South Metropolitan Crop Research Hub

Flora, vegetation and fauna habitat survey

Prepared for
Murdoch University
by Strategen

March 2018

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South Metropolitan Crop Research Hub

Flora, vegetation and fauna habitat survey

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March 2018

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Client: Murdoch University

Report Version	Revision No.	Purpose	Strategen author/reviewer	Submitted to Client	
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Table of contents

List of tables

List of figures

List of appendices

1. Introduction

1.1 Purpose

This report presents the findings of a reconnaissance flora vegetation and fauna habitat survey undertaken to support proposed agricultural research (the Survey Area, Figure 1).

The proposed works will require clearing of native vegetation and as such, a flora, vegetation and fauna habitat survey was deemed necessary to determine the environmental values of the vegetation proposed to be cleared.

1.2 Scope

The scope of this flora, vegetation and black cockatoo survey was to undertake a desktop assessment and field assessment within the Survey Area (Figure 1).

The objectives were to:

- conduct a desktop survey for Threatened and Priority flora which have been identified as being present in or around the survey area
- collect and identify the vascular plant species present within the Survey Area
- search areas of suitable habitat for Threatened and/or Priority flora
- define and map the native vegetation communities present within the Survey Area
- map vegetation condition within the survey area
- provide recommendations on the local and regional significance of the vegetation communities
- identify the extent and quality of black cockatoo foraging habitat
- identify the presence of any potential black cockatoo nesting trees
- prepare a report summarising the findings.

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Figure 1: Survey Area

Scale 1:1,000 at A3

0 10 20 30 m

N

Legend

Survey area

Coordinate System: GDA 1994 MGA Zone 50
Note that positional errors may occur in some areas
Date: 8/03/2018
Author: JCrute
Source: Topography: Geoscience Australia 2011.

Path: Q:\Consult\2017\MUN\MUN17465\01_GIS_documents\ArcMap_documents\MUN17465_G008_RevC.mxd

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2. Overview of existing environment

2.1 Geology, landform and soils

The Survey Area is located within the Swan Coastal Plain bioregion (SWA2 – Swan Coastal Plain subregion) of Western Australia (Mitchell et al. 2002). The Swan Coastal Plain comprises five major geomorphologic systems that lie parallel to the coast, namely (from west to east) the Quindalup Dunes, Spearwood Dunes, Bassendean Dunes, Pinjarra Plain and Ridge Hill Shelf (Churchward & McArthur 1980; Gibson *et al.* 1994). Each major system is composed of further subdivisions in the form of detailed geomorphologic units (Churchward & McArthur 1980; Semeniuk 1990; Gibson *et al.*1994). Beard (1990) describes the Swan Coastal Plain as a low-lying coastal plain, often swampy, with sandhills also containing dissected country rising to the duricrusted Dandaragan plateau on Mesozoic, mainly sandy, yellow soils. The Survey Area is situated within the Bassendean Dunes formation.

2.2 Hydrology

2.2.1 Surface water

Rainfall is anticipated to infiltrate the soil within the site. No standing water was observed within the Survey Area at the time of the survey.

2.2.2 Groundwater

Based on mapping provided by the Department of Water, groundwater is 5.8 m below ground level within the Survey Area (DoW 2017).

2.3 Vegetation

Strategen undertook a flora, vegetation and fauna habitat survey within the Survey Area (Figure 1) on 30 November 2017. The survey was undertaken in accordance with methodology outlined in the Environmental Protection Authority (EPA) publication *Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA 2016). The results of the assessment are summarised in the following sections.

2.3.1 Regional vegetation

Beard (1990) Botanical Subdistrict

The Survey Area occurs within the Drummond Botanical Subdistrict which is characterised by low *Banksia* woodlands on leached sands; *Melaleuca* swamps on poorly-drained depressions; and *Eucalyptus gomphocephala* (Tuart), *Eucalyptus marginata* (Jarrah) and *Corymbia calophylla* (Marri) woodlands on less leached soils (Beard 1990).

IBRA subregion

The Interim Biogeographic Regionalisation for Australia (IBRA) divides Western Australia into 26 biogeographic regions and 53 subregions based on dominant landscape characteristics of climate, lithology, geology, landform and vegetation (McKenzie et al. 2003).

IBRA describes a system of 85 'biogeographic regions' (bioregions) and 403 subregions covering the entirety of the Australian continent (Thackway & Cresswell 1995). Bioregions are defined on the basis of climate, geology, landforms, vegetation and fauna.

The Survey Area occurs within the Swan Coastal Plain 2 IBRA subregion which is dominated by *Banksia* or Tuart on sandy soils, *Casuarina obesa* on outwash plains and paperbark (*Melaleuca*) in swampy areas (Mitchell et al. 2002).

System 6 and vegetation system association mapping

Vegetation occurring within the region was initially mapped at a broad scale (1: 1 000 000) by Beard during the 1970s. This dataset has formed the basis of several regional mapping systems, including physiographic regions defined by Beard (1981); System 6 Vegetation Complex mapping undertaken by Heddle et al. (1980); the biogeographical region dataset (Interim Biogeographic Regionalisation for Australia) for Western Australia (DEE 2017a).

The project area is situated within vegetation association Bassendean 1001 – *Medium very sparse woodland; jarrah, with low woodland; banksia & casuarina* (Beard 1990), of which 22.28% remains in the IBRA bioregion (GoWA 2016).

Based on regional vegetation complex mapping (Heddle et al. 1980) the Survey Area contains the Bassendean Central and South and Karrakatta Central and South vegetation complexes, of which 25.68% and 23.61% respectively remains in the IBRA bioregion (GoWA 2017) (Figure 2).

Bush Forever and wetlands

No Bush Forever sites or geomorphic wetlands mapped by the Department of Environment and Conservation (now Department of Biodiversity, Conservation and Attractions [DBCA]) are present within the Survey Area.

A Conservation Category Wetlands (CCW; UFI 6513, in Chelodina Nature Reserve) is located immediately to the north of the Survey Area. An additional CCW (UFI 14645) is located to the south of the Survey Area, also on Murdoch University property.

The nearest Bush Forever site (North Lake and Bibra Lake, site 244) is situated approximately 600 m to the south of the Survey Area.

Figure 2: Regional vegetation mapping

Scale 1:5,000 at A3

0 50 100 150 m

N

Coordinate System: GDA 1994 MGA Zone 50
Note that positional errors may occur in some areas
Date: 8/03/2018
Author: JCrute
Source: Topography: Geoscience Australia 2011.

