeds or flowers).	• Presence of suitable foraging plant species at a low to moderate density (i.e. food sources present at 20-40% PFC); • Foraging species with 40-60% PFC but foraging habitat viability reduced due to high weed invasion and/or tree deaths indicating that the vegetation could potentially decline in the medium term due to suppressed regrowth or disease; and/or • Lower quality foraging habitat but with evidence of use (i.e. chewed nuts, cones, seeds or flowers).
Low to moderate	• Suitable foraging species present but at a lower density (i.e. primary food sources present at 10-20% PFC, secondary food sources present at 20-40% PFC);	• Suitable foraging species present but at a lower density (i.e. primary food sources present at 10-20% PFC, secondary food sources present at 20-40% PFC);

Foraging habitat quality	Carnaby's Cockatoo	Forest Black Cockatoo (Baudin's Cockatoo and Forest Red-tailed Black Cockatoo)
	• Foraging species with 20-40% projected foliage cover but foraging habitat viability reduced due to high weed invasion and/or tree deaths indicating that the vegetation could potentially decline in the medium term due to suppressed regrowth or disease; and/or • Lower quality foraging habitat but with evidence of use (i.e. chewed nuts, cones, seeds or flowers).	• Foraging species with 20-40% projected foliage cover but foraging habitat viability reduced due to high weed invasion and/or tree deaths indicating that the vegetation could potentially decline in the medium term due to suppressed regrowth or disease; and/or • Lower quality foraging habitat but with evidence of use (i.e. chewed nuts, cones, seeds or flowers).
Low	• Suitable foraging species present at a low density (i.e. primary food sources present at <10% PFC, secondary food sources present at 10-20% PFC); and/or • Scattered foraging species or paddocks with known food sources such as melons or weeds that represent a short-term food source.	• Suitable foraging species present at a low density (i.e. food sources present at 1-5% PFC); and/or • Scattered foraging species or paddocks with known food sources such as melons or weeds that represent a short-term food source.
Negligible to low	• Presence of some scattered foraging species but <2% PFC.	• Presence of some scattered foraging species but <1% PFC.
No foraging value	• No foraging value. No Proteaceae, eucalypts or other potential sources of food. Examples: water bodies, bare ground, developed sites, mown grass.	• No foraging value. No eucalypts or other potential sources of food. Examples: water bodies, bare ground, developed sites.

[1] Based on the list of suitable foraging plants collated forom the following soureces: DAWE (2022), Groom (2011), Johnstone *et al.* (2010), Heydenrych (2012), and Lee *et al.* (2013).

[2] Primary food sources for Carnaby's Cockatoo are defined as those species which are known to provide a regular foraging resource and have been designated as being 'high' priority for planting by the Department of Environment and Conservation (now known as DBCA), where as secondary food items are defined as those species that are only occasionally foraged upon, and which have been assigned as being moderate to low priority for planting by DBCA (Groom 2011).

[3] PFC = projected foliage cover

References

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Johnstone, R., Johnstone, C., and Kirkby, T. 2010. *Carnaby's Cockatoo (Calyptorhynchus latirostris), Baudin's Cockatoo (Calyptorhynchus baudinii) and the Forest Red-tailed Black Cockatoo (Calyptorhynchus banksii naso) on the Swan Coastal Plain (Lancelin–Dunsborough), Western Australia. Studies on distribution, status, breeding, food, movements and historical changes.* Report for the Department of Planning, Western Australia.

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Lee, J., Finn, H., and Calver, M. 2013. Ecology of Black Cockatoos at a Mine site in the Eastern Jarrah-Marri Forest, Western Australia. *Pacific Conservation Biology* 19: 76–90.

Appendix E Protected Matters Search Tool (PMST) results

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Please see the caveat for interpretation of information provided here.

Report created: 29-Oct-2024

Summary

Matters of National Environment Significance

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

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance (Ramsar	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	1
Listed Threatened Ecological Communities:	4
Listed Threatened Species:	59
Listed Migratory Species:	49

Other Matters Protected by the EPBC Act

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

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

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

Commonwealth Lands:	46
Commonwealth Heritage Places:	None
Listed Marine Species:	74
Whales and Other Cetaceans:	12
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	2
Habitat Critical to the Survival of Marine Turtles:	None

Extra Information

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

State and Territory Reserves:	7
Regional Forest Agreements:	None
Nationally Important Wetlands:	1
EPBC Act Referrals:	55
Key Ecological Features (Marine):	2
Biologically Important Areas:	10
Bioregional Assessments:	None
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

Commonwealth Marine Area [Resource Information]

Approval is required for a proposed activity that is located within the Commonwealth Marine Area which has, will have, or is likely to have a significant impact on the environment. Approval may be required for a proposed action taken outside a Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area.

Feature Name	Buffer Status
Commonwealth Marine Areas (EPBC Act)	In buffer area only

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.
Status of Vulnerable, Disallowed and Ineligible are not MNES under the EPBC Act.

Community Name	Threatened Category	Presence Text	Buffer Status
Banksia Woodlands of the Swan Coastal Plain ecological community	Endangered	Community likely to occur within area	In feature area
Empodisma peatlands of southwestern Australia	Endangered	Community may occur within area	In buffer area only
Honeymyrtle shrubland on limestone ridges of the Swan Coastal Plain Bioregion	Critically Endangered	Community likely to occur within area	In feature area
Tuart (Eucalyptus gomphocephala) Woodlands and Forests of the Swan Coastal Plain ecological community	Critically Endangered	Community likely to occur within area	In feature area

Listed Threatened Species [Resource Information]

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.
Number is the current name ID.

Scientific Name	Threatened Category	Presence Text	Buffer Status
BIRD			
Anous tenuirostris melanops			
Australian Lesser Noddy [26000]	Vulnerable	Species or species habitat may occur within area	In feature area
Ardenna grisea			
Sooty Shearwater [82651]	Vulnerable	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat may occur within area	In buffer area only
Calidris acuminata Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat known to occur within area	In feature area
Calidris canutus Red Knot, Knot [855]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Calyptorhynchus banksii naso Forest Red-tailed Black-Cockatoo, Karrak [67034]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Diomedea amsterdamensis Amsterdam Albatross [64405]	Endangered	Species or species habitat may occur within area	In feature area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Species or species habitat may occur within area	In feature area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Leipoa ocellata Malleefowl [934]	Vulnerable	Species or species habitat likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Limosa lapponica menzbieri Northern Siberian Bar-tailed Godwit, Russkoye Bar-tailed Godwit [86432]	Endangered	Species or species habitat likely to occur within area	In feature area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area	In feature area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area	In feature area
Pachyptila turtur subantarctica Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Phaethon rubricauda westralis Red-tailed Tropicbird (Indian Ocean), Indian Ocean Red-tailed Tropicbird [91824]	Endangered	Species or species habitat may occur within area	In feature area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area	In feature area
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area	In feature area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Thalassarche cauta			
Shy Albatross [89224]	Endangered	Species or species habitat may occur within area	In feature area
Thalassarche impavida			
Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area	In feature area
Thalassarche melanophris			
Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Thalassarche steadi			
White-capped Albatross [64462]	Vulnerable	Species or species habitat may occur within area	In feature area
Tringa nebularia			
Common Greenshank, Greenshank [832]	Endangered	Species or species habitat known to occur within area	In buffer area only
Zanda latirostris listed as Calyptorhynchus latirostris			
Carnaby's Black Cockatoo, Short-billed Black-cockatoo [87737]	Endangered	Breeding known to occur within area	In feature area
INSECT			
Hesperocolletes douglasi			
Douglas' Broad-headed Bee, Rottnest Bee [66734]	Critically Endangered	Species or species habitat may occur within area	In feature area
MAMMAL			
Balaenoptera musculus			
Blue Whale [36]	Endangered	Species or species habitat likely to occur within area	In feature area
Dasyurus geoffroii			
Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Eubalaena australis			
Southern Right Whale [40]	Endangered	Breeding known to occur within area	In feature area
Macroderma gigas			
Ghost Bat [174]	Vulnerable	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Neophoca cinerea](#) Australian Sea-lion, Australian Sea Lion [22]	Endangered	Species or species habitat likely to occur within area	In feature area
PLANT			
[Andersonia gracilis](#) Slender Andersonia [14470]	Endangered	Species or species habitat likely to occur within area	In feature area
[Anigozanthos viridis subsp. terraspectans](#) Dwarf Green Kangaroo Paw [3435]	Vulnerable	Species or species habitat may occur within area	In buffer area only
[Banksia mimica](#) Summer Honeypot [82765]	Endangered	Species or species habitat may occur within area	In buffer area only
[Caladenia huegelii](#) King Spider-orchid, Grand Spider-orchid, Rusty Spider-orchid [7309]	Endangered	Species or species habitat may occur within area	In buffer area only
[Caleana dixonii listed as Paracaleana dixonii](#) Sandplain Duck Orchid [87944]	Endangered	Species or species habitat may occur within area	In buffer area only
[Diuris micrantha](#) Dwarf Bee-orchid [55082]	Vulnerable	Species or species habitat likely to occur within area	In feature area
[Diuris purdiei](#) Purdie's Donkey-orchid [12950]	Endangered	Species or species habitat may occur within area	In buffer area only
[Drakaea elastica](#) Glossy-leafed Hammer Orchid, Glossy-leaved Hammer Orchid, Warty Hammer Orchid [16753]	Endangered	Species or species habitat likely to occur within area	In feature area
[Drakaea micrantha](#) Dwarf Hammer-orchid [56755]	Vulnerable	Species or species habitat may occur within area	In buffer area only
[Eleocharis keigheryi](#) Keighery's Eleocharis [64893]	Vulnerable	Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Eucalyptus argutifolia			
Yanchep Mallee, Wabling Hill Mallee [24263]	Vulnerable	Species or species habitat known to occur within area	In feature area
Macarthuria keigheryi			
Keighery's Macarthuria [64930]	Endangered	Species or species habitat may occur within area	In buffer area only
Marianthus paralius			
[83925]	Endangered	Species or species habitat known to occur within area	In feature area
Melaleuca sp. Wanneroo (G.J. Keighery 16705)			
[89456]	Endangered	Species or species habitat known to occur within area	In buffer area only
REPTILE			
Caretta caretta			
Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area	In feature area
Chelonia mydas			
Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
Dermochelys coriacea			
Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area	In feature area
Natator depressus			
Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
SHARK			
Carcharias taurus (west coast population)			
Grey Nurse Shark (west coast population) [68752]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Carcharodon carcharias			
White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Pristis pristis Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756]	Vulnerable	Species or species habitat may occur within area	In feature area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area	In feature area
Sphyrna lewini Scalloped Hammerhead [85267]	Conservation Dependent	Species or species habitat likely to occur within area	In feature area

Listed Migratory Species [Resource Information]

Scientific Name	Threatened Category	Presence Text	Buffer Status
Migratory Marine Birds			
Anous stolidus Common Noddy [825]		Species or species habitat likely to occur within area	In feature area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area	In feature area
Ardenna carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Foraging, feeding or related behaviour likely to occur within area	In feature area
Ardenna grisea Sooty Shearwater [82651]	Vulnerable	Species or species habitat may occur within area	In feature area
Diomedea amsterdamensis Amsterdam Albatross [64405]	Endangered	Species or species habitat may occur within area	In feature area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Species or species habitat may occur within area	In feature area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Hydroprogne caspia Caspian Tern [808]		Foraging, feeding or related behaviour known to occur within area	In feature area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area	In feature area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Onychoprion anaethetus Bridled Tern [82845]		Breeding known to occur within area	In feature area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area	In feature area
Sterna dougallii Roseate Tern [817]		Foraging, feeding or related behaviour likely to occur within area	In feature area
Sternula albifrons Little Tern [82849]		Species or species habitat may occur within area	In feature area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Thalassarche cauta Shy Albatross [89224]	Endangered	Species or species habitat may occur within area	In feature area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area	In feature area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Thalassarche steadi](#) White-capped Albatross [64462]	Vulnerable	Species or species habitat may occur within area	In feature area
Migratory Marine Species			
[Balaenoptera edeni](#) Bryde's Whale [35]		Species or species habitat may occur within area	In feature area
[Balaenoptera musculus](#) Blue Whale [36]	Endangered	Species or species habitat likely to occur within area	In feature area
[Caperea marginata](#) Pygmy Right Whale [39]		Species or species habitat may occur within area	In feature area
[Carcharhinus longimanus](#) Oceanic Whitetip Shark [84108]		Species or species habitat may occur within area	In feature area
[Carcharias taurus](#) Grey Nurse Shark [64469]		Species or species habitat likely to occur within area	In feature area
[Carcharodon carcharias](#) White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area	In feature area
[Caretta caretta](#) Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area	In feature area
[Chelonia mydas](#) Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
[Dermochelys coriacea](#) Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area	In feature area
[Eubalaena australis as Balaena glacialis australis](#) Southern Right Whale [40]	Endangered	Breeding known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Lamna nasus](#) Porbeagle, Mackerel Shark [83288]		Species or species habitat may occur within area	In feature area
[Megaptera novaeangliae](#) Humpback Whale [38]		Species or species habitat known to occur within area	In feature area
[Mobula alfredi as Manta alfredi](#) Reef Manta Ray, Coastal Manta Ray [90033]		Species or species habitat may occur within area	In feature area
[Mobula birostris as Manta birostris](#) Giant Manta Ray [90034]		Species or species habitat may occur within area	In feature area
[Natator depressus](#) Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
[Orcinus orca](#) Killer Whale, Orca [46]		Species or species habitat may occur within area	In feature area
[Pristis pristis](#) Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756]	Vulnerable	Species or species habitat may occur within area	In feature area
[Rhincodon typus](#) Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area	In feature area
Migratory Terrestrial Species			
[Motacilla cinerea](#) Grey Wagtail [642]		Species or species habitat may occur within area	In feature area
Migratory Wetlands Species			
[Actitis hypoleucos](#) Common Sandpiper [59309]		Species or species habitat known to occur within area	In feature area
[Calidris acuminata](#) Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Calidris canutus](#) Red Knot, Knot [855]	Vulnerable	Species or species habitat likely to occur within area	In feature area
[Calidris ferruginea](#) Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area	In feature area
[Calidris melanotos](#) Pectoral Sandpiper [858]		Species or species habitat may occur within area	In feature area
[Calidris ruficollis](#) Red-necked Stint [860]		Species or species habitat known to occur within area	In buffer area only
[Charadrius leschenaultii](#) Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat likely to occur within area	In feature area
[Limosa lapponica](#) Bar-tailed Godwit [844]		Species or species habitat likely to occur within area	In feature area
[Numenius madagascariensis](#) Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area	In feature area
[Pandion haliaetus](#) Osprey [952]		Species or species habitat known to occur within area	In feature area
[Tringa nebularia](#) Common Greenshank, Greenshank [832]	Endangered	Species or species habitat known to occur within area	In buffer area only