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Legend

Survey area

System association (Beard)	Vegetation class (Heddle)
Bassendean 1001	Bassendean complex - central and south
Bassendean 125	Herdsman Complex
Spearwood 6	Karrakatta complex - central and south

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Figure 3: Wetlands and Bush Forever sites within 5 km of survey area

Scale 1:50,000 at A3

0 500 1,000 1,500 m

Coordinate System: GDA 1994 MGA Zone 50
Note that positional errors may occur in some areas
Date: 8/03/2018
Author: JCrute
Source: Topography: Geoscience Australia 2011.

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Legend

- Survey area
- 5km survey area buffer
- Bush Forever site

Conservation wetland

- Conservation
- Multiple Use
- Resource Enhancement

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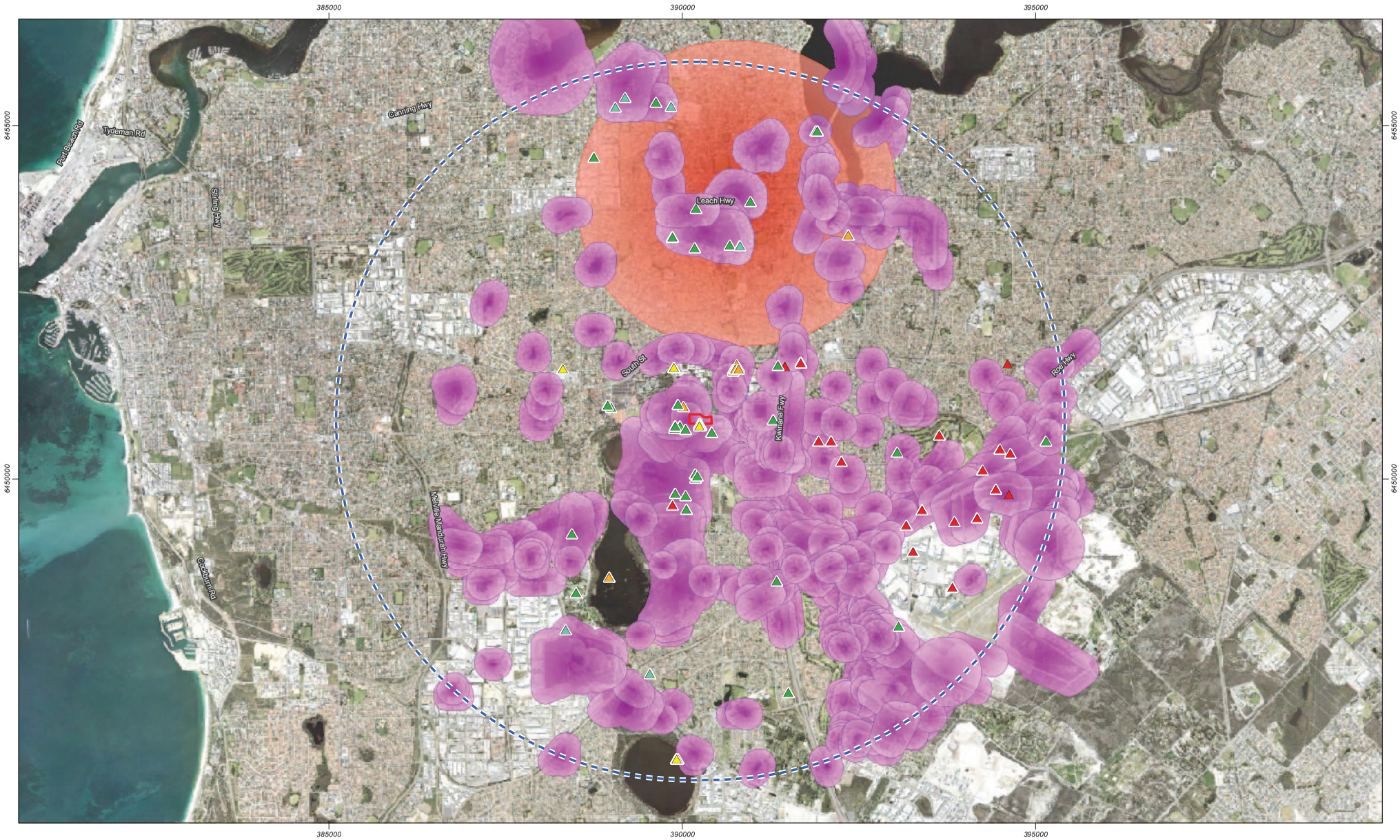

Figure 4: Location of Threatened and Priority Flora and Ecological Communities within 5 km of Survey Area

Scale 1:50,000 at A3

0 500 1,000 1,500 m

N

Coordinate System: GDA 1994 MGA Zone 50
Note that positional errors may occur in some areas
Date: 8/03/2018
Author: JCrute
Source: Topography: Geoscience Australia 2011.

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Legend

Threatened & Priority Flora

- (T) Threatened Rare Flora - Extant Taxa
- Priority 1 - Poorly Known Taxa
- Priority 2 - Poorly Known Taxa
- Priority 3 - Poorly Known Taxa
- Priority 4 - Rare Taxa
- Survey area
- 5km survey area buffer

Threatened & Priority ecological communities

- Priority 2
- Priority 3

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3. Vegetation assessment

3.1 Methods

3.1.1 Desktop assessment

Database searches of NatureMap (Parks and Wildlife 2007-) and the Department of the Environment and Energy (DEE) protected matters database (DEE 2017b) were undertaken to determine the likelihood of any Threatened or Priority flora species within a 5 km radius of the Survey Area (Appendix 1).

A desktop search was also undertaken to determine the likelihood of any Threatened or Priority Ecological Communities (TECs, PECs) potentially occurring within 3 km of the Survey Area.

3.1.2 Field assessment

A Senior Ecologist from Strategen attended the Survey Area on 30 November 2017 and undertook the following:

- Reconnaissance Survey fulfilling the requirements of the Environmental Protection Authority (EPA) (2016), *Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment*
- fauna and fauna habitat survey.

A site walkover was undertaken and one quadrat was sampled within the Survey Area. Notes were taken on any fauna sightings and regarding the quality of black cockatoo habitat.

Aerial photography interpretation and field notes taken during the survey were used to develop VT mapping polygon boundaries. These polygon boundaries were then digitised using Geographic Information System (GIS) software.

Vegetation condition was recorded and described using the vegetation condition scale for the South West Botanical Province (Keighery 1994). Vegetation condition polygon boundaries were developed using this information in conjunction with aerial photography interpretation, and were digitised as for VT mapping polygon boundaries.

3.2 Results

3.2.1 Desktop assessment

Table 1 shows the Threatened and Priority flora potentially occurring within the Survey Area. The desktop assessment identified seven Threatened flora and four Priority flora species that have been recorded in the regional area.