Other Matters Protected by the EPBC Act

Commonwealth Lands [Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Commonwealth Land Name	State	Buffer Status
Unknown		

Commonwealth Land Name	State	Buffer Status
Commonwealth Land - [50574]	WA	In buffer area only
Commonwealth Land - [50575]	WA	In buffer area only
Commonwealth Land - [50587]	WA	In buffer area only
Commonwealth Land - [50586]	WA	In buffer area only
Commonwealth Land - [50585]	WA	In buffer area only
Commonwealth Land - [50584]	WA	In buffer area only
Commonwealth Land - [50582]	WA	In buffer area only
Commonwealth Land - [50583]	WA	In buffer area only
Commonwealth Land - [50588]	WA	In buffer area only
Commonwealth Land - [50489]	WA	In buffer area only
Commonwealth Land - [51491]	WA	In buffer area only
Commonwealth Land - [50553]	WA	In buffer area only
Commonwealth Land - [50711]	WA	In buffer area only
Commonwealth Land - [50668]	WA	In buffer area only
Commonwealth Land - [50559]	WA	In buffer area only
Commonwealth Land - [50667]	WA	In buffer area only
Commonwealth Land - [50576]	WA	In buffer area only
Commonwealth Land - [50436]	WA	In buffer area only
Commonwealth Land - [50626]	WA	In buffer area only
Commonwealth Land - [50439]	WA	In buffer area only
Commonwealth Land - [51978]	WA	In buffer area only
Commonwealth Land - [51118]	WA	In buffer area only
Commonwealth Land - [50430]	WA	In buffer area only
Commonwealth Land - [50625]	WA	In buffer area only
Commonwealth Land - [50413]	WA	In buffer area only
Commonwealth Land - [50606]	WA	In buffer area only
Commonwealth Land - [50594]	WA	In buffer area only

Commonwealth Land Name	State	Buffer Status
Commonwealth Land - [50410]	WA	In buffer area only
Commonwealth Land - [50592]	WA	In buffer area only
Commonwealth Land - [50494]	WA	In buffer area only
Commonwealth Land - [50562]	WA	In buffer area only
Commonwealth Land - [50563]	WA	In buffer area only
Commonwealth Land - [50682]	WA	In buffer area only
Commonwealth Land - [50316]	WA	In buffer area only
Commonwealth Land - [50593]	WA	In buffer area only
Commonwealth Land - [50598]	WA	In buffer area only
Commonwealth Land - [50440]	WA	In buffer area only
Commonwealth Land - [50271]	WA	In buffer area only
Commonwealth Land - [50448]	WA	In buffer area only
Commonwealth Land - [51120]	WA	In buffer area only
Commonwealth Land - [50502]	WA	In buffer area only
Commonwealth Land - [50508]	WA	In buffer area only
Commonwealth Land - [50630]	WA	In buffer area only
Commonwealth Land - [50560]	WA	In buffer area only
Commonwealth Land - [51111]	WA	In buffer area only
Commonwealth Land - [50561]	WA	In buffer area only

Listed Marine Species			[Resource Information]
Scientific Name	Threatened Category	Presence Text	Buffer Status
Bird			
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area	In feature area
Anous stolidus Common Noddy [825]		Species or species habitat likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Anous tenuirostris melanops Australian Lesser Noddy [26000]	Vulnerable	Species or species habitat may occur within area	In feature area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area	In feature area
Ardenna carneipes as Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Foraging, feeding or related behaviour likely to occur within area	In feature area
Ardenna grisea as Puffinus griseus Sooty Shearwater [82651]	Vulnerable	Species or species habitat may occur within area	In feature area
Bubulcus ibis as Ardea ibis Cattle Egret [66521]		Species or species habitat may occur within area overfly marine area	In feature area
Calidris acuminata Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat known to occur within area	In feature area
Calidris canutus Red Knot, Knot [855]	Vulnerable	Species or species habitat likely to occur within area overfly marine area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area overfly marine area	In feature area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area overfly marine area	In feature area
Calidris ruficollis Red-necked Stint [860]		Species or species habitat known to occur within area overfly marine area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Charadrius leschenaultii](#) Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat likely to occur within area	In feature area
[Diomedea amsterdamensis](#) Amsterdam Albatross [64405]	Endangered	Species or species habitat may occur within area	In feature area
[Diomedea epomophora](#) Southern Royal Albatross [89221]	Vulnerable	Species or species habitat may occur within area	In feature area
[Diomedea exulans](#) Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
[Haliaeetus leucogaster](#) White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area	In feature area
[Halobaena caerulea](#) Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area	In buffer area only
[Himantopus himantopus](#) Pied Stilt, Black-winged Stilt [870]		Species or species habitat known to occur within area overfly marine area	In buffer area only
[Hydroprogne caspia as Sterna caspia](#) Caspian Tern [808]		Foraging, feeding or related behaviour known to occur within area	In feature area
[Larus pacificus](#) Pacific Gull [811]		Foraging, feeding or related behaviour may occur within area	In feature area
[Limosa lapponica](#) Bar-tailed Godwit [844]		Species or species habitat likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area	In feature area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area	In feature area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area overfly marine area	In feature area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area	In feature area
Onychoprion anaethetus as Sterna anaethetus Bridled Tern [82845]		Breeding known to occur within area	In feature area
Pachyptila turtur Fairy Prion [1066]		Species or species habitat likely to occur within area	In feature area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area	In feature area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area	In feature area
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Puffinus assimilis Little Shearwater [59363]		Foraging, feeding or related behaviour known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Recurvirostra novaehollandiae](#) Red-necked Avocet [871]		Species or species habitat known to occur within area overfly marine area	In buffer area only
[Rostratula australis as Rostratula benghalensis (sensu lato)](#) Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area overfly marine area	In feature area
[Stercorarius antarcticus as Catharacta skua](#) Brown Skua [85039]		Species or species habitat may occur within area	In buffer area only
[Sterna dougallii](#) Roseate Tern [817]		Foraging, feeding or related behaviour likely to occur within area	In feature area
[Sternula albifrons as Sterna albifrons](#) Little Tern [82849]		Species or species habitat may occur within area	In feature area
[Thalassarche carteri](#) Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat likely to occur within area	In feature area
[Thalassarche cauta](#) Shy Albatross [89224]	Endangered	Species or species habitat may occur within area	In feature area
[Thalassarche impavida](#) Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area	In feature area
[Thalassarche melanophris](#) Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
[Thalassarche steadi](#) White-capped Albatross [64462]	Vulnerable	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Thinornis cucullatus as Thinornis rubricollis](#) Hooded Plover, Hooded Dotterel [87735]		Species or species habitat may occur within area overfly marine area	In feature area
[Tringa nebularia](#) Common Greenshank, Greenshank [832]	Endangered	Species or species habitat known to occur within area overfly marine area	In buffer area only
Fish			
[Acentronura australe](#) Southern Pygmy Pipehorse [66185]		Species or species habitat may occur within area	In feature area
[Campichthys galei](#) Gale's Pipefish [66191]		Species or species habitat may occur within area	In feature area
[Choeroichthys suillus](#) Pig-snouted Pipefish [66198]		Species or species habitat may occur within area	In feature area
[Halicampus brocki](#) Brock's Pipefish [66219]		Species or species habitat may occur within area	In feature area
[Hippocampus angustus](#) Western Spiny Seahorse, Narrow-bellied Seahorse [66234]		Species or species habitat may occur within area	In feature area
[Hippocampus breviceps](#) Short-head Seahorse, Short-snouted Seahorse [66235]		Species or species habitat may occur within area	In feature area
[Hippocampus subelongatus](#) West Australian Seahorse [66722]		Species or species habitat may occur within area	In feature area
[Lissocampus fatiloquus](#) Prophet's Pipefish [66250]		Species or species habitat may occur within area	In feature area
[Maroubra perserrata](#) Sawtooth Pipefish [66252]		Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Mitotichthys meraculus Western Crested Pipefish [66259]		Species or species habitat may occur within area	In feature area
Nannocampus subosseus Bonyhead Pipefish, Bony-headed Pipefish [66264]		Species or species habitat may occur within area	In feature area
Phycodurus eques Leafy Seadragon [66267]		Species or species habitat may occur within area	In feature area
Phyllopteryx taeniolatus Common Seadragon, Weedy Seadragon [66268]		Species or species habitat may occur within area	In feature area
Pugnaso curtirostris Pugnose Pipefish, Pug-nosed Pipefish [66269]		Species or species habitat may occur within area	In feature area
Solegnathus lettiensis Gunther's Pipehorse, Indonesian Pipefish [66273]		Species or species habitat may occur within area	In feature area
Stigmatopora argus Spotted Pipefish, Gulf Pipefish, Peacock Pipefish [66276]		Species or species habitat may occur within area	In feature area
Stigmatopora nigra Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277]		Species or species habitat may occur within area	In feature area
Syngnathoides biaculeatus Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area	In feature area
Urocampus carinirostris Hairy Pipefish [66282]		Species or species habitat may occur within area	In feature area
Vanacampus margaritifer Mother-of-pearl Pipefish [66283]		Species or species habitat may occur within area	In feature area
Mammal			

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Arctocephalus forsteri](#) Long-nosed Fur-seal, New Zealand Fur-seal [20]		Species or species habitat may occur within area	In feature area
[Neophoca cinerea](#) Australian Sea-lion, Australian Sea Lion [22]	Endangered	Species or species habitat likely to occur within area	In feature area
Reptile			
[Aipysurus pooleorum](#) Shark Bay Sea Snake [66061]		Species or species habitat may occur within area	In feature area
[Caretta caretta](#) Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area	In feature area
[Chelonia mydas](#) Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
[Dermochelys coriacea](#) Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area	In feature area
[Hydrophis kingii as Disteira kingii](#) Spectacled Sea Snake [93511]		Species or species habitat may occur within area	In feature area
[Hydrophis platura as Pelamis platurus](#) Yellow-bellied Sea Snake [93746]		Species or species habitat may occur within area	In feature area
[Natator depressus](#) Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area

Whales and Other Cetaceans			[Resource Information]
Current Scientific Name	Status	Type of Presence	Buffer Status
Mammal			

Current Scientific Name	Status	Type of Presence	Buffer Status
[Balaenoptera acutorostrata](#) Minke Whale [33]		Species or species habitat may occur within area	In feature area
[Balaenoptera edeni](#) Bryde's Whale [35]		Species or species habitat may occur within area	In feature area
[Balaenoptera musculus](#) Blue Whale [36]	Endangered	Species or species habitat likely to occur within area	In feature area
[Caperea marginata](#) Pygmy Right Whale [39]		Species or species habitat may occur within area	In feature area
[Delphinus delphis](#) Common Dolphin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area	In feature area
[Eubalaena australis](#) Southern Right Whale [40]	Endangered	Breeding known to occur within area	In feature area
[Grampus griseus](#) Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area	In feature area
[Megaptera novaeangliae](#) Humpback Whale [38]		Species or species habitat known to occur within area	In feature area
[Orcinus orca](#) Killer Whale, Orca [46]		Species or species habitat may occur within area	In feature area
[Stenella attenuata](#) Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area	In feature area
[Tursiops aduncus](#) Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area	In feature area

Current Scientific Name	Status	Type of Presence	Buffer Status
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area	In feature area

Australian Marine Parks [Resource Information]

Park Name	Zone & IUCN Categories	Buffer Status
Two Rocks	Multiple Use Zone (IUCN VI)	In buffer area only
Two Rocks	National Park Zone (IUCN II)	In buffer area only

Extra Information

State and Territory Reserves [Resource Information]

Protected Area Name	Reserve Type	State	Buffer Status
Lake Joondalup	Nature Reserve	WA	In buffer area only
Marmion	Marine Park	WA	In feature area
Neerabup	National Park	WA	In buffer area only
Neerabup	Nature Reserve	WA	In buffer area only
Unnamed WA21176	5(1)(h) Reserve	WA	In buffer area only
Unnamed WA43290	Conservation Park	WA	In buffer area only
Woodvale	5(1)(h) Reserve	WA	In buffer area only

Nationally Important Wetlands [Resource Information]

Wetland Name	State	Buffer Status
Joondalup Lake	WA	In buffer area only

EPBC Act Referrals [Resource Information]

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Alkimos Seawater Desalination	2019/8453		Completed	In buffer area only
Expansion of Limestone Extraction	2022/09324		Post-Approval	In buffer area only
Land clearing for timber storage	2022/09367		Completed	In buffer area only
Land Development, James Street and Well Street, East Wanneroo, Elberton Property	2021/9106		Assessment	In buffer area only

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Marine Route Survey for Subsea Fibre Optic Data Cable System - Australia West	2024/09826		Completed	In buffer area only
Upgrade of Flynn Drive to dual carriageway between Tranquil Vista to Old Yanchep Road, CARRAMAR, BANKSIA GROVE and NEERABUP.	2024/09948		Referral Decision	In buffer area only
Wattle Avenue East Quarry	2022/09326		Referral Decision	In buffer area only
Controlled action				
Butler North District Open Space playing fields development, Wanneroo, WA	2017/8053	Controlled Action	Post-Approval	In buffer area only
Catalina Residential Development	2010/5785	Controlled Action	Post-Approval	In buffer area only
Excavate sand and limestone resources	2010/5621	Controlled Action	Completed	In buffer area only
Jindee Residential Development	2012/6631	Controlled Action	Post-Approval	In buffer area only
Limestone extraction on Lot 8 Wattle Avenue, Nowergup	2013/6767	Controlled Action	Post-Approval	In buffer area only
Lot 1665 Wanneroo Road, Sinagra.	2017/7921	Controlled Action	Post-Approval	In buffer area only
Lot 9000 Wanneroo Road Sinagra Mixed Use Development, Western Australia	2020/8798	Controlled Action	Proposed Decision	In buffer area only
Meridian Business Park Industrial Development	2007/3479	Controlled Action	Post-Approval	In buffer area only
Mitchell Freeway Extension and Wanneroo Road Upgrade, WA	2018/8367	Controlled Action	Post-Approval	In buffer area only
Mitchell Freeway Extension between Burns Beach Rd and Hester Av, Neerabup, WA	2013/7091	Controlled Action	Post-Approval	In buffer area only
Mitchell Freeway Principal Shared Path Gaps Project Ocean Reef Road to Hepburn Avenue	2020/8833	Controlled Action	Post-Approval	In buffer area only
National Lifestyle Villages Development	2011/6020	Controlled Action	Post-Approval	In buffer area only
Nava-1 Cable System	2001/510	Controlled Action	Completed	In buffer area only