A search of the DBCA Threatened and Priority Flora database indicated that the only records of conservation significant species within the Survey Area are fungus species (*Amanita waduwalitu* and *A. preissii*) which fall outside the scope of this survey, which covers vascular flora species only. No records of either Threatened or Priority vascular Flora are known within the Survey Area. Preferred or potential habitat for two Threatened Flora species is identified as being present within the Survey Area:

- *Caladenia huegelii* (T)
- *Drakaea micrantha* (T).

Additionally, two Priority flora species are known from the local area, however, as no habitat information is available for these two species, the application of the precautionary principle should be applied. As such, the following species should be considered as potentially occurring within the Survey Area:

- *Dampiera triloba* (P3)
- *Styphelia filifolia* (P3).

Table 1: Threatened and Priority flora potentially occurring within the Survey Area

Species	Conservation status		Description	Potential to occur
	EPBC Act	WC Act		
Andersonia gracilis	Endangered	T	A slender, erect or open straggly shrub, 10 to 100 cm high. Flowers are white to pink to purple from September to November. Habitat for this species occurs in white/grey sand, sandy clay, gravelly loam within winter-wet areas and near swamps (Western Australian Herbarium 1998-). The species occurs in damp black, sandy clay flats near swamps in open low heath with Calothamnus hirsutus (hairy clawflower), Verticordia densiflora (compact featherflower), Kunzea recurva (recurved kunzea) and Banksia telmatiaea over sedges.	**Unlikely** due to absence of preferred habitat.
Caladenia huegelii	Endangered	T	A slender orchid 30 to 50 cm tall. One or two striking flowers characterised by a greenish-cream lower petal with a maroon tip. Other petals are cream with red or pink suffusions. Habitat for this species occurs within well-drained, deep sandy soils in low mixed *Banksia*, *Allocasuarina* and Jarrah woodlands (Western Australian Herbarium 1998-, DEE 2017b).	**Possible** due to presence of preferred habitat.
Dampiera triloba	Not listed	P3	Erect perennial, herb or shrub, to 0.5 m high. Flowers blue between August and December (Western Australian Herbarium 1998-).	**Possible.** No information is available for this species, therefore the precautionary principle must be applied.
Diuris micrantha	Vulnerable	T	A slender orchid to 60 cm tall. Flowers are yellow with reddish-brown markings and visible from September to October. Habitat for this species occurs within clay-loam substrates in winter-wet depressions or swamps (DEE 2017b).	**Unlikely** due to absence of preferred habitat.
Diuris purdiei	Endangered	T	A slender orchid to 0.35 m tall. Flowers are yellow and visible from September to October. Habitat for this species is grey-black sand substrates in winter-wet swamps which have high moisture (Western Australian Herbarium 1998-). Diuris purdiei occurs from Perth south to near the Whicher Range, within the Swan (Western Australia) Natural Resource Management Region. It grows on sand to sandy clay soils, in areas subject to winter inundation, and amongst native sedges and dense heath with scattered emergent Melaleuca preissiana, Corymbia calophylla, E. marginata and Nuytsia floribunda (DEE 2017b).	**Unlikely** due to absence of preferred habitat.
Drakaea elastica	Endangered	T	A slender orchid to 30 cm tall with a prostrate, round to heart shaped leaf. Singular, bright green, glossy flower. *Drakaea elastica* is currently known only from the Swan Coastal Plain over a range of approximately 350 km between Cataby in the north and Busselton in the south. The species is known to grow on bare patches of sand within otherwise dense vegetation in low-lying areas alongside winter-wet swamps (DEE 2017b). The species typically grows in Banksia (*Banksia menziesii*, *B. attenuata* and *B. ilicifolia*) woodland or Spearwood (*Kunzea glabrescens*) thicket vegetation.	**Unlikely** due to absence of preferred habitat.

Species	Conservation status		Description	Potential to occur
	EPBC Act	WC Act		
Drakaea micrantha	Vulnerable	T	A tuberous, terrestrial herb which has a diminutive red and yellow flower, 1.2–2.5 cm long, on a stem that grows to 30 cm. Flowering occurs form September to October. Its heart-shaped leaf, about 1.5 cm long, is silvery grey with prominent green veins. Habitat for this species occurs within cleared firebreaks or open sandy patches that have been disturbed, where competition from other plants has been removed (Western Australian Herbarium 1998-, DEE 2017b).	**Possible** due to presence of preferred habitat.
Eleocharis keigheryi	Vulnerable	T	A rhizomatous, tufted/clumped perennial herb, reaching a maximum diameter of 40 cm. It has erect, smooth, green stems that are 20–40 cm tall and hollow, supporting cross bars that are 2 mm in diameter. This species grows in small clumps in a substrate of clay or sandy loam. This species is emergent in freshwater creeks, and transient waterbodies such as drainage lines and claypans in water to approximately 15 cm deep. Fringing woodland species and associated species include Swamp Sheoak (Casuarina obesa), Flooded Gum (Eucalyptus rudis), Red Robin Bush (Melaleuca lateritia), Swamp Paperbark (M. rhaphiophylla), Common Spike-sedge (Eleocharis acuta), Aponogeton hexatepalus, Veined Swamp Wallaby Grass (Amphibromus nervosus) and herbs such as Wurmbea, Tribonanthes and Leptocarpus spp. (Western Australian Herbarium 1998-, DotE 2015d).	**Unlikely** due to absence of preferred habitat.
Jacksonia gracillima	Not listed	P3	A spreading, compact shrub 100 cm tall and 100 cm wide. Flower buds are very angular and wings are orange with a darker orange keel. Habitat for this species occurs within winter wet Bassendean sands and littered, grey, peaty, loamy sand (Western Australian Herbarium 1998-).	**Unlikely** due to absence of preferred habitat.
Lepidosperma rostratum	Endangered	P4	A rhizomatous, tufted perennial, grass-like or herb (sedge), 50 cm tall. Flowers are brown and flowering occurs from May to June. Habitat for this species occurs in peaty sand or clay and within seasonally wet swamps (Western Australian Herbarium 1998-, DEE 2017b).	**Unlikely** due to absence of preferred habitat.
Styphelia filifolia	Not listed	P3	No habitat information available.	**Possible.** No information is available for this species, therefore the precautionary principle must be applied.
Synaphea sp. Fairbridge Farm	Critically Endangered	T	A dense, clumped sub-shrub 25–65 cm tall by 20–80 cm wide. Habitat for the species occurs on grey, clayey sand with lateritic pebbles in low woodland areas near winter-wet flats. Associated species include Running Postman (*Kennedia prostrata*), Grass Tree (*Xanthorrhoea preissii*), Cone Flowers (*Conostylis* sp.) and Dwellingup Synaphea (*Synaphea stenoloba*). Two subpopulations occur in seasonally wet Swamp Teatree (*Pericalymma ellipticum*) dominated shrubland, with Teatrees (*Leptospermum* sp.), Blue Lechenaultia (*Lechenaultia biloba*), Semaphore Sedge (*Mesomelaena tetragona*), *Adenanthos meisneri*, White Myrtle (*Hypocalymma angustifolium*) and Dwarf Sheoak (*Allocasuarina humilis*).	**Unlikely** due to absence of preferred habitat.

3.2.2 Field assessment results

A total of 16 native vascular plant taxa from 10 plant families were recorded within the Survey Area. The majority of taxa were recorded within the Fabaceae (four taxa) and Myrtaceae (four taxa) families (Table 2).

No flora species listed as Threatened under the *Wildlife Conservation Act 1950* (WC Act) or *Environment Protection and Biodiversity Conservation Act 1986* (EPBC Act), or Priority Flora species as listed by the DBCA were recorded during the field survey.

Table 2: Native flora taxa recorded within Survey Area

Family	Species
Dilleniaceae	*Hibbertia cuneiformis*
Ericaceae	*Conostephium pendulum*
Fabaceae	*Acacia saligna*
	Acacia stenoptera
	Gompholobium tomentosum
	Hardenbergia comptoniana
Haemodoraceae	*Conostylis aculeata*
Hemerocallidaceae	*Dianella revoluta*
Myrtaceae	*Corymbia calophylla*
	Eucalyptus marginata
	Eucalyptus gomphocephala
	Kunzea glabrescens
Proteaceae	*Banksia attenuata*
Restionaceae	*Desmocladus flexuosus*
Xanthorrhoeaceae	*Xanthorrhoea preissii*
Zamiaceae	*Macrozamia riedlei*

The following eleven exotic (*) and planted native (^) taxa were also recorded within the Survey Area:

- **Acacia longifolia*
- **Asparagus asparagoides*
- **Briza maxima*
- **Disa bracteata*
- **Ehrharta calycina*
- ^*Eucalyptus camaldulensis*
- **Gladiolus* sp.
- **Hypochaeris glabra*
- **Leptospermum laevigatum*
- **Pinus* sp.
- **Ursinia anthemoides.*

**Asparagus asparagoides* is a Declared Plant species in Western Australia pursuant to section 22 of the *Biodiversity and Agriculture Management Act 2007* (BAM Act) according to the Western Australian Department of Agriculture and Food (DAFWA 2017).

Threatened and Priority Flora

No threatened or priority flora were recorded within the Survey Area. Whilst the desktop assessment identified the potential for suitable habitat for *Caladenia huegelii* (T) and *Drakaea micrantha* (T) to be present, the field survey confirmed that neither species were likely to be present based on the observed habitat and size of the area.

Although the desktop assessment identified potential habitat for *Caladenia huegelii,* the survey area was considered too degraded for this species to be present given the species tends to favour vegetation with dense undergrowth (DEC 2009).

Drakaea micrantha is usually found on cleared firebreaks or open sandy patches that have been disturbed, where competition from other plants has been removed (Brown *et al.* 1998; Hearn *et al.* 2006). The survey area is degraded and therefore potentially meets the condition element for *Drakaea micrantha* habitat suitability, however, the paddock grasses and weeds present are likely to outcompete the species. In addition, use of the paddock for grazing purposes also contributes to the conclusion that the species is highly unlikely to be present.

Vegetation types

Two vegetation types were recorded within the Survey Area (Figure 5, Table 3). Vegetation types are also illustrated in Plate 1 - Plate 2.

Table 3: Vegetation type and condition within Survey Area

Vegetation type	Description	Area (ha) within Survey Area
VT1	Open woodland of ^*Pinus* spp. and ^*Eucalyptus camaldulensis* over mixed native and introduced species.	0.4
VT2	Closed grassland of planted pasture grasses with scattered **Pinus* sp., ^*Eucalyptus camaldulensis, Eucalyptus gomphocephala and Corymbia calophylla.*	3.2
Total		**3.6**

Vegetation condition

Vegetation condition ranged from Degraded (VT1) to Completely Degraded (VT2). Vegetation condition appeared to have been affected by historical clearing, replanting with non-native species and invasion of weedy species, in particular grasses (Keighery 1994; Figure 5, Table 8).

Table 4: Area (ha) covered by each vegetation condition category within the Survey Area

Condition rating	Area (ha) within Survey Area	Percentage of Survey Area
Degraded	0.4	11
Completely Degraded	3.2	89
Total	**3.6**	**100**

Threatened and Priority Ecological Communities

The following Threatened and Priority Ecological Communities were identified within 5 km of the Survey Area (Figure 4).

Table 5: Threatened and Priority Ecological Communities identified within 5 km of the Survey Area

Community identifier	Description	Conservation status	
		WC Act	EPBC Act
Banksia woodlands of the Swan Coastal Plain	Woodland community associated with the Swan Coastal Plain of southwest Western Australia. A key diagnostic feature is a prominent tree layer of Banksia, with scattered eucalypts and other tree species often present among or emerging above the Banksia canopy. The understorey is a species rich mix of sclerophyllous shrubs, graminoids and forbs. The ecological community is characterised by a high endemism and considerable localised variation in species composition across its range.	Various listings depending on floristic community type	Endangered
Subtropical and Temperate Coastal Saltmarsh	Variable community of salt-tolerant vegetation including grasses, herbs, sedges, rushes and shrubs, occurring within a relatively narrow margin of the Australian coastline within the subtropical and temperate climatic zones.	Priority 3	Vulnerable
SCP21c / component of broader Banksia woodlands of the Swan Coastal Plain community	Low lying Banksia attenuata woodlands or shrublands.	Priority 3	Vulnerable
SCP22 / component of broader Banksia woodlands of the Swan Coastal Plain community	Banksia ilicifolia woodlands.	Priority 3	Vulnerable
Wooded waterbird wetlands	Wooded wetlands that support colonial waterbird nesting areas. Located at Chandala, Booragoon Lake, unnamed wetland near Pinjarra, McCarleys Swamp.	Priority 2	Not listed

Database records indicate that the buffers of several instances of the Banksia Woodlands of the Swan Coastal Plain overlap the Survey Area; however, field results indicated the community was not present. The nearest location of the community lies immediately to the south of the Survey Area.

No other PECs or TECs were considered to be represented by the vegetation within the Survey Area.

Plate 1: VT 1

Plate 2: VT 2

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Figure 5: Vegetation Types (VTs) mapped within the survey area

Scale 1:1,000 at A3

0 10 20 30 m

N

Coordinate System: GDA 1994 MGA Zone 50
Note that positional errors may occur in some areas
Date: 8/03/2018
Author: JCrute
Source: Topography: Geoscience Australia 2011.