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Controlled action				
Neerabup Industrial Area, WA	2021/8917	Controlled Action	Assessment Approach	In buffer area only
Neerabup Industrial Estate, Lot 701 Flynn Drive Neerabup WA	2012/6424	Controlled Action	Post-Approval	In buffer area only
Ocean Reef Marina Development	2009/4937	Controlled Action	Completed	In buffer area only
Residential development Lot 1004 Alkimos WA	2011/5902	Controlled Action	Post-Approval	In buffer area only
Shark Hazard Mitigation Drum Line Program, WA	2014/7174	Controlled Action	Completed	In buffer area only
Subdivision of Lot 902 Flynn Drive Neerabup for Industrial Development	2021/8977	Controlled Action	Assessment Approach	In buffer area only
Urban and Residential Development at Lot 9 Brighton	2011/6137	Controlled Action	Post-Approval	In buffer area only
Urban development in accordance with the Local Structure Plan	2008/4601	Controlled Action	Post-Approval	In buffer area only
Urban Residential Development at Lot 9049 Marmoin Avenue	2009/5155	Controlled Action	Post-Approval	In buffer area only
Vegetation Clearing, Wannaroo Rd and Nowergup Rd	2011/5955	Controlled Action	Completed	In buffer area only
Not controlled action				
APX-West Fibre-optic telecommunications cable system, WA to Singapore	2013/7102	Not Controlled Action	Completed	In buffer area only
Butler Railway Extension Project - Nowergup Depot Eastern Alignment	2011/5989	Not Controlled Action	Completed	In buffer area only
Commercial development of Lot 9004 Hodges Drive, Joondalup, WA	2016/7844	Not Controlled Action	Completed	In buffer area only
Connect Joondalup - Lot 9000 McLarty Ave and Lot 999 Piccadilly Circus, Joondalup, WA	2016/7758	Not Controlled Action	Completed	In buffer area only
Container Deposit Scheme Project	2019/8517	Not Controlled Action	Completed	In buffer area only
Development of ECU Engineering Annex, Joondalup Campus, WA	2017/7995	Not Controlled Action	Completed	In buffer area only
Eradication of the European House Borer, Perth metropolitan area, WA	2009/5027	Not Controlled Action	Completed	In buffer area only

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Not controlled action				
Extension of 7.5km of the Joondalup Line electrified passenger railway from Cla	2010/5632	Not Controlled Action	Completed	In buffer area only
Flynn Drive / Pinjar Road Intersection Works, Lot 9000 Flynn Drive, Neerabup, WA	2017/7983	Not Controlled Action	Completed	In buffer area only
Groundwater Replenishment Scheme (GWRS) Stage 2	2016/7786	Not Controlled Action	Completed	In buffer area only
Improving rabbit biocontrol: releasing another strain of RHDV, sthrn two thirds of Australia	2015/7522	Not Controlled Action	Completed	In feature area
INDIGO West Submarine Telecommunications Cable, WA	2017/8126	Not Controlled Action	Completed	In buffer area only
Ocean Reef Marina Development, City of Joondalup, WA	2014/7237	Not Controlled Action	Completed	In buffer area only
Pinjar Motorcycle Park Raceway Development	2012/6419	Not Controlled Action	Completed	In buffer area only
Quinns Main sewer extension, Clarkson - Neerabup, WA	2018/8215	Not Controlled Action	Completed	In buffer area only
Realignment of Flynn Drive	2011/6170	Not Controlled Action	Completed	In buffer area only
Residential Development, Lots 10 Dundebar Road and 28 and 29 Belgrade Road, East Wanneroo, WA	2019/8521	Not Controlled Action	Completed	In buffer area only
Residential Subdivision - Lots 12, 36 & 38 Capron St, Wanneroo	2012/6409	Not Controlled Action	Completed	In buffer area only
Seismic Survey, Bremer Basin, Mentelle Basin and Zeewyck Sub-basin	2004/1700	Not Controlled Action	Completed	In buffer area only
Wanneroo Road/Ocean Reef Road Grade Separation, Pearsall, WA	2017/8110	Not Controlled Action	Completed	In buffer area only
Wanneroo Road Duplication, WA	2015/7632	Not Controlled Action	Completed	In buffer area only
Not controlled action (particular manner)				
Australia to Singapore Fibre Optic Submarine Cable System	2011/6127	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only
Laying a submarine optical fibre telecommunications cable, Perth to Singapore and Jakarta	2014/7332	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Not controlled action (particular manner)				
Road realignment and widening	2009/4926	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only
Subdivision Lot 4 Flynn Drive and earthworks for industrial development, 240 Fl	2009/5028	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only

Key Ecological Features [Resource Information]

Key Ecological Features are the parts of the marine ecosystem that are considered to be important for the biodiversity or ecosystem functioning and integrity of the Commonwealth Marine Area.

Name	Region	Buffer Status
Commonwealth marine environment within and adjacent to the west coast inshore lagoons	South-west	In buffer area only
Western rock lobster	South-west	In buffer area only

Biologically Important Areas [Resource Information]

Scientific Name	Behaviour	Presence	Buffer Status
Seabirds			
Ardenna pacifica			
Wedge-tailed Shearwater [84292]	Foraging (in high numbers)	Known to occur	In feature area
Hydroprogne caspia			
Caspian Tern [808]	Foraging (provisioning young)	Known to occur	In feature area
Larus pacificus			
Pacific Gull [811]	Foraging (in high numbers)	Former Range	In feature area
Onychoprion anaethetus			
Bridled Tern [82845]	Foraging (in high numbers)	Known to occur	In feature area
Puffinus assimilis tunneyi			
Little Shearwater [59363]	Foraging (in high numbers)	Known to occur	In feature area
Sterna dougallii			
Roseate Tern [817]	Foraging	Known to occur	In feature area

Scientific Name	Behaviour	Presence	Buffer Status
[Sternula nereis](#) Fairy Tern [82949]	Foraging (in high numbers)	Known to occur	In feature area
Seals			
[Neophoca cinerea](#) Australian Sea Lion [22]	Foraging (male)	Likely to occur	In feature area
Whales			
[Megaptera novaeangliae](#) Humpback Whale [38]	Migration (north)	Known to occur	In buffer area only
[Megaptera novaeangliae](#) Humpback Whale [38]	Migration (north and south)	Known to occur	In feature area

Caveat

1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data is available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance on the contents of this report.

3 DATA SOURCES

Threatened ecological communities

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

Threatened, migratory and marine species

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

Where little information is available for a species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc.).

In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More detailed distribution mapping methods are used to update these distributions when time permits.