Legend

Significant tree

Survey area

Vegetation type

VT1 - Open woodland of ^*Pinus* spp., ^*Eucalyptus camaldulensis, Banksia attenuata* and *Corymbia calophylla* over mixed native and introduced species – Degraded

VT2 - Closed grassland of planted non-native pasture grasses with scattered ^*Pinus* sp., ^*Eucalyptus camaldulensis, Eucalyptus gomphocephala* and *Corymbia calophylla* – Completely Degraded

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4. Fauna

4.1 Threatened Fauna habitat

Database searches of NatureMap and the DEE Protected Matters Database were undertaken to determine the likelihood of any Threatened or Priority fauna species within the Survey Area, including a buffer around the boundary. The likelihood of these species occurring within the Survey Area is presented in Table 6.

The following species were considered likely to occur within the Survey Area based on the habitat assessment provided in Table 6.

- *Calyptorhynchus banksii* subsp. *naso* (Forest Red-tailed Black-Cockatoo)
- *Calyptorhynchus latirostris* (Carnaby's Cockatoo (short-billed black-cockatoo), Carnaby's Cockatoo)
- *Isoodon obesulus* (Southern Brown Bandicoot).

The following species were considered as potentially occurring within the Survey Area

- *Ardea ibis* (Cattle egret)
- *Lerista lineata* (Perth Slider, Lined Skink)
- *Merops ornatus* (Rainbow Bee-eater).

Table 6: Assessment of likelihood of conservation significant fauna species occurring within Survey Area

Species	Common name	Conservation status		Description	Likelihood of presence within Survey Area
		WC Act	EPBC Act		
Actitis hypoleucos	Common Sandpiper		IA	Occurs around coastal wetlands and some inland wetlands, muddy margins or rocky shores and rarely on mudflats, including man-made water bodies. Forages in shallow water or bare mud at the edges of wetlands. Roosting sites are typically on rocks or in roots of vegetation (e.g. mangroves), as well as artificial structures (DEE 2017b).	**Unlikely** due to absence of preferred habitat.
Ardea ibis	Cattle Egret		IA	Occurs in tropical and temperate grasslands, wooded lands and terrestrial wetlands, and is often associated with farmland and other man-made sites. Forages away from water on low lying grasslands, improved pastures and croplands. Roosts in trees or amongst ground vegetation in or near lakes and swamps (DEE 2017b).	**Possible** due to presence of preferred habitat.
Ardea modesta	Great egret, white egret		IA	Occurs in a wide range of wetland habitats, including swamps, river margins, lakes, flooded grasslands, pastures and agricultural lands, sewage treatment ponds, and salt pans (DEE 2017b).	**Unlikely** due to absence of preferred habitat.
Botaurus poiciloptilus	Australasian Bittern	T	Endangered	Occurs in terrestrial freshwater wetlands and, rarely, estuarine habitats. It favours wetlands with tall, dense vegetation, where it forages in still, shallow water up to 0.3 m deep, often at the edges of pools or waterways, or from platforms or mats of vegetation over deep water. The species favours permanent and seasonal freshwater habitats, particularly those dominated by sedges, rushes and/or reeds (e.g. Phragmites, Cyperus, Eleocharis, Juncus, Typha, Baumea, Bolboschoenus) or cutting grass (Gahnia) growing over muddy or peaty substrate (DEE 2017b).	**Unlikely** due to absence of preferred habitat.
Calidris acuminata	Sharp-tailed Sandpiper		IA	Prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation, also man-made water bodies including saltworks, sewage farms, and flooded paddocks, tending to occupy coastal mudflats mainly after ephemeral terrestrial wetlands have dried out, moving back during the wet season. Forages at the edge of the water of wetlands or intertidal mudflats, among inundated vegetation of saltmarsh, in sewage ponds, and flooded paddocks. Roosting occurs at the edges of wetlands and other locations in or near water (DEE 2017b).	**Unlikely** due to absence of preferred habitat.
Calidris canutus	Red Knot, Knot	T	Endangered	This species is migratory. Known habitat includes intertidal mudflats, sandflats and sandy beaches of sheltered coasts. This species is known around the coast of Australia and has a broad distribution. The greatest threat to this species is indirect and direct habitat loss (DEE 2017b).	**Unlikely** due to absence of preferred habitat.

Species	Common name	Conservation status		Description	Likelihood of presence within Survey Area
		WC Act	EPBC Act		
Calidris ferruginea	Curlew Sandpiper	T	Critically Endangered	This species is migratory. Known habitat includes intertidal mudflats in sheltered coastal areas, such as estuaries and non-tidal swamps and lakes near the coast (DEE 2017b). The species has been recorded less often inland around lakes, dams and bore drains with bare edges of mud or sand. The distribution of the species is limited by land clearing and disturbance at roost and feeding sites (DEE 2017b).	**Unlikely** due to absence of preferred habitat.
Calidris ruficollis	Red-necked Stint		IA	Occurs in intertidal mudflats, sandflats and sandy beaches of sheltered coasts, in estuaries, bays, inlets, lagoons and harbours, sandy ocean beaches. Occasionally seen on terrestrial saline wetlands near the coast and man-made water bodies such as sewage ponds and saltworks, but rarely use inland or freshwater swamps (DEE 2017b).	**Unlikely** due to absence of preferred habitat.
Calyptorhynchus banksii subsp. naso	Forest Red-tailed Black-Cockatoo	T	Vulnerable	Known habitat includes remnant eucalypt woodlands, especially Jarrah, Marri and Karri forest. The species is also known from the Perth metropolitan area and in remnant patches of native vegetation on land cleared for development or agriculture (DEE 2017b). Known to utilise Corymbia calophylla, *Corymbia citriodora, Allocasuarina fraseriana, Eucalyptus patens and Eucalyptus marginata as a foraging plant and C. calophylla as breeding habitat (Johnstone et al. 2011). The species is known at the Murdoch University campus, with significant counts of the species having been recorded (Finn et al. 2014).	**Likely** due to presence of preferred habitat and known records of the species in the local area.
Calyptorhynchus latirostris	Carnaby's Cockatoo (short-billed black-cockatoo), Carnaby's Cockatoo	T	Endangered	Known habitat includes remnant eucalypt woodlands, and shrubland or Kwongan heathland dominated by proteaceous species. The species is also known from the Perth metropolitan area and in remnant patches of native vegetation on land cleared for agriculture (DEE 2017b). Known to utilise C. calophylla, *C. citriodora, E. patens, E. marginata, X. preissii, A. fraseriana as a foraging plant, C. calophylla as breeding habitat and C. calophylla and E. marginata as roosting habitat (Johnstone et al. 2011). Known from Beeliar Regional Park, which includes areas of bushland on Murdoch University campus (CALM 2006). The species is known at the Murdoch University campus, with significant counts of the species having been recorded (Finn et al. 2014).	**Likely** due to presence of preferred habitat and known records of the species in the local area.
Charadrius dubius	Little Ringed Plover		IA	During the breeding season, prefers bare or sparsely vegetated sandy and pebbly shores of shallow standing freshwater pools, lakes or slow-flowing rivers. May also utilise temporary artificial habitats such as gravel pits, sewage works and industrial wastelands. Generally avoids rough or broken terrain, forest, cultivated land or pastures, and tall or dense vegetation including vegetated margins of inland waters. Breeding is in the vicinity of water, and often on small islands (BLI 2017). Considered a rare vagrant in Australia (Slater et al. 1986).	**Unlikely** due to absence of preferred habitat.