4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

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

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded breeding sites; and
- seals which have only been mapped for breeding sites near the Australian continent

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

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

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

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

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

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Appendix F Flora species list

Family	Species Name	Status
Aizoaceae	*Carpobrotus virescens*	
Apiaceae	*Daucus glochidiatus*	
Araliaceae	*Trachymene pilosa*	
Asparagaceae	*Acanthocarpus preissii*	
	Lomandra maritima	
Asphodelaceae	**Trachyandra divaricata*	Permitted – s11
Asteraceae	**Hypochaeris glabra*	Permitted – s11
	**Lactuca serriola*	Permitted – s11
	**Sonchus oleraceus*	Permitted – s11
	**Urospermum picroides*	Permitted – s11
	Olearia axillaris	
Brassicaceae	**Brassica tournefortii*	Permitted – s11
	**Heliophila pusella*	Permitted – s11
Caryophyllaceae	**Stellaria media*	Permitted – s11
Chenopodiaceae	*Rhagodia baccata*	
	Threlkeldia diffusa	
Crassulaceae	**Crassula glomerata*	Permitted – s11
	Crassula colorata	
Cyperaceae	*Lepidosperma ?calcicola*	
Ericaceae	*Leucopogon parviflorus*	
	Styphelia insularis	
Fabaceae	**Melilotus indicus*	Permitted – s11
	**Trifolium campestre*	Permitted – s11
	Acacia cyclops	
	Acacia rostellifera	
	Acacia truncata	
	Acacia lasiocarpa	
	Gompholobium tomentosum	
	Hardenbergia comptoniana	
	Kennedia prostrata	
	Templetonia retusa	
Gentianaceae	**Centaurium pulchellum*	Permitted – s11
Geraniaceae	**Geranium molle*	Permitted – s11
Goodeniaceae	*Scaevola nitida*	
Haemodoraceae	*Conostylis candicans*	
Hemerocallidaceae	*Dianella revoluta*	
Lauraceae	*Cassytha flava*	
	Cassytha racemosa	
Malvaceae	*Thomasia triphylla*	
Myrtaceae	*Melaleuca huegelii*	
	Melaleuca systena	
Orchidaceae	*Caladenia flava*	

Family	Species Name	Status
	Caladenia latifola	
	Caladenia sp.	
Phyllanthaceae	*Lysiandra calycina*	
Poaceae	**Ehrharta longiflora*	
	**Lagurus ovatus*	Permitted – s11
	**Vulpia bromoides*	Permitted – s11
	**Vulpia myuros*	Permitted – s11
	Poa poiformis	
Primulaceae	**Lysimachia arvensis*	Permitted – s11
Proteaceae	*Grevillea preissii*	
Ranunculaceae	*Clematis linearifolia*	
Restionaceae	*Desmocladus flexuosus*	
Rhamnaceae	*Spyridium globulosum*	
	Trymalium ledifolium	
Rubiaceae	**Galium murale*	Permitted – s11
	Opercularia vaginata	
Scrophulariaceae	*Eremophila glabra*	
Urticaceae	*Parietaria debilis*	

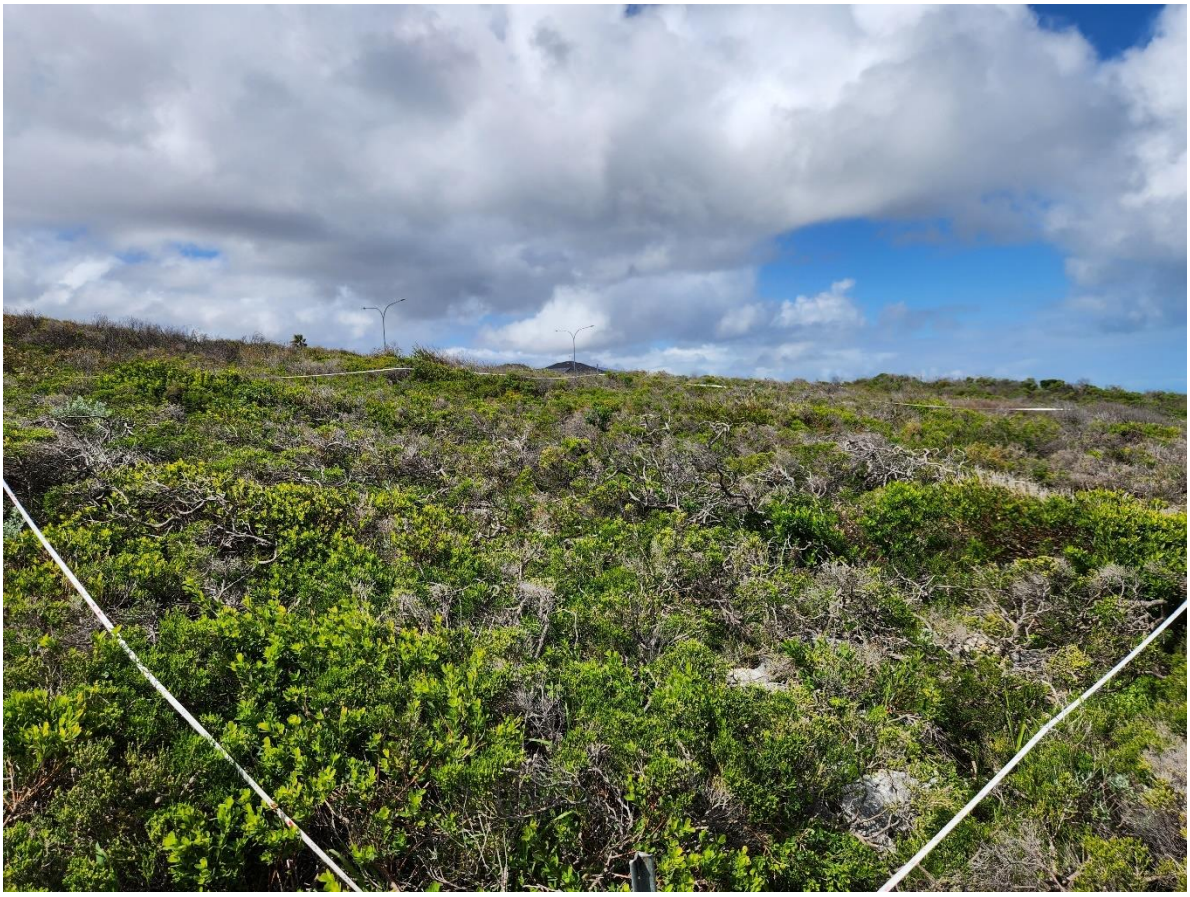
Appendix G Species by site matrix

Species Name	MOR1	MOR2	Q13
**Brassica tournefortii*		x	
**Bromus diandrus*			x
**Centaurium pulchellum*	x		x
**Cerastrium glomeratum*			x
**Crassula glomerata*	x	x	x
**Dichisma arernarium*			x
**Ehrharta longiflora*	x	x	x
**Galium murale*	x	x	x
**Geranium molle*	x		
**Gladiolus caryophyllaceus*			x
**Heliophila pusilla*		x	
**Hypochaeris glabra*	x	x	
**Lactuca serriola*	x	x	
**Lagurus ovatus*		x	
**Lysimachia arvensis*	x	x	x
**Melilotus indicus*	x	x	x
**Sonchus oleraceus*	x		x
**Stellaria media*	x	x	
**Trachyandra divaricata*		x	
**Trifolium campestre*	x	x	x
**Urospermum picroides*	x	x	
**Vulpia bromoides*	x		x
**Vulpia myuros*		x	
Acacia cyclops		x	x
Acacia rostellifera	x		x
Acacia truncata	x	x	x
Acacia lasiocarpa	x		x
Acanthocarpus preissii	x	x	x
Ammothyron grandiflorum			x
Caladenia flava		x	
Caladenia latifola	x		
Caladenia sp.		x	
Calothamnus quadrifidus			x
Carpobrotus virescens		x	x
Cassytha flava		x	
Cassytha racemosa	x		x
Clematis linearifolia	x	x	
Conostylis candicans		x	x
Crassula colorata	x		x
Daucus glochidiatus	x	x	
Desmocladus flexuosus	x	x	x
Dianella revoluta	x	x	