Species	Common name	Conservation status		Description	Likelihood of presence within Survey Area
		WC Act	EPBC Act		
Dasyurus geoffroii	Chuditch, Western Quoll	T	Vulnerable	Current habitat largely restricted to the southwest forests. The distribution of the species is limited by land clearing and predation by feral cats and foxes (DEE 2017b).	**Unlikely** due to absence of preferred habitat.
Falco peregrinus	Peregrine Falcon	S		Varied habitats, from rainforests to the arid zone. Requires abundant prey and secure nest sites, and prefers coastal and inland cliffs or open woodlands near water. Can be found in urban locations including nesting on city buildings (BLA 2017).	**Unlikely** due to absence of preferred habitat.
Isoodon obesulus	Southern Brown Bandicoot	P4		Known habitat is swampy and/or scrubby vegetation with dense cover, often feeds in adjacent forests and woodland that is burnt on a regular basis. The species will thrive in open habitat in the absence of introduced predators (DEC 2012). Known from Beeliar Regional Park, which includes areas of bushland on Murdoch University campus (CALM 2006).	**Likely** due to presence of preferred habitat and known records of the species in the local area.
Leioproctus contrarius	Short-tongued bee	P3		This is invertebrate fauna, which is outside the scope of this survey and will not be discussed further.	N/A.
Leipoa ocellata	Malleefowl	T	Vulnerable	The Malleefowl occurs in semi-arid and arid zones of temperate Australia, where it occupies shrublands and low woodlands that are dominated by mallee vegetation. It also occurs in other habitat types including eucalypt or native pine Callitris woodlands, acacia shrublands, Broombush Melaleuca uncinata vegetation or coastal heathlands (DEE 2017b).	**Unlikely** due to known distribution and absence of preferred habitat.
Lerista lineata	Perth Slider, Lined Skink	P3		Locally restricted to the south of the Swan River, where it inhabits coastal dunes, banksia / eucalypt woodlands and suburban gardens (Bush 2010).	**Possible** due to presence of preferred habitat.
Merops ornatus	Rainbow Bee-eater		Marine	Occurs mainly in open forests and woodlands, shrublands, and in various cleared or semi-cleared habitats, including farmland and areas of human habitation. It usually occurs in open, cleared or lightly-timbered areas that are often, but not always, located in close proximity to permanent water (DEE 2017b).	**Possible** due to presence of preferred habitat.
Numenius madagascariensis	Eastern Curlew, Far Eastern Curlew	T	Critically Endangered	Most commonly associated with sheltered coasts, large intertidal mudflats or sandflats, often with beds of seagrass during the no-breeding season. Occasionally, occurs on ocean beaches (often near estuaries), and coral reefs, rock platforms, or rocky islets. The birds are often recorded among saltmarsh and on mudflats fringed by mangroves, and sometimes within the mangroves. The birds are also found in coastal saltworks and sewage farms (DEE 2017b).	**Unlikely** due to absence of preferred habitat.
Oxyura australis	Blue-billed Duck	P4		Occupies permanent deep water-bodies in southern Australia, particularly in the Murray-Darling basin and southern Victoria. Found on terrestrial wetlands in temperate regions, that are freshwater to saline, and may be natural or artificial. Nests in rushes, sedges, Lignum Muehlenbeckia cunninghamii and paperbark Melaleuca (BLI 2017).	**Unlikely** due to absence of preferred habitat.

Species	Common name	Conservation status		Description	Likelihood of presence within Survey Area
		WC Act	EPBC Act		
Plegadis falcinellus	Glossy Ibis		IA	Preferred habitat for foraging and breeding are fresh water marshes at the edges of lakes and rivers, lagoons, flood-plains, wet meadows, swamps, reservoirs, sewage ponds, rice-fields and cultivated areas under irrigation. Occasionally found in coastal locations such as estuaries, deltas, saltmarshes and coastal lagoons. Within Australia, the largest contiguous areas of prime habitat is inland and northern floodplains (DEE 2017b).	**Unlikely** due to absence of preferred habitat.
Pluvialis squatarola	Grey Plover		IA	Nests in the high Arctic, outside of the breeding season the species frequents intertidal mudflats, saltmarshes and beaches, bays and estuaries (BLA 2017). Uncommon migrant around Australian mainland and Tasmania (Slater et al. 1986).	**Unlikely** due to absence of preferred habitat.
Pseudocheirus occidentalis	Western Ringtail Possum	T	Vulnerable	Habitat for this species is generally within areas of forest or woodland containing Peppermint trees (Agonis flexuosa) (DEE 2017b).	**Unlikely** due to absence of preferred habitat.
Rostratula australis	Australian Painted Snipe	T	Endangered	Generally inhabit shallow terrestrial freshwater (occasionally brackish) wetlands, including temporary and permanent lakes, swamps and claypans. Also use inundated or waterlogged grassland or saltmarsh and man-made water bodies. Typical sites include those with rank emergent tussocks of grass, sedges, rushes or reeds, or samphire; often with scattered clumps of lignum Muehlenbeckia or canegrass or sometimes tea-tree (Melaleuca) (DEE 2017b).	**Unlikely** due to absence of preferred habitat.
Tringa glareola	Wood Sandpiper		IA	Prefers open areas such as the margins of inland freshwater lakes and reservoirs, muddy marshlands, grassy stream banks, sewage farms, wet paddyfields, small temporary pools, permanent swamps, flooded grassland and irrigation channels (BLI 2017). Uncommon summer visitor to wooded swamps and lakes throughout the Australian mainland (Slater et al. 1986).	**Unlikely** due to absence of preferred habitat.
Tringa nebularia	Common Greenshank, greenshank		IA	Found in a wide variety of inland wetlands and sheltered coastal habitats of varying salinity. It occurs in sheltered coastal habitats, typically with large mudflats and saltmarsh, mangroves or seagrass. Habitats include embayments, harbours, river estuaries, deltas and lagoons and are recorded less often in round tidal pools, rock-flats and rock platforms. The species uses both permanent and ephemeral terrestrial wetlands, including swamps, lakes, dams, rivers, creeks, billabongs, waterholes and inundated floodplains, claypans and saltflats DEE 2017b).	**Unlikely** due to absence of preferred habitat.