Species Name	MOR1	MOR2	Q13
Eremophila glabra	x		x
Gompholobium tomentosum	x	x	x
Grevillea preissii	x	x	x
Hardenbergia comptoniana	x	x	x
Isolepis marginata			x
Kennedia prostrata		x	x
Lepidosperma ?calcicola	x	x	
Leucopogon parviflorus	x	x	x
Lomandra maritima	x	x	x
Lysiandra calycina		x	x
Melaleuca huegelii	x	x	x
Melaleuca systena	x	x	x
Olearia axillaris	x	x	x
Opercularia vaginata	x	x	x
Parietaria debilis		x	x
Poa poiformis	x	x	x
Rhagodia baccata	x	x	x
Rhodanthe corymbosa			x
Scaevola nitida	x		
Senecio pinnatifolius			x
Spyridium globulosum	x	x	x
Styphelia insularis	x		x
Templetonia retusa	x		x
Thomasia triphylla	x		
Threlkeldia diffusa	x	x	x
Trachymene pilosa	x		x
Trymalium ledifolium		x	

Appendix H Quadrat data

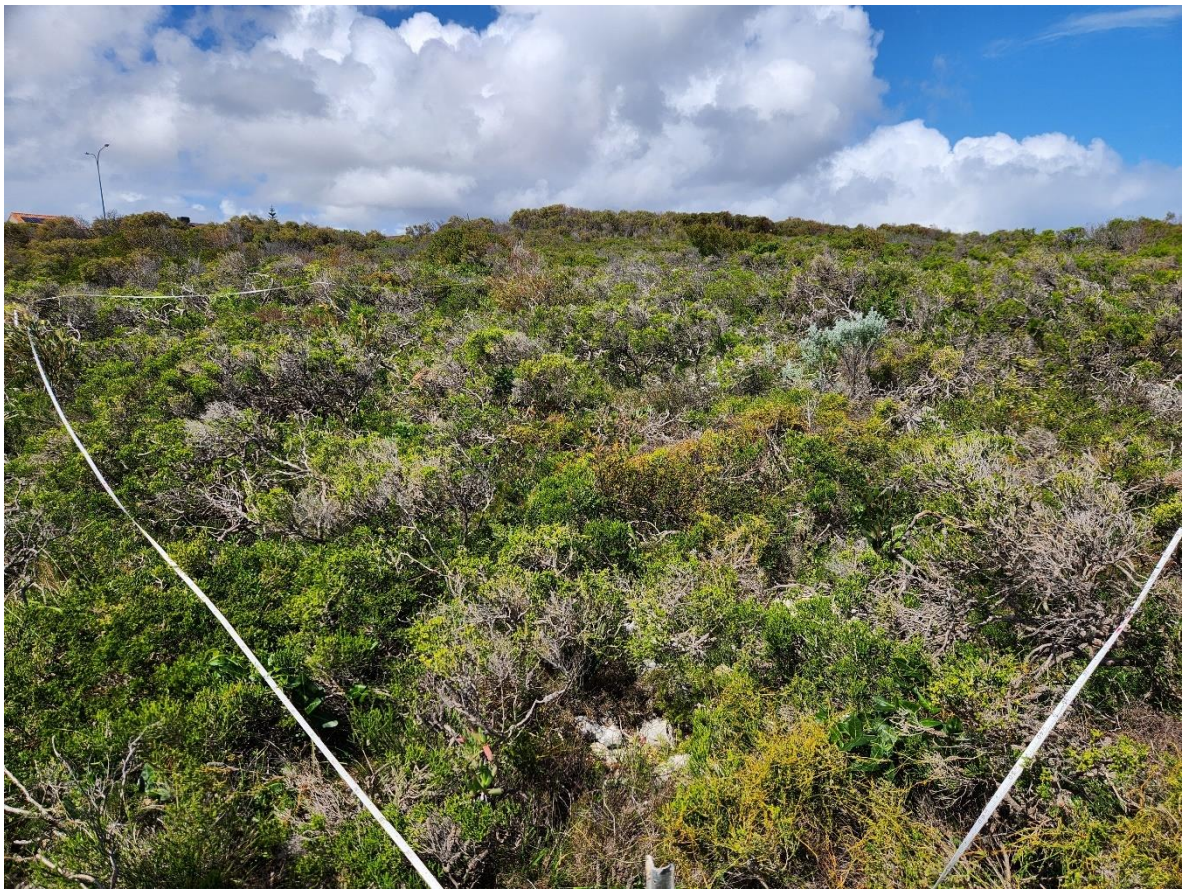
Site name	Date	Site type	Observer
MOR1	6/9/2024	Quadrat 10 x 10m	JC
Vegetation condition	**Disturbance**	**Age since fire (years)**	**Vegetation community**
Very Good	Weeds	Old (>20)	*M. cardiophylla* heath
Habitat description	**Landform unit**	**Aspect**	**Slope (%)**
Melaleuca huegelii heath	Hill, slope	W	5
Soil colour	**Soil type**	**Rock type**	**Outcropping (%)**
Dark brown	Fine skeletal sand	Limestone	10 – 20%
Easting		**Northing**	
379275		6487096	



Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Melaleuca huegelii	60	M	Shrubs <1m
Templetonia retusa	5	M	Shrubs <1m
Acacia truncata	2.5	M	Shrubs <1m
Thomasia triphylla	0.5	M	Shrubs <1m
Grevillea preissii	0.5	M	Shrubs <1m
Melaleuca systena	0.5	M	Shrubs <1m
Styphelia insularis	0.5	M	Shrubs <1m

Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Acacia rostellifera	0.5	M	Shrubs <1m
Spyridium globulosum	0.2	M	Shrubs <1m
Olearia axillaris	0.2	M	Shrubs <1m
Acacia lasiocarpa	0.2	M	Shrubs <1m
Rhagodia baccata	0.2	M	Shrubs <1m
Gompholobium tomentosum	0.1	M	Shrubs <1m
Dianella revoluta	0.1	M	Shrubs <1m
Leucopogon parviflorus	0.1	M	Shrubs <1m
Threlkeldia diffusa	0.1	M	Shrubs <1m
Eremophila glabra	0.1	M	Shrubs <1m
Lepidosperma ?calcicola	0.05	G	Sedges
**Lysimachia arvensis*	0.5	G	Herbs
Desmocladus flexuosus	0.5	G	Herbs
**Melilotus indicus*	0.5	G	Herbs
Opercularia vaginata	0.4	G	Herbs
Lomandra maritima	0.2	G	Herbs
Daucus glochidiatus	0.2	G	Herbs
**Stellaria media*	0.2	G	Herbs
**Sonchus oleraceus*	0.1	G	Herbs
**Galium murale*	0.1	G	Herbs
**Geranium molle*	0.1	G	Herbs
**Lactuca serriola*	0.1	G	Herbs
**Crassula glomerata*	0.1	G	Herbs
Acanthocarpus preissii	0.1	G	Herbs
**Hypochaeris glabra*	0.1	G	Herbs
Scaevola nitida	0.1	G	Herbs
Trachymene pilosa	0.1	G	Herbs
**Triphiloum campestre*	0.1	G	Herbs
Crassula colorata	0.05	G	Herbs
**Centaurium pulchellum*	0.05	G	Herbs
**Urospermum picroides*	0.05	G	Herbs
Caladenia latifola	0.01	G	Herbs
**Ehrharta longiflora*	1	G	Grasses
**Vulpia bromoides*	0.2	G	Grasses
Poa poiformis	0.1	G	Grasses
Clematis linearifolia	0.1	G	Climber
Cassytha racemosa	0.1	G	Climber
Hardenbergia comptoniana	0.1	G	Climber

Site name	Date	Site type	Observer
MOR2	6/9/2024	Quadrat 10 x 10m	JC
Vegetation condition	**Disturbance**	**Age since fire (years)**	**Vegetation community**
Very Good	Weeds	Old (>20)	*M. cardiophylla* heath
Habitat description	**Landform unit**	**Aspect**	**Slope (%)**
Melaleuca huegelii heath	Hill, slope	W	5
Soil colour	**Soil type**	**Rock type**	**Outcropping (%)**
Dark brown	Fine skeletal sand	Limestone	10 – 20%
Easting		**Northing**	
379254		6487205	



Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Melaleuca huegelii	50	U	Shrubs 1-2m
Acacia cyclops	0.2	U	Shrubs 1-2m
Trymalium ledifolium	3.5	M	Shrubs <1m
Melaleuca systena	2.5	M	Shrubs <1m
Acacia truncata	2	M	Shrubs <1m
Grevillea preissii	0.5	M	Shrubs <1m
Spyridium globulosum	0.5	M	Shrubs <1m
Gompholobium tomentosum	0.2	M	Shrubs <1m
Leucopogon parviflorus	0.2	M	Shrubs <1m
Lysiandra calycina	0.2	M	Shrubs <1m

Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Rhagodia baccata	0.2	M	Shrubs <1m
Dianella revoluta	0.1	M	Shrubs <1m
Kennedia prostrata	0.1	M	Shrubs <1m
Olearia axillaris	0.1	M	Shrubs <1m
Threlkeldia diffusa	0.1	M	Shrubs <1m
Lepidosperma ?calcicola	0.1	G	Sedges
**Melilotus indicus*	1	G	Herbs
**Stellaria media*	0.5	G	Herbs
Desmocladus flexuosus	0.5	G	Herbs
Lomandra maritima	0.5	G	Herbs
**Hypochaeris glabra*	0.2	G	Herbs
**Lysimachia arvensis*	0.2	G	Herbs
Carpobrotus virescens	0.2	G	Herbs
Daucus glochidiatus	0.2	G	Herbs
Opercularia vaginata	0.2	G	Herbs
**Brassica tournefortii*	0.1	G	Herbs
**Crassula glomerata*	0.1	G	Herbs
**Galium murale*	0.1	G	Herbs
**Heliophila pusilla*	0.1	G	Herbs
**Lactuca serriola*	0.1	G	Herbs
**Trachyandra divaricata*	0.1	G	Herbs
**Triphiloum campestre*	0.1	G	Herbs
**Urospermum picroides*	0.1	G	Herbs
Acanthocarpus preissii	0.1	G	Herbs
Conostylis candicans	0.1	G	Herbs
Parietaria debilis	0.1	G	Herbs
Caladenia flava	0.05	G	Herbs
Caladenia sp.	0.05	G	Herbs
**Ehrharta longiflora*	0.5	G	Grasses
Poa poiformis	0.2	G	Grasses
**Lagurus ovatus*	0.1	G	Grasses
**Vulpia myuros*	0.1	G	Grasses
Cassytha flava	0.1	G	Climber
Clematis linearifolia	0.1	G	Climber
Hardenbergia comptoniana	0.1	G	Climber

Site name	Date	Site type	Observer
Q13 (ELA 2024)	22/9/2023	Quadrat 10 x 10m	JC
Vegetation condition	**Disturbance**	**Age since fire (years)**	**Vegetation community**
Excellent	Weeds, rabbits	Old (>20)	*M. cardiophylla* heath
Habitat description	**Landform unit**	**Aspect**	**Slope (%)**
Melaleuca huegelii heath	Hill	W	5
Soil colour	**Soil type**	**Rock type**	**Outcropping (%)**
Dark brown	Fine skeletal sand	Limestone	10 – 20%
Easting		**Northing**	
379233		6487163	

Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Spyridium globulosum	1.5	M	Shrubs 1-2m
Banksia sessilis	0.5	M	Shrubs 1-2m
Olearia axillaris	0.5	M	Shrubs 1-2m
Melaleuca huegelii	30	M	Shrubs <1m
Rhagodia baccata	5	M	Shrubs <1m
Acacia truncata	2	M	Shrubs <1m
Acacia lasiocarpa	1.5	M	Shrubs <1m
Acacia cyclops	0.5	M	Shrubs <1m

Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Calothamnus quadrifidus	0.5	M	Shrubs <1m
Grevillea preissii	0.5	M	Shrubs <1m
Melaleuca systena	0.5	M	Shrubs <1m
Acacia rostellifera	0.3	M	Shrubs <1m
Acanthocarpus preissii	0.2	M	Shrubs <1m
Eremophila glabra	0.2	M	Shrubs <1m
Leucopogon parviflorus	0.2	M	Shrubs <1m
Lysiandra calycina	0.2	M	Shrubs <1m
Styphelia insularis	0.2	M	Shrubs <1m
Templetonia retusa	0.2	M	Shrubs <1m
Gompholobium tomentosum	0.1	M	Shrubs <1m
Desmocladus flexuosus	0.4	G	Sedges
Ammothryon grandiflorum	0.1	G	Sedges
Isolepis marginata	0.05	G	Sedges
Lepidosperma calcicola	0.05	G	Sedges
**Ehrharta longiflora*	0.3	G	Grasses
Poa poiformis	0.3	G	Grasses
**Bromus diandrus*	0.1	G	Grasses
**Vulpia bromoides*	0.1	G	Grasses
Threlkeldia diffusa	1	G	Herbs
**Melilotus indicus*	0.5	G	Herbs
**Trifolium campestre*	0.5	G	Herbs
Hardenbergia comptoniana	0.5	G	Herbs
**Lysimachia arvensis*	0.2	G	Herbs
Carpobrotus virescens	0.2	G	Herbs
**Crassula glomerata*	0.1	G	Herbs
**Galium murale*	0.1	G	Herbs
**Sonchus oleraceus*	0.1	G	Herbs
Cassytha racemosa	0.1	G	Herbs
Conostylis candicans subsp. calcicola	0.1	G	Herbs
Dianella revoluta var. revoluta	0.1	G	Herbs
Kennedia prostrata	0.1	G	Herbs
Lomandra maritima	0.1	G	Herbs
Opercularia vaginata	0.1	G	Herbs
Rhodanthe corymbosa	0.1	G	Herbs
Senecio pinnatifolius	0.1	G	Herbs
Trachymene pilosa	0.1	G	Herbs
**Centaurium pulchellum*	0.05	G	Herbs
**Cerastium glomeratum*	0.05	G	Herbs
**Dischisma arenarium*	0.05	G	Herbs
**Gladiolus caryophyllaceus*	0.05	G	Herbs
Crassula colorata	0.05	G	Herbs
Parietaria debilis	0.05	G	Herbs