4.2 Black cockatoo habitat

Three potential breeding habitat trees were recorded within or near the Survey Area (*Corymbia calophylla* and *Eucalyptus gomphocephala*) (Figure 5). No hollows were observed in any of the three trees.

Habitat foraging quality of each vegetation type is shown in Table 8 and was determined using the scale described in Table 7.

Table 7: Definition of black cockatoo foraging habitat within the Survey Area

Foraging quality	Justification
Excellent	High density of species suitable for foraging by black cockatoos (i.e. foliage cover of suitable species >60%) and presence of food sources at several strata (i.e. canopy, midstorey and understorey).
Good	High density of species suitable for foraging by black cockatoos (i.e. foliage cover of suitable species >60%) but food sources only present at one or two strata (i.e. canopy and midstorey).
Moderate	Moderate foraging value density of species suitable for foraging by black cockatoos (i.e. foliage cover of suitable species 20-40%) and food sources only present at one or two strata (i.e. canopy and midstorey).
Poor	Low density of species suitable for foraging by black cockatoos (i.e. foliage cover of suitable species 10-20%) and presence of food sources at only one stratum (i.e. canopy).
Very poor	Very low density of species suitable for foraging by black cockatoos (i.e. foliage cover of suitable species <10%) and presence of food sources at only one stratum (i.e. canopy).
Nil	Cleared areas - no suitable vegetation present.

Table 8: Vegetation types and black cockatoo foraging species within the Survey Area

Vegetation type	Black cockatoo foraging species	Foraging quality	Area (ha) within Survey Area
VT1	CBC – *Acacia saligna*, *Banksia attenuata*, *Corymbia calophylla*, *Eucalyptus marginata, Xanthorrhoea preissii* FRTBC - *Corymbia calophylla, Eucalyptus marginata*.	CBC - Very poor FRTBC – Very poor	0.4
VT2	CBC – *Corymbia calophylla, Eucalyptus marginata, Eucalyptus gomphocephala, Xanthorrhoea preissii* FRTBC – *Corymbia calophylla, Eucalyptus marginata.*	CBC - Very poor FRTBC – Very poor	3.2
		TOTAL	**3.6**

5. Discussion

The flora, vegetation and black cockatoo habitat assessment of the Survey Area was conducted during November 2017, which was prime flowering time for majority of species within the region. The field survey focussed on traversing the entire Survey Area to delineate vegetation types and is consistent with the requirements of a detailed flora and vegetation survey as specified in *Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA 2016).

The Survey Area falls within one broad-scale vegetation type, Bassendean 1001, of which 21.6% of the pre-European extent remains, as at the most recent assessment in 2016 (Government of Western Australia 2016). Two VTs were mapped within the Survey Area, an open woodland of ^*Pinus* spp. and ^*Eucalyptus camaldulensis* over mixed native and introduced species, and a closed grassland of planted pasture grasses with scattered ^*Pinus* sp., ^*Eucalyptus camaldulensis, Eucalyptus gomphocephala and Corymbia calophylla.*

VT1 appeared to have been at least partially cleared in the past, and replanted with non-native tree species. While some remnant native species were present or had regrown, this vegetation type was in Degraded condition and comprised a majority of introduced species. VT2 was essentially a paddock with sown pasture grasses and scattered native and non-native trees.

Sixteen native vascular plant taxa from 10 plant families as well as 11 exotic taxa were recorded from the Survey Area. One Declared Plant species pursuant to section 22 of the BAM Act , **Asparagus asparagoides*, was recorded within the Survey Area.

The following Threatened Flora have the potential to occur within the Survey Area (Table 1) based on habitat requirements:

- *Caladenia huegelii* (T)
- *Drakaea micrantha* (T).

No habitat information was available for two Priority Flora species identified by desktop searches. As such, the application of the precautionary principle should be applied and these species should be considered as potentially occurring within the Survey Area:

- *Dampiera triloba* (P3)
- *Styphelia filifolia* (P3).

No Threatened flora species as listed under section 178 of the EPBC Act or pursuant to Schedule 1 of the WC Act and as listed by Parks and Wildlife (2015) were recorded within the Survey Area. Whilst the desktop assessment identified the potential for suitable habitat for *Caladenia huegelii* (T) and *Drakaea micrantha* (T) to be present, the field survey confirmed that neither species were likely to be present based on the observed habitat and size of the area.

Additionally, no Priority flora species as listed by Western Australian Herbarium (1998-), including those listed above, were recorded.

The entire Survey Area was rated as Very Poor quality habitat for Carnaby's and Forest Red-tailed Black Cockatoo. The low quality was as a result of heavy historical disturbance of remnant vegetation within the Survey Area (i.e. removal of native vegetation and replacement with non-native species). Three potential black cockatoo nesting habitat trees (DBH >500 mm; two *Eucalyptus gomphocephala* and one *Corymbia calophylla*) were recorded within the Survey Area. No hollows were observed in any of these trees.

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Appendix 1
NatureMap and Protected Matters
Database search results

Australian Government
Department of the Environment and Energy

EPBC Act Protected Matters Report

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

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

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

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Coordinates
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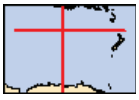

Summary

Matters of National Environmental 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:	1
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	1
Listed Threatened Species:	19
Listed Migratory Species:	17

Other Matters Protected by the EPBC Act

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

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

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

Commonwealth Land:	1
Commonwealth Heritage Places:	None
Listed Marine Species:	26
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Commonwealth Reserves Marine:	None

Extra Information

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

State and Territory Reserves:	None
Regional Forest Agreements:	None
Invasive Species:	40
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar) [Resource Information]

Name	Proximity
Forrestdale and thomsons lakes	Within 10km of Ramsar

Listed Threatened Ecological Communities [Resource Information]

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

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

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calyptorhynchus banksii naso Forest Red-tailed Black-Cockatoo, Karrak [67034]	Vulnerable	Species or species habitat known to occur within area
Calyptorhynchus latirostris Carnaby's Cockatoo, Short-billed Black-Cockatoo [59523]	Endangered	Species or species habitat known to occur within area
Leipoa ocellata Malleefowl [934]	Vulnerable	Species or species habitat likely to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat likely to occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area
Mammals		
Dasyurus geoffroii Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat likely to occur within area
Pseudocheirus occidentalis Western Ringtail Possum, Ngwayir, Womp, Woder, Ngoor, Ngoolangit [25911]	Vulnerable	Species or species habitat likely to occur

Name	Status	Type of Presence within area
Plants		
Andersonia gracilis Slender Andersonia [14470]	Endangered	Species or species habitat may occur within area
Caladenia huegelii King Spider-orchid, Grand Spider-orchid, Rusty Spider-orchid [7309]	Endangered	Species or species habitat known to occur within area
Diuris micrantha Dwarf Bee-orchid [55082]	Vulnerable	Species or species habitat likely to occur within area
Diuris purdiei Purdie's Donkey-orchid [12950]	Endangered	Species or species habitat likely to occur within area
Drakaea elastica Glossy-leafed Hammer Orchid, Glossy-leaved Hammer Orchid, Warty Hammer Orchid [16753]	Endangered	Species or species habitat likely to occur within area
Drakaea micrantha Dwarf Hammer-orchid [56755]	Vulnerable	Species or species habitat likely to occur within area
Eleocharis keigheryi Keighery's Eleocharis [64893]	Vulnerable	Species or species habitat may occur within area
Lepidosperma rostratum Beaked Lepidosperma [14152]	Endangered	Species or species habitat likely to occur within area
Synaphea sp. Fairbridge Farm (D. Papenfus 696) Selena's Synaphea [82881]	Critically Endangered	Species or species habitat may occur within area

Listed Migratory Species [Resource Information]

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

Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat known to occur

Name	Threatened	Type of Presence within area
Calidris ruficollis Red-necked Stint [860]		Species or species habitat known to occur within area
Calidris subminuta Long-toed Stint [861]		Species or species habitat known to occur within area
Charadrius dubius Little Ringed Plover [896]		Species or species habitat known to occur within area
Limosa limosa Black-tailed Godwit [845]		Species or species habitat known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat likely to occur within area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area
Philomachus pugnax Ruff (Reeve) [850]		Species or species habitat known to occur within area
Tringa glareola Wood Sandpiper [829]		Species or species habitat known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Species or species habitat known to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [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.

Name
Commonwealth Land -

Listed Marine Species [Resource Information]

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

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Breeding known to occur within area
Ardea ibis Cattle Egret [59542]		Species or species

Name	Threatened	Type of Presence
		habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat known to occur within area
Calidris ruficollis Red-necked Stint [860]		Species or species habitat known to occur within area
Calidris subminuta Long-toed Stint [861]		Species or species habitat known to occur within area
Charadrius dubius Little Ringed Plover [896]		Species or species habitat known to occur within area
Charadrius ruficapillus Red-capped Plover [881]		Species or species habitat known to occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
Himantopus himantopus Black-winged Stilt [870]		Species or species habitat known to occur within area
Limosa limosa Black-tailed Godwit [845]		Species or species habitat known to occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat likely to occur within area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area
Philomachus pugnax Ruff (Reeve) [850]		Species or species habitat known to occur within area
Recurvirostra novaehollandiae Red-necked Avocet [871]		Species or species habitat known to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat likely to occur

Name	Threatened	Type of Presence within area
Thinornis rubricollis Hooded Plover [59510]		Species or species habitat likely to occur within area
Tringa glareola Wood Sandpiper [829]		Species or species habitat known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Species or species habitat known to occur within area

Extra Information

Invasive Species [Resource Information]

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

Name	Status	Type of Presence
Birds		
Acridotheres tristis Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Carduelis carduelis European Goldfinch [403]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Passer montanus Eurasian Tree Sparrow [406]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Streptopelia senegalensis Laughing Turtle-dove, Laughing Dove [781]		Species or species habitat likely to occur

Name	Status	Type of Presence
		within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Turdus merula Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Funambulus pennantii Northern Palm Squirrel, Five-striped Palm Squirrel [129]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus norvegicus Brown Rat, Norway Rat [83]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Anredera cordifolia Madeira Vine, Jalap, Lamb's-tail, Mignonette Vine, Anredera, Gulf Madeiravine, Heartleaf Madeiravine, Potato Vine [2643]		Species or species habitat likely to occur within area
Asparagus aethiopicus Asparagus Fern, Ground Asparagus, Basket Fern, Sprengi's Fern, Bushy Asparagus, Emerald Asparagus [62425]		Species or species habitat likely to occur within area
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Asparagus plumosus Climbing Asparagus-fern [48993]		Species or species habitat likely to occur within area
Brachiaria mutica Para Grass [5879]		Species or species habitat may occur within area
Cenchrus ciliaris Buffel-grass, Black Buffel-grass [20213]		Species or species habitat may occur within area
Chrysanthemoides monilifera Bitou Bush, Boneseed [18983]		Species or species

Name	Status	Type of Presence
		habitat may occur within area
Chrysanthemoides monilifera subsp. monilifera Boneseed [16905]		Species or species habitat likely to occur within area
Genista sp. X Genista monspessulana Broom [67538]		Species or species habitat may occur within area
Lantana camara Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892]		Species or species habitat likely to occur within area
Lycium ferocissimum African Boxthorn, Boxthorn [19235]		Species or species habitat likely to occur within area
Olea europaea Olive, Common Olive [9160]		Species or species habitat may occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Protasparagus densiflorus Asparagus Fern, Plume Asparagus [5015]		Species or species habitat likely to occur within area
Protasparagus plumosus Climbing Asparagus-fern, Ferny Asparagus [11747]		Species or species habitat likely to occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Sagittaria platyphylla Delta Arrowhead, Arrowhead, Slender Arrowhead [68483]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
Salvinia molesta Salvinia, Giant Salvinia, Aquarium Watermoss, Kariba Weed [13665]		Species or species habitat likely to occur within area
Tamarix aphylla Athel Pine, Athel Tree, Tamarisk, Athel Tamarisk, Athel Tamarix, Desert Tamarisk, Flowering Cypress, Salt Cedar [16018]		Species or species habitat likely to occur within area
Reptiles		
Hemidactylus frenatus Asian House Gecko [1708]		Species or species habitat likely to occur within area

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

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

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

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

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

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

- migratory and
- marine

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

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

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

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

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

Coordinates

-32.071307 115.836944,-32.071307 115.836924,-32.071307 115.836944,-32.071878 115.836985,-32.07264 115.83721,-32.073142 115.838027,-32.072934 115.839111,-32.07309 115.84001,-32.072848 115.840725,-32.073385 115.841093,-32.073921 115.841154,-32.074389 115.841624,-32.074389 115.835064,-32.07264 115.835085,-32.071307 115.836944

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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NatureMap
Mapping Western Australia's biodiversity

NatureMap Species Report

Created By Guest user on 13/12/2017

Kingdom Plantae
Conservation Status Conservation Taxon (T, X, IA, S, P1-P5)
Current Names Only Yes
Core Datasets Only Yes
Method 'By Circle'
Centre 115° 50' 16" E,32° 04' 25" S
Buffer 2km

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
1.	1596	*Caladenia huegelii (Grand Spider Orchid)*		T	
2.	7485	*Dampiera triloba*		P3	
3.	20462	*Jacksonia gracillima*		P3	
4.	48297	*Styphelia filifolia*		P3	

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

